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PLANNING REPORT NO. 30

Wisconsin-Regional-South East

Graduate Research Center
Dept. of Urban and Regional Planning
The University of Wisconsin
Old Music Hall, 925 Lathrop Dr.
Madison, Wisconsin 53706

A REGIONAL WATER QUALITY MANAGEMENT PLAN FOR SOUTHEASTERN WISCONSIN -- 2000



volume three

RECOMMENDED PLAN

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Planning Report No. 30

Wis - Region 1 S.E.

A REGIONAL WATER QUALITY MANAGEMENT PLAN FOR SOUTHEASTERN WISCONSIN: 2000

Volume Three

RECOMMENDED PLAN

Prepared by the

Southeastern Wisconsin Regional Planning Commission
P. O. Box 769
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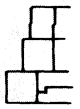
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June 21, 1979

STATEMENT OF THE CHAIRMAN

This is the third and final volume of the planning report setting forth the findings and recommendations of the areawide water quality management planning program conducted by this Commission within the Southeastern Wisconsin Region pursuant to the provisions of Section 208 of the Federal Water Pollution Control Act. It presents a plan for the attainment of clean and wholesome surface waters within the Region—surface waters that are "fishable and swimmable." Moreover, the plan would achieve such waters in a cost-effective manner.

The plan consists of five elements. The first element consists of a land use element setting forth recommendations with respect to the spatial and temporal location of urban development within the Region and for the preservation of the primary environmental corridors and the prime agricultural lands of the Region. This land use plan is the foundation of the other four elements of the areawide water quality management plan, and provides the means for relating those other four elements not only to each other but to the transportation, park and open space, flood control, and other functional plans prepared by this Commission. The second element is a point source pollution abatement element, which contains recommendations concerning the extent and location of sanitary sewer service areas; the location, type, and capacity of sewage treatment facilities and the level of treatment required at such facilities in order to meet the established water use objectives; the location and configuration of trunk sewers; the abatement of pollution from separate and combined sewer overflows; and the abatement of pollution from miscellaneous point source discharges, including industrial wastewater discharges. The third element is a nonpoint source pollution abatement element consisting of recommendations for the control of pollutant runoff from both rural and urban lands. The fourth element is a sludge management plan consisting of recommendations for the handling and disposal of residual sludges from public and private sewage treatment facilities. The fifth element consists of a recommendation for the establishment of a continuing water quality monitoring program within the Region. This report also sets forth the specific actions required by the various local, state, and federal units and agencies of government concerned to fully implement the plan over time. These recommendations may be thought of as a sixth plan element, the so-called "management plan" required by federal regulations.

The work of the Regional Planning Commission has to date been entirely advisory to its constituent units and agencies of government. Strictly speaking, this will remain true upon adoption and certification of the areawide water quality management plan. State and federal regulations, however, can be expected to operate in such a manner as to promote plan implementation in a positive manner. First, state and federal grants may be anticipated to be conditioned upon the conformance of water quality control projects with the adopted plan. Second, the issuance of permits under the Wisconsin Pollutant Discharge Elimination System by law may not conflict with the recommendations of the plan. Third, the sanitary sewer service areas associated with specific sewer extensions must conform by state regulation to the areas recommended in the plan. In spite of these state and federal measures, plan implementation can ultimately be achieved only through the cooperative action of all of the units and agencies of government concerned.

The plan presented in this report is the product of almost four years of intensive planning effort. This effort was culminated in a series of public informational meetings, a regional planning conference, and a formal public hearing in which the findings and recommendations of the work were subject to evaluation by public officials and interested citizens. The reaction to the plan at the informational meetings, conference, and hearing was largely favorable, reflecting the high degree of public participation in the plan formulation provided by the Technical Advisory Committee and by the Citizens Advisory Panel for Public Participation created by the Commission to assist in this effort. The Committee and Panel were comprised of distinguished public works officials, sanitary engineers, agricultural land management experts, representatives of major universities, state and federal agency representatives, and representatives of local units of government, as well as citizen leaders from across the Region, who unselfishly placed their knowledge and experience at the disposal of the Commission in the making of the water quality management plan.

The Commission hereby recommends this plan to all of the implementing agencies as a sound point of departure for the making of water quality management and related land use development decisions within the Region. In its continuing role as a coordinator of plan implementation activities within the Region, the Commission stands ready to assist those agencies in the implementation of the recommended areawide water quality management plan and, through such implementation, the attainment of a more healthful and attractive environment for life within the Region.

Respectfully,

George C. Berteau, Chairman

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Chapter I

INTRODUCTION

The major findings and recommendations of the areawide water quality management planning program for southeastern Wisconsin, a program conducted pursuant to Section 208 of the Federal Water Pollution Control Act, are presented in two Commission planning reports. The first report, SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin, sets forth the findings and recommendations of the planning program relative to the management of sludges generated and expected to be generated within the Region as a result of water and wastewater treatment. The second report, SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, is a three-volume planning report. The first volume sets forth the basic principles and concepts underlying the areawide water quality management planning program; discusses the relationship of that program to the Commission's comprehensive regional planning program for southeastern Wisconsin; describes the existing and man-made features of the Region which affect and are affected by water quality conditions; describes existing levels of, and historic trends in, water quality conditions in the lakes and streams of the Region together with the relationship of those conditions to established water use objectives and supportive water quality standards; describes the existing sources of water pollution in the Region including both point and diffuse sources; and describes the legal and financial structures which are available to support the implementation of recommended water quality management measures.[1]

The second volume of SEWRPC Planning Report No. 30 sets forth recommended water use objectives and supporting water quality standards for the lakes and streams of the Region; discusses anticipated future growth and change in population and economic activity levels and in land use development within the Region; and presents and evaluates alternative plans to meet the recommended water use objectives. The alternative plan evaluation includes consideration of the technical, economic, legal, and practical aspects of the plans as well as of the effects on water quality conditions in order to provide a sound basis for the selection of a recommended areawide water quality management plan for the Region.

This third and final volume of SEWRPC Planning Report No. 30 presents the recommended water quality management plan, consisting of a land use element, a point source pollution abatement element, an urban and rural nonpoint source pollution abatement element, a wastewater sludge management element, and a water quality monitoring element. In addition, plans for the protection and rehabilitation of the 100 major inland lakes within the Region are presented. The wastewater sludge management element set forth in SEWRPC Planning Report No. 29 is represented in summary form. Importantly, this third volume identifies the means of achieving the staged implementation of the recommended plan over the plan design period. An environmental assessment of the recommended plan has been separately published and is available from the Commission offices.

THE WATER QUALITY MANAGEMENT PLANNING PROCESS—A BRIEF REVIEW

The recommended areawide water quality management plan presented in this volume was developed by application of a seven-step planning process through which existing and probable future surface water quality conditions within the Region can be quantitatively described and evaluated in relation to alternative water use objectives and supporting water quality standards; and the effects of alternative land use and management and of alternative pollution abatement measures can be quantitatively estimated. The seven steps involved in this planning process are: 1) study organization and design, 2) formulation of objectives and standards, 3) inventory, 4) analysis and forecasts, 5) plan design, test, and evaluation, 6) plan selection and adoption, and 7) plan implementation. The previous two volumes of this planning report have dealt with the first five steps of this planning process. This volume deals with the final two steps, plan selection and adoption and plan implementation. A brief description of each of the seven steps comprising the planning process is contained in Volume One, Chapter II of this report, together with the basic principles and concepts underlying the areawide water quality management planning process. An elaboration on the two steps in the planning process with which this volume is concerned is warranted here.

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[1] *In addition to the referenced SEWRPC Planning Reports Nos. 29 and 30, the following SEWRPC reports have been compiled as part of the areawide water quality management planning program for southeastern Wisconsin: Technical Report No. 2 (revised edition), Water Law in Southeastern Wisconsin; Technical Report No. 6 (revised edition), Planning Law in Southeastern Wisconsin; Technical Report No. 17, Water Quality of Lakes and Streams in Southeastern Wisconsin: 1964-1975; Technical Report No. 18, State of the Art of Water Pollution Control in Southeastern Wisconsin, Volume One, Point Sources, Volume Two, Sludge Management, Volume Three, Urban Storm Water Runoff, and Volume Four, Rural Storm Water Runoff; Technical Report No. 21, Sources of Water Pollution in Southeastern Wisconsin: 1975; and SEWRPC Staff Memorandum, "Water Quality Simulation Modeling in Southeastern Wisconsin."*

Plan Selection and Adoption

The general approach used in the selection of one plan from among the considered alternatives was to proceed through the use of the Technical Coordinating and Advisory Committee structure through interagency meetings and hearings to a final decision and plan adoption by the Commission in accordance with the provisions of enabling state and federal legislation. Plan selection and adoption necessarily involve both technical and nontechnical policy determinations. Accordingly, plan selection and adoption must be founded in the active involvement in the planning process of the various governmental bodies, technical agencies, and private interest groups concerned with water quality management. Such involvement is particularly important in light of the advisory role of the Commission in shaping regional development. The use of advisory committees and both formal and informal public hearings appears to be the most practical and effective procedure available for involving public officials, technicians, and citizens in the planning process, and for openly arriving at agreement among the various interests on objectives and plans which can be jointly adopted and cooperatively implemented.

The selection of the recommended plan must focus primarily upon the degree to which the agreed-upon regional water use objectives are satisfied and upon the accompanying costs. Selection of the elements to be included in the final plan ultimately must be made by the responsible elected and appointed public officials concerned and not by the planning technicians, although the latter may properly make recommendations based upon evaluation of technical factors.

As an integral part of the areawide water quality planning program, a series of informal public informational meetings and a formal public hearing were held. The dates and locations of these meetings and the hearing, together with a summary of the public, Commission staff, and advisory committee reaction to the recommended plan, are set forth in Chapter II of this volume.

Plan Implementation

No plan may be considered complete unless it includes provisions to ensure and facilitate its implementation. The public participation, which was the key element in the regional water quality management planning process, should lead to a high degree of plan acceptability and, hence, eliminate one serious obstacle to plan implementation. However, plan acceptance and adoption alone cannot guarantee implementation. Moreover, Section 208 of the Federal Water Pollution Control Act requires explicit identification of plan implementation responsibilities through the designation of management agencies.

Implementation of the recommended plan requires that an institutional structure technically, legally, and financially capable of managing, financing, and coordinating plan implementation be identified. Accordingly, the regional water quality management planning program sought to identify those management agencies which have the authority and capability to effectively implement the various plan elements. Designations are set forth in Chapter III of this volume, together with recommendations for needed enabling legislation.

Chapter II

RECOMMENDED WATER QUALITY MANAGEMENT PLAN [1]

INTRODUCTION

The two previous volumes of this report have presented in summary form the basic information essential to sound regional water quality management planning. These volumes have described the existing and man-made features of the Region which affect and are affected by water quality conditions: the existing levels of, and historic trends in, water quality conditions in the lakes and streams of the Region, together with the relationship of those conditions to the currently adopted water use objectives and supporting water quality standards; the existing sources of water pollution in the Region, including both point and nonpoint, or diffuse, sources; and the legal and financial structures which are available to support the implementation of recommended water quality management measures. In addition, such volumes have set forth recommended revisions to the water use objectives and supporting water quality standards for the lakes and streams of the Region so as to achieve to the greatest extent practicable the national goal of "fishable and swimmable" waters. Finally, such volumes have set forth the anticipated future growth and change in population and economic activity levels and in land use development in the Region, and presented and evaluated alternative plans to achieve the desired water use objectives, given existing and probable future conditions within the Region. This alternative plan evaluation included consideration of the technical, economic, and legal aspects of the plans, as well as the effects on water quality conditions, in order to provide a sound basis for the selection of a recommended areawide water quality management plan for the Region.

This chapter builds on the inventories, analyses, forecasts, and alternative plan evaluations previously presented, setting forth a recommended means of abating water pollution from all known sources in the Region, together with the estimated costs of the recommended abatement measures. The selection of the recommended plan from among the various alternatives considered was based upon an evaluation of the many tangible and intangible factors bearing upon water pollution control—with primary emphasis, however, upon the degree to which the various alternatives, as described in Volume Two of this report, met the recommended water use objectives—and upon the accompanying costs. The plan selection process involved the extensive use of advisory committees, including the Citizens Advisory Panel on Public Participation, and both informal public meetings and a formal public hearing. It should be noted that in some cases the recommended water quality management plan elements presented herein represent a refinement of the elements selected from the alternatives presented in Volume Two, Chapter IV of this report. These refinements consist of such modifications to the initially developed alternatives as were deemed desirable upon agency review of these alternatives.

The recommended regional water quality management plan for southeastern Wisconsin consists of five major elements: a land use plan element, a point source pollution abatement plan element, a nonpoint source pollution abatement plan element, a sludge management plan element, and a water quality monitoring plan element. Each of these five elements is described below. Following this description, analyses are presented with respect to plan costs and the extent to which the recommended plan may be expected to meet the recommended water use objectives and supporting water quality standards. The final section of the chapter presents a summary discussion of the major issues raised in the development of the areawide water quality management plan.

LAND USE PLAN ELEMENT

The most fundamental and basic element of the regional water quality management plan is the land use element. The future distribution of urban and rural land uses will determine to a large degree the character, magnitude, and distribution of nonpoint sources of pollution, the practicality of as well as the need for various forms of sludge management, and, ultimately, the quality of the surface waters of the Region. Consequently, the selection of a regional land use plan is the first and most basic step in synthesizing a regional water quality management plan.

In a planning effort conducted concurrently with the areawide water quality management study, the Commission prepared and adopted on December 19, 1977, a new regional land use plan for the design year 2000. This plan is set forth in full in SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volume One, Inventory Findings, and Volume Two, Alternative and Recommended Plans. In addition, the Commission prepared and adopted on December 1, 1977, a regional park and open space plan, also for the design year 2000. This plan is set forth in full in SEWRPC Planning Report No. 27, A Regional Park and Open Space Plan for Southeastern Wisconsin: 2000. The regional

[1] *The plan set forth in this chapter is the preliminary recommended areawide water quality management plan. That plan was presented at a series of public informational meetings and a regional planning conference, and which was the subject of a formal public hearing. The plan was revised in several aspects following the public hearing, in response to public reaction to the plan. Changes to the plan as it is described in this chapter are set forth in Chapter IV of this volume beginning on page 225. A reading of this chapter and the changes to the plan set forth in Chapter IV will give the reader a clear understanding of both the preliminary recommended plan that was taken to public hearing and the final recommended plan that came out of the public hearing.*

land use plan and the regional park and open space plan were prepared in a fully integrated manner, with the regional park and open space plan constituting a refinement of the park, outdoor recreation, and open space recommendations contained in the regional land use plan. Although the regional land use plan and the regional park and open space plan are hereby incorporated in full by reference into the regional water quality management plan, a brief description of the basic land use plan element, as set forth in these two companion plan documents, is warranted here for convenience.

Basic Land Use Development Concepts

The design year 2000 land use plan for the Southeastern Wisconsin Region is shown in graphic summary form on Map 1. The regional land use plan seeks to centralize land use development to the greatest degree practicable; to encourage new urban development to occur at densities consistent with the provision of public centralized sanitary sewer, water supply, and mass transit facilities and services; to encourage new urban development to occur only in areas covered by soils well suited to urban use and not subject to special hazards, such as flooding; and to encourage new urban development and redevelopment to occur in areas in which essential urban facilities and services are available—particularly the existing urban centers of the Region—or into which such facilities and services can be readily and economically extended. While the plan continues to recognize the importance of the urban land market in determining the location, intensity, and character of future urban development within the Region, it proposes to regulate to a greater degree than in the past the effect of this market on development in order to promote a more orderly and economic settlement pattern; to avoid further intensification of the existing and the creation of new areawide developmental and environmental problems; and to generally channel the results of market forces into better conformance with sound, areawide land use development objectives.

Urban Development and Density

The recommended regional land use plan envisions converting about 113 square miles of land from rural to urban use over the period 1970 through 2000, substantially less than the approximately 235 square miles which would have to be converted under a continuation of the existing trends toward decentralization of urban development within the Region. The degree of centralization envisioned in the new plan is indicated by the fact that more than 60 percent of all new urban residential land, and about 49 percent of the incremental resident population, would be located within 20 miles of the central business district (CBD) of the City of Milwaukee. The plan envisions that new urban development would occur primarily in planned neighborhood units at medium-density population levels; that is, at about four dwelling units per net residential acre, or about 5,000 persons per gross square mile. The plan envisions that by the year 2000, about 92 percent of all urban land uses and about 93 percent of the resident population of the Region would be served with public sanitary sewer and public water supply services.

The plan recognizes that there will continue to be some demand within the Region for rural, or "country," living by nonfarm people. To a large extent in past years, this demand has been met through the development of subdivisions served by septic tanks and private wells with lot sizes ranging from less than one up to about three acres per dwelling unit. The new regional land use plan seeks to discourage this kind of development, since such growth represents neither sound rural nor sound urban development. Rather, the plan recommends that this portion of the housing market be satisfied through very low-density country estate-type development with lot sizes averaging at least five acres per dwelling unit. This type of rural residential development can effectively satisfy the demands for those nonfarm people within the Region who want to live in rural areas. With proper attention to soil and other natural resource base limitations, such development can be sustained without public sanitary sewer, water supply, or urban storm drainage facilities; high-value woodland and wetland areas can be preserved; and wildlife can continue to sustain itself in the area. The plan envisions that no more than 10 percent of the forecast increase in regional population be accommodated through such truly rural residential development.

Major Regional Commercial and Industrial Centers

The regional land use plan specifically addressed major retail and service and industrial centers. There were 12 major retail and service centers within the Region in 1970. The regional land use plan envisions retaining 11 of these existing major centers, and adding five new major retail and service centers. One of these new major centers—Northridge in Milwaukee—has already been developed. The second new major center—called Racine West—would supplant the existing Elmwood Plaza shopping area as a major center, and is proposed for development by 1980. A third new major retail and service center would be located in the City of Oak Creek. The remaining two new centers function today as the central business districts of the Cities of West Bend and Waukesha. The plan envisions that these two central business districts would be strengthened and improved through expansion in retail and service floor space so that by the year 2000 they could meet the criteria established for designation as a major regional center.

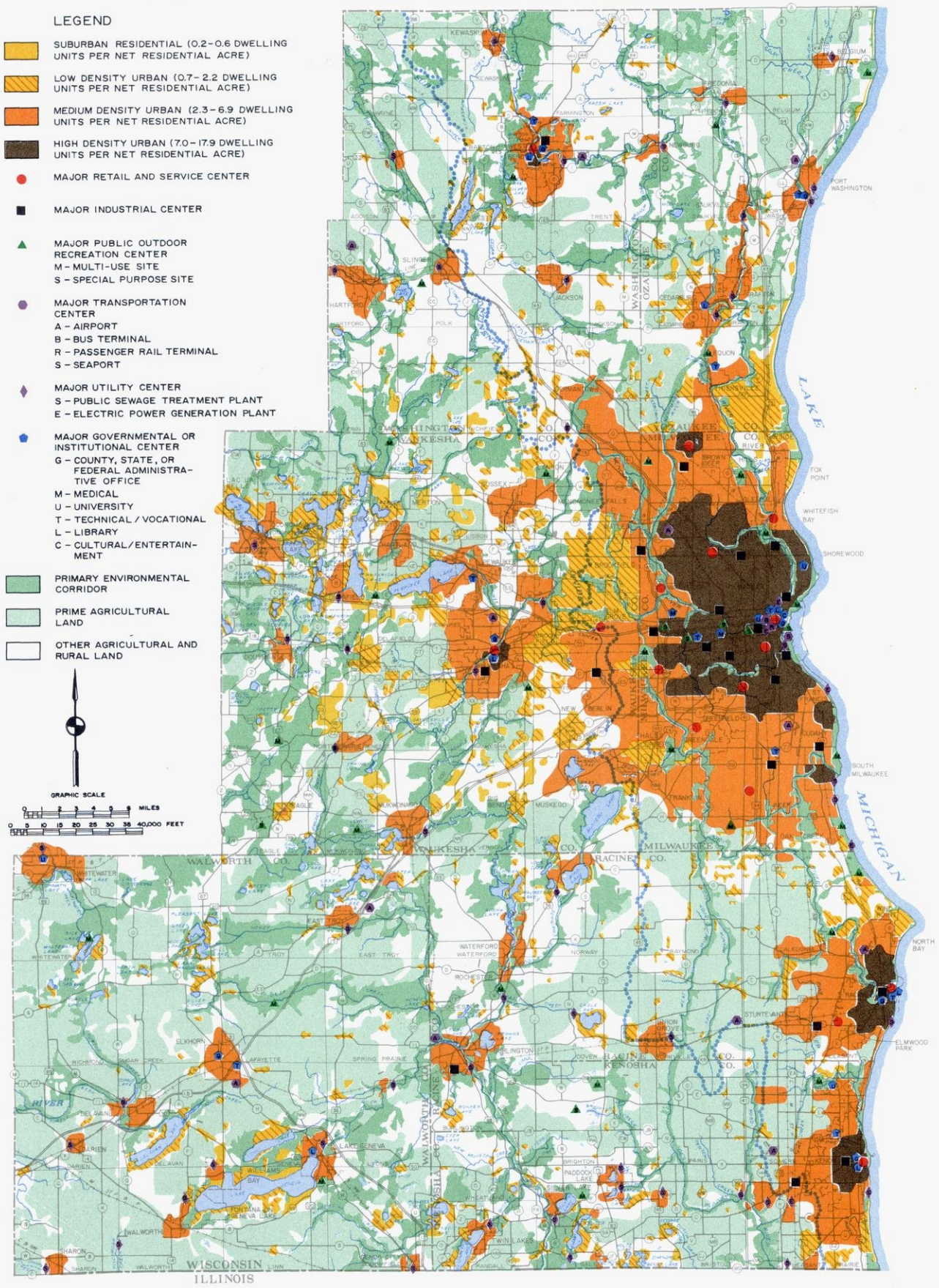
There were 17 major industrial centers in the Region in 1970. All 17 of these areas—including the major center in the Menomonee River Valley in the City of Milwaukee—are proposed to be retained in the recommended new regional land use plan. Five new major industrial centers are proposed to be added. These five centers are located on the western edge of Kenosha, in the Granville portion of the City of Milwaukee, and in the Cities of Oak Creek, Burlington, and Waukesha.

Park and Outdoor Recreation Areas

Under the regional land use and park and open space plans, the acreage of large parks, defined as parks having a site area greater than 100 acres, within the Region would be increased by about 48 percent, from 11,610 acres in 1973 to about 17,200 acres in the year 2000. About 4,180 acres, or 75 percent of the proposed 5,590-acre increase, would result from the public acquisition and development of 20 new large parks and the expansion of existing large parks. The remaining 1,410 acres would result from the development of existing parklands. By the year 2000 there would be

Map 1

ADOPTED REGIONAL LAND USE PLAN FOR SOUTHEASTERN WISCONSIN: 2000



The new year 2000 regional land use plan was designed for a resident population level of about 2.2 million persons, an increase of about 463,000 persons over the 1970 level. To accommodate this increase, the plan proposes to convert an additional 113 square miles of land from rural to urban use—less than one-half of the projected 235 square miles of land that would be converted under a continuation of existing trends. The plan seeks to encourage new urban development only in those areas of the Region which are covered by soils suitable for such development, which are not subject to special hazards such as flooding, and which can be readily provided with such urban services as sanitary sewer, water supply, and mass transit—the yellow, orange, and brown areas on the plan map. Development would be encouraged to occur at medium densities in planned neighborhood units providing a wide range of housing types and styles. The plan also seeks to preserve all of the remaining primary environmental corridors—the dark green areas on the plan map—in essentially natural open uses, thus protecting the best remaining woodlands, wetlands, and wildlife habitat areas as well as the undeveloped shorelands and floodlands, surface waters, and groundwater discharge and recharge areas from incompatible development. Finally, the plan seeks to preserve almost all of the remaining prime agricultural areas of the Region—the light green areas on the plan map—in agricultural use.

a total of 29 major public outdoor recreation centers in the Region, such centers being defined as those large parks having a site area of 250 acres or more. Of this total, 27 such sites existed in 1970, due in large part to implementation of the Commission's original design year 1990 regional land use plan. One new major public outdoor recreation center would be located on Sugar Creek in the Town of LaFayette, Walworth County, and the other in Paradise Valley in the Town of West Bend, Washington County. The adopted regional park and open space plan is graphically summarized on Map 2.

Under the recommended park and open space plan, all additional resource-oriented recreation facilities would be developed at existing or proposed large parks. Facility development proposals include the provision of five new public swimming beaches along Lake Michigan and five new inland swimming beaches; almost 220 new public camp sites; 12 new golf facilities; about 2,200 new picnic tables; 8 new public nature study areas; and 2 new public downhill skiing areas in the Region.

The park and open space plan also proposes the development of a recreation corridor network of a total length of about 437 linear miles. This network would accommodate trails for biking and hiking, horseback riding, and ski touring, and would connect many of the existing and proposed large parks. It is envisioned that biking and hiking trails would be developed throughout the entire 437-mile corridor network, together with about 113 mile miles of horseback riding trails, 45 miles of nature study trails, and 38 miles of ski touring trails.

The plan further recommends new or improved small boat water access points on 18 major inland lakes in the Region. Finally, the plan calls for the provision of 1,300 additional boat mooring slips and 19 additional boat launch ramps within harbors-of-refuge along the Lake Michigan shoreline. The achievement of the recommended water use objectives through implementation of the recommended regional water quality management plan described later in this chapter will be important to the full and beneficial use of all of these proposed outdoor recreation facilities.

Primary Environmental Corridors

The most important elements of the natural resource base of the Region, including the best remaining woodlands; wetlands; wildlife habitat areas; surface waters and associated undeveloped shorelands and floodlands; areas covered by organic soils; areas containing rough topography and significant geological formations; the best remaining sites having scenic, historic, and scientific values; groundwater recharge and discharge areas; and the best remaining potential park and related open space sites all have been found to occur together in linear patterns in the natural landscape. These linear patterns have been termed primary environmental corridors. Like the Commission's original design year 1990 regional land use plan, the year 2000 regional land use plan proposes that these environmental corridors be protected and preserved in essentially natural, open space use. Such protection and preservation is considered essential to the protection and wise use of the natural resource base and to the preservation of the Region's cultural heritage and natural beauty, and important to the enrichment of the physical, intellectual, and spiritual development of the resident population, as well as to the prevention of new and the intensification of existing environmental problems such as flooding and, importantly, water pollution. The topography, soils, and flood hazard existing in these corridors, moreover, make them poorly suited to intensive urban development of any kind, but well suited to recreational and conservancy uses.

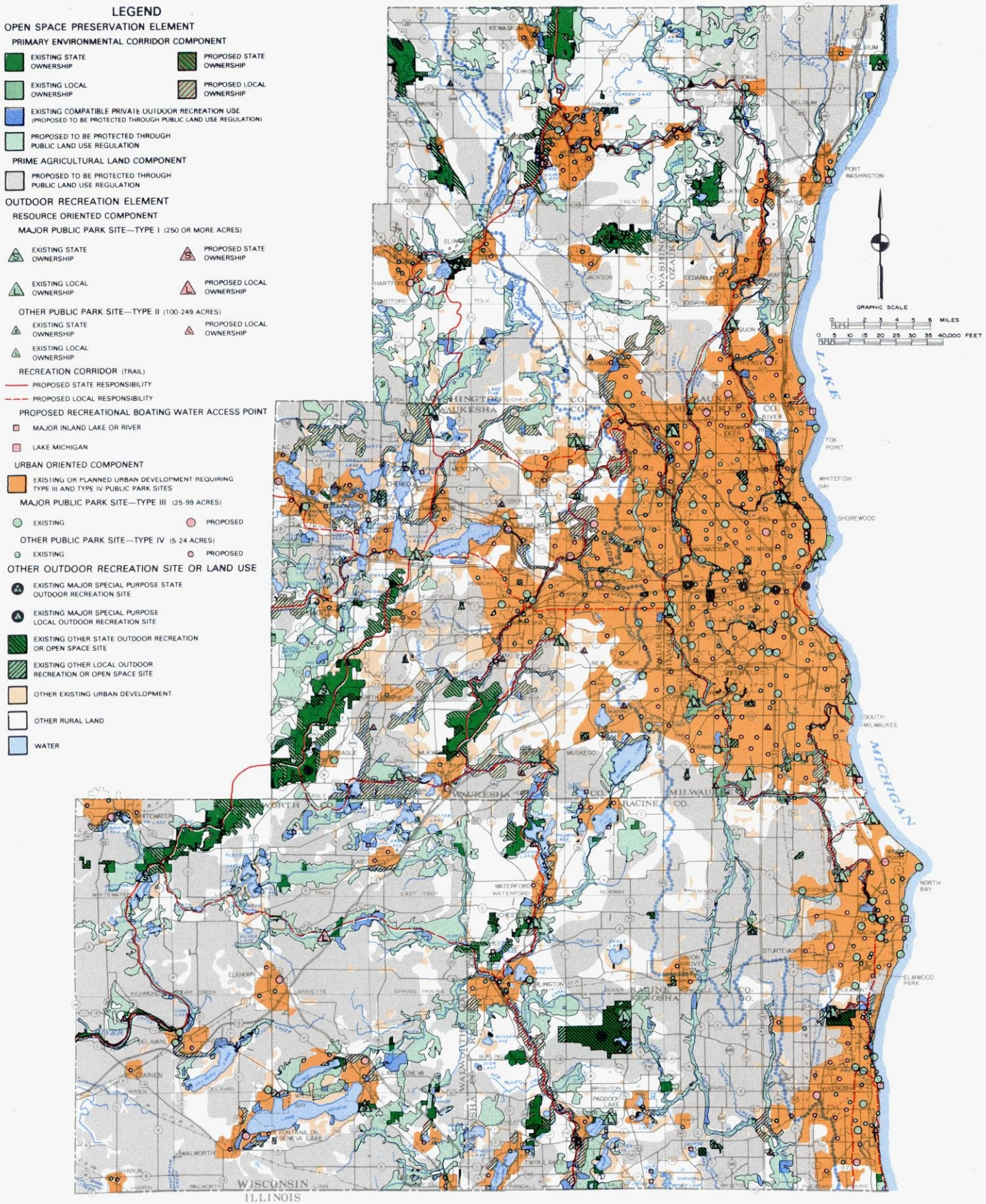
Together, these primary environmental corridors encompass about 542 square miles, or about 20 percent of the total area of the Region. Of this total, about 437 square miles, or 16 percent of the area of the Region, are considered "net" corridor; that is, not in an urban land use or covered by surface waters. The regional park and open space plan adopted by the Commission in 1977 includes definitive recommendations for the protection and preservation of these lands, including identifying which areas of the corridors should be publicly acquired and which should be preserved through private ownership and appropriate land use regulation. About 72 square miles, or 16 percent of the net corridor area, are already publicly owned. The adopted regional park and open space plan calls for public acquisition of an additional 113 square miles of net corridor, or an additional 25 percent. The remaining 252 square miles of net corridor land are recommended to be protected through appropriate local use controls.

Prime Agricultural Lands

Like the Commission's original design year 1990 regional land use plan, the design year 2000 regional land use plan proposes to preserve to the greatest extent practicable those areas of the Region identified as prime agricultural lands. In 1970 these lands totaled about 746 square miles, or 28 percent of the area of the Region. The year 2000 plan proposes to convert to urban use only those prime agricultural lands which have already been committed to urban development due to the proximity to existing and expanding concentrations of urban uses and the prior commitment of heavy capital investments in utility extensions. Only about 8,000 acres, or about 2 percent, of the prime agricultural lands would be converted to urban use under the plan.

The preservation of prime agricultural lands has important implications for water quality management planning. Prime agricultural land preservation will assist in the implementation of sound soil and water conservation practices and nonpoint source water pollution abatement measures, such as conservation tillage, crop rotation, contour plowing, cover crops, terracing, diversion structures and dikes, water and grade control structures, and grassed waterways, and will facilitate implementation of appropriate wind erosion measures, streambank erosion measures, and pesticide, fertilizer, and animal controls. Well-managed agricultural land contributes less pollutants to surface waters than urban land uses. However, landowners are willing to invest in such practices only on lands located in what are perceived to be "permanent"

ADOPTED REGIONAL PARK AND OPEN SPACE PLAN FOR SOUTHEASTERN WISCONSIN: 2000



The new year 2000 regional park and open space plan recommends that all of the remaining 437 square miles of net primary environmental corridor lands in the Region be preserved in essentially natural, open uses. Approximately 72 square miles of such corridor lands are already in public ownership. The plan recommends that approximately 113 additional square miles be purchased for preservation while the remaining 252 square miles be preserved through appropriate public land use regulations. The plan also recommends that the approximately 733 square miles of prime agricultural lands be protected through appropriate public land use regulation. Twenty large—greater than 100 acre—resource-oriented parks would be provided under the plan for resource-oriented recreation activities like camping, picnicking, and golf, and approximately 437 linear miles of recreation corridors would be provided for hiking, biking, and cross country skiing. The plan also proposes the provision of additional water access facilities on Lake Michigan, on major rivers, and on inland lakes in the Region. Finally, the plan proposes the provision of an additional 240 local parks, each less than 100 acres in area, for intensive nonresource-oriented recreation activities such as baseball, ice skating, and tennis.

agricultural areas. Investments in such practices will not likely be made on lands proposed to be converted to other uses. Accordingly, implementation of the prime agricultural land component of the regional land use plan element will be important to the implementation of the nonpoint source pollution abatement plan element and to the achievement of the recommended water use objectives and supporting water quality standards.

Development Policy Framework

The regional land use plan as depicted on Map 1 represents a traditional approach to the graphic display of a land use plan, emphasizing the desired physical location and arrangement of the various land uses required to meet the socioeconomic needs of the Region. An alternative approach to the graphic display of the plan is set forth on Map 3. Whereas the traditional approach portrays the recommended plan within the context of urban residential densities and specific concentrations of major land uses, this graphic alternative portrays the plan within a "development policy framework" context. Viewed within this context, the land use plan would divide the Region into two essentially different areas: an urban service area and a rural service area. Different development policies to guide future land use development would be implemented within each of these two service areas, the policies being keyed to the adopted regional land use development objectives. The policies would seek to restrict urban growth in the rural service areas through proper zoning and other land use controls while encouraging the preservation of agricultural and other open space lands. The policies would seek to encourage orderly urban growth in the urban service areas through the timely extension of public facilities and services, and through proper zoning and other land use controls.

The urban service area would be further divided into two components: that allotted to the outward expansion of the Milwaukee, Racine, and Kenosha urbanized areas and that allotted to the outward expansion of 12 freestanding urban growth centers. The urban service area would, by the design year of the plan, encompass an aggregate area of about 516 square miles, or about 81 percent of the total urban land in the Region. The resident population of this urban service area would be an estimated 1.88 million persons, or about 85 percent of the total regional population. The urban service area would also provide about 939,000 jobs, or about 93 percent of the total regional employment. A full range of urban services and facilities would be provided within the urban service area, including centralized sanitary sewer and water supply; solid waste collection; police, fire, and rescue services; and, in the Milwaukee, Racine, and Kenosha urbanized areas, mass transit facilities.

The Milwaukee, Racine, and Kenosha urbanized areas would, by the design year of the plan, encompass a total area of 453 square miles, or about 88 percent of the total areal extent of the urban service area within the Region and 71 percent of the total 635 square miles of urban land within the Region. These three urbanized areas would have an estimated design year population level of about 1.71 million, or about 91 percent of the design year urban service population and 77 percent of the total design year regional population. They would also provide an estimated 854,800 jobs, or 91 percent of the design year urban service area employment and 84 percent of the total design year regional employment.

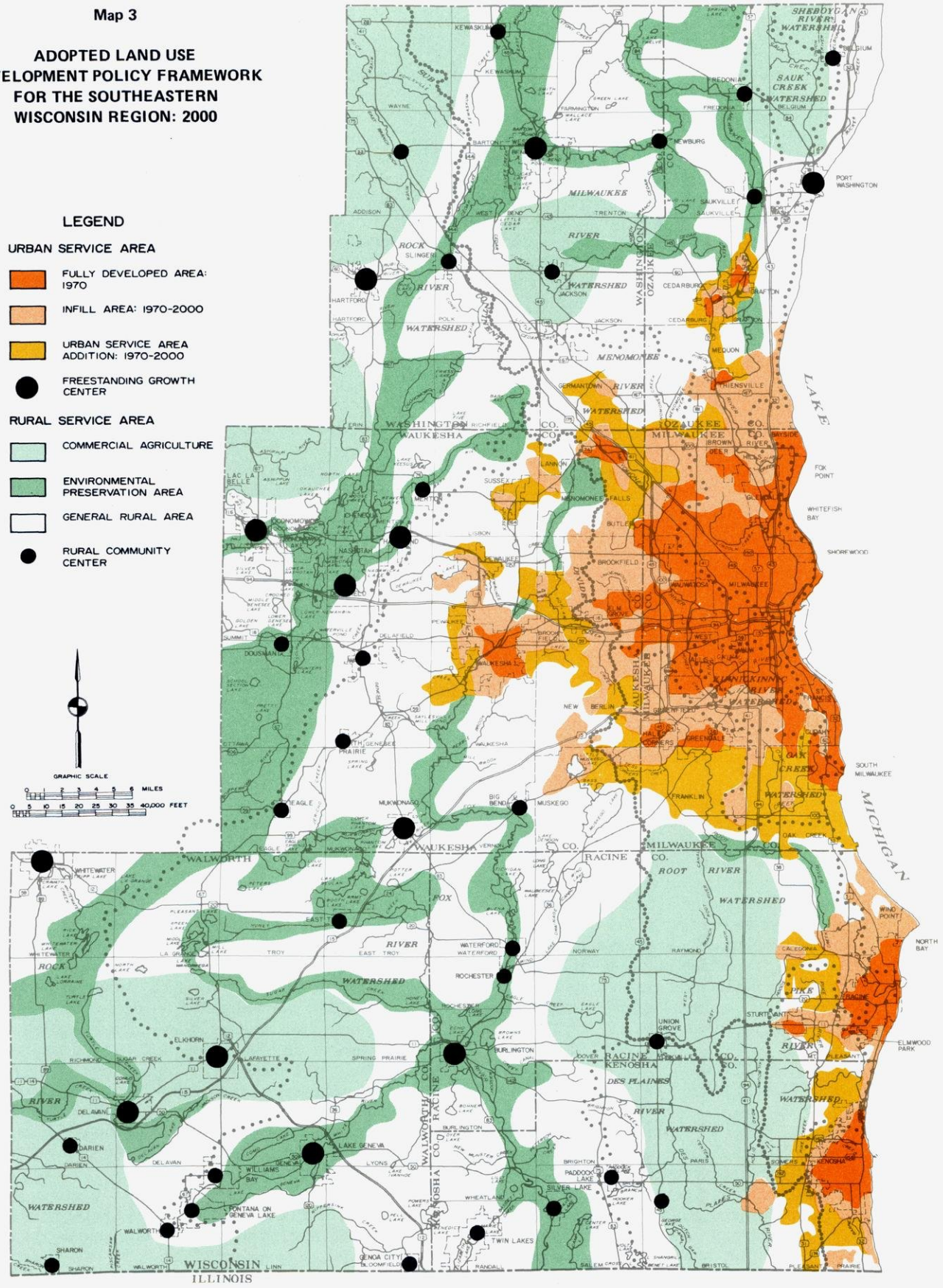
The growth management policy for the Milwaukee, Racine, and Kenosha urban areas would specifically seek to encourage the development and redevelopment of these urban areas in planned residential neighborhood units. Areas designated on Map 3 as "urban service area additions" would utilize this neighborhood concept. All new residential development would be properly serviced by public sanitary sewer and water supply facilities, and would contain within the immediate vicinity of each dwelling unit the full complement of public facilities needed by the family in its daily activities, such as elementary school and church and local park and convenience shopping centers. Also, all new residential development would provide ready access from residential areas to the regional transportation system. Such a policy would not only promote the efficient provision of community facilities and services to residential areas but would provide for the development of stable residential areas containing a wide range of housing types, designs, and costs, and would provide a desirable environment for family life.

The freestanding urban growth centers represent concentrations of urban activity outside of the Milwaukee, Racine, and Kenosha urbanized areas in predominantly rural areas of the Region. Each of the 12 proposed freestanding urban growth centers would have a resident population in the design year of at least 7,000 persons and a diversified economic base sufficient to provide at least 2,000 jobs. Altogether, the 12 freestanding urban growth centers proposed in the plan would, by the design year, encompass an area of 63 square miles, or about 12 percent of the total areal extent of the urban service area and about 10 percent of the total urban land in the Region. Together, these centers would have an estimated year 2000 resident population level of about 179,000 persons, or about 9 percent of the total urban service area population and about 8 percent of the total regional population. Such centers would together provide an estimated 84,500 jobs, or about 9 percent of the total urban service area employment and 9 percent of the total regional employment. Growth management policies to be encouraged within these freestanding growth centers would be similar in most respects to those instituted in the Milwaukee, Racine, and Kenosha urbanized areas.

The proposed rural service area consists of all lands in the Region outside the Milwaukee, Racine, and Kenosha urbanized areas and the 12 freestanding growth centers. The rural service area, or 81 percent of the total area of the Region, would contain only about 335,000 persons, or 15 percent of the design year regional population level, and would provide about 76,700 jobs, or about 7 percent of the design year employment level. The rural service area would, however, include an overwhelming majority of the regional agricultural and open space

Map 3

ADOPTED LAND USE DEVELOPMENT POLICY FRAMEWORK FOR THE SOUTHEASTERN WISCONSIN REGION: 2000



A display of the regional land use plan viewed within a development framework context highlights the rural-urban mix which would exist in the Region in the year 2000. The urban service area, which consists of the "cities" represented by the Milwaukee, Racine, and Kenosha urbanized areas and by 12 freestanding urban growth centers, would encompass about 516 square miles, or 19 percent of the total area of the Region. This area, however, would contain about 1.88 million persons, or 85 percent of the total population of the Region, and provide 939,000 jobs, or 93 percent of the total regional employment. The remaining rural service area, while encompassing 2,173 square miles, or 81 percent of the total area of the Region, would contain about 335,000 persons, or 15 percent of the year 2000 regional population, and 76,700 jobs, or 7 percent of the year 2000 regional employment.

Source: SEWRPC.

lands, as well as 28 rural community centers. Like the freestanding growth centers, almost all of these rural community centers would be provided with urban-type facilities and services, including centralized sanitary sewer and public water supply facilities. Such areas would, however, lack the population concentration and the diversified economic base to sustain a large employment level. Growth management policies in the rural service area should seek to preserve agricultural areas that should remain indefinitely in open natural use because of their unique productive capability, as well as other natural open areas containing significant elements of the natural resource base, and to maintain the stability of the rural community centers.

Thus, the regional land use plan, when viewed within a development framework context, highlights the rural-urban dichotomy which should exist in the Region in the design year of the plan with respect to land use. The graphic display of the plan in this context, as shown on Map 3, clearly indicates a stratification of urban areas ranging from rural community centers to freestanding growth centers to contiguous urban growth concentrations. The description of the latter by the categories of "fully developed areas," "infill areas," or "urban service area additions," rather than by ultimate residential density as indicated in the more traditional land use plan shown on Map 2, facilitates a better understanding of the various growth management policies that would have to be encouraged in order to implement the recommended land use plan for the year 2000 within each of these areas.

The development policy framework described above has important implications for water quality management planning. For example, from a policy perspective centralized sanitary sewer service would be provided to all of the urban service areas identified on Map 3. In addition, centralized sanitary sewer service could be provided as needed in the identified rural community centers. As a policy matter, however, such service would not be provided in the rural service area except as may be required to resolve existing severe public health and water pollution problems. Similarly, as a matter of policy, measures designed to reduce pollution from agricultural and other rural lands should be concentrated primarily in the rural service area, where investments should be made to encourage continued rural land uses.

POINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT

Point sources of water pollution include sewage treatment plant outfalls, industrial wastewater outfalls, and combined and separate sewerage system flow relief devices. Because pollutants associated with urban storm water runoff have discharge characteristics related to the tributary land uses and associated land management practices, urban storm sewer system discharges were considered nonpoint, or diffuse, sources of water pollution and are addressed under the plan element relating to the abatement of pollution from such sources.

The preparation of the areawide water quality management plan represents the beginning of the second cycle of system planning for point source water pollution control in southeastern Wisconsin. The first cycle of such planning consisted of the preparation of the regional sanitary sewerage system plan as documented in SEWRPC Planning Report No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin, and adopted in 1974. The completion of this first cycle of system planning was followed by a series of local facilities planning efforts that were intended to refine and detail the regional system plan and provide the basis for sewerage facility construction projects that would implement the regional plan. Thus, sewerage facility development proposals were initially advanced at the areawide systems level of planning and were refined for implementation at the local project planning. If a particular facility construction proposal advanced at the areawide systems planning level could not be implemented at the project level, that determination was taken into account in the next cycle of planning, beginning with the preparation of an updated systems plan.

The areawide water quality management plan was thus designed to build upon and incorporate all of the decisions made in the first cycle of systems and facilities planning. Certain modifications to and refinements of the original sanitary sewerage system plan were deemed necessary, including modifications and refinements resulting from the findings of local facilities planning studies and from the changes in future resident population, employment, and land use development patterns set forth in the new design year 2000 regional land use plan on which the new areawide water quality management plan was based. For convenience, a comparison of the major differences between the initial regional sanitary sewerage system plan and the new areawide point source pollution abatement element of the areawide water quality management plan is set forth later in this chapter.

The recommendations of the point source pollution abatement element of the areawide water quality management plan are intended to provide a guide that can be used by officials in evaluating proposals for the provision of sanitary sewerage facilities and services within the Region as such proposals arise. In some cases, the more detailed local facilities planning work required for system plan implementation is already underway. In other cases, detailed local facilities planning efforts will have to be undertaken as the initial step toward system plan implementation. Such detailed planning may properly result in modifications of and refinements to the recommendations contained in the point source pollution abatement element of the areawide water quality management plan.

The following section describes the recommended point source pollution abatement plan element. The description includes recommended sanitary sewer service areas; recommended sewage treatment facilities with recommended sizings and levels of treatment and means of disposal of treated wastes; required trunk sewers; recom-

mendations concerning abatement of combined sewer overflows; and recommendations concerning the abatement of miscellaneous point source discharges. In addition, a series of auxiliary point source-related plan recommendations is presented.

Sewer Service Areas

The areas within the Region recommended for sanitary sewer service by the plan design year 2000 are shown in graphic summary form on Map 4, as are the boundaries of the 11 subregional areas, as defined for alternative point source pollution abatement plan preparation purposes in Volume Two, Chapter IV of this report. The sewer service areas are based upon the adopted design year 2000 regional land use plan and represent refinements of the sewer service areas delineated in the adopted regional sanitary sewerage system plan.

The designated sewer service areas represent general delineations designed to accommodate urban growth within the Region until the year 2000. The precise placement of future urban development in both time and space within the broad conceptual framework of the adopted regional land use and regional water quality management plans is properly the responsibility of local public officials. Accordingly, a certain amount of flexibility is intended with respect to the boundaries of the designated sewer service areas in order to facilitate local planning and plan implementation. This flexibility derives from the need to provide for local preferences concerning such matters as population density, as well as to permit some latitude in plan implementation. Thus, the designated service areas are intended to accommodate, through refinement at the facilities planning stage, a broad range of housing types and styles, population densities, and commercial and industrial land use intensities, as well as, to the extent possible, the dictates of the urban land market, while meeting the agreed-upon areawide land use development and water quality management objectives. The preparation of local sewerage facilities plans is intended to provide the means to adjust the recommended sewer service areas to meet local needs and objectives within the framework of the areawide plan. It is recommended that the sewer service areas designated herein be utilized, along with duly prepared and adopted local refinements thereof, as the basis for the extension of public sanitary sewer service within the Region. Minor changes in sewer service area boundaries should be accommodated readily through the administration of the plan and the granting of sewer service extensions. Major changes in those boundaries and the creation of new sewer service areas should be accommodated in the continuing planning process as it involves areawide systems planning and local facilities planning.

In 1975 centralized sanitary sewer service in the Region was provided to a total area of about 353 square miles, or to about 13 percent of the total area of the Region. This area housed about 1.5 million persons, or about 86 percent of the resident population of the Region. The extension of centralized sanitary sewer service to all of the areas designated for such service on Map 4 would result in service being provided to a total area of about 640 square miles, or about 24 percent of the area of the Region. This would result in providing centralized sanitary sewer service to about 93 percent of the total anticipated year 2000 resident population of about 2.2 million persons (see Table 1). Of the 287 square miles of incremental sewer service area proposed in the plan, it is important to note that about 124 square miles consist of land already developed for urban purposes. In some cases, sewer service has already been extended to such areas since the program inventories were conducted in 1975, particularly including the existing urban development along the shorelines of Pewaukee Lake, Wind Lake, and Eagle Lake. Of the total increment in sewer service area, then, of about 287 square miles, about 163 square miles represent proposed new urban development.

While the areawide water quality management plan recommends the provision of centralized sanitary sewer service to much of the urban land use pattern identified in the adopted regional land use plan, some urban areas identified on that plan are not included within the recommended year 2000 sewer service areas. In most cases, these areas are relatively small, consisting of isolated enclaves of residential and commercial land uses located either along the shorelines of inland lakes or at rural highway intersections. Such areas were not included in a recommended sewer service area for a number of reasons, including the small size and isolated nature of some of this development, the presence of a significant number of seasonal homes, location in or adjacent to the Kettle Moraine State Forest and other environmentally sensitive areas where additional urban development should not be encouraged, or location on soils generally well suited for the use of onsite soil absorption sewage disposal systems. As described later in this chapter, the nonpoint source pollution abatement plan element recommends that detailed local studies be made of all such isolated enclaves of urban development as a step toward improved management of onsite sewage disposal facilities. Such detailed local studies may uncover serious existing or potential public health hazards or ground and surface water pollution problems, and could result in recommendations for the provision of additional public centralized sanitary sewer service within the Region.

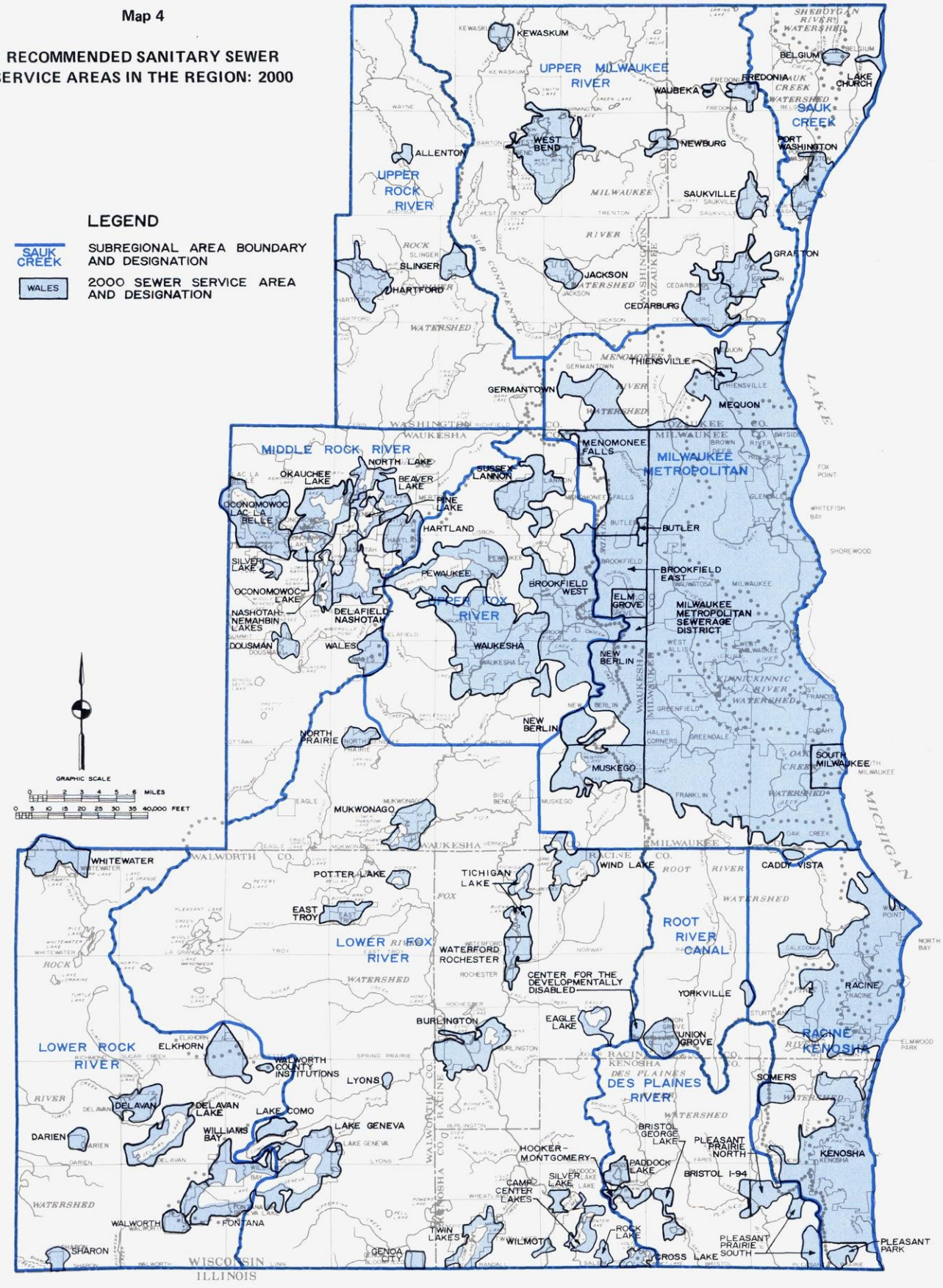
Public Sewage Treatment Facilities

The recommended point source pollution abatement plan element proposes to provide treatment for sewage generated in the recommended year 2000 sanitary sewer system service areas at a total of 48 public sewage treatment facilities. The location of these 48 recommended facilities is shown on Map 5, and the facilities are listed in Table 2, together with certain key design data for the facilities such as capacity and level of treatment proposed to be provided.

In order to meet the recommended water use objectives and supporting water quality standards for the streams in the Region, as well as to meet the water quality recommendations of the Lake Michigan Enforcement

Map 4

RECOMMENDED SANITARY SEWER SERVICE AREAS IN THE REGION: 2000



Eleven subregional areas were defined for purposes of preparing the point source pollution abatement plan element. These 11 areas are shown on this map, together with the 85 individual sewer service areas. These sewer service areas represent refinements of areas initially delineated in the design year 1990 regional sanitary sewerage system plan. Extension of sanitary sewer service to all of the above-shown areas would result in service being provided over a total area of about 640 square miles, or about 24 percent of the area of the Region. Of the 287 square miles of incremental sewer service area proposed in the plan, about 124 square miles consist of land already developed for urban purposes.

Source: SEWRPC.

Table 1

PUBLIC SANITARY SEWER SERVICE AREA AND POPULATION SERVED IN THE REGION BY SUBREGIONAL AREA: EXISTING 1975 AND RECOMMENDED LAND USE PLAN 2000

Subregional Area	Existing 1975								Recommended Plan 2000							
	Area Served (square miles)	Population Served[a]		Population Unserved		Total		Average Hydraulic Loading (mgd)	Area Served[b] (square miles)	Population Served[a]		Population Unserved		Total		Average Hydraulic Loading (mgd)
		Number	Percent	Number	Percent	Number	Percent			Number	Percent	Number	Percent	Number	Percent	
Milwaukee Metropolitan	230.78	1,093,200	96	44,600	4	1,137,800	100	209.75	317.94	1,273,500	99	6,200	1	1,279,700	100	247.86
Upper Milwaukee River	13.37	48,600	65	26,700	35	75,300	100	7.21	33.90	99,200	80	25,000	20	124,200	100	17.99
Sauk Creek	2.83	10,400	77	3,100	23	13,500	100	1.77	7.06	15,800	87	2,300	13	18,100	100	2.92
Kenosha-Racine	49.38	221,200	93	16,900	7	238,100	100	39.85	80.97	288,600	97	9,200	3	297,800	100	54.00
Root River Canal	0.97	4,600	41	6,700	59	11,300	100	0.62	4.17	8,400	58	6,000	42	14,400	100	1.46
Des Plaines River	2.65	4,800	40	7,200	60	12,000	100	0.45	11.07	11,400	64	6,500	36	17,900	100	2.10
Upper Fox River	24.46	76,300	70	33,000	30	109,300	100	13.34	68.39	150,500	91	15,600	9	166,100	100	28.93
Lower Fox River	11.09	31,300	37	54,100	63	85,400	100	3.78	44.99	81,900	65	44,000	35	125,900	100	15.89
Upper Rock River	2.56	9,700	38	15,500	62	25,200	100	1.60	8.28	21,900	52	19,900	48	41,800	100	4.17
Middle Rock River	4.44	16,500	40	25,100	60	41,600	100	2.43	36.83	55,900	79	14,900	21	70,800	100	10.88[b]
Lower Rock River	10.91	27,000	67	13,400	33	40,400	100	3.67	26.01	53,900	86	8,600	14	62,500	100	11.25
Total	353.44	1,543,600	86	246,300	14	1,789,900	100	284.47	639.61	2,061,000	93	158,200	7	2,219,200	100	397.45

[a] *Does not include seasonal resident population, or populations within proposed sewer service areas outside the Region.*

[b] *The total increment in sewer service area between 1975 and 2000 is 287 square miles. Of this total, 124 square miles represent urban development that existed in 1975 and was served by onsite septic tank sewage disposal systems.*

Source: SEWRPC.

Conference and the International Joint Commission Great Lakes Quality Board for Lake Michigan, the plan recommends that all 48 public sewage facilities provide advanced waste treatment. At 27 of the 48 plants, the plan recommends that the treated effluent be discharged to surface waters. At the remaining 21 plants, the plan recommends that the effluent be discharged to land through irrigation or other methods following secondary treatment and disinfection, with the advanced level of waste treatment being provided naturally through the soil mantle.

The selection of land disposal of effluent for 21 of the 48 recommended public sewage treatment facilities in the Region represents an attempt to use to the maximum extent possible the natural ability of the soil to purify sewage treatment plant effluent, and to thereby rely less heavily upon in-plant biological, chemical, and physical treatment processes to provide the advanced treatment for pollutant removal. Together, the 48 public sewage treatment facilities would provide a total design capacity of about 472 million gallons per day (mgd). Of this total, about 455 mgd would be given advanced waste treatment through biological, chemical, and physical processes and discharged to surface waters following disinfection. The remaining 17 mgd would be subject to conventional secondary waste treatment and disinfection, and then to advanced waste treatment through land application.

The feasibility of land application of sewage treatment plant effluent was one of the major issues addressed in the areawide water quality management planning program for southeastern Wisconsin. This issue, together with related issues of advanced waste treatment and phosphorus standards for surface waters, is discussed in the concluding section of this chapter. It should be noted here, however, that the recommendation to provide advanced waste treatment through land application of sewage effluent from conventional secondary treatment plants has been made on the basis of systems level analyses. In every case, it would be possible to provide advanced waste treatment through additional biological, chemical, and physical treatment prior to discharge of the effluent to surface waters.

The systems level analyses, however, indicated that land application at 21 of the 48 facilities, most of which are relatively small and located in the more rural areas of the Region, appears to be the best alternative treatment method available. In some cases, land application was found to be the least costly treatment method. In other cases, the cost of the land application alternative, while higher than the surface water discharge alternative, was found to be within 15 percent of the cost of the latter, and thus within the cost differential recognized by the U. S. Environmental Protection Agency (EPA) in its incentive grant program designed to encourage land application of sewage treatment plant effluent. In such cases the land application alternative was included in the recommended plan. It is recognized, however, that more detailed local facilities planning could result in a decision to provide an advanced level of waste treatment through other chemical, biological, and physical processes rather than through land application. Thus, it is not intended that the system level recommendation to provide for land application of treatment plant effluent constrain the more detailed evaluation of treatment alternatives in the preparation of local facilities plan. Similarly, where the system level plan envisions the discharge of sewage effluent to surface waters, it is not intended to constrain the reevaluation of the recommended treatment alternative, including land application, in the subsequent, more detailed, facilities planning. The

Table 2

RECOMMENDED TREATMENT LEVELS AND PERFORMANCE STANDARDS FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION: 2000

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Milwaukee Metropolitan						
Milwaukee Metropolitan Sewerage District--Jones Island Plant	Milwaukee Metropolitan Sewerage District Mequon Thiensville Germantown Menomonee Falls Butler Brookfield-East Elm Grove New Berlin Muskego Caddy Vista	200.0	1,250,900	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Milwaukee Metropolitan Sewerage District--South Shore Plant		120.0		Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of South Milwaukee	South Milwaukee	2.67	22,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Upper Milwaukee River						
Village of Kewaskum	Kewaskum	0.93	4,900	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Disinfection	Fecal Coliform Concentration: 200/100 ml
City of West Bend	West Bend	8.03	41,600	Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Disinfection	Fecal Coliform Concentration: 200/100 ml
Village of Jackson	Jackson	1.24	6,000	Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Disinfection	Fecal Coliform Concentration: 200/100 ml
					Effluent Aeration	Dissolved Oxygen in Effluent: 6.0 mg/l
Village of Newburg	Newburg	0.45	2,400	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Fredonia	Fredonia Waubeka	0.54	2,700	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Grafton	Grafton	2.56	16,800	Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Disinfection	Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
City of Cedarburg	Cedarburg	3.07	18,300	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Saukville	Saukville	1.17	6,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Sauk Creek City of Port Washington	Port Washington	2.56	13,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Belgium	Belgium Lake Church	0.36	2,200	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/1 Fecal Coliform Concentration: 200/100 ml
Kenosha-Racine City of Racine	Racine	26.2	153,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/1 Phosphorus Discharge: 1.0 mg/1 Fecal Coliform Concentration: 200/100 ml
City of Kenosha	Kenosha Somers Pleasant Park	27.8	135,100	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/1 Phosphorus Discharge: 1.0 mg/1 Fecal Coliform Concentration: 200/100 ml
Root River Canal Village of Union Grove	Union Grove Center for the Developmentally Disabled	1.39	8,300	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Yorkville Sanitary District No. 1	Yorkville	0.07	100	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Des Plaines River						
Town of Pleasant Prairie Sewer Utility District D	Pleasant Prairie-North Bristol-IH 94	0.85	3,300	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Pleasant Prairie Sanitary District No. 73-1	Pleasant Prairie-South	0.22	1,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Salem Sewer Utility District No. 1	Paddock Lake Hooker-Montgomery Lakes	0.71	5,100	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Bristol Sewer Utility District No. 1	Bristol-George Lakes	0.32	2,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Upper Fox River						
City of Brookfield	Brookfield-West Sussex-Lannon Pewaukee	13.4	72,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml
City of Waukesha	Waukesha	15.5	77,900	Secondary Advanced Auxiliary	Trickling Filter Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Lower Fox River						
Village of Mukwonago	Mukwonago	1.66	9,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml
Village of East Troy	East Troy Potter Lake	1.20	6,700	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of Lake Geneva	Lake Geneva Lake Como	3.18	17,300	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Lyons Sanitary District No. 2	Lyons	0.15	700	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Genoa City	Genoa City	0.22	1,800	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Norway Sanitary District No. 1	Wind Lake	1.55	7,400	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Dover-Eagle Lake Sewer Utility District No. 1	Eagle Lake	0.38	1,800	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Western Racine County Sewerage District	Waterford-Rochester Tichigan Lake	1.50	9,400	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml
City of Burlington	Burlington	2.70	16,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Silver Lake	Silver Lake	0.38	2,400	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Twin Lakes	Twin Lakes	1.00	6,200	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Salem Sanitary District No. 2	Camp-Center Wilmot Cross Lake Rock Lake	1.61	7,700	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml
Village of North Prairie	North Prairie	0.36	1,700	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Upper Rock River Allenton Sanitary District No. 1	Allenton	0.33	2,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Village of Slinger	Slinger	0.81	4,400	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of Hartford	Hartford	3.03	15,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Middle Rock River City of Oconomowoc	Oconomowoc- Lac La Belle Oconomowoc Lake Okauchee Lake North Lake Pine Lake Beaver Lake Silver Lake	6.52	33,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Delafield-Hartland Water Pollution Control Commission	Hartland Delafield-Nashotah Nashotah-Nemahbin Lakes	3.37	18,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Dousman	Dousman	0.34	2,100	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Wales	Wales	0.65	3,100	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Lower Rock River City of Whitewater	Whitewater	3.37	19,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 2 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Walworth County Metropolitan Sewerage District	Delavan Delavan Lake Elkhorn Walworth County Institutions	4.08	23,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Darien	Darien	0.35	2,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Walworth	Fontana Williams Bay Walworth	3.12	15,200	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogem Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Sharon	Sharon	0.33	2,600	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Indicates performance standards recommended if effluent land application is not selected and implemented.

[a] *See Map 4.*

[b] *The recommended sewage effluent concentrations set forth in this table are directly related to the sewage treatment levels recommended in the plan, and to the type of sewage treatment assumed for analytical purposes in the planning program. The recommended levels of treatment and their attendant effluent concentrations are those which were found sufficient, based upon the regional systems level analyses, to meet the water quality standards associated with the recommended water use objectives. The recommended effluent standards should be regarded as preliminary in nature and subject to refinement based upon detailed instream water quality and related effluent limitation studies which more precisely reflect localized stream conditions and such factors as seasonal variations. Thus, the recommended effluent limitations set forth in this table are not meant to be directly incorporated into waste discharge permits issued by the Wisconsin Department of Natural Resources. The recommended effluent concentrations do, however, represent what a well-operated plant will achieve given the influent characteristics and the particular configuration of treatment levels and processes assumed for systems planning purposes.*

[c] *Recommended sewage effluent criteria for suspended solids are not specifically provided in this table. However, values of suspended solids are expected to correlate closely with effluent BOD_5 values. Estimates of the suspended solids concentrations associated with each set of treatment levels are discussed in greater detail in Volume Two, Chapter IV of this report and in SEWRPC Technical Report No. 18, State of the Art of Water Pollution Control in Southeastern Wisconsin, Volume One, Point Sources.*

Source: SEWRPC.

system level planning process has, however, identified those cases in which land application appears to be the most attractive alternative available for providing the required level of sewage treatment.

It is estimated that approximately 7,000 acres of land, or less than 1 percent of the agricultural land in the Region, would be required for the application of wastewater from these 21 facilities.

Full implementation of the recommended point source pollution abatement plan element would permit the abandonment of 21 existing public sewage treatment facilities. These facilities are shown on Map 5 and listed in Table 3. Implementation of the recommended plan would require the construction of eight new sewage treatment plants in the Region.[2] These facilities are also

[2] *One of the eight new sewage treatment plants would serve the Town of Yorkville Sanitary District No. 1. The plan envisions that the private sewage treatment plant now serving the Racine County Highway and Park Commission Building would be expanded and upgraded to become the new Yorkville plant.*

Table 3

PUBLIC SEWAGE TREATMENT FACILITIES PROPOSED TO BE ABANDONED UPON FULL IMPLEMENTATION OF THE RECOMMENDED WATER QUALITY MANAGEMENT PLAN FOR THE REGION: 2000

Public Sewage Treatment Facility to be Abandoned (by subregional area)	Agency or Unit of Government Operating the Facility	Effluent Discharge	Public Sewage Treatment Facility to Provide Service Following Abandonment
Milwaukee Metropolitan			
Hales Corners	Milwaukee Metropolitan Sewerage District	Minor Tributary to Root River	Milwaukee Metropolitan Sewerage District
Rawson Homes[a]	Rawson Homes Sewer and Water Trust	Minor Tributary to Root River	Milwaukee Metropolitan Sewerage District
Thiensville	Village of Thiensville	Pigeon Creek	Milwaukee Metropolitan Sewerage District
Caddy Vista	Caddy Vista Sanitary District	Root River	Milwaukee Metropolitan Sewerage District
Germantown	Village of Germantown	Menomonee River	Milwaukee Metropolitan Sewerage District
Muskego–Big Muskego Lake Plant	City of Muskego	Big Muskego Lake	Milwaukee Metropolitan Sewerage District
Muskego–Northeast District Plant	City of Muskego	Seepage Lagoon--Overflow to Tess Corners Creek	Milwaukee Metropolitan Sewerage District
New Berlin--Regal Manors Plant	City of New Berlin	Deer Creek	Milwaukee Metropolitan Sewerage District
Menomonee Falls--Pilgrim Road Plant	Village of Menomonee Falls	Menomonee River	Milwaukee Metropolitan Sewerage District
Menomonee Falls--Lilly Road Plant	Village of Menomonee Falls	Menomonee River	Milwaukee Metropolitan Sewerage District
Upper Milwaukee River			
None	--	--	--
Sauk Creek			
None	--	--	--
Kenosha-Racine			
Pleasant Park	Pleasant Park Utility Company, Inc.	Ditch Tributary to Lake Michigan	City of Kenosha
Somers	Town of Somers Sanitary District No. 2	Pike River	City of Kenosha
Sturtevant	Village of Sturtevant	Minor Tributary to Pike River	City of Racine
North Park	North Park Sanitary District	Ditch Tributary to Lake Michigan	City of Racine
Root River Canal			
None	--	--	--
Des Plaines River			
Paddock Lake	Village of Paddock Lake	Brighton Creek	Town of Salem Sewer Utility District No. 1
Upper Fox River			
Pewaukee	Village of Pewaukee	Pewaukee River	City of Brookfield
Sussex	Village of Sussex	Sussex Creek	City of Brookfield
Lower Fox River			
None	--	--	--
Upper Rock River			
None	--	--	--
Middle Rock River			
Hartland	Village of Hartland	Bark River	Delafield-Hartland Water Pollution Control Commission
Lower Rock River			
Elkhorn	City of Elkhorn	Jackson Creek	Walworth County Metropolitan Sewerage Commission
Fontana	Village of Fontana	Seepage Lagoon–Overflow to Lake Geneva	Village of Walworth
Williams Bay	Village of Williams Bay	Seepage Lagoon	Village of Walworth

[a] *Facility abandoned as of 1977.*

Source: SEWRPC.

shown on Map 5 and are listed in Table 4. Thus, full implementation of the plan would result in a net decrease of 13 public sewage treatment plants within the Region by the design year .[3]

Recommended sewage treatment levels and performance standards, average hydraulic design capacities, and population levels to be served by the year 2000 for each of the 48 recommended public sewage treatment facilities in the Region are set forth in Table 2. Detailed cost estimates for the recommended construction of new plants and for improvements at existing plants are set forth in Table 5. The following discussion summarizes the public sewage treatment facility recommendations contained in the point source pollution abatement plan element by subregional area as those areas are identifed on Map 4.

Milwaukee Metropolitan Subregional Area: As discussed in Volume Two, Chapter V of this report, the regional water quality management plan incorporated the sewage treatment plant recommendations set forth in the adopted regional sanitary sewerage system plan for the Milwaukee metropolitan subregional area. The plan proposes that three public sewage treatment plants serve this subregional area in the year 2000. These three facilities are the Jones Island and South Shore plants operated by the Milwaukee Metropolitan Sewerage District and the South Milwaukee plant operated by the City of South Milwaukee. All three plants are recommended to provide an advanced level of waste treatment for phosphorus removal. Together, the three plants are anticipated to serve a total population of about 1.27 million persons by the year 2000, representing nearly all of the anticipated year 2000 population of this subregional area. The Milwaukee metropolitan sewerage system would constitute by far the single largest and most significant sanitary sewerage system in the Region in 2000 as it did in 1975.

A total of 10 existing public sewage treatment facilities would be abandoned upon full implementation of the recommended water quality management plan in the Milwaukee metropolitan subregional area. These consist of the Hales Corners facility operated by the Milwaukee Metropolitan Sewerage District; the Rawson Homes facility in the City of Franklin operated by the Rawson Homes Sewer and Water Trust;[4] the Thiensville facility operated by the Village of Thiensville; the Caddy Vista facility operated by the Caddy Vista Sanitary District in the Town of Caledonia; the Germantown facility operated by the Village of Germantown; the Big Muskego Lake and Northeast District facilities operated by the City of Muskego; the Regal Manors facility operated by the City of New Berlin; and the Pilgrim Road and Lilly Road facilities operated by the Village of Menomonee Falls.

A major local (Section 20) sewerage facilities planning program for the Milwaukee subregional area was begun by the Milwaukee Metropolitan Sewerage District as the regional (Section 208) planning effort was drawing to a close. This facilities planning effort is being conducted in part in response to requirements stemming from both intrastate and interstate litigation. With respect to treatment plants, both the intrastate and interstate litigation have resulted in, performance standards in terms of effluent limitations that differ, in some cases substantially, from the performance standards recommended in the areawide water quality management plan. These various performance standards are summarized in Table 6. Of particular importance in this respect are the performance standards set forth in the stipulation with the State of Illinois that call for the Jones Island and South Shore treatment plants to achieve an effluent quality of 5.0 milligrams per liter (mg/l) of five-day biochemical oxygen demand (BOD_5) and 5.0 mg/l of suspended solids as measured on a 30-consecutive-day average basis. A similar situation exists with respect to the South Milwaukee sewage treatment plant, where the settlement agreement calls for a treatment quality of 10 mg/l of BOD_5 and 10 mg/l of suspended solids on a monthly average basis. By contrast, the regional water quality management plan calls for an effluent quality on a monthly average basis of 20 mg/l of BOD_5 at the Jones Island and South Shore plants and of 15 mg/l of BOD_5 at the South Milwaukee plant.

[3] *Since the conduct of the regional sanitary sewerage system inventory in 1975, the base year for preparation of the point source pollution abatement plan element, one of the recommended eight new public sewage treatment facilities has been constructed and placed into operation—that for the Town of Norway Sanitary District No. 1. In addition, the Delafield-Hartland Water Pollution Control Commission and the Town of Dover-Eagle Lake Sewer Utility District have begun construction on recommended new plants.*

[4] *This facility was abandoned in 1977.*

Table 4

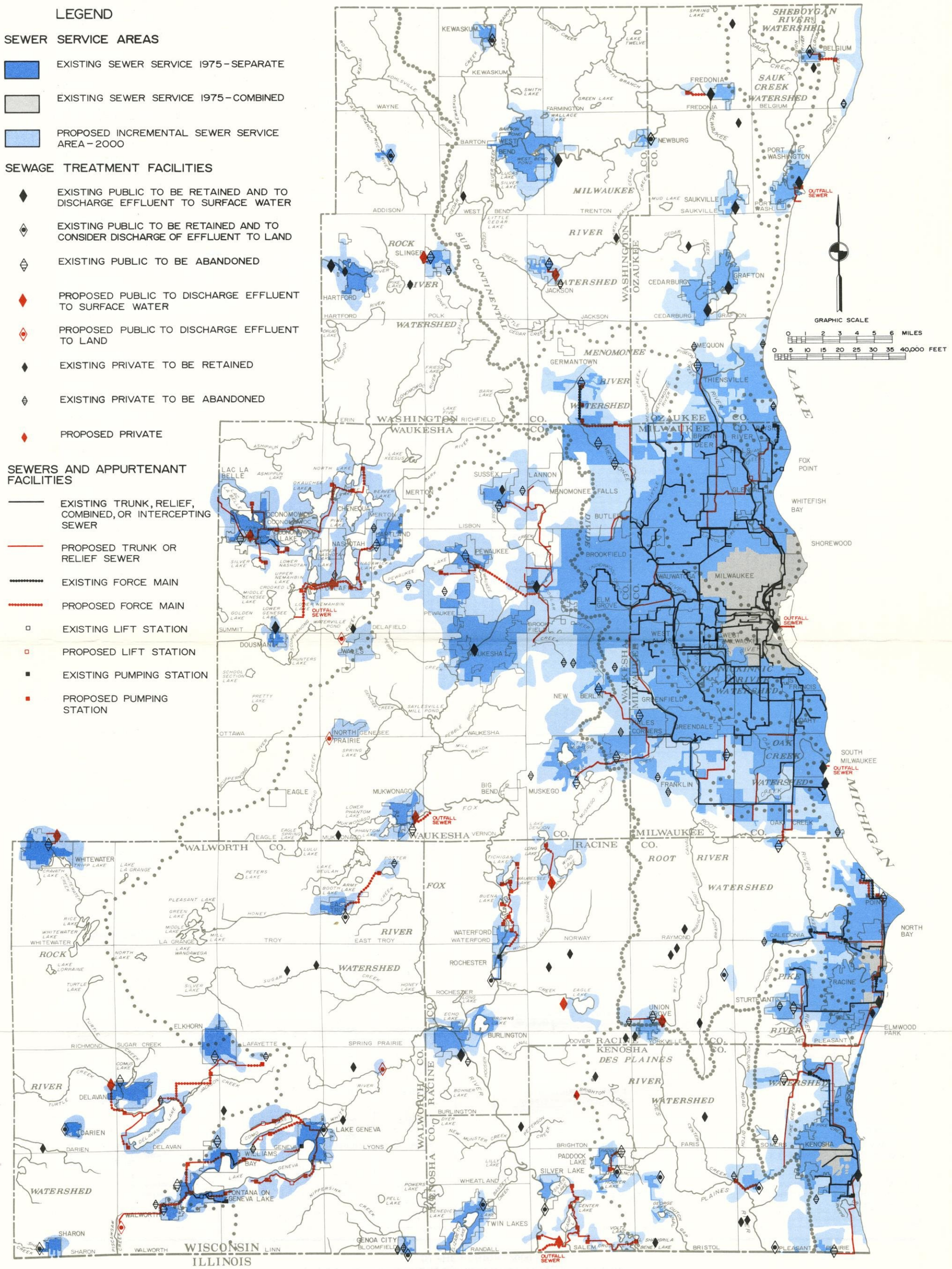
NEW PUBLIC SEWAGE TREATMENT FACILITIES INCLUDED IN THE RECOMMENDED WATER QUALITY MANAGEMENT PLAN FOR THE REGION: 2000

New Public Sewage Treatment Facilities (by subregional area)	Agency or Unit of Government Proposed to Operate the Facility	Effluent Discharge
Root River Canal		
Yorkville	Town of Yorkville Sanitary District No. 1	Land Application
Lower Fox River		
Wind Lake[a]	Town of Norway Sanitary District No. 1	Waubeesee Lake Drainage Canal
Eagle Lake[b]	Town of Dover-Eagle Lake Sewer Utility District	Eagle Creek
Salem	Town of Salem Sewer Utility District No. 2	Fox River
North Prairie	Village of North Prairie	Land Application
Lyons	Town of Lyons Sanitary District No. 2	Land Application
Middle Rock River		
Delafield-Hartland[b]	Delafield-Hartland Water Pollution Control Commission	Bark River
Wales	Village of Wales	Land Application

[a] *Facility placed into operation in 1978.*
[b] *Facility construction underway in 1978.*
Source: SEWRPC.

Map 5

RECOMMENDED SEWAGE TREATMENT FACILITIES AND INTERCOMMUNITY TRUNK SEWERS IN THE REGION: 2000



Under the recommended plan, 48 public sewage treatment facilities would exist in the Region in the year 2000. Of these 48 facilities, 27 plants are recommended to discharge effluent to surface waters following advanced waste treatment, while the discharge of effluent to land through irrigation practices was determined to be a viable alternative for the remaining 21 plants. For these 21 plants, it is recommended that land application be evaluated further at the local level as an alternative to discharge of effluent to the surface water following the needed levels of advanced waste treatment. Of the 68 private sewage treatment facilities currently serving industrial and isolated land use enclaves, 35 are recommended to be abandoned and the land uses connected to centralized sanitary sewer systems. The remaining 33 private sewage treatment facilities, together with one new private facility to serve the Bong Recreational Area in Kenosha County, are recommended to remain in operation, with treatment levels upgraded as necessary to meet water quality standards. The above map also identifies those intercommunity trunk sewers needed to extend centralized sanitary sewer service and to enable the abandonment of public sewage treatment facilities.

Source: SEWRPC.

Table 5

COST ESTIMATES FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION: 2000

Sewage Treatment Plant (by subregional area)	Estimated Cost[a] Total Capital 1975-2000	Estimated Cost[a] Average Annual Operation and Maintenance
Milwaukee Metropolitan		
Milwaukee Metropolitan Sewerage District--Jones Island Plant		
Facilities (200.00 mgd)[b]	$ 45,000,000	$11,000,000
Outfall Sewer	5,000,000	--
Subtotal	50,000,000	11,000,000
Milwaukee Metropolitan Sewerage District--South Shore Plant		
Facilities (120.00 mgd)[b]	1,400,000	8,700,000
South Milwaukee		
Facilities (2.67 mgd)	--	360,000
Outfall	450,000	--
Subtotal	450,000	360,000
Subtotal--Subregional Area	$ 51,850,000	$20,060,000
Upper Milwaukee River		
Kewaskum		
Facilities (0.93 mgd)	$ 2,127,000	$ 149,000
Land	315,000	--
Subtotal	2,442,000	149,000
West Bend Facilities (8.0 mgd)	9,075,000	927,000
Jackson Facilities (1.24 mgd)	3,215,000	195,000
Newburg		
Facilities (0.45 mgd)	2,294,000	83,000
Land	162,000	--
Subtotal	2,456,000	83,000
Fredonia Facilities (0.54 mgd)	1,335,000	117,000
Grafton Facilities (2.56 mgd)	3,005,000	264,000
Cedarburg Facilities (3.07 mgd)	1,713,000	432,000
Saukville Facilities (1.17 mgd)	1,876,000	143,000
Subtotal--Subregional Area	$ 25,117,000	$ 2,310,000
Sauk Creek		
Port Washington		
Facilities (2.56 mgd)	$ 2,113,000	$ 303,000
Outfall	1,010,000	7,000
Subtotal	3,123,000	310,000
Belgium		
Facilities (0.36 mgd)	1,927,000	80,000
Land	144,000	--
Subtotal	2,071,000	80,000
Subtotal--Subregional Area	$ 5,194,000	$ 390,000

Sewage Treatment Plant (by subregional area)	Estimated Cost[a] Total Capital 1975-2000	Estimated Cost[a] Average Annual Operation and Maintenance
Kenosha-Racine		
Kenosha Facilities (27.8 mgd)	$ 10,900,000	$ 2,000,000
Racine Facilities (26.2 mgd)	8,200,000	1,900,000
Subtotal--Subregional Area	$ 19,100,000	$ 3,900,000
Root River Canal		
Union Grove Facilities (1.39 mgd)	$ 4,160,000	$ 224,000
Yorkville Sanitary District No. 1		
Facilities (0.07 mgd)	686,000	15,000
Land	49,000	--
Subtotal	735,000	15,000
Subtotal--Subregional Area	$ 4,895,000	$ 239,000
Des Plaines River		
Pleasant Prairie Sewer Utility District D		
Facilities (0.85 mgd)	$ 2,883,000	$ 99,000
Land	288,000	--
Subtotal	3,171,000	99,000
Pleasant Prairie Sanitary District No. 73-1		
Facilities (0.22 mgd)	914,000	56,000
Land	90,000	--
Subtotal	1,004,000	56,000
Salem Sewer Utility District No. 1		
Facilities (0.71 mgd)	2,153,000	96,000
Land	247,000	--
Subtotal	2,400,000	59,000
Bristol Sewer Utility District No. 1		
Facilities (0.32 mgd)	1,581,000	64,000
Land	108,000	--
Subtotal	1,689,000	64,000
Subtotal--Subregional Area	$ 8,264,000	$ 318,000
Upper Fox River		
Brookfield Facilities (13.4 mgd)	$ 12,989,000	$ 1,024,000
Waukesha Facilities (15.5 mgd)	14,238,000	1,471,000
Subtotal--Subregional Area	$ 27,227,000	$ 2,495,000

Sewage Treatment Plant (by subregional area)	Estimated Cost[a] Total Capital 1975-2000	Estimated Cost[a] Average Annual Operation and Maintenance
Lower Fox River		
Mukwonago		
Facilities (1.66 mgd)	$ 3,566,000	$ 241,000
Outfall	416,000	--
Subtotal	3,982,000	241,000
East Troy		
Facilities (1.20 mgd)	3,963,000	144,000
Land	396,000	--
Subtotal	4,359,000	144,000
Lake Geneva		
Facilities (3.18 mgd)	9,118,000	272,000
Land	792,000	--
Subtotal	9,910,000	272,000
Lyons Sanitary District No. 2		
Facilities (0.15 mgd)	1,401,000	51,000
Land	67,000	--
Subtotal	1,468,000	51,000
Genoa City		
Facilities (0.22 mgd)	1,576,000	57,000
Land	97,000	--
Subtotal	1,673,000	57,000
Norway Sanitary District No. 1 Facilities (1.55 mgd)	4,226,000	238,000
Eagle Lake Sewer Utility District Facilities (0.38 mgd)	1,825,000	116,000
Western Racine County		
Facilities (1.50 mgd)	4,576,000	176,000
Land	473,000	--
Subtotal	5,049,000	176,000
Burlington Facilities (2.70 mgd)	3,147,000	412,000
Silver Lake		
Facilities (0.38 mgd)	2,003,000	90,000
Land	148,000	--
Subtotal	2,151,000	90,000
Twin Lakes		
Facilities (1.00 mgd)	3,037,000	157,000
Land	325,000	--
Subtotal	3,362,000	157,000
Salem Sewer Utility District No. 2		
Facilities (1.61 mgd)	3,262,000	194,000
Outfall	656,000	--
Subtotal	3,918,000	194,000
North Prairie		
Facilities (0.36 mgd)	2,000,000	52,000
Land	143,000	--
Subtotal	2,143,000	52,000
Subtotal--Subregional Area	$ 47,213,000	$ 2,200,000

Sewage Treatment Plant (by subregional area)	Estimated Cost[a] Total Capital 1975-2000	Estimated Cost[a] Average Annual Operation and Maintenance
Upper Rock River		
Allenton Sanitary District		
Facilities (0.33 mgd)	$ 1,964,000	$ 81,000
Land	128,000	--
Subtotal	2,092,000	81,000
Slinger Facilities (0.81 mgd)	2,608,000	158,000
Hartford Facilities (3.03 mgd)	3,966,000	414,000
Subtotal--Subregional Area	$ 8,666,000	$ 653,000
Middle Rock River		
Oconomowoc Facilities (6.5 mgd)	$ 9,221,000	$ 662,000
Delafield-Hartland Water Pollution Control Commission		
Facilities (3.37 mgd)	6,711,000	362,000
Outfall	2,563,000	9,000
Subtotal	9,274,000	371,000
Dousman Facilities (0.34 mgd)	1,746,000	112,000
Wales		
Facilities (0.65 mgd)	2,699,000	73,000
Land	225,000	--
Subtotal	2,924,000	73,000
Subtotal--Subregional Area	$ 23,165,000	$ 1,218,000
Lower Rock River		
Whitewater Facilities (2.93 mgd)	$ 5,216,000	$ 374,000
Walworth County Metropolitan Sewerage District Facilities (4.08 mgd)	6,614,000	529,000
Darien		
Facilities (0.35 mgd)	1,936,000	79,000
Land	135,000	--
Subtotal	2,071,000	79,000
Walworth		
Facilities (3.12 mgd)	7,206,000	236,000
Land	855,000	--
Subtotal	8,061,000	236,000
Sharon		
Facilities (0.33 mgd)	1,825,000	76,000
Land	132,000	--
Subtotal	1,957,000	76,000
Subtotal--Subregional Area	$ 23,919,000	$ 1,294,000
Total	$244,610,000	$35,077,000

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interestt during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

[b] *Estimates based upon data contained in Milwaukee Pollution Abatement Program Technical Memorandum 4/1-3 dated March 22, 1978. Costs do not include sludge management items which are included in a later section.*

Source: SEWRPC.

The treatment plant effluent standards recommended in the regional plan for the three public sewage treatment facilities serving the Milwaukee metropolitan subregional area represent the estimated effluent quality which can be achieved following secondary treatment plus advanced waste treatment for phosphorus removal. Based upon the relatively high strength of the influent sewage tributary to the plants operated by the Milwaukee Metropolitan Sewerage District, an effluent containing a maximum of about 20 mg/l of BOD_5 on a monthly average basis may be expected through application of the recommended treatment levels. For treatment plants with lower influent sewage strengths—as is the case for the South Milwaukee facility—an effluent containing a maximum of about 15 mg/l of BOD_5 on a monthly average basis may be expected through application of the recommended treatment levels.

The potential additional treatment level requirements resulting from the litigation with the State of Illinois have important cost implications for the residents of the Milwaukee metropolitan subregional area. A comparison of cost estimates for both capital and operation and maintenance costs for the three treatment plants in the Milwaukee area as estimated in the regional water quality management plan and under the Wisconsin and Illinois stipulations is set forth in Table 7. As shown in this table, the capital cost of meeting the treatment level standards set forth in the Illinois stipulation are estimated to exceed the cost of achieving the performance standards set forth in the regional water quality management plan by a factor of about 2.2 for the Jones Island and South Shore plants. Similarly, the average operation and maintenance cost at the Jones Island and South Shore plants, if they must meet the treatment level requirements set forth in the Illinois stipulation, exceed the estimated cost of meeting the treatment level standards called for in the regional plan by a factor of about 0.3. It should be noted that the Milwaukee Metropolitan Sewerage District is currently appealing the decision of the U. S. District Court concerning this matter.

It is expected that the major Section 201 sewerage facilities planning effort now underway for the entire Milwaukee metropolitan subregional area, including the City of South Milwaukee, will reopen certain system level decisions that have been made in past years, particularly decisions relating to trunk sewer construction and retention of existing satellite sewage treatment plants. The resultant Section 201 sewerage facilities plan is intended, then, upon its adoption by all of the agencies concerned to constitute an amendment to the Section 208 regional water quality management plan herein presented. Until the Section 201 plan is completed and adopted by all of the agencies concerned, the recommendations set forth above concerning sewage treatment facilities are intended to serve as a guide for decisionmaking.

Upper Milwaukee River Subregional Area: The recommended plan proposes that eight public sewage treatment facilities serve the Upper Milwaukee River subregional area by the plan design year 2000. These eight facilities would be operated by the Cities of Cedarburg and West Bend; and the Villages of Kewaskum, Jackson, Newburg, Fredonia, Grafton, and Saukville. Together, these eight plants are anticipated to serve a total resident population of about 99,200 persons by the year 2000, or about 80 percent of the anticipated resident population of this subregional area in the year 2000.

No additional capacity would be required for the facility serving the Kewaskum area by the year 2000, although the existing plant could be expected to reach the end of its useful life near the end of the planning period. In order to meet the recommended water use objectives and supporting water quality standards, and assuming that surface water discharge of sewage treatment plant effluent is continued, the existing treatment level will have to be raised to provide advanced waste treatment not only for phosphorus removal, which is currently being provided, but for nitrification. Based on the alternatives analysis presented in Volume Two of this report, however, the plan recommends that secondary sewage effluent from the Kewaskum sewage treatment facility instead be disposed of through land irrigation. About 360 acres of land would be required to accommodate such effluent disposal by the year 2000.

A new sewage treatment facility to serve the City of West Bend and environs is currently under construction. This new facility will have sufficient capacity to serve the design sewage flows to the year 2000. In order to meet the recommended water use objectives and supporting water quality standards, however, the West Bend plant will need to achieve a level of phosphorus in the effluent beyond that provided in the design of the new plant, i.e., 0.1 mg/l.

One of the issues raised in the public hearings on the 1990 regional sanitary sewerage system plan concerned the recommendation in that plan that centralized sanitary sewer service be provided to existing urban development along the shorelines of Big Cedar Lake, Little Cedar Lake, and Silver Lake, commonly known as the Tri-lakes area, in the Towns of West Bend and Polk. The new West Bend sewage treatment facility has been designed with sufficient capacity to accept sewage flow from such existing urban development. Because of the concern expressed by residents of the Tri-lakes area about the effect of the installation of sanitary sewers on urban development around the lakes, and because of questions raised by such residents concerning the need for sewers to protect lake water quality, it was recognized in the regional sanitary sewerage system plan that the recommendation to provide sanitary sewer service to the Tri-lakes area should be reevaluated in a more detailed lake water quality management study.

More detailed lake water quality management studies of the three lakes comprising the Tri-lakes area were accordingly conducted by the Wisconsin Department of Natural Resources in cooperation with the lake communities concerned simultaneously with the areawide water quality management planning effort. These studies

Table 6

COMPARISON OF SEWAGE EFFLUENT QUALITY PERFORMANCE STANDARDS FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE MILWAUKEE METROPOLITAN SUBREGIONAL AREA: RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN, WISCONSIN STIPULATION, AND ILLINOIS STIPULATION

Sewage Treatment Plant	Regional Water Quality Management Plan	Wisconsin Stipulation[a]	Illinois Stipulation[b]
Milwaukee Metropolitan Sewerage District-- Jones Island and South Shore Plants	Monthly Average 20 mg/l BOD_5 1 mg/l Phosphorus 200/100 ml Fecal Coliform	Monthly Average 30 mg/l BOD_5 30 mg/l Suspended Solids 1 mg/l Phosphorus 400/100 ml Fecal Coliform Weekly Average 45 mg/l BOD_5 45 mg/l Suspended Solids	30-Consecutive-Day Average 5 mg/l BOD_5 5 mg/l Suspended Solids Monthly Average 1 mg/l Phosphorus Not to Exceed on Any Day 10 mg/l BOD_5 10 mg/l Suspended Solids Not to Exceed on Any Grab Sample 40/100 Fecal Coliform Free Chlorine Residual at All Times
South Milwaukee	Monthly Average 15 mg/l BOD_5 1 mg/l Phosphorus 200/100 ml Fecal Coliform	Not Applicable	Monthly Average 10 mg/l BOD_5 10 mg/l Suspended Solids 1 mg/l Phosphorus Annual Average 90 percent Phosphorus Removal 20/100 ml Fecal Coliform

[a] *Stipulation by Milwaukee Metropolitan Sewerage District of May 25, 1977, with the State of Wisconsin, Case No. 152-342, Circuit Court of Dane County.*

[b] *Stipulation by Milwaukee Metropolitan Sewerage District with the State of Illinois and Judgment Order of November 14, 1977, U. S. District Court, Northern District of Illinois, Eastern Division. Settlement agreement by City of South Milwaukee with State of Illinois dated January 11, 1977. The South Milwaukee agreement is binding only if all other municipalities discharging to Lake Michigan in the four states bordering Lake Michigan are also required to meet the treatment standards.*

Source: Milwaukee Metropolitan Sewerage District, City of South Milwaukee, and SEWRPC.

concluded that septic tanks contributed less than 20 percent of the annual phosphorus loading to the lakes and that under the existing and year 2000 development conditions, the total nutrient load to these lakes is relatively low. Accordingly, the installation of centralized sanitary sewers to serve existing urban development in the Tri-lakes area would likely not significantly improve water quality. Furthermore, these studies indicated that there was no reason to believe that, given a proper program of septic tank system inspection and maintenance over time and further given curtailed urban development in the lake subwatershed as called for in the adopted regional land use plan, septic tank effluent would constitute a significant source of water pollution in the foreseeable future. Based upon these studies, then, the areawide water quality management plan does not propose that centralized sanitary sewer service be extended to the Tri-lakes area. The capacity provided at the West Bend sewage treatment plant for ultimate service to the Tri-lakes area, which is estimated at 1.0 mgd—11 percent of the total capacity of the new plant—can thus be made available to accommodate other urban development in the rapidly growing West Bend urban area.

At the end of 1978, plans for a new sewage treatment plant to serve the Village of Jackson were nearing completion. The new plant was proposed to have an average hydraulic design capacity of 0.87 mgd and to provide an advanced level of waste treatment including nitrification and phosphorus removal, with the latter nutrient being limited to 1.0 mg/l in the treated effluent. The areawide water quality management plan envisions that the proposed new Jackson sewage treatment plant will require expansion after 1985 to provide an average hydraulic design capacity of 1.24 mgd. In addition, in order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the phosphorus content of the effluent of the plant be limited to 0.1 mg/l. At the time the additional capacity is provided and the plant is designed to provide for the higher level of waste treatment in terms of phosphorus removal, it is recommended that land application of effluent be considered. It is estimated that 450 acres of land would be required for such disposal.

The plan recommends that the treatment facility serving the Village of Newburg be expanded from its existing capacity of 0.05 mgd to a year 2000 design capacity of 0.45 mgd, and that the effluent be disposed of through land application. About 180 acres would be required to accommodate sewage treatment plant effluent disposal by land application in the year 2000. If the plant does not discharge sewage effluent to land, then the plant will need to be upgraded upon its expansion to provide for an advanced level of waste treatment, consisting of phosphorus removal with an effluent quality of 1.0 mg/l of phosphorus.

The plan recommends that the Fredonia sewage treatment plant be expanded from an existing design capacity of 0.12 mgd to a year 2000 design capacity of 0.54 mgd; this would provide sufficient capacity to serve existing and planned urban development in the Waubeka as well as Fredonia area. In addition, the plan recommends that the expanded Fredonia treatment plant provide an advanced level of treatment for phosphorus removal, with the phosphorus content of the treated effluent being limited to 1.0 mg/l.

The plan recommends that the existing treatment plant serving the Village of Grafton be expanded from its current design capacity of 1.0 mgd to a year 2000 design capacity of 2.56 mgd, with the effluent continuing to be discharged to the Milwaukee River. At the present time, the plant provides an advanced level of waste treatment that consists of phosphorus removal, with the phosphorus content of the effluent being limited to 1.0 mg/l. The plan recommends that, upon expansion of the plant, the treatment level be improved to provide nitrification.

At the present time, the sewage treatment plant serving the City of Cedarburg has an average hydraulic design capacity of about 3.00 mgd. If clear water infiltration and inflow into the tributary sewerage system can be adequately controlled, this capacity should be sufficient to handle the anticipated year 2000 loading, estimated to approximate 3.07 mgd. Improvements in the level of treatment to be provided will be necessary, including the provision of nitrification, an increase in the level of phosphorus removal provided in order to limit the phosphorus content of the effluent to 0.1 mg/l, and the addition of an auxiliary level of waste treatment to provide for effluent aeration.

Table 7

COMPARISON OF COST ESTIMATES FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE MILWAUKEE METROPOLITAN SUBREGIONAL AREA: RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN, WISCONSIN STIPULATION, AND ILLINOIS STIPULATION

Sewage Treatment Plant	Regional Water Quality Management Plan[a]		Wisconsin Stipulation[a,b]		Illinois Stipulation[a,c]	
	Capital Cost 1975-2000	Average Annual Operation and Maintenance Cost	Capital Cost 1975-2000	Average Annual Operation and Maintenance Cost	Capital Cost 1975-2000	Average Annual Operation and Maintenance Cost
Milwaukee Metropolitan Sewerage District						
Jones Island Plant						
Facilities (200 mgd) . . .	$45,000,000	$11,000,000	$45,000,000	$11,000,000	$110,000,000	$14,000,000
Outfall Sewer	5,000,000	--	5,000,000	--	5,000,000	--
Subtotal	$50,000,000	$11,000,000	$50,000,000	$11,000,000	$115,000,000	$14,000,000
Milwaukee Metropolitan Sewerage District						
South Shore Plant						
Facilities (120 mgd) . . .	$ 1,400,000	$ 8,700,000	$ 1,400,000	$ 8,700,000	$ 49,000,000	$11,600,000
South Milwaukee						
Facilities (2.67 mgd) . . .	$ --	$ 360,000	Not	Not	$ 700,000	$ 400,000
Outfall Sewer	450,000	--	Applicable	Applicable	450,000	--
Subtotal	$ 450,000	$ 360,000	--	--	$ 1,150,000	$ 400,000
Total	$51,850,000	$20,060,000	$51,400,000	$19,700,000	$165,150,000	$26,000,000

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement for the effects of inflation. The costs do not include those associated with sludge management, which are discussed in a later section.*

[b] *Stipulation by Milwaukee Metropolitan Sewerage District of May 25, 1977, with the State of Wisconsin, Case No. 152-342, Circuit Court of Dane County.*

[c] *Stipulation by Milwaukee Metropolitan Sewerage District with the State of Illinois and Judgment Order of November 14, 1977, U. S. District Court, Northern District of Illinois, Eastern Division, Settlement Agreement by City of South Milwaukee with State of Illinois dated January 11, 1977.*

Source: Milwaukee Metropolitan Sewerage District and SEWRPC.

Finally, the plan recommends that the existing Village of Saukville sewage treatment plant be replaced by a new plant on the existing site having an average hydraulic design capacity of 1.17 mgd. It will be necessary for this new plant to provide an advanced level of waste treatment to limit the phosphorus content of the effluent to 1.0 mg/l.

Under the recommended plan for the Upper Milwaukee River subregional area, no existing public sewage treatment facilities would be abandoned, although several would be expanded or replaced. The Jackson sewage treatment facility is recommended to be relocated on a new site on Cedar Creek downstream from the existing plant site.

Sauk Creek Subregional Area: The recommended plan proposes that two public sewage treatment facilities serve the Sauk Creek subregional area by the year 2000. These facilities would be operated by the City of Port Washington and the Village of Belgium. Together, these two plants are anticipated to serve a total resident population of about 15,800 persons in the plan design year 2000, or about 87 percent of the anticipated year 2000 resident population of this subregional area.

The plan recommends that the existing Port Washington sewage treatment facility, which has a capacity of about 1.25 mgd, be expanded to a year 2000 design capacity of about 2.56 mgd, and that an outfall sewer be constructed to discharge the sewage treatment plant effluent to Lake

Michigan beyond the confines of the area enclosed by the harbor breakwaters. The plant would provide for, as it does now, an advanced level of waste treatment for phosphorus removal, with the phosphorus content of the effluent being limited to 1.0 mg/l.

The plan recommends that the existing Village of Belgium sewage treatment plant, which has a capacity of about 0.07 mgd, be expanded to provide for a design year 2000 capacity of about 0.36 mgd. The plant would be designed to serve not only the Village of Belgium but also urban development in the Town of Belgium in the Lake Church area and along the Lake Michigan shoreline, including service to Harrington Beach State Park. The plan recommends that the expanded plant provide for a secondary level of waste treatment, with the effluent being disposed of through land irrigation. It is estimated that 160 acres of land will be required by the year 2000 for such land disposal. If the plant continues to discharge to surface waters, it will be necessary, in order to meet the recommended water use objectives and supporting water quality standards, for the plant to provide for an advanced level of waste treatment including nitrification and phosphorus removal, with the phosphorus content of the effluent being limited to 0.1 mg/l, and auxiliary treatment for effluent aeration.

No existing public sewage treatment facilities would be abandoned upon implementation of the recommended plan for the Sauk Creek subregional area.

Kenosha-Racine Subregional Area: The recommended plan proposes that two public sewage treatment facilities serve the Kenosha-Racine subregional area by the year 2000. These facilities would be operated by the Cities of Kenosha and Racine. Together, these two plants are anticipated to serve a total resident population of about 288,600 persons by the plan design year 2000, or about 97 percent of the anticipated year 2000 resident population of this subregional area.

Under the plan, both the Kenosha and Racine sewage treatment facilities would provide a secondary level of waste treatment, with the BOD_5 content of the effluent approximating 15 mg/l, and an advanced level of waste treatment for phosphorus removal, with the phosphorus content of the discharge approximating 1.0 mg/l. With a recently completed expansion program, the City of Racine facility should have sufficient capacity to accommodate the design year 2000 loadings. The City of Kenosha facility will have to be expanded from an existing capacity of about 18 mgd to a design year capacity of about 28 mgd.

In response to interstate litigation, the Cities of Kenosha and Racine on October 16, 1973, signed an agreement which would commit the two cities to provide higher levels of waste treatment than those provided and to eliminate pollution from combined sewer overflows. The terms of this agreement, which are binding on Kenosha and Racine only if federal and state funding is made available and if all other municipalities discharging sewage treatment plant effluent to Lake Michigan in the four states bordering Lake Michigan are also required to meet the treatment standards, call for higher levels of treatment than those recommended in the areawide water quality management plan. A comparison of the various effluent limitations is set forth in Table 8. The most important difference concerns the level of BOD_5 in the sewage effluent, which under the agreement would have to be reduced to 4 mg/l as compared to the 15 mg/l called for in this recommended plan.

These differences in treatment levels have important cost implications. A comparison of cost estimates for both capital and operation and maintenance costs for the two treatment plants as estimated in the areawide water quality management plan and under the stipulation agreement is set forth in Table 9. As shown in this table, the capital cost of meeting the treatment level standards set forth in the agreement is estimated to exceed the cost of achieving the performance standards set forth in the plan by a factor of about 0.9 for the Kenosha plant and a factor of about 1.2 for the Racine plant. Similarly, the average operation and maintenance costs in the Kenosha and Racine plants, if they must meet the treatment level requirements set forth in the agreement, exceed the estimated costs of meeting the treatment level standards called for in the regional plan by a factor of about 0.2 at both facilities.

Under the recommended plan for the Kenosha-Racine subregional area, four existing public sewage treatment facilities would be abandoned. These four facilities are: the Pleasant Park facility in the Town of Pleasant Prairie operated by the Pleasant Park Utility Company,

Table 8

COMPARISON OF SEWAGE EFFLUENT QUALITY PERFORMANCE STANDARDS FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE KENOSHA-RACINE SUBREGIONAL AREA: RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN AND KENOSHA AND RACINE AGREEMENT WITH STATE OF ILLINOIS

Effluent Limitation	Regional Water Quality Management Plan	Agreement With State of Illinois[a]		
		By December 31, 1976	By December 31, 1977	By July 1, 1979
BOD_5	15 mg/l (monthly average)	20 mg/l (monthly average)	10 mg/l (monthly average)	4 mg/l (monthly average)
Suspended Solids	..	20 mg/l (monthly average)	10 mg/l (monthly average)	5 mg/l (monthly average)
Phosphorus	1 mg/l (monthly average)	1 mg/l (monthly average)	1 mg/l (monthly average)	1 mg/l (monthly average)
			90 Percent Removal (annual average)	90 Percent Removal (annual average)
Fecal Coliform	200/100 ml (monthly average)	40/100 ml (maximum at any time)	40/100 ml (maximum at any time)	40/100 ml (maximum at any time)
		20/100 ml (annual average)	20/100 ml (annual average)	20/100 ml (annual average)

[a] *Settlement agreement by the Cities of Kenosha and Racine with the State of Illinois dated October 16, 1973. The terms of this agreement are binding on Kenosha and Racine only if federal and state funding is made available and if all other municipalities discharging sewage treatment plant effluent to Lake Michigan in the four states bordering Lake Michigan are also required to meet the treatment standards.*

Source: Cities of Kenosha and Racine and SEWRPC.

Table 9

COMPARISON OF COST ESTIMATES FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE KENOSHA-RACINE SUBREGIONAL AREA: RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN AND KENOSHA AND RACINE AGREEMENTS WITH STATE OF ILLINOIS

Sewage Treatment Plant	Regional Water Quality Management Plan[a]		Agreements With State of Illinois[a,b]	
	Capital Cost 1975-2000	Average Annual Operation and Maintenance Cost	Capital Cost 1975-2000	Average Annual Operation and Maintenance Cost
Kenosha Facilities (28 mgd)	$10,900,000	$2,000,000	$21,200,000	$2,400,000
Racine Facilities (26 mgd)	8,200,000	1,900,000	18,200,000	2,300,000
Total	$19,100,000	$3,900,000	$39,100,000	$4,700,000

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement for the effects of inflation. The costs do not include those associated with sludge management, which are discussed in a later section.*

[b] *Agreements of October 16, 1973, between State of Illinois and Cities of Kenosha and Racine.*

Source: SEWRPC.

Inc.;[5] the Somers facility operated by the Town of Somers Sanitary District No. 2; the Sturtevant facility operated by the Village of Sturtevant;[6] and the North Park facility operated by the North Park Sanitary District and serving the Town of Caledonia and the Village of Wind Point.

Root River Canal Subregional Area: The recommended plan proposes that two public sewage treatment facilities serve the Root River Canal subregional area by the plan design year 2000. These facilities would be operated by the Village of Union Grove and the Town of Yorkville Sanitary District No. 1. The plants are anticipated to serve a total resident population of about 8,400 persons by the plan design year 2000, or about 58 percent of the anticipated year 2000 resident population of this subregional area.

The Village of Union Grove recently placed into operation a new sewage treatment facility having an average hydraulic design capacity of about 1.0 mgd. This facility currently provides an advanced level of waste treatment including nitrification and phosphorus removal, with a phosphorus discharge level of 1.0 mg/l, and an auxiliary level of waste treatment for effluent aeration. This new plant should adequately serve the needs of the Village of Union Grove through the design year 2000. The recommended plan further envisions, however, that the treatment facility serving the Wisconsin Department of Health and Social Services Center for the Developmentally Disabled in the Town of Dover would be abandoned, and that sewage from that Center would be conveyed to the new Union Grove treatment facility for treatment and disposal. This would require expansion of the plant to provide a capacity of about 1.39 mgd. In addition, in order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the phosphorus content of the effluent be limited to 0.1 mg/l. At the time the additional capacity is provided and the design of the facilities to provide for the higher level of phosphorus removal is initiated, it is recommended that land application for the disposal of the treated effluent be considered. It is estimated that 480 acres of land would be required for such disposal.

The plan recommends that a new public sewage treatment facility be developed to serve primarily existing urban development in the Yorkville area of Racine County, centered around the interchanges of STH 20 and CTH C with IH 94. Currently, the Racine County Highway and Office Building located in the Yorkville area is served by a private sewage treatment facility. The plan envisions that this facility would be expanded to serve the entire Yorkville sewer service area, with the treated effluent being disposed of on land through irrigation. About 70 acres of land would be required for this purpose. If land application for effluent disposal is not provided, then the plant will need to be significantly upgraded to provide for an advanced level of waste treatment including nitrification, phosphorus removal to achieve a phosphorus level in the discharge of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

No existing public sewage treatment facilities would be abandoned upon implementation of the recommended plan for the Root River Canal subregional area. As noted above, however, one existing private facility, that serving the Center for the Developmentally Disabled, would ultimately be abandoned, and another existing private facility, that serving the Racine County Highway and Office Building, would be converted to a public use facility that would serve the entire Yorkville sewer service area.

Des Plaines River Subregional Area: The recommended plan proposes that four public sewage treatment facilities serve the Des Plaines River subregional area by the year 2000. These facilities would be operated by the Pleasant Prairie Sewer Utility District D, the Pleasant Prairie Sanitary District No. 73-1, the Town of Salem Sewer Utility District No. 1, and the Town of Bristol Sewer Utility District No. 1. Together, these four plants are anticipated to serve a total resident population of about 11,400 persons by the plan design year 2000, or about 59 percent of the anticipated year 2000 resident population of this subregional area.

[5] *Based upon a referendum conducted on April 6, 1976, the electors in the Town of Pleasant Prairie voted to authorize the Town Board to proceed with negotiations to purchase the assets of the privately owned Pleasant Park Utility Company, Inc., and to convert the operation to a public utility.*

[6] *Late in 1978 construction began on a new trunk sewer in accordance with the adopted regional sanitary sewerage system plan that would permit abandonment of the Sturtevant sewage treatment facility. It is anticipated that trunk sewer construction will be completed by 1980, and the Sturtevant facility abandoned at that time.*

The plan recommends that the treatment facility operated by the Pleasant Prairie Sewer Utility District D be expanded from its existing capacity of 0.13 mgd to a year 2000 design capacity of 0.85 mgd, and that the effluent be disposed of through land application. About 320 acres would be required to accommodate effluent disposal by land application by the year 2000. If the plant does not discharge sewage effluent to land, then the plant will need to be upgraded upon its expansion to provide for an advanced level of waste treatment, consisting of nitrification, phosphorus removal to achieve an effluent with a level of phosphorus approximating 0.1 mg/l, and auxiliary waste treatment for effluent aeration. The plant would serve not only the current area encompassed by the Town of Pleasant Prairie Utility District D but also the highway-oriented commercial land use development located along the west side of IH 94 in the Town of Bristol.

The relatively new sewage treatment facility operated by the Town of Pleasant Prairie Sanitary District No. 73-1 should have sufficient capacity to serve the anticipated design year 2000 loadings. The plan recommends that effluent be disposed of through land application. About 100 acres would be required to accommodate effluent disposal by land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal to achieve an effluent with a level of phosphorus approximating 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

The plan recommends that the treatment facility operated by the Town of Salem Sewer Utility District No. 1 be expanded from an existing design capacity of 0.30 mgd to a year 2000 design capacity of 0.71 mgd. The expansion would be required to accommodate sewage flow from the Village of Paddock Lake sewer service area. The alternatives analysis set forth in Volume Two of this report indicated that it would be more cost-effective to abandon the Paddock Lake sewage treatment plant and connect its tributary sewer service area to the Salem plant than to construct a new Paddock Lake sewage treatment facility. The plan recommends that, upon its expansion, the Salem plant be designed to provide for a secondary level of waste treatment with effluent disposal through land application. About 280 acres would be required to accommodate effluent disposal by land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded upon its expansion to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal to achieve an effluent with a level of phosphorus approximating 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Finally, the plan recommends that the treatment facility operated by the Town of Bristol Sewer Utility District No. 1 be expanded from its existing capacity of 0.16 mgd to a year 2000 design capacity of 0.32 mgd and that the effluent be disposed of through land application. About 120 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded upon its expansion to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal to achieve an effluent with a level of phosphorus approximating 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Under the recommended plan for the Des Plaines River subregional area, one existing public sewage treatment facility, that operated by the Village of Paddock, would be abandoned. The sewer service area tributary to this plant would be served by the Town of Salem Sewer Utility District No. 1 treatment facility.

Upper Fox River Subregional Area: The recommended plan proposes that two public sewage treatment facilities serve the Upper Fox River subregional area by the year 2000. These two facilities would be operated by the Cities of Brookfield and Waukesha. Together, these two plants are anticipated to serve a total resident population of about 150,500 persons by the plan design year 2000, or about 91 percent of the anticipated year 2000 resident population of this subregional area.

The Brookfield sewage treatment facility would serve the Brookfield-West, Sussex-Lannon, and Pewaukee sewer service areas, as shown on Map 4. The plan envisions that the plant would be expanded from its current average hydraulic design capacity of 5.0 mgd to a design year 2000 capacity of 13.4 mgd. At the present time, the Brookfield plant provides an advanced level of treatment for phosphorus removal, with an effluent having a phosphorus level of 1.0 mg/l. In order to meet the recommended water use objectives and supporting water quality standards, however, the Brookfield plant will need to provide for advanced waste treatment for nitrification, as well as for a higher level of phosphorus removal. The phosphorus level in the plant effluent would have to approximate 0.1 mg/l to meet the established water use objectives.

Construction began late in 1978 on a new Waukesha sewage treatment facility. This new facility will have a capacity of about 16 mgd, which should be sufficient to serve the anticipated loadings to the year 2000. The plant as designed will provide for an advanced level of waste treatment consisting of nitrification and phosphorus removal, with an effluent having a phosphorus level of 1.0 mg/l. In order to meet the recommended water use objectives and supporting water quality standards, however, it will be necessary for the Waukesha plant to ultimately provide an effluent having a phosphorus level of 0.1 mg/l.

Under the recommended plan for the Upper Fox River subregional area, two existing public sewage treatment facilities would be abandoned. These facilities currently serve the Village of Pewaukee and the Village of Sussex.

Lower Fox River Subregional Area: The recommended plan proposes that 13 public sewage treatment facilities serve the Lower Fox River subregional area by the year

2000. These 13 facilities would be operated by the Cities of Burlington and Lake Geneva; the Villages of East Troy, Genoa City, Mukwonago, North Prairie, Silver Lake, and Twin Lakes; the Western Racine County Sewerage District; the Town of Lyons Sanitary District No. 2; the Town of Dover-Eagle Lake Sewer Utility District No. 1; the Town of Salem Sanitary District No. 2; and the Town of Norway Sanitary District No. 1. Together, these 13 plants are anticipated to serve a total resident population of about 81,900 persons by the plan design year 2000, or about 65 percent of the anticipated year 2000 resident population of this subregional area.

The plan recommends that a new sewage treatment facility be constructed to serve the Village of Mukwonago and environs, with effluent to be discharged through a new outfall sewer directly to the Fox River. The proposed plant, which has already been designed, would provide an average hydraulic design capacity of 1.5 mgd, which should be sufficient to accommodate the anticipated design year 2000 loadings. The plant has been designed to provide an advanced level of waste treatment for phosphorus removal, with an effluent having a phosphorus level of 1.0 mg/l. In order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the phosphorus content of the effluent be limited to 0.1 mg/l. At the time the design for the additional facilities needed for a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 550 acres of land would be required for such disposal.

The plan recommends that the sewage treatment facility operated by the Village of East Troy be expanded from its existing capacity of 0.32 mgd to a year 2000 design capacity of 1.20 mgd, and that the effluent be disposed of through land application. About 420 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded upon its expansion to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal for an effluent having a phosphorus level of 0.1 mg/l, and auxiliary treatment for effluent aeration. The plant would provide service not only to the Village of East Troy but to existing and proposed urban development along the shoreline of Potter Lake in the Town of East Troy.

The plan recommends that the existing treatment facility serving the City of Lake Geneva be expanded from its current capacity of 1.1 mgd to a year 2000 design capacity of 3.18 mgd, and that the effluent be disposed of through land application. A total of 960 acres would be required to accommodate effluent disposal by land application in the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded to provide for an advanced level of waste treatment for nitrification, phosphorus removal to provide an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration. The plant would have sufficient capacity to serve not only the City of Lake Geneva but the existing and proposed urban development along the shoreline of Lake Geneva in the Town of Linn and the shoreline of Lake Como in the Town of Geneva.

The plan recommends that a new sewage treatment facility be constructed to serve the Town of Lyons Sanitary District No. 2. The plant would have an average hydraulic design capacity of about 0.15 mgd, and its effluent would be disposed of through land application. About 80 acres would be required to accommodate the effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to provide for an advanced level of waste treatment for phosphorus removal to provide an effluent having a phosphorus level of 1.0 mg/l.

The plan recommends that the existing treatment facility serving the Village of Genoa City be expanded from its existing capacity of 0.12 mgd to a year 2000 design capacity of 0.22 mgd and that effluent from this plant be disposed of through land application. About 100 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded to provide for an advanced level of waste treatment for phosphorus removal to provide an effluent having a phosphorus level of 0.1 mg/l.

A new sewage treatment facility was recently placed into operation by the Town of Norway Sanitary District No. 1. This facility has an average hydraulic design capacity of about 0.75 mgd. The facility currently provides an advanced level of waste treatment including phosphorus removal to achieve an effluent having a phosphorus level of 1.0 mg/l, nitrification, and auxiliary waste treatment for effluent aeration. The new Town of Norway plant will require expansion after 1985 to provide an average hydraulic capacity of 1.55 mgd. In addition, in order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the plant ultimately provide an advanced level of waste treatment for phosphorus removal to provide an effluent having a phosphorus level of 0.1 mg/l. At the time the design for the additional facilities needed for a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 500 acres of land would be required for such disposal.

A new sewage treatment facility to serve the Town of Dover-Eagle Lake Sewer Utility District is currently under construction. This new facility should have sufficient capacity to serve anticipated design sewage flows to the year 2000. The new plant has been designed to provide an advanced level of waste treatment for nitrification and an auxiliary level of waste treatment for effluent aeration. In order to meet the recommended water use objectives and supporting water quality standards, however, it will be necessary for the Eagle Lake plant to provide for additional phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l. At the time the design of the additional facilities needed for

a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 170 acres would be required for such disposal.

The treatment facility currently operated by the Western Racine County Sewerage District serves the Villages of Rochester and Waterford and the Town of Rochester Sewer Utility District No. 1. The plan recommends that this facility be expanded from an existing average hydraulic design capacity of 0.94 mgd to a design year 2000 capacity of about 1.50 mgd. This additional capacity would be required to serve existing urban development along the shorelines of Tichigan and Buena Lakes and the Fox River in the Town of Waterford. The plan recommends that effluent from the Western Racine County plant be disposed of through land application. About 500 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the plant will need to be upgraded to provide for an advanced level of waste treatment beyond that currently provided. At the present time, the plant provides for phosphorus removal to achieve an effluent having a phosphorus level of 1.0 mg/l.

The treatment facility serving the City of Burlington and environs currently has a hydraulic capacity of 2.50 mgd. This capacity should be adequate to serve anticipated growth during the plan period to the year 2000. The plan recommends that the level of treatment provided be improved to provide for an effluent having a phosphorus level of 0.1 mg/l. At the present time, the plant is designed to provide an effluent having a phosphorus level of 1.0 mg/l.

The sewage treatment plant currently serving the Village of Silver Lake has an average hydraulic design capacity of about 0.30 mgd. This capacity should be sufficient to serve the anticipated growth for the design life of the facility. The plan recommends that the effluent from this plant be disposed of through land application. About 170 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the level of treatment provided will need to be improved to achieve an effluent having a phosphorus level of 1.0 mg/l.

The plan recommends that the sewage treatment plant serving the Village of Twin Lakes be expanded from its current design capacity of 0.82 mgd to a year 2000 design capacity of 1.00 mgd, and that the effluent be disposed of through land application. About 170 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the level of treatment will need to be improved to an advanced level consisting of nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

At the end of 1978, the Town of Salem Sanitary District No. 2 had completed design of a new sewage treatment facility that would provide an average hydraulic design capacity of about 1.50 mgd, and an advanced level of waste treatment consisting of phosphorus removal to achieve an effluent having a phosphorus level of 1.0 mg/l. This plant has been designed to provide new sanitary sewer service to existing urban development along the shorelines of Silver, Camp, Center, Cross, and Rock Lakes, and in the community of Wilmot. In order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the level of treatment be further improved to provide for an effluent having a phosphorus level of 0.1 mg/l. At the time the design for additional facilities needed for a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 550 acres of land would be required for such disposal.

The plan proposes that a new sewage treatment facility be constructed to serve the Village of North Prairie. This new facility would have an average hydraulic design capacity of about 0.36 mgd. Effluent from the new facility is proposed to be disposed of through land application. About 160 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then the new plant will need to be designed to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Under the recommended plan for the Lower Fox River subregional area, no existing public sewage treatment facilities would be abandoned. The Mukwonago sewage treatment facility is recommended to be relocated on a new site on the Mukwonago River downstream from the existing plant site.

Upper Rock River Subregional Area: The recommended plan proposes that three public sewage treatment plants serve the Upper Rock River subregional area by the year 2000. These three plants would be operated by the City of Hartford, the Village of Slinger, and the Allenton Sanitary District No. 1. Together, these three plants are anticipated to serve a total resident population of about 21,900 persons by the plan design year 2000, or about 52 percent of the anticipated year 2000 resident population of this subregional area.

The plan recommends that the treatment facility operated by the Allenton Sanitary District No. 1 in the Town of Addison be expanded from its existing average hydraulic design capacity of 0.10 mgd to a year 2000 design capacity of 0.33 mgd, and that the effluent be disposed of through land application. About 140 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then an advanced level of waste treatment will need to be provided consisting of nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 1.0 mg/l, and auxiliary waste treatment for effluent aeration.

The plan recommends that the existing sewage treatment facility serving the Village of Slinger be replaced with a new facility having an average hydraulic design capacity of about 0.81 mgd. Local facilities planning has been completed for this plant. This facility plan proposes that the new treatment plant provide an advanced level of waste treatment consisting of nitrification and auxiliary waste treatment for effluent aeration. Phosphorus removal is not being provided at the new plant. However, in order to meet the recommended water use objectives and supporting water quality standards, the Slinger treatment facility will need to provide phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l. At the time the design for the additional facilities needed for a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 300 acres of land would be required for such disposal.

In 1973 the City of Hartford placed into operation a new sewage treatment facility having an average hydraulic design capacity of 2.0 mgd. The plan recommends that this facility be expanded to a year 2000 design capacity of 3.0 mgd. At the present time, the plant provides an advanced level of waste treatment for phosphorus removal and has an effluent phosphorus level of 1.0 mg/l. In order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that the plant provide nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

The 1990 regional sanitary sewerage system plan recommended that centralized sanitary sewer service be provided to existing urban development along the shoreline of Pike Lake and to the Pike Lake State Park, with treatment for sewage flows from these areas to be provided at the Hartford sewage treatment facility. As part of the areawide water quality management planning effort, a detailed water quality management study was undertaken for Pike Lake. This study, which was conducted for the Commission by the Wisconsin Department of Natural Resources, concluded that septic tanks contributed less than 10 percent of the phosphorus loading to Pike Lake and that, under the existing and proposed year 2000 development conditions, the total nutrient load to the lake is relatively low. Accordingly, the installation of centralized sanitary sewers to serve existing urban development and the Pike Lake State Park would probably not significantly improve water quality. Furthermore, this study indicated that, given a proper program of septic tank system inspection and maintenance over time and curtailed urban development in the lake subwatershed as called for in the adopted regional land use plan, it is unlikely that septic tank effluent would constitute a significant source of water pollution in the foreseeable future. Based upon this study, then, the areawide water quality management plan recommends that centralized sanitary sewer service not be extended to the Pike Lake area.

Under the recommended plan for the Upper Rock River subregional area, no existing public sewage treatment facilities would be abandoned.

Middle Rock River Subregional Area: The recommended plan proposes that four public sewage treatment facilities serve the Middle Rock River subregional area by the year 2000. These four facilities would be operated by the City of Oconomowoc, the Villages of Dousman and Wales, and the Delafield-Hartland Water Pollution Control Commission. Together, these four plants are anticipated to serve a total resident population of about 55,900 persons by the design year 2000, or about 79 percent of the anticipated year 2000 resident population of this subregional area.

In 1978 the City of Oconomowoc placed into operation a new sewage treatment plant. This plant has an average hydraulic design capacity of about 4.0 mgd, and has been designed as the initial phase of a facility intended ultimately to serve as an areawide plant providing sewage treatment services not only for the City of Oconomowoc but for the sewer service areas identified as Lac La Belle, Oconomowoc Lake, Pine Lake, Beaver Lake, and Silver Lake as shown on Map 4. The new plant is designed to provide secondary and tertiary waste treatment. The plan recommends that this plant ultimately be expanded to a design year 2000 capacity of about 6.5 mgd. The plan recommends that the level of treatment be improved to provide for nitrification and phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l.

A new sewage treatment facility to serve the City of Delafield, the Villages of Hartland and Nashotah, and the existing and proposed urban development along the shorelines of the Nashotah and Nemahbin Lakes in the Town of Summit is currently being constructed by the Delafield-Hartland Water Pollution Control Commission. This facility, with an average hydraulic design capacity of 2.2 mgd, should be capable of serving the anticipated sewage flows from the tributary service areas to the year 2000. The facility has been designed to provide an advanced level of waste treatment including nitrification and auxiliary waste treatment for effluent aeration, but has not been designed for phosphorus removal. In order to meet the recommended water use objectives and supporting water quality standards, the plan recommends that this plant ultimately provide for phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l.

The plan recommends that the existing Dousman sewage treatment facility be expanded from its current capacity of 0.12 mgd to a year 2000 design capacity of 0.34 mgd. At the present time, the Village has completed preliminary planning for the expansion of this plant, including the provision of an advanced level of waste treatment for nitrification and effluent aeration. The new plant does not provide for phosphorus removal, but to meet the water use objectives and supporting water quality standards, the plant will ultimately have to provide such removal to achieve an effluent having a phosphorus level of 0.1 mg/l. At the time the design for the additional

facilities needed for a higher level of phosphorus control is initiated, it is recommended that land application for disposal of the treated effluent be considered. About 150 acres of land would be required for such disposal.

The plan recommends that a new sewage treatment plant be constructed to serve the Village of Wales and environs. This plant would have a design capacity of 0.65 mgd and would utilize land application for effluent disposal. A total of 250 acres would be required to accommodate effluent disposal through land application by the year 2000. If the proposed new plant does not discharge effluent to land, then the plant will need to be designed to provide for an advanced level of waste treatment including nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Under the recommended plan for the Middle Rock River subregional area, no existing public sewage treatment facilities would be abandoned.

Lower Rock River Subregional Area: The recommended plan proposes that five public sewage treatment facilities serve the Lower Rock River subregional area by the year 2000. These five facilities would be operated by the City of Whitewater; the Villages of Darien, Sharon, and Walworth; and the Walworth County Metropolitan Sewerage District. Together, these five plants are anticipated to serve a total resident population of about 53,900 persons by the plan design year 2000, or about 86 percent of the anticipated year 2000 resident population of this subregional area and about 2,500 persons in Jefferson County served by the Whitewater sewerage system.

The City of Whitewater is nearing construction of a new sewage treatment plant. The plant has been designed to provide an average hydraulic design capacity of about 3.60 mgd, which should be sufficient to serve the anticipated design sewage flows from the tributary service area to the year 2000. The plant has been designed to provide an advanced level of waste treatment including nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 1.0 mg/l, and auxiliary waste treatment for effluent aeration. In order to meet the recommended water use objectives and supporting water quality standards, however, the Whitewater plant will need to provide for an effluent having a phosphorus level of 0.1 mg/l.

The Walworth County Metropolitan Sewerage District is also nearing construction of a new sewage treatment facility. This facility will have an average hydraulic design capacity of about 3.60 mgd, which should be sufficient to serve the anticipated design sewage flows to the year 2000. The facility, which will serve the Cities of Elkhorn and Delavan, the Delavan Lake Sanitary District, and the Walworth County Institutions, has been designed to provide an advanced level of waste treatment including nitrification and auxiliary waste treatment for effluent aeration. The plan recommends that this new plant ultimately provide for phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l.

The plan recommends that the treatment facility serving the Village of Darien be expanded from its current capacity of 0.15 mgd to a year 2000 design capacity of 0.35 mgd, and that the effluent be disposed of through land application. About 150 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then an advanced level of waste treatment will need to be provided consisting of nitrification and phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l.

The plan recommends that a sewage treatment facility be constructed to serve the Walworth, Fontana, and Williams Bay sewer service areas. This plant would have an average hydraulic design capacity of about 3.12 mgd and discharge effluent to land through irrigation. About 1,300 acres would be required to accommodate effluent disposal through land application by the year 2000. If the new plant does not discharge effluent to land, then it will need to be designed to provide for an advanced level of waste treatment consisting of nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Finally, the plan recommends that the treatment facility serving the Village of Sharon be expanded from its existing capacity of 0.15 mgd to a year 2000 design capacity of 0.33 mgd, and that the effluent be disposed of through land application. About 150 acres would be required to accommodate effluent disposal through land application by the year 2000. If the plant does not discharge effluent to land, then an advanced level of waste treatment will need to be provided consisting of nitrification, phosphorus removal to achieve an effluent having a phosphorus level of 0.1 mg/l, and auxiliary waste treatment for effluent aeration.

Under the recommended plan for the Lower Rock River subregional area, three existing public sewage treatment facilities would be abandoned. These three facilities are currently operated by the City of Elkhorn and the Villages of Fontana and Williams Bay. In addition, three facilities would be replaced—those operated by the Cities of Whitewater and Delavan and the Village of Walworth.

Private Sewage Treatment Plants

As noted in Volume One, Chapter V of this report, there were in 1975 a total of 67 private sewage treatment facilities in operation within the Region. These facilities generally served isolated enclaves of urban land uses including private and public recreational facilities; institutional facilities; commercial service facilities; isolated residential areas, such as mobile home parks; and industries. Since 1975 one additional private sewage treatment facility has been constructed in the Region, that serving the Alpine Valley Music Center in the Town of LaFayette, Walworth County. In addition, the Wisconsin Department of Natural Resources in 1978 proposed the construction of a new private sewage treatment facility to serve the Bong Recreational Area in Kenosha County.

Under the recommended water quality management plan for the Region, 35 of the 68 now existing private sewage

treatment facilities would be abandoned upon full implementation of the plan proposals (see Table 10). These 35 facilities lie within or immediately adjacent to the proposed year 2000 sanitary sewer service areas. Of the 35 private facilities that would be abandoned, 11 lie within the Milwaukee metropolitan subregional area and include the facilities serving the following land use complexes: the Highway 100 Drive-in Theatre and the Union Oil truck stop in the City of Franklin; the Chalet-on-the-Lake Restaurant, the Sisters of Notre Dame Academy, and the Federal Food Company, all in the City of Mequon; Brookfield Central High School in the City of Brookfield; Cleveland Heights Elementary School, the Highway 24 Outdoor Theatre, and the New Berlin Memorial Hospital in the City of New Berlin; the Muskego Rendering Company, Inc. in the City of Muskego; and the Wisconsin Electric Power Company, Oak Creek plant in the City of Oak Creek.

The remaining 24 private sewage treatment facilities that would be abandoned upon full plan implementation are scattered throughout the Region and consist of those facilities serving the following land uses: within the Upper Milwaukee River subregional area, the Libby, McNeill, and Libby, Inc. canning plant in the Town of Jackson; within the Sauk Creek subregional area, the Port Country Club in the Town of Belgium; within the Kenosha-Racine subregional area, the American Motors Truck Service Center in the Town of Somers, the Sienna-dale Motherhouse in the Town of Pleasant Prairie, the Frank Pure Food Company in the Towns of Caledonia and Mt. Pleasant, and the St. Bonaventure Seminary in the Town of Mt. Pleasant; within the Root River Canal subregional area, the Wisconsin Department of Health and Social Services Center for the Developmentally Disabled in the Town of Dover and the Racine County Highway and Office Building in the Town of Yorkville, which is recommended to be expanded and converted to a public sewage treatment facility serving the Town of Yorkville Sanitary District No. 1; within the Des Plaines River subregional area, the Howard Johnson Motor Lodge in the Town of Bristol; within the Upper Fox River subregional area, the Steeplechase Inn in the Town of Pewaukee, the New Berlin—West High School in the City of New Berlin, the Oakton Manor-Tumblebrook Golf Course in the Town of Delafield, and the Willow Springs Mobile Home Park in the Town of Lisbon; within the Lower Fox River subregional area, the Packaging Corporation of America in the Town of Burlington, the Praiser Produce Company and the Wisconsin Dairy Cooperative in the Village of Genoa City, the Slovak Sokol Camp in the Town of East Troy, and the Lake Geneva Interlaken Resort Village in the Town of Geneva; within the Upper Rock River subregional area, the National Farmers Organization—Slinger Transfer Station in the Town of Polk; within the Middle Rock River subregional area, the St. John's Military Academy and the Gigas Hillside Apartments in the City of Delafield; and within the Lower Rock River subregional area, the Lake Lawn Lodge in the Town of Delavan, the Walworth County Institutions in the Town of Geneva, and the Kikkoman Foods, Inc. plant in the Town of Walworth.

The remaining 33 existing private sewage treatment facilities and the one proposed private sewage treatment facility to serve the Bong Recreational Area are scattered throughout the Region and are of various types (see Table 11). One of these facilities, that serving the J. I. Case Company in the Town of Mt. Pleasant, is a special-purpose industrial waste treatment facility which, while located within a proposed year 2000 sanitary sewer service area, should be retained to accommodate the special industrial wastes from that plant. Fourteen of the private treatment facilities to be retained serve agricultural-related industries in the Region. These facilities serve the Level Valley Dairy, the Justro Feed Corporation, and the S&R Cheese factory in the Upper Milwaukee River subregional area; the Cedar Valley Cheese Company and the Krier Preserving Company in the Sauk Creek subregional area; the Pekin Duck Farm, the Meeter Brothers Company, the C&D Duck Farm, and the Grove Duck Farm in the Root River Canal subregional area; the Kenosha Packing Company in the Des Plaines River subregional area; the Mammoth Springs Canning Corporation in the Upper Fox River subregional area; the Downy Duck Company in the Lower Fox River subregional area; the Libby, McNeill, and Libby, Inc. canning plant in the Upper Rock River subregional area; and the Libby, McNeill, and Libby, Inc. canning plant in the Lower Rock River subregional area. The private treatment facilities serving the Mammoth Springs Canning Corporation and the Meeter Brothers Company lie within the proposed year 2000 sewer service area limits of the Upper Fox River and Root River Canal subregional areas, respectively. However, each of these facilities is a specialized treatment system constructed to treat canning wastes with relatively high and seasonally variable waste strength and volumes. These facilities are recommended to be retained and should be upgraded as necessary.

The remaining 18 private sewage treatment facilities to be retained and the one proposed facility to be constructed in the plan are domestic waste-oriented and serve institutional, commercial, residential, and recreational land uses beyond the proposed year 2000 sanitary sewer service area limits. These 19 facilities serve the Cedar Lake Rest Home in the Upper Milwaukee River subregional area; Fonk's Mobile Home Park No. 1 in the Root River Canal subregional area; the Brightondale County Park, the Paramski Mobile Home Park, the Wisconsin Tourist Information Center, the George Connolly commercial development, Fonk's Mobile Home Park No. 2, and the Bong Recreational Area in the Des Plaines River subregional area; Holy Redeemer College, the Alpine Valley Lodge, the Alpine Valley Music Center, the Playboy Club Hotel, the Rainbow Springs Resort, the Country Estates Mobile Home Park, the STH 15 East Troy rest area, and the Wheatland Mobile Home park in the Lower Fox River subregional area; the Pike Lake State Park in the Upper Rock River subregional area; the Ethan Allen School in the Middle Rock River subregional area; and the Walworth County Correctional Center in the Lower Rock River subregional area.

Table 10

PRIVATE SEWAGE TREATMENT PLANTS PROPOSED TO BE ABANDONED UPON FULL IMPLEMENTATION OF THE RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN: 2000

Private Sewage Treatment Facility to be Abandoned (by subregional area)	Type of Wastewater	Civil Division Location	Current Effluent Discharge	Public Sewage Treatment Facility to Provide Service Following Abandonment
Milwaukee Metropolitan				
Highway 100 Drive In Theatre	Sanitary	City of Franklin	Root River	Milwaukee Metropolitan Sewerage District
Union Oil Truck Stop	Sanitary	City of Franklin	Root River	Milwaukee Metropolitan Sewerage District
Chalet-on-the-Lake Restaurant	Sanitary	City of Mequon	Lake Michigan	Milwaukee Metropolitan Sewerage District
Sisters of Notre Dame Academy	Sanitary	City of Mequon	Lake Michigan	Milwaukee Metropolitan Sewerage District
Federal Food Company	Process and Sanitary	City of Mequon	Soil Absorption	Milwaukee Metropolitan Sewerage District
Brookfield Central High School	Sanitary	City of Brookfield	Soil Absorption	Milwaukee Metropolitan Sewerage District
Cleveland Heights Elementary School	Sanitary	City of New Berlin	Tributary to Poplar Creek	Milwaukee Metropolitan Sewerage District
Highway 24 Outdoor Theatre[a]	Sanitary	City of New Berlin	Soil Absorption	Milwaukee Metropolitan Sewerage District
New Berlin Memorial Hospital	Sanitary	City of New Berlin	Tributary to Root River	Milwaukee Metropolitan Sewerage District
Muskego Rendering Company, Inc.	Process	City of Muskego	Soil Absorption	Milwaukee Metropolitan Sewerage District
Wisconsin Electric Power Company, Oak Creek Plant[b]	Sanitary	City of Oak Creek	Lake Michigan	Milwaukee Metropolitan Sewerage District
Upper Milwaukee River				
Libby, McNeill, and Libby, Inc.	Process	Town of Jackson	Soil Absorption and Cedar Creek	Village of Jackson
Sauk Creek				
Port Country Club	Sanitary	Town of Belgium	Soil Absorption	Village of Belgium
Kenosha-Racine				
American Motors Truck Service[c]	Process	Town of Somers	Pike River	City of Kenosha
Siennadale Motherhouse	Sanitary	Town of Pleasant Prairie	Bartlett Creek	City of Kenosha
Frank Pure Food Company	Process	Towns of Caledonia and Mt. Pleasant	Hoods Creek	City of Racine
St. Bonaventure Seminary	Sanitary	Town of Mt. Pleasant	Minor Tributary to Pike River	City of Racine
Root River Canal				
Center for the Developmentally Disabled	Sanitary	Town of Dover	West Branch Root River Canal	Village of Union Grove
Racine County Highway and Office Building[d]	Sanitary	Town of Yorkville	Hoods Creek	Town of Yorkville Sanitary District No. 1
Des Plaines River				
Howard Johnson Motor Lodge	Sanitary	Town of Bristol	Des Plaines River	Town of Pleasant Prairie Sewer Utility District D
Upper Fox River				
Steeplechase Inn--Waukesha	Sanitary	Town of Pewaukee	Soil Absorption	City of Waukesha
New Berlin--West High School	Sanitary	City of New Berlin	Tributary to Poplar Creek	City of Brookfield
Oakton Manor-Tumblebrook Golf Course	Sanitary	Town of Delafield	Pewaukee Lake	City of Brookfield
Willow Springs Mobile Home Park	Sanitary	Town of Lisbon	Soil Absorption	City of Brookfield
Lower Fox River				
Packaging Corporation of America	Process and Sanitary	Town of Burlington	Tributary to Fox River	City of Burlington
Praiser Produce Company	Process	Village of Genoa City	Soil Absorption	Village of Genoa City
Wisconsin Dairies Cooperative	Process	Village of Genoa City	Nippersink Creek	Village of Genoa City
Slovak Sokol Camp	Sanitary	Town of East Troy	Soil Absorption	Village of East Troy
Lake Geneva Interlaken Resort Village	Sanitary	Town of Geneva	Soil Absorption	City of Lake Geneva
Upper Rock River				
National Farmers Organization--Slinger Transfer Station	Process	Town of Polk	Soil Absorption	Village of Slinger
Middle Rock River				
St. John's Military Academy	Sanitary	City of Delafield	Bark River and Soil Absorption	Delafield-Hartland Water Pollution Control Commission
Gigas Hillside Apartments	Sanitary	City of Delafield	Soil Absorption	Delafield-Hartland Water Pollution Control Commission
Lower Rock River				
Lake Lawn Lodge	Sanitary	Town of Delavan	Delavan Lake	Walworth County Metropolitan Sewerage District
Walworth County Institutions	Sanitary	Town of Geneva	Jackson Creek	Walworth County Metropolitan Sewerage District
Kikkoman Foods, Inc.	Process	Town of Walworth	Soil Absorption	Village of Walworth

[a] *The facility serving the Highway 24 Outdoor Theatre is presently (1978) not in operation. A wastewater holding tank is being utilized to store wastewater prior to removal by tank truck.*

[b] *This facility lies immediately adjacent to the year 2000 sewer service area and as such is recommended for abandonment herein. However, topography makes the conveyance of wastes from this facility to a public treatment plant costly. The cost-effectiveness of retaining this facility should be carefully analyzed at the local facility planning level, and the results of that analysis incorporated into the areawide plan upon adoption by all concerned agencies.*

[c] *The facility serving the American Motor Truck Service is presently (1978) not in operation. A wastewater holding tank is being utilized to store wastewater prior to removal by tank truck.*

[d] *The facility has been classified as a public wastewater treatment plant serving the Town of Yorkville Sanitary District No. 1.*

Source: SEWRPC.

Table 11

PRIVATE SEWAGE TREATMENT FACILITIES PROPOSED TO BE RETAINED UNDER THE RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN FOR THE REGION: 2000

Private Sewage Treatment Facility to be Retained (by subregional area)	Type of Wastewater	Civil Division Location	Current Effluent Discharge
Milwaukee Metropolitan			
None	--	--	--
Upper Milwaukee River			
Level Valley Dairy	Process and Cooling	Town of Jackson	Cedar Creek
Justro Feed Corporation[a]	Process	Town of Cedarburg	Soil Absorption
S & R Cheese Factory	Process	Town of Saukville	Soil Absorption
Cedar Lake Rest Home	Sanitary	Town of West Bend	Soil Absorption
Sauk Creek			
Cedar Valley Cheese Company	Process and Cooling	Town of Fredonia	Soil Absorption
Krier Preserving Company	Process	Town of Belgium	Soil Absorption and a Tributary of the Onion River
Kenosha-Racine			
J. I. Case Company	Process and Cooling	Town of Mt. Pleasant	Lake Michigan
Root River Canal			
Fonk's Mobile Home Park No. 1	Sanitary	Town of Yorkville	East Branch Root River Canal
Pekin Duck Farm	Process	Town of Yorkville	Soil Absorption
Meeter Brothers Company	Process	Town of Dover	Tributary of the Des Plaines River
C&D Duck Farm	Process	Town of Yorkville	West Branch Root River Canal
Grove Duck Farm	Process	Town of Raymond	West Branch Root River Canal
Des Plaines River			
Brightondale County Park	Sanitary	Town of Brighton	Brighton Creek
Paramski Mobile Home Park	Sanitary	Town of Bristol	Soil Absorption
Wisconsin Tourist Information Center	Sanitary	Town of Pleasant Prairie	Des Plaines River
George Connolly Development[b]	Sanitary	Town of Pleasant Prairie	Tributary to Des Plaines River
Fonk's Mobile Home Park No. 2	Sanitary	Town of Dover	Tributary to Des Plaines River
Kenosha Packing Company	Cooling, Process, and Sanitary	Town of Paris	Soil Absorption
Bong Recreational Area[c]	Sanitary	Town of Brighton	--
Upper Fox River			
Mammoth Springs Canning Corporation	Process	Town of Lisbon	Soil Absorption
Lower Fox River			
Holy Redeemer College	Sanitary	Town of Dover	Tributary to Wind Lake Canal
Alpine Valley Resort (two plants)[d]	Sanitary	Town of LaFayette	Soil Absorption
Playboy Club Hotel	Sanitary	Town of Lyons	White River
Rainbow Springs Resort[e]	Sanitary	Town of Mukwonago	Tributary to Mukwonago River
Country Estates Mobile Home Park	Sanitary	Town of Lyons	Tributary to Ore Creek
East Troy Rest Area (STH 15)	Sanitary	Town of LaFayette	Tributary to Sugar Creek
Wheatland Mobile Home Park	Sanitary	Town of Wheatland	Minor Tributary to Fox River
Downy Duck Company	Process	Town of Dover	Soil Absorption
Upper Rock River			
Libby, McNeill, and Libby, Inc.	Process	City of Hartford	--[f]
Pike Lake State Park	Sanitary	Town of Hartford	Soil Absorption
Middle Rock River			
Ethan Allan School	Sanitary	Town of Delafield	Soil Absorption
Lower Rock River			
Libby, McNeill, and Libby, Inc.	Process	Town of Darien	Soil Absorption
Walworth County Correctional Center[g]	Sanitary	Town of Geneva	Soil Absorption

[a] *The facility serving the Justro Feed Corporation is not presently (1978) in operation.*

[b] *The facility serving the George Connolly development is not presently (1978) in operation.*

[c] *This facility was not in existence in 1978, but is recommended to be constructed to serve the recreational development proposed for the Bong Recreation Area.*

[d] *One of these facilities was placed into operation since 1975 and is not reflected in the inventory of private sewage treatment plants reported in SEWRPC Technical Report No. 21, Sources of Water Pollution in Southeastern Wisconsin: 1975. It is recommended that the operation of the older 0.04 mgd treatment facility serving the Alpine Valley main building be carefully monitored and that the facility be considered an interim plant. At such time as that facility operation becomes unsatisfactory, it is recommended that the plant be abandoned and all waste be connected to the new Fox Wood treatment facility.*

[e] *The facility serving the Rainbow Springs Resort is not presently in operation.*

[f] *The facility serving Libby, McNeill, and Libby, Inc. is presently utilized only for pretreatment of wastewater prior to the discharge of wastes to the City of Hartford sanitary sewerage system.*

[g] *This facility is not presently (1978) in operation.*

Source: SEWRPC.

It is recognized that those private sewage treatment facilities recommended to be retained in the plan are unique in terms of the type and location of the land uses served and the types of wastes to be treated. Accordingly, definitive recommendations concerning the type and level of treatment to be provided must be formulated on a case-by-case basis during plan implementation. In order to provide guidance for such implementation, however, the areawide water quality management plan does recommend that all of the 34 private sewage treatment facilities proposed to be retained except two, those being the facilities serving the J. I. Case Company in the Town of Mt. Pleasant and the Libby, McNeill, and Libby, Inc. facility in the City of Hartford, dispose of the treated effluent through land irrigation or soil absorption sewage lagoons. At the present time, 16 of the 32 private sewage treatment plants to which this recommendation is directed already utilize some form of land disposal of treated effluent. The costs relating to such land disposal of sewage effluent are set forth in Table 12. Land application of effluent for treatment facilities of the size of plants involved may be generally expected to be more cost-effective than providing an advanced level of waste treatment through biological, physical, and chemical treatment with discharge of the treated effluent to surface waters. Should detailed studies during plan implementation indicate that land application of sewage effluent is not practical at a given private sewage treatment facility, then it is recommended that the facility be designed to provide the level of treatment needed to meet the water use objectives and supporting water quality standards with the effluent discharged to surface waters.

It is important to recognize that additional private sewage treatment facilities may be needed during the plan implementation period to serve new enclaves of isolated land use development. Generally, such new facilities may be expected to lie beyond the plan 2000 sewer service areas, although it is possible that interim private sewage treatment facilities may be needed to accommodate urban development even within the recommended sanitary sewer service areas until appropriate extensions of sanitary sewers can be fully effected. Each proposal for a new private sewage treatment facility must accordingly be individually evaluated in light of the adopted plan and the objectives which that plan is intended to achieve.

Certain types of urban land uses are properly and logically located in the more rural reaches of the Region and at times may require the provision of a sewage treatment facility, as opposed to septic tank systems. The types of urban land uses that must of necessity often be located in rural areas, where public centralized sanitary sewer service is not available, include highway-oriented commercial service facilities, such as motels, restaurants, and certain types of truck service stations and terminals; certain transportation facilities, such as airports; park and outdoor recreational facilities, both public and private; certain institutional facilities; and industrial facilities directly related to the agricultural land use base. It is not possible within the context of a regional planning effort to identify the need for or to locate all such potential land uses in the rural areas. Accordingly, each proposal must be evaluated as it arises. Those additional private sewage treatment facilities found to be essential to accommodate such isolated urban enclaves must provide a type and level of treatment that will achieve the recommended water use objectives. Generally, the best way to achieve such objectives will be to dispose of the treated sewage effluent through land application. In considering this matter, it should be recognized that while there are a number of different types of land uses which need to be located in the rural areas of the Region and which may, therefore, properly be provided with individual sewage treatment facilities, such facilities should not be used to accommodate new urban residential development or new urban commercial or industrial development that can more rationally and efficiently be accommodated within the recommended year 2000 sanitary sewer service areas—areas where substantial public capital investment has in many cases already been made to accommodate future development.

Trunk Sewers

Intercommunity: The regional water quality management plan includes proposals for those trunk sewers necessary to extend centralized sanitary sewer service to the proposed year 2000 sanitary sewer service areas and to enable the abandonment of certain public sewage treatment plants. The general alignment and approximate size of these intercommunity trunk sewers are shown on Map 5. Cost estimates for the proposed intercommunity trunk sewers included in the plan are set forth in Table 13.

Within the Milwaukee metropolitan subregional area, the plan recommendations and costs are based, with but one exception, on completion of the long-range trunk sewer plan set forth in the adopted regional sanitary sewerage system plan and the Milwaukee Metropolitan Sewerage District trunk, relief, and intercepting sewer plan. These sewer extensions are designed to provide sanitary sewer service to existing and proposed urban development within the District and its contract service areas and to provide relief to portions of the trunk sewer system now experiencing surcharging.[7] The single exception is the Ryan Creek trunk sewer, a sewer designed to serve the southernmost portions of the Cities of Franklin and Muskego. Based upon the new regional land use plan, this sewer would not be needed to accommodate urban development by the year 2000. It is further recommended that other revisions and refinements to the long-range trunk sewer plan for the Milwaukee metropolitan subregional area be developed to reflect updated population and land use data as part of the facilities

[7] *The Milwaukee metropolitan trunk sewer system has been designed in part to provide for selective routing of sewage flows to the two major sewage treatment facilities—Jones Island and South Shore.*

Table 12

COST ESTIMATES FOR PRIVATE SEWAGE TREATMENT PLANTS IN THE REGION: 2000

Private Sewage Treatment Plant (by subregional area)	Estimated Cost[a]	
	Total Capital 1975-2000	Average Annual Operation and Maintenance
Milwaukee Metropolitan		
None	$ --	$ --
Upper Milwaukee River		
Level Valley Dairy	$ 300,000	$ 52,000
Justro Feed Corporation	50,000	$ 4,000
S & R Cheese Factory	20,000	2,000
Cedar Lake Rest Home	100,000	9,000
Subtotal--Subregional Area	$ 970,000	$ 67,000
Sauk Creek		
Cedar Valley Cheese Company	$ 110,000	$ 13,000
Krier Preserving Company	440,000	70,000
Subtotal--Subregional Area	$ 550,000	$ 83,000
Kenosha-Racine		
J. I. Case Company	$ 320,000	$ 36,000
Subtotal--Subregional Area	$ 320,000	$ 36,000
Root River Canal		
Fonk's Mobile Home Park No. 1	$ 190,000	$ 7,000
Pekin Duck Farm	130,000	14,000
Meeter Brothers Company	450,000	16,000
C&D Duck Farm	870,000	35,000
Grove Duck Farm	250,000	9,000
Subtotal--Subregional Area	$1,890,000	$ 81,000
Des Plaines River		
Brightondale County Park	$ 60,000	$ 5,000
Paramski Mobile Home Park	370,000	13,000
Wisconsin Tourist Information Center	250,000	7,000
George Connolly Development	330,000	11,000
Fonk's Mobile Home Park No. 2	250,000	10,000
Kenosha Packing Company	70,000	10,000
Bong Recreational Area	250,000	9,000
Subtotal--Subregional Area	$1,580,000	$ 65,000
Upper Fox River		
Mammoth Springs Canning Corporation	$ 170,000	$ 23,000
Subtotal--Subregional Area	$ 170,000	$ 23,000
Lower Fox River		
Holy Redeemer College	$ 230,000	$ 7,000
Alpine Valley Resort (two plants)[b]	400,000	15,000
Playboy Club Hotel	560,000	25,000
Rainbow Springs Resort	790,000	32,000
Country Estates Mobile Home Park	250,000	10,000
East Troy Rest Area (STH 15)	270,000	10,000
Wheatland Mobile Home Park	390,000	13,000
Downy Duck Company	130,000	14,000
Subtotal--Subregional Area	$3,020,000	$126,000
Upper Rock River		
Libby, McNeill, and Libby, Inc.	$ 200,000	$ 15,000
Pike Lake State Park	230,000	18,000
Subtotal--Subregional Area	$ 430,000	$ 33,000
Middle Rock River		
Ethan Allan School	$ 240,000	$ 20,000
Subtotal--Subregional Area	$ 240,000	$ 20,000
Lower Rock River		
Libby, McNeill, and Libby, Inc.	$ 390,000	$ 80,000
Walworth County Correctional Center	110,000	7,000
Subtotal--Subregional Area	$ 500,000	$ 87,000
Total	$9,670,000	$621,000

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

[b] *It is recommended that the operation of the older 0.04 mgd treatment facility serving the Alpine Valley Lodge main building be carefully monitored and that the facility be considered an interim plant. At such time as that facility operation becomes unsatisfactory, it is recommended that the plant be abandoned and all wastes be connected to the new Fox Wood treatment facility.*

Source: SEWRPC.

Table 13

COST ESTIMATES FOR INTERCOMMUNITY TRUNK SEWERS IN THE REGION: 2000

Intercommunity Trunk Sewer (by subregional area)	Estimated Cost[a]	
	Total Capital 1975-2000	Average Annual Operation and Maintenance
Milwaukee Metropolitan		
Milwaukee Metropolitan Sewerage District[b]		
Northridge (875)	$ 847,000	$ 240
Northeast Side Relief--North Branch (246, 250,867, 939)	17,796,000	84
Northeast Side Relief--East Branch (247, 251, 252, 255, 256, 257, 868)	16,359,000	10,100
Milwaukee River Relief (278)	1,668,000	400
Menomonee Falls-Germantown (813, 921, 922)[c]	13,108,000	1,100
Menomonee River (233, 239)[d]	13,240,000	900
Underwood Creek (276, 275)	4,479,000	900
Root River (241, 242, 243)	9,083,000	1,400
Hales Corners (237)[e]	5,173,000	700
Franklin-Muskego (238, 266)	4,975,000	900
Franklin-Northeast (261,262,263)	6,594,000	1,300
Oak Creek-Southwest (267)	1,872,000	200
Oak Creek (264, 265)	2,905,000	600
Oak Creek-South (273)	1,840,000	200
Mitchell Field-South (272)	2,808,000	600
Caddy Vista (271)	3,525,000	500
Subtotal	106,272,000	$ 20,100
Caddy Vista Sanitary District	$ 510,000	$ 7,100
Muskego	2,260,000	1,100
New Berlin	1,350,000	1,100
Brookfield-Menomonee Falls	580,000	600
Germantown	4,090,000	41,300
Thiensville-Mequon	790,000	700
Subtotal	9,580,000	51,900
Subtotal--Subregional Area	$115,852,000	$ 72,000
Upper Milwaukee River		
Jackson	$ 204,000	$ 300
Waubeka-Fredonia	383,000	2,800
Subtotal--Subregional Area	$ 587,000	$ 3,100
Sauk Creek		
Lake Church-Belgium	$ 471,000	$ 2,600
Subtotal--Subregional Area	$ 471,000	$ 2,600
Kenosha-Racine		
Caledonia-Crestview and North Park-Racine	$ 5,016,000	$ 20,700
Sturtevant-Mt. Pleasant-Racine and Sandus Park[f]	10,660,000	12,200
Somers-Kenosha	7,546,000	3,700
Pleasant Prairie-Kenosha	2,831,000	4,300
Subtotal--Subregional Area	$ 26,053,000	$ 40,900
Root River Canal		
Center for Developmentally Disabled--Union Grove	$ 210,000	$ 400
Union Grove[g]	186,000	400
Subtotal--Subregional Area	$ 396,000	$ 800
Des Plaines River		
Bristol-Pleasant Prairie	$ 722,000	$ 5,100
Paddock Lake-Salem	606,000	8,200
Subtotal--Subregional Area	$ 1,328,000	$ 13,300
Upper Fox River		
Sussex-Lannon	$ 965,000	$ 300
Lannon-Menomonee Falls	4,164,000	1,600
Duplainville	229,000	400
Springdale[h]	327,000	600
Pewaukee Lake[i]-Pewaukee	1,209,000	6,200
Pewaukee-Brookfield	3,461,000	14,500
Poplar Creek[j]	2,691,000	17,000
Subtotal--Subregional Area	$ 13,046,000	$ 25,300
Lower Fox River		
Mukwonago	$ 135,000	$ 200
Potter Lake-East Troy	691,000	5,400
Lake Geneva-North	336,000	400
Lake Geneva-South	2,486,000	13,200
Como Lake-North	1,037,000	7,500
Como Lake-South	1,295,000	8,200
Muskego-Norway[k]	777,000	6,400
Tichigan Lake-Rochester	3,031,000	34,600
Silver Lake-Camp Lake	1,113,000	14,400
Wilmot	400,000	3,700
Cross-Rock Lakes	1,928,000	10,100
Subtotal--Subregional Area	$ 13,229,000	$104,000
Upper Rock River		
Slinger	$ 68,000	$ 100
Subtotal--Subregional Area	$ 68,000	$ 100
Middle Rock River		
Lac La Belle-Oconomowoc-East	$ 514,000	$ 4,100
Lac La Belle-Oconomowoc-West	590,000	1,000
North Lake-Oconomowoc	4,412,000	20,300
Silver Lake-Oconomowoc	312,000	2,900
Hartland-Delafield[l]	3,907,000	36,000
Nashotah-Delafield[l]	478,000	900
Summit-Delafield	594,000	7,900
Subtotal--Subregional Area	$ 10,807,000	$ 73,100
Lower Rock River		
Whitewater	$ 643,000	$ 400
Walworth County Institutions	935,000	5,000
Elkhorn	1,436,000	16,600
Delavan Lake	3,525,000	17,300
Williams Bay-Lake Geneva	326,000	9,300
Williams Bay-Fontana	1,469,000	13,900
Fontana-Lake Geneva	1,342,000	9,700
Fontana-Walworth	1,135,000	8,000
Walworth	751,000	1,000
Subtotal--Subregional Area	$ 11,562,000	$ 81,200
Total	$193,399,000	$416,100

NOTE: Numbers in parentheses represent Milwaukee Metropolitan Sewerage District contract numbers.

[a] *Costs are expressed in terms of August 1976 dollars.*

[b] *Capital cost estimates based upon data contained in Milwaukee Pollution Abatement Program Technical Memorandum 4/1-3 dated March 22, 1978.*

[c] *That portion of this sewer designated as Contract Number 813 was under construction early in 1979. When completed, this portion of the sewer will permit abandonment of the two Menomonee Falls sewage treatment plants.*

[d] *This sewer was completed and placed into service in 1977.*

[e] *A portion of this sewer is planned to be under construction early in 1979. When completed, this portion of the sewer will permit abandonment of the Hales Corners sewage treatment plant.*

[f] *This sewer was under construction late in 1978.*

[g] *This sewer was placed into service in 1978.*

[h] *This sewer was placed into service in 1979.*

[i] *This sewer was under construction in 1978.*

[j] *The initial portion of this sewer from the Brookfield sewage treatment plant to IH 94 was completed in 1978.*

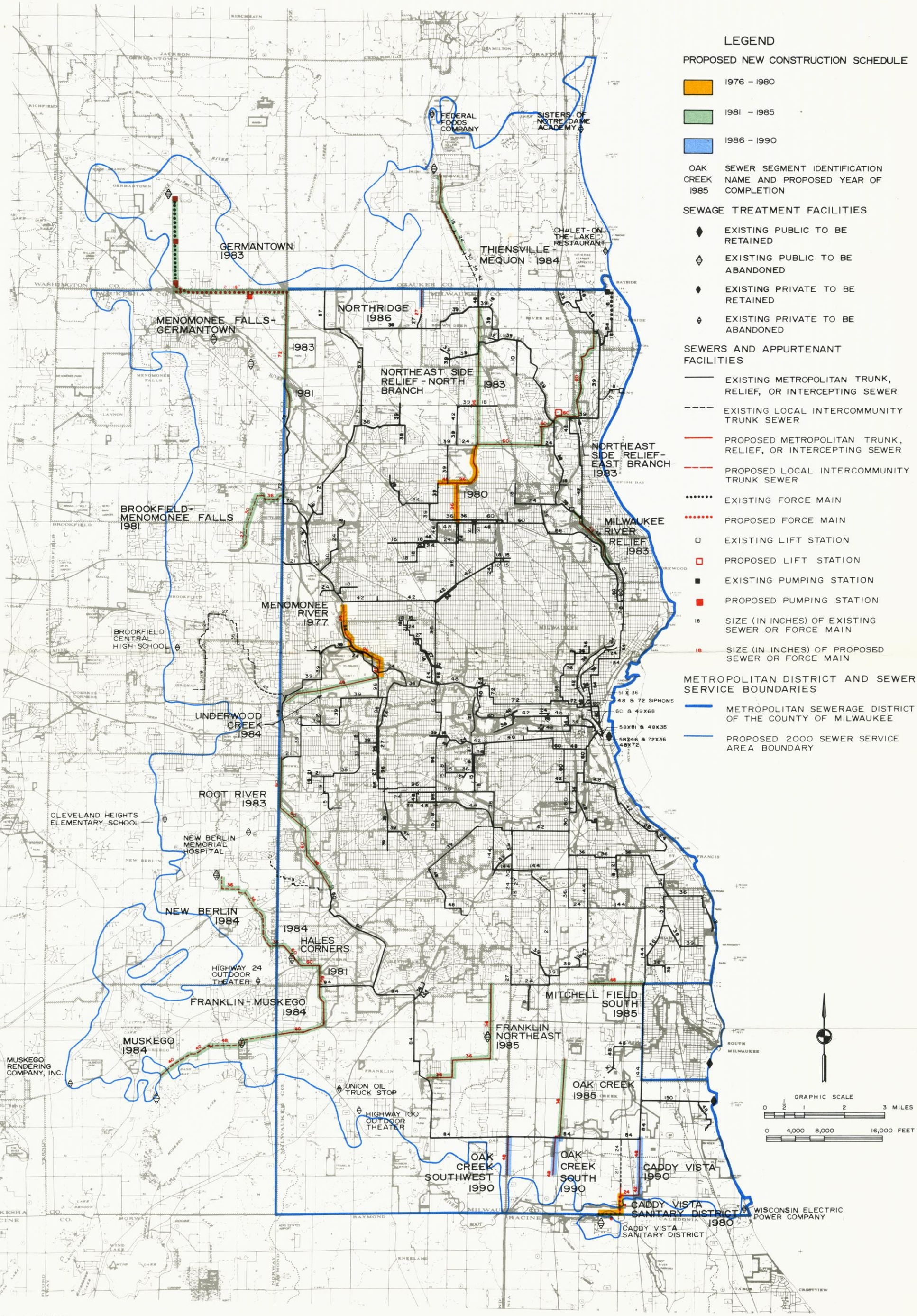
[k] *This sewer was placed into service in 1978.*

[l] *This sewer was under construction in 1978.*

Source: SEWRPC.

Map 6

IDENTIFICATION BY SEGMENT OF THE RECOMMENDED TRUNK SEWERS IN THE MILWAUKEE METROPOLITAN SUBREGIONAL AREA



LEGEND

PROPOSED NEW CONSTRUCTION SCHEDULE

- 1976 – 1980
- 1981 – 1985
- 1986 – 1990

OAK CREEK 1985 — SEWER SEGMENT IDENTIFICATION NAME AND PROPOSED YEAR OF COMPLETION

SEWAGE TREATMENT FACILITIES

- EXISTING PUBLIC TO BE RETAINED
- EXISTING PUBLIC TO BE ABANDONED
- EXISTING PRIVATE TO BE RETAINED
- EXISTING PRIVATE TO BE ABANDONED

SEWERS AND APPURTENANT FACILITIES

- EXISTING METROPOLITAN TRUNK, RELIEF, OR INTERCEPTING SEWER
- EXISTING LOCAL INTERCOMMUNITY TRUNK SEWER
- PROPOSED METROPOLITAN TRUNK, RELIEF, OR INTERCEPTING SEWER
- PROPOSED LOCAL INTERCOMMUNITY TRUNK SEWER
- EXISTING FORCE MAIN
- PROPOSED FORCE MAIN
- EXISTING LIFT STATION
- PROPOSED LIFT STATION
- EXISTING PUMPING STATION
- PROPOSED PUMPING STATION
- 18 — SIZE (IN INCHES) OF EXISTING SEWER OR FORCE MAIN
- 18 — SIZE (IN INCHES) OF PROPOSED SEWER OR FORCE MAIN

METROPOLITAN DISTRICT AND SEWER SERVICE BOUNDARIES

- METROPOLITAN SEWERAGE DISTRICT OF THE COUNTY OF MILWAUKEE
- PROPOSED 2000 SEWER SERVICE AREA BOUNDARY

Source: SEWRPC.

planning program presently being conducted by the Milwaukee Metropolitan Sewerage District. The modifications developed under the local facility planning program are being coordinated with and will be incorporated into the regional water quality management plan upon review and adoption by all parties concerned. The proposed extensions to the Milwaukee metropolitan trunk sewer system are shown on Map 6. Several of the segments relate directly to the abandonment of public sewage treatment facilities within the Milwaukee Metropolitan Sewerage District and its existing and proposed contract service areas. Construction of the Hales Corners trunk sewer will permit the abandonment of the Hales Corners sewage treatment facility. Construction of the Hales Corners trunk sewer is also essential to the abandonment of the Regal Manors sewage treatment plant in the City of New Berlin. Construction of the Franklin-Muskego trunk sewer is essential to the abandonment of the Northeast District and Big Muskego Lake sewage treatment plants in the City of Muskego. Construction of the initial portion of the Menomonee Falls-Germantown trunk sewer is essential to the abandonment of the Lilly Road and Pilgrim Road sewage treatment plants in the Village of Menomonee Falls. Construction of the final portion of the Menomonee Falls-Germantown trunk sewer is essential to the abandonment of the Village of Germantown sewage treatment plant. Finally, the construction of the North Branch of the Northeast Side relief sewer is essential to the abandonment of the Village of Thiensville sewage treatment plant.

Other metropolitan trunk sewers recommended for construction include the Northridge trunk sewer in the Granville portion of the City of Milwaukee, the East Branch of the Northeast Side relief sewer, the Milwaukee River relief sewer, the Menomonee River relief sewer,[8] the Underwood Creek sewer, the Root River sewer, the Franklin Northeast sewer, the Oak Creek sewer, the Oak Creek Southwest sewer, the Oak Creek South sewer, the Mitchell Field South sewer, and the Caddy Vista sewer.[9]

In addition to the foregoing proposed trunk sewer extensions, which lie under the direct jurisdiction of the Milwaukee-Metropolitan Sewerage Commissions, the recommended plan includes trunk sewers in the Milwaukee metropolitan subregional area that lie under local jurisdiction but are required to provide intercommunity connections, to permit the abandonment of existing public sewage treatment plants, or to provide sewer service to areas presently unsewered. These six trunk sewers consist of the Caddy Vista Sanitary District sewer, which would connect to an existing local trunk sewer in the City of Oak Creek and permit abandonment of the Caddy Vista Sanitary District sewage treatment facility; the Muskego sewer, which would enable the abandonment of both the Northeast District and Big Muskego Lake sewage treatment facilities operated by the City of Muskego; the New Berlin sewer, which would permit the abandonment of the Regal Manors sewage treatment facility operated by the City of New Berlin; the Brookfield-Menomonee Falls sewer, which would provide sewer service to existing and proposed urban development in both the City of Brookfield and the Village of Menomonee Falls; the Germantown sewer, which would permit abandonment of the Germantown sewage treatment facility operated by the Village of Germantown; and the Thiensville-Mequon sewer, which would permit abandonment of the Thiensville sewage treatment facility operated by the Village of Thiensville.

As noted earlier in this chapter, a sewerage facilities planning effort is currently underway for the Milwaukee metropolitan subregional area. It is expected that this facility planning effort will reopen system level decisions that have been made in past years, including decisions relating to trunk sewer construction. Accordingly, the foregoing trunk sewer recommendations for the Milwaukee metropolitan subregional area are intended to serve as guidelines for decisionmaking until such time as the Milwaukee metropolitan subregional area sewerage facilities plan is completed and adopted by all parties concerned as an amendment to the areawide water quality management plan.

Within the Upper Milwaukee River subregional area, the plan proposes construction of two trunk sewers. The first is attendant to the relocation of the Village of Jackson sewage treatment plant. The second would provide for sewage conveyance from the proposed Waubeka sanitary sewer service area to the Village of Fredonia sewage treatment facility.

Within the Sauk Creek subregional area, construction of one trunk sewer is proposed in the recommended plan. This sewer would permit connection of the Lake Church sewer service area in the Town of Belgium to the Village of Belgium sewage treatment facility and provide public sanitary sewer service to the Harrington Beach State Park.

Within the Kenosha-Racine subregional area, four trunk sewers are proposed. These four sewers are either extensions of existing sewers or proposed new sewers radiating from the area sewage treatment facilities. These include: a new sewer extending from the Racine sewage treatment facility to serve the Town of Caledonia and the Crestview and North Park Sanitary Districts, permitting the abandonment of the North Park sewage treatment facility operated by the North Park Sanitary District and an

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[8] *This sewer has been constructed and was placed into operation in 1977.*

[9] *The Milwaukee metropolitan trunk sewer identified as Caddy Vista, while designed to ultimately carry sewage flow from the Caddy Vista Sanitary District in the Town of Caledonia, Racine County, as well as from about five square miles of land in Milwaukee County, is not essential to the initial abandonment of the sewage treatment plant operated by the Caddy Vista Sanitary District. That plant can be abandoned on an interim basis through a connection to a local trunk sewer owned and operated by the City of Oak Creek.*

extension of a trunk sewer to connect the Caledonia sanitary sewer service area to the City of Racine sewage treatment plant; a new sewer from the City of Racine sewage treatment plant to connect the Village of Sturtevant and the Town of Mt. Pleasant service areas to that plant, and to permit the abandonment of the Sturtevant sewage treatment plant operated by the Village of Sturtevant;[10] a new sewer extending from the City of Kenosha sewage treatment plant to serve the Town of Somers and the University of Wisconsin-Parkside area, and to permit the abandonment of the sewage treatment facility operated by the Town of Somers Sanitary District No. 2; and a new sewer from the City of Kenosha sewage treatment plant to the Town of Pleasant Prairie, which would permit the abandonment of the Pleasant Park sewage treatment facility currently operated by the Pleasant Park Utility Company, Inc.

Within the Root River Canal subregional area, two trunk sewers are included in the recommended plan. The first would be attendant to the recommended relocation of the Union Grove sewage treatment facility, and would provide capacity to convey the wastes from both Union Grove and the Center for the Developmentally Disabled between the old and new Union Grove treatment plant locations.[11] The second sewer would connect the Center for the Developmentally Disabled with the above-noted new Union Grove trunk sewer, thus permitting abandonment of the private treatment plant currently operated by the Wisconsin Department of Health and Social Services.

Within the Des Plaines River subregional area, two trunk sewers are included in the recommended plan. The first would provide for the conveyance of sewage from the Bristol-IH 94 sewer service area to the sewage treatment facility operated by the Town of Pleasant Prairie Sewer Utility District D. The second would provide for the conveyance of sewage from the Village of Paddock Lake sewer service area to the sewage treatment facility operated by the Town of Salem Sewer Utility District No. 1, and would permit the abandonment of the existing Paddock Lake sewage treatment plant.

Within the Upper Fox River subregional area, seven trunk sewers are included within the recommended plan. Together, these seven sewers would provide for conveyance of sewage from several existing and proposed sanitary sewer service areas to the City of Brookfield sewage treatment plant. The first of these seven sewers would extend from the Brookfield treatment plant north to the Villages of Lannon and Menomonee Falls. The second would extend from the Lannon-Menomonee Falls sewer to the Village of Sussex and would permit abandonment of the existing Sussex sewage treatment facility operated by the Village of Sussex. The third would extend from the Lannon-Menomonee Falls sewer to portions of the City of Brookfield and to the Duplainville portion of the Town of Pewaukee Sanitary District No. 3. The fourth would extend from the Brookfield plant to the Springdale area of the Town of Pewaukee Sanitary District No. 3.[12] The fifth would extend from the City of Brookfield plant to the Village of Pewaukee to provide service to the Village and the Lake Pewaukee Sanitary District and permit abandonment of the existing Village of Pewaukee sewage treatment facility. The sixth would extend from the Pewaukee-Brookfield sewer to the Pewaukee Lake Sanitary District.[13] The seventh would extend from the Brookfield plant south along Poplar Creek and would provide sanitary sewer service to the Town of Brookfield and the City of New Berlin.[14]

Within the Lower Fox River subregional area, 11 trunk sewers are included in the recommended plan. The first would permit relocation of the Mukwonago sewage treatment plant to a new site downstream of the Mukwonago River. The second would provide sewer service to the Potter Lake area in the Town of East Troy and would extend from the Village of East Troy sewage treatment facility to a point near Potter Lake. The third would extend from the City of Lake Geneva along the north shore of Lake Geneva in the Towns of Geneva and Linn. The fourth would extend from the City of Lake Geneva along the southern shoreline of Lake Geneva in the Town of Linn. The fifth and sixth would extend from the City of Lake Geneva to urban development situated along the northern and southern shorelines, respectively, of Lake Como in the Town of Geneva. The seventh would provide for sewer service to urban development along the shoreline of Denoon Lake in the City of Muskego, connecting that area to the sewage treatment plant operated by the Town of Norway Sanitary District No. 1.[15] The eighth would extend from the Western Racine County Sewerage District sewage treatment facility to urban development along the Fox River and Tichigan Lake in the Town of Waterford Sanitary District No. 1. The ninth, tenth, and eleventh consist of new trunk sewers proposed to interconnect the Wilmot, Cross-Rock Lakes, and Camp and Center Lakes sewer service areas in the Town of Salem to a proposed sewage treatment facility to be owned and operated by the Town of Salem Sewer Utility District No. 2.

Within the Upper Rock River subregional area, one trunk sewer is included in the recommended plan. That sewer would permit the relocation of the Slinger sewage treatment plant.

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[10] *This sewer was under construction late in 1978.*

[11] *This facility has been constructed and was placed into operation in 1978.*

[12] *This sewer has been constructed and was placed into operation in 1979.*

[13] *This sewer was under construction in 1978.*

[14] *The initial portion of this sewer from the Brookfield sewage treatment plant to IH 94 was completed in 1978.*

[15] *This sewer has been constructed and was placed into operation in 1978.*

Within the Middle Rock River subregional area, seven trunk sewers are included in the recommended plan. The first two sewers would extend from the Oconomowoc sewage treatment facility to and along the east and west shorelines of Lac La Belle to serve urban development in the Town of Oconomowoc and the Village of Lac La Belle. The third sewer would extend easterly from the Oconomowoc sewage treatment plant and provide sewer service to urban development along the shorelines of Oconomowoc Lake, Okauchee Lake, North Lake, Pine Lake, and Beaver Lake. The fourth would extend from the Oconomowoc treatment facility southerly to serve existing and proposed urban development along the shoreline of Silver Lake. The fifth would extend from the proposed new Delafield-Hartland sewage treatment facility to serve the City of Delafield and the Village of Hartland, and would permit abandonment of the existing Village of Hartland treatment facilities.[16] The sixth would extend northerly from the Delafield-Hartland sewage treatment facility to serve the City of Delafield and the Village of Nashotah.[17] The seventh would extend from the Delafield-Hartland sewage treatment facility to serve existing and proposed urban development along the shorelines of Nashotah and Nemahbin Lakes in the Town of Summit.

Within the Lower Rock River subregional area, nine trunk sewers are included in the recommended plan. The first would permit relocation of the existing City of Whitewater sewage treatment facility to a new site downstream on Whitewater Creek. The second, third, and fourth sewers would connect the Walworth County Institutions, the City of Elkhorn, and the Delavan Lake Sanitary District to the new sewage treatment facility proposed to be constructed by the Walworth County Metropolitan Sewerage District at Delavan, thus permitting the abandonment of the existing Elkhorn treatment plant. The fifth would extend from the Village of Fontana along the shoreline of Lake Geneva in the Town of Linn, while the sixth would extend from the Village of Williams Bay along the northerly shoreline of Lake Geneva in the Town of Linn. The seventh, eighth, and ninth new trunk sewers would interconnect the Williams Bay, Fontana, and Walworth sewer service areas to a new sewage treatment facility located at the site of the existing Walworth treatment plant effluent lagoons near Piscasaw Creek downstream of Walworth, thus permitting abandonment of the existing Williams Bay, Fontana, and Walworth sewage treatment facilities.

Local: The foregoing specific trunk sewer recommendations concern only those trunk sewers which are of an intercommunity nature. Also of importance to the attainment of the basic plan recommendation to provide centralized sanitary sewer service to the recommended future sewer service areas are local trunk sewer extensions, which generally involve only a single community and are not, therefore, of areawide significance. As part of the plan preparation process, data on the configuration and size of locally proposed trunk sewers were obtained directly from local officials. These data represent specific proposals set forth in official community development plans and related engineering studies. Map scale limitations preclude showing these locally proposed trunk sewers on Map 5. Accordingly, based upon the data submitted by the local officials, larger-scale, individual community maps identifying the locally proposed trunk sewers have been obtained by the Commission and are on file in the Commission offices. It should be clearly understood that these locally proposed trunk sewers, while not shown on the recommended plan map or included in the plan cost estimates, represent an important adjunct to the recommended regional water quality management plan and, as such, should be useful in plan implementation.

To illustrate the type of local community trunk sewer mapping data provided by the local officials, a representative example of such a map prepared from that data has been reproduced in this report (see Map 7). This map illustrates the locally proposed trunk sewer extensions to serve the recommended future sewer service area in the Cedarburg-Grafton area. A list of all cities, villages, and special districts for which local trunk sewer plans have been prepared and are on file in the Commission offices is set forth in Table 14. Since all local units of government and special-purpose districts were contacted in 1975 by the Commission and asked to provide information on locally proposed trunk sewer extensions, it may be assumed that at the time the water quality management plan was prepared and evaluated, those units and districts not listed in Table 14 had no firm plans for local trunk sewer extensions.

Abatement of Combined Sewer Overflows

Combined sewer overflows constitute a water pollution and environmental health problem in the older central portions of the three urbanized areas of the Region—the Kenosha, Milwaukee, and Racine urbanized areas. In the City of Kenosha, combined sewers in 1975 served an area of about 2.2 square miles.[18] The combined sewer

[16] *This sewer was under construction in 1978.*

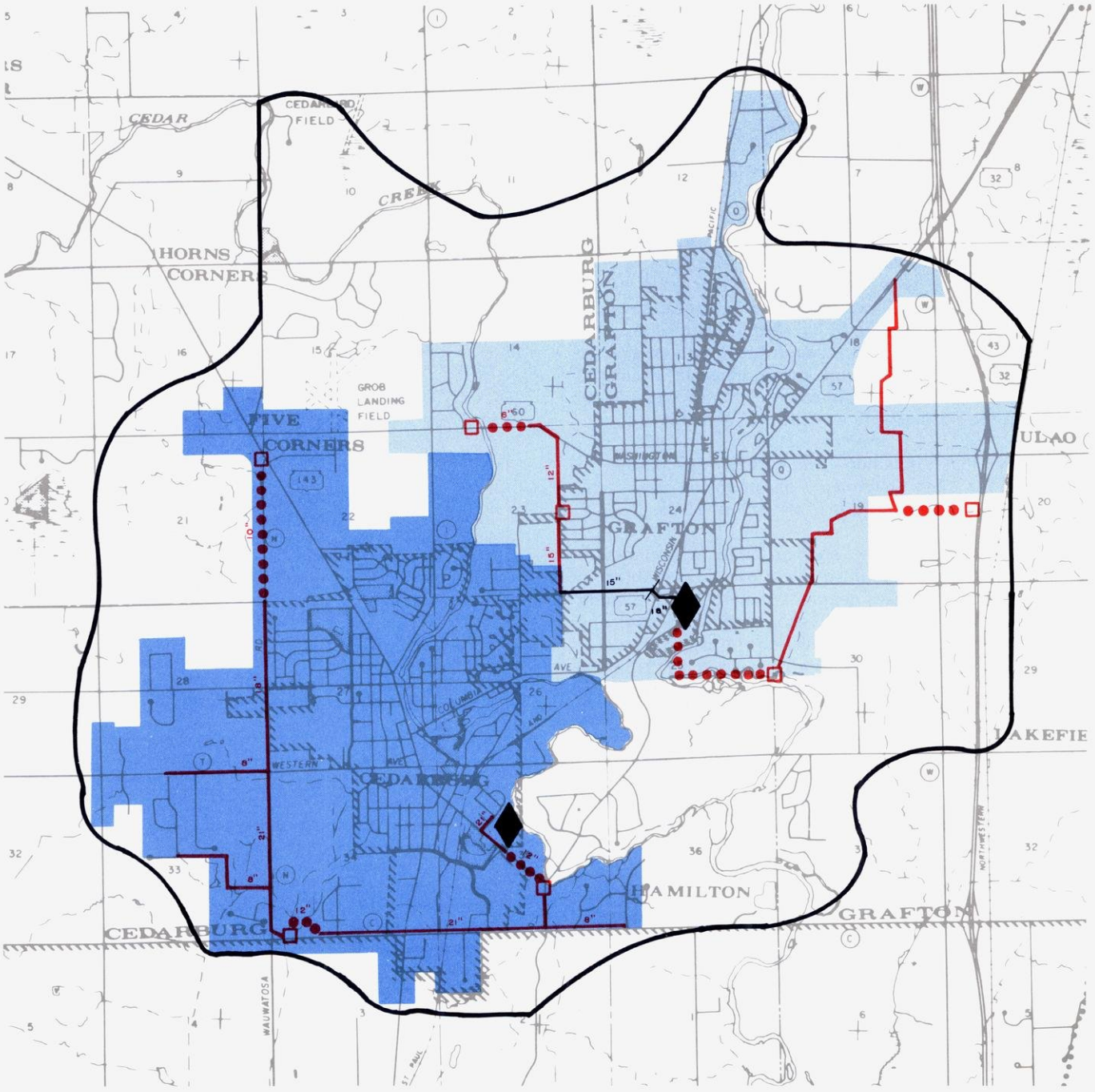
[17] *This sewer was under construction in 1978.*

[18] *Since the conduct of the Commission inventories in 1975, the City of Kenosha has completed partial separation of the combined sewers for about 0.32 square mile of the total, or about 15 percent of the 2.2-square-mile area referenced. Thus, at the end of 1978, about 1.88 square miles of combined sewer area remained in the City of Kenosha. Similarly, the discharge frequency of 20 times per year and the volume of discharge ranging from 68 to 247 million gallons per year were estimated in the preliminary draft report, Kenosha Service Area Combined Sewer Overflow/Facilities Plan Report, transmitted to the City September 14, 1978, by the consul-*

(footnoted continued on page 46)

Map 7

TYPICAL MAP ILLUSTRATING LOCAL TRUNK SEWER PLANS: CEDARBURG-GRAFTON AREA



LEGEND

SEWER SERVICE AREA: 2000

- CEDARBURG
- GRAFTON

SEWAGE TREATMENT FACILITIES

- EXISTING PUBLIC TO BE RETAINED

PLANNING AREA

- BOUNDARY

SEWERS AND APPURTENANT FACILITIES

- EXISTING TRUNK SEWER
- PROPOSED TRUNK SEWER
- PROPOSED FORCE MAIN
- PROPOSED LIFT STATION

GRAPHIC SCALE
0 2000 4000 FEET

As part of the regional water quality management plan preparation process, data on the configuration and size of locally proposed trunk sewers were obtained from local public officials. These local trunk sewers are essential to the provision of sewer service to the recommended urban development area and, as such, constitute an important adjunct to the recommended plan. Map scale limitations preclude showing these locally proposed trunk sewers on the recommended plan map (see Map 5). The above map of locally proposed trunk sewers in the Cedarburg-Grafton area illustrates the type of local community trunk sewer mapping data provided by local officials and on file in the Commission offices for all cities, villages, and special districts listed in Table 14.

Source: City of Cedarburg, Village of Grafton, Towns of Cedarburg and Grafton, and SEWRPC.

overflows were discharged through four outfalls in the City of Kenosha, with the overflows occurring on an average of 20 times per year, and discharging an estimated 260 million gallons of raw sewage to the surface waters of the area annually. In the City of Racine, combined sewers in 1975 served an area of about 2.1 square miles in three separate locations. The combined sewer overflows were discharged through 10 combined sewer outfalls in the City, with the overflow occurring on an average of 20 times per year and discharging an estimated 290 million gallons of raw sewage to the surface waters of the area annually.[19] In 1975 combined sewers served an area of about 22.4 square miles in the City of Milwaukee and Village of Shorewood. The combined sewer overflows were discharged through 112 outfalls, with the overflows occurring on an average of 52 times per year and discharging an estimated 3.34 billion gallons of raw sewage—mixed with storm water—to the surface waters of the area annually.

The following discussion summarizes the status of planning for the abatement of pollution from the combined sewer overflows as of the end of 1978.

Milwaukee Area: At the end of 1978, a preliminary facility plan of the combined sewer overflow problem in the Milwaukee area was nearing completion. That study was a direct outgrowth of a recommendation made by the Regional Planning Commission in the Milwaukee River watershed plan as adopted in March 1972. In the preparation of that watershed plan, the Commission considered numerous alternative means of abating pollution from the combined sewers, including sewer separation, treatment at outfall locations, and storage with subsequent conveyance to treatment plants for treatment and disposal. The Milwaukee River watershed plan included a preliminary recommendation that the combined sewer overflow problem in the Milwaukee area be resolved through the construction of a deep tunnel mined-storage, flow-through treatment system. This system would collect, convey, store, and adequately treat all combined sewer overflows caused by up to two inches of runoff over the tributary drainage area.

(footnote 18 continued)

tant, Donohue & Associates. For the City of Racine, a rough draft report transmitted to the City October 20, 1978, and entitled Combined Sewer Overflow Report—Racine, Wisconsin, reported an estimated discharge frequency of 20 times per year, and an area served in 1978 of about 1.7 square miles. No estimate of the annual discharge volume was included in the report. In conjunction with the combined sewer overflow abatement study of the Milwaukee Metropolitan Sewerage District, a draft report entitled Water Quality Analysis of the Milwaukee River, dated June 30, 1978, reported a refined estimate of average discharge frequency of 47 times per year, and a volume of about 4.12 billion gallons.

[19] *Ibid.*

Table 14

LIST OF CITY, VILLAGE, AND SPECIAL DISTRICT TRUNK SEWER PLANS ON FILE WITH THE SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION: 1975

City Trunk Sewer Plans

Brookfield	Greenfield	Port Washington
Burlington	Hartford	Racine
Cedarburg	Kenosha	St. Francis
Cudahy	Mequon	South Milwaukee
Delafield	Milwaukee	Waukesha
Delavan	Muskego	Wauwatosa
Elkhorn	New Berlin	West Allis
Franklin	Oak Creek	West Bend
Glendale	Oconomowoc	Whitewater

Village Trunk Sewer Plans

Bayside	Greendale	Shorewood
Belgium	Hales Corners	Silver Lake
Brown Deer	Hartland	Slinger
Butler	Jackson	Sturtevant
Darien	Kewaskum	Sussex
Dousman	Menomonee Falls	Thiensville
East Troy	Mukwonago	Twin Lakes
Elm Grove	North Bay	Union Grove
Elmwood Park	Newburg	Walworth
Fontana	Paddock Lake	Waterford
Fox Point	Pewaukee	West Milwaukee
Fredonia	River Hills	Whitefish Bay
Genoa City	Rochester	Williams Bay
Germantown	Saukville	
Grafton	Sharon	

Special District Trunk Sewer Plans

Allenton Sanitary District
Town of Bristol Sewer Utility District No. 1
Browns Lake Sanitary District
Town of Caledonia Sewer Utility District No. 1
Crestview Sanitary District
Delafield-Hartland Water Pollution Control Commission
Delavan Lake Sanitary District
Town of Dover/Eagle Lake Sewer Utility District
Milwaukee Metropolitan Sewerage District
Town of Mt. Pleasant Sewer Utility District No. 1
Town of Norway Sanitary District No. 1
North Park Sanitary District
Town of Pleasant Prairie Sewer Utility Districts A, B, C, D, E, 1, and 2
Town of Pleasant Prairie Sanitary District No. 73-1
Pewaukee Lake Sanitary District
Town of Rochester Sewer Utility District No. 1
Town of Salem Sewer Utility District Nos. 1 and 2
Town of Somers Sanitary District No. 1
Town of Somers Sewer Utility District No. 1
Western Racine County Sewerage District

Source: SEWRPC.

The plan further recommended that the Milwaukee-Metropolitan Sewerage Commissions undertake the facility planning study necessary to review the findings and recommendations of the watershed plan, and either reaffirm the basic validity of the combined sewer overflow abatement recommendations contained in that

plan, or provide alternative recommendations. The Regional Planning Commission prepared and published in July 1973, at the request of the Sewerage Commission of the City of Milwaukee and the Metropolitan Sewerage Commission of the County of Milwaukee, a prospectus for that study. The study began in 1974 and is now nearing completion.

The preliminary engineering study has proceeded to the point where two basic alternatives, or combinations thereof, remain; namely, 1) full separation—including separation on private property—of the combined sewer areas through the construction of a new system of sanitary sewers and the use of the existing combined sewers for storm sewers; and, 2) the construction of a deep tunnel system to collect and store combined sewer overflows, with subsequent treatment and disposal. Auxiliary instream measures under consideration to achieve the water use objectives and supporting standards include instream aeration and dredging the rivers and inner harbor. Each of these basic alternatives is now undergoing evaluation, including a determination of the effects of each alternative on surface water quality. It is intended that upon completion and adoption by all parties concerned, the recommendations of the Milwaukee combined sewer overflow study will become an amendment to the areawide water quality management plan. For the purpose of estimating the costs entailed in implementation of the areawide plan, which is being completed in advance of the Milwaukee combined sewer overflow study, it was decided to include the most recent cost of the alternative last agreed upon by a technical and citizens advisory committee after public deliberation on the economical, social, and environmental effects of the two final alternatives being considered. This last agreed-upon alternative is the construction of a deep tunnel collection, storage, and treatment system. That committee action is being taken under the regional sanitary sewerage system planning program. Accordingly, the cost of this alternative has been included in Table 15. As noted in this table, the capital cost of carrying out the deep tunnel conveyance, storage, and treatment alternative is estimated at $384 million, with an average annual operation and maintenance of $1.1 million.

Kenosha Area: A preliminary engineering study is also underway at the present time of the combined sewer overflow problem in the City of Kenosha. The preliminary recommendation of that study is to continue the current program of providing for partial separation of the remaining combined sewers. Such separation would consist of the construction of a new system of storm sewers to convey storm water flow from street inlets and catch basins and the use of the existing combined sewers as partially separated sanitary sewers. The costs of completing this program in the Kenosha area are summarized in Table 15. This program is estimated to have a capital cost of $14.1 million, and minimal operating costs.

Racine Area: A preliminary engineering study of the sewer overflow problem is also nearing completion in the City of Racine. The preliminary recommendation from that study is to complete partial separation of the remaining combined sewers. Such separation would consist of the construction of a new system of storm sewers and the conversion of the existing combined sewers to sanitary sewers. The costs of carrying out this preliminary recommendation are set forth in Table 15. The total capital cost of completing this separation program is estimated at $3.9 million, and minimal operating costs.

Table 15

COST ESTIMATES FOR COMBINED SEWER OVERFLOW ABATEMENT IN THE REGION: 2000

Combined Sewer Overflow Abatement Plan Subelement	Estimated Cost[a]	
	Total Capital 1975-2000	Average Annual Operation and Maintenance
Milwaukee (deep tunnel conveyance, storage, and treatment)[b]	$384,000,000	$1,100,000
Racine (partial sewer separation)[c]	3,900,000	--
Kenosha (partial sewer separation)[d]	14,100,000	--
Total	$347,200,000	$1,100,000

[a] *All costs are expressed in terms of August 1976 dollars.*

[b] *Costs obtained from excerpts from Combined Sewer Overflow Facility Plan Element draft report prepared by the Milwaukee Water Pollution Abatement Program Office, October 1978. Costs do not reflect the impact of the Illinois stipulation.*

[c] *Costs obtained from preliminary draft facilities plan report, Combined Sewer Overflow Report--Racine, Wisconsin, October 1978.*

[d] *Costs obtained from the preliminary findings of the Kenosha local facilities planning program as documented in the report Kenosha Service Area Combined Sewer Overflow/Facility Plan Report, September 1978.*

Source: SEWRPC.

Concluding Remarks—Combined Sewer Overflows: Since the areawide water quality management plan is being completed ahead of the three combined sewer overflow abatement studies in the Kenosha, Milwaukee, and Racine urban areas, the foregoing recommendations should be considered preliminary in nature and subject to change upon completion of each of the three studies. It is intended that the final, approved recommendations of the three studies be incorporated into the areawide water quality management plan as amendments thereto upon formal adoption by the Regional Planning Commission.

Miscellaneous Point Source Discharges

There were in the Region in 1975, 277 known point sources of wastewater discharge to surface waters other than public and private sewage treatment plants and combined and separate sanitary sewerage system flow relief devices. These "other" point sources of wastewater discharge consist primarily of industrial cooling, process, rinse, and wash waters which were discharged directly, sometimes following treatment, to the streams and watercourses of the Region or to storm sewers tributary to such streams and watercourses. The identity and location of these 277 facilities and the existing characteristics of the attendant wastewater discharges as of 1975 were reported in Volume Two, Chapter IV of this report.

It is recommended that these other point sources reduce the concentration of pollutants in the attendant discharges to levels that are, at a minimum, consistent with the effluent characteristics recommended for public and private sewage treatment facilities discharging to the same or similar surface watercourses. It is also recommended that these point sources reduce discharges of other pollutants, such as sediment, grease, heavy

metals, organics, and heat, to levels attainable by application of the "Best Available Technology Economically Achievable for Toxic and Non-Conventional Pollutants" and "Best Conventional Pollutant Control Technology" as identified on a case-by-case basis under the state discharge permit system process. Since these other point sources are generally unique in terms of the type of wastes to be treated and the degree of treatment, the costs for constructing and operating treatment facilities associated with these point sources must be determined on an individual basis as must other pretreatment requirements for existing discharges to public sanitary sewerage systems. In order to present a complete analysis of the cost of the recommended areawide water quality management plan, however, an estimate was made of the treatment requirements that appeared to be needed from the data available on these point sources. This cost estimate excludes the costs of operating and maintaining existing industrial process system modifications designed to reduce pollutant discharge, existing industrial treatment facilities, and existing pretreatment systems utilized for treatment of waste conveyed to public sanitary sewerage systems.

The estimated costs of the recommendations for the abatement of pollution from these other point sources were based upon the construction of facilities needed to reduce effluent concentrations of BOD_5, ammonia-nitrogen, suspended solids, total phosphorus, and fecal coliform to levels generally equal to those recommended for public sewage treatment facilities discharging to the same or similar surface watercourses. Other effluent constituents were established at levels typically required by permits issued under the Wisconsin Pollutant Discharge Elimination System (WPDES). The cost estimates are based primarily upon the wastewater characteristics data identified through previous studies conducted by the Commission and through existing secondary sources. The secondary sources consulted included river basin survey reports and pollution abatement orders of the Wisconsin Department of Natural Resources, permits issued under the WPDES, reports submitted under Chapter NR 101 of the Wisconsin Administrative Code dealing with discharges to surface waters, and records of municipal engineering and public works departments. Because of the multiple sources utilized, there was some variation in the quality and completeness of the data available from the various agencies concerned. For example, in some cases average annual discharge characteristics were reported, while in other cases maximum values recorded were reported. It should also be expected that several industrial discharges, which are noted as requiring further treatment based upon the 1975 effluent characteristics data, may have been modified through treatment or process changes that have taken place after the data were reported, and thus in some cases further treatment may no longer be needed. In other cases, it should be expected that the industries involved may be able to modify the plant discharges satisfactorily through process changes as opposed to treatment of the discharge. In view of these uncertainties, the cost of the industrial waste treatment presented herein should be considered as an estimate, that, while reasonably accurate in the aggregate, cannot be necessarily applied to any individual outfall. The other point sources of wastewater for which treatment was assumed, or for which interconnection to the public sanitary sewer system was recommended, and the estimated costs associated therewith are set forth in Table 16.

Auxiliary Point Source Pollution Abatement Recommendations

The foregoing discussion describes the recommended areawide water quality management plan point source element as it applies to the various subareas of the seven-county Southeastern Wisconsin Region. There are a number of additional recommendations auxiliary to the plan recommendations which apply, in general, to all existing and proposed sanitary sewerage systems within the Region. These auxiliary plan elements include clear water infiltration and inflow reduction, waste load reduction, flow metering, elimination of sewage flow relief points, industrial pretreatment, and treatment plant operation and maintenance.

Clear Water Reduction: Infiltration and inflow are two types of excess flow that constitute problems for the sound wastewater management in the Region. Excess flows can reduce the effectiveness and increase the cost of sewage conveyance and treatment. A commitment to eliminate excessive infiltration and inflow into sanitary sewer systems is required before federal grant monies can be made available to expand and improve existing or construct new municipal sewage treatment facilities to serve existing sewerage systems. Thus, each local sewerage facilities plan being prepared in the Region must include an analysis of the quantity of infiltration and inflow which can be economically eliminated from the sewer system by rehabilitation. Further studies, termed sewer system evaluation surveys, are conducted when the initial infiltration and inflow analysis indicates excessive infiltration and inflow. Such surveys involve the determination of the locations and causes of infiltration and inflow in the sewer system concerned, the recommendation of measures to reduce excess flows, and estimates of the costs of the recommended measures. Following these studies, that portion of the excess flow which can be cost-effectively removed—as opposed to being conveyed and treated—is determined, and a sewer system rehabilitation program is undertaken to remove that portion.

It is recommended that all communities that have potential excessive flows undertake infiltration and inflow analyses and, if needed, sewer system evaluation surveys. It is further recommended that sewer system rehabilitation measures and preventive measures be instituted so that all infiltration and inflow which can be cost-effectively eliminated be eliminated, and that new sewers be designed and constructed so as to minimize infiltration and inflow. It should be noted that, as of 1975, approximately 40 communities in the Region had completed infiltration/inflow analyses. Additional communities, including all those within the existing and proposed contract service area of the Milwaukee Metropolitan Sewerage District, had contracted for or were conducting such studies subsequent to 1975.

Table 16

COST ESTIMATES FOR KNOWN POINT SOURCES OTHER THAN SEWAGE TREATMENT PLANTS AND SEWAGE FLOW RELIEF DEVICES IN THE REGION: 2000

Point Source Discharge (by subregional area)		Average Flow 1975 (mgd)	Constituent Assumed to Require Treatment in Estimated Costs[a]	Estimated Cost[b]	
Name	Civil Division Location			Total Capital 1975-2000	Average Annual Operation and Maintenance
Milwaukee Metropolitan					
Allied Smelting Corporation	City of West Allis	0.121	Oil and Grease	$ 69,000	$ 6,000
Allis Chalmers Corporation	City of West Allis	0.070	Suspended Solids	--[d]	--[d]
AMF, Inc., Harley-Davidson Company	City of Wauwatosa	0.040	BOD_5, Suspended Solids	74,000	2,000
Appleton Electric Company—Lighting Products Division	City of South Milwaukee	0.034	BOD_5, Oil and Grease	35,000[c]	3,000[c]
Aqua-Chem, Inc.--North Plant No. 2	City of Milwaukee	0.038	Suspended Solids, Phosphorus, Ammonia-Nitrogen	81,000	2,000
Babcock & Wilcox--Tubular Products Division	Village of West Milwaukee	0.825	BOD_5, Suspended Solids, Oil and Grease	262,000	22,000
Badger Meter, Inc.	Village of Brown Deer	0.007	Heavy Metals	--[d]	--[d]
Briggs & Stratton Corporation	City of Wauwatosa	0.025	BOD_5, Oil and Grease	43,000	3,000
Bucyrus Erie Company (Oak Creek)	City of South Milwaukee	0.780	Suspended Solids, Oil and Grease	348,000	22,000
Chicago, Milwaukee, St. Paul & Pacific Railroad Company	City of Milwaukee	0.320	BOD_5, Suspended Solids, Phosphorus, Ammonia-Nitrogen, Oil and Grease	250,000	50,000
Chicago & North Western Railway	Village of Butler	0.001	Suspended Solids	--[d]	--[d]
Chris Hanson's Laboratory, Inc.	City of West Allis	0.050	BOD_5, Phosphorus	50,000	2,000
Eaton Corporation	City of West Allis	0.129	BOD_5, Phosphorus	100,000	6,000
Falk Corporation–Plant No. 1	City of Milwaukee	0.512	Suspended Solids, Phosphorus	310,000	14,000
Florence Eisman, Inc.	City of Milwaukee	0.001	BOD_5, Suspended Solids, Temperature	--[c]	--[c]
Grey Iron Foundry, Inc.	City of West Allis	0.370	Suspended Solids, Oil and Grease	200,000	16,000
Heil Company-Bulk Trailer Division	City of Milwaukee	0.011	BOD_5, Suspended Solids, Phosphorus	--[c]	--[c]
Hentzen Chemical Coatings, Inc.	City of Milwaukee	0.049	Temperature	97,000	1,000
Joseph Schlitz Brewing Company	City of Milwaukee	2.275	Fecal Coliform[e]	--	--
Longview Fibre Company--Downing Box Division	City of Milwaukee	0.005	Temperature	--[d]	--[d]
Maynard Steel Casting Corporation	City of Milwaukee	0.110	Suspended Solids	--[d]	--[d]
Menomonee Falls Water Utility	Village of Menomonee Falls	0.163	Suspended Solids	--[d]	--[d]
Milwaukee Solvay Coke Company	City of Milwaukee	4.820	Suspended Solids	450,000	19,000
Milwaukee Waterworks--Howard Avenue Plant	City of Milwaukee	0.416	Suspended Solids	169,000	4,000
Milwaukee Waterworks–Linwood Avenue Plant	City of Milwaukee	1.013	Suspended Solids	229,000	6,000
Mobil Oil Corporation Lube Plant	City of Milwaukee	0.005	Suspended Solids	--[d]	--[d]
Motor Casting Plant No. 1	City of West Allis	0.220	Suspended Solids, Ammonia-Nitrogen	95,000	2,000
Motor Casting Plant No. 2	City of Milwaukee	0.018	BOD_5	--[c]	--[c]
Oak Creek Water Filtration Plant	City of Oak Creek	0.612	Suspended Solids	193,000	5,000
Oster Corporation	City of Milwaukee	0.041	Suspended Solids	30,000	2,000

Table 16 (continued)

Point Source Discharge (by subregional area)		Average Flow 1975 (mgd)	Constituent Assumed to Require Treatment in Estimated Costs[a]	Extimated Cost[b]	
Name	Civil Division Location			Total Capital 1975-2000	Average Annual Operation and Maintenance
Outboard Marine Corporation Plant No. 1, Research Annex	City of Milwaukee	0.262	Temperature	$ 84,000	$ 1,000
Pelton Casteel, Inc.	City of Milwaukee	0.080	BOD_5	--[d]	--[d]
Peter Cooper Corporation--U.S. Glue and Gelatin Division	City of Oak Creek	3.205	Suspended Solids	265,000	1,000
P. P. G. Industries, Inc.	City of Oak Creek	0.004	Heavy Metals	--[d]	--[d]
Rexnord, Inc.-Nordberg Machinery Group	City of Milwaukee	0.448	Suspended Solids, Phosphorus	317,000	8,000
Shell Oil Company	City of Milwaukee	0.001	Ammonia-Nitrogen	--[d]	--[d]
Teldyne Wisconsin Motor--Outfall No. 5	City of West Allis	0.009	Suspended Solids	--[d]	--[d]
Union Oil of California--Mitchell Field	City of Milwaukee	Inter-mittent	Suspended Solids	--[d]	--[d]
W.A. Krueger Company, Inc.	City of Brookfield	0.010	Suspended Solids	63,000	1,000
Western Electric Power Company, Inc., Wisconsin Service Center	City of Milwaukee	0.001	Heavy Metals	--[d]	--[d]
Wisconsin Electric Power Company, Commerce Street Plant	City of Milwaukee	0.200	Temperature	76,000	1,000
Wisconsin Electric Power Company, Oak Creek Plant Outfall No. 7	City of Oak Creek	4.080	Suspended Solids	320,000	10,000
Wisconsin Electric Power Company Wells Street Plant	City of Milwaukee	0.024	Suspended Solids, Temperature	72,000	2,000
Subtotal--Subregional Area	--	--	--	$4,282,000	$211,000
Upper Milwaukee River					
Dayton Malleable Meta-Mold Division	City of Cedarburg	0.021	BOD_5, Suspended Solids	$ --[c]	$ --[c]
Bermico Company	City of West Bend	0.229	Suspended Solids	139,000	3,000
Culligan Water Conditioning, Inc.	City of West Bend	0.003	BOD_5, Heavy Metals	--[d]	--[d]
Subtotal--Subregional Area	--	--	--	$ 139,000	$ 3,000
Sauk Creek					
Wisconsin Electric Power Company, Port Washington Power Plant	City of Port Washington	1.800	Suspended Solids	$ --[d]	$ --[d]
Subtotal--Subregional Area	--	--	--	--	--
Kenosha-Racine					
Frank Pure Food Company	Town of Caledonia	0.013	Suspended Solids	$ --[d]	$ --[d]
Twin Disc, Inc., Racine Street Plant	City of Racine	0.017	Phosphorus	108,000	2,000
Subtotal--Subregional Area	--	--	--	$ 108,000	$ 2,000
Root River					
Culligan Water Conditioning Company	Village of Union Grove	0.001	Suspended Solids	$ --[d]	$ --[d]
Subtotal--Subregional Area	--	--	--	--	--
Des Plaines River					
Bristol Water Utility	Town of Bristol	Inter-mittent	Suspended Solids	$ --[d]	$ --[d]
Ladish Company Tri-Clover Division	Town of Pleasant Prairie	0.094	Phosphorus, Oil and Grease	100,000	3,000
Subtotal--Subregional Area	--	--	--	$ 100,000	$ 3,000

Table 16 (continued)

Point Source Discharge (by subregional area)		Average Flow 1975 (mgd)	Constituent Assumed to Require Treatment in Estimated Costs[a]	Extimated Cost[b]	
Name	Civil Division Location			Total Capital 1975-2000	Average Annual Operation and Maintenance
Upper Fox River					
International Harvestor Company	City of Waukesha	0.018	Suspended Solids	$ --[d]	$ --[d]
Mammoth Springs Canning Corporation	Town of Lisbon	0.001	Suspended Solids	--[d]	--[d]
Payne & Dolan of Wisconsin, Inc.	Town of Pewaukee	0.922	Suspended Solids	128,000	4,000
Halquist Stone Company, Inc.	Town of Lisbon	1.186	Suspended Solids	144,000	5,000
Subtotal--Subregional Area	--	--	--	272,000	9,000
Lower Fox River					
Culligan Soft Water Service	City of Burlington	0.001	Suspended Solids, Ammonia-Nitrogen	$ --[d]	$ --[d]
Lavelle Industries, Inc.	City of Burlington	0.055	BOD_5, Suspended Solids, Phosphorus, Heavy Metals	94,000	2,000
Coca Cola Bottling Company, Inc.	Town of Lyons	0.007	BOD_5, Suspended Solids	--[c]	--[c]
Subtotal--Subregional Area	--	--	--	94,000	2,000
Upper Rock River					
W. B. Place & Company, Inc.	City of Hartford	0.001	Suspended Solids, Phosphorus, Temperature	$ --[c]	$ --[c]
Subtotal--Subregional Area	--	--	--	--	--
Middle Rock River					
Carnation Can Company Division	City of Oconomwoc	0.018	BOD_5, Oil and Grease	$ --[c]	$ --[c]
Subtotal--Subregional Area	--	--	--	--	--
Lower Rock River					
Allied Music Corporation	City of Elkhorn	0.003	Suspended Solids, Heavy Metals	$ --[d]	$ --[d]
Buncker Ramo Corporation	City of Delavan	0.004	Heavy Metals	--[d]	--[d]
Frank Holton and Company	City of Elkhorn	0.015	Suspended Solids, Heavy Metals	--[d]	--[d]
Getzen Company	City of Elkhorn	0.010	Suspended Solids	--[d]	--[d]
Subtotal--Subregional Area	--	--	--	--	--
Total	--	--	--	$4,995,000	$230,000

[a] *For sources of data and more detailed information on wastewater characteristics, see Chapter III of SEWRPC Technical Report No. 21, Sources of Water Pollution in Southeastern Wisconsin: 1975.*

[b] *Costs are expressed in terms of August 1976 dollars.*

[c] *Assumes connection to a public sanitary sewerage system.*

[d] *Costs were not estimated because of very small or intermittent flow or because wastewater characteristics were bordering the recommended levels and it was assumed low-cost process modifications could be effected to satisfactorily reduce the effluent concentrations.*

[e] *Reflects bacteriological contamination of the Milwaukee River, the source of supply for this noncontact cooling water.*

Source: SEWRPC.

Infiltration and inflow studies being conducted by the Milwaukee Metropolitan Sewerage District have concluded that clear water entering the sewer systems in the District's service area is a more extensive problem than originally anticipated. Excessive infiltration and inflow was identified in 337 of 363 study areas established for the project. Further analysis needs were identified that will consider the treatment and conveyance requirements in the area, as well as the sewer system rehabilitation program. The infiltration and inflow study is being conducted in conjunction with relief and combined sewer overflow pollution abatement phases of the local facility planning program.

Waste Load Reduction: The Wisconsin State Legislature, in Chapter 275 of the Laws of 1977, has mandated that all new household flow fixtures, including water closets, faucets, and shower heads, sold after 1978 shall be of a water-conserving nature. Use of these fixtures in new construction and for replacement in older structures is expected to retard the increase in per capita water use and sewage production which has been observed over the past decade. It is herein recommended that public education efforts be undertaken to encourage voluntary reduction in water use. It is further recommended that industries examine opportunities for reduction and reuse of wastewaters so as to minimize discharges to public sewerage systems. Municipal and other governmental agencies are also recommended to examine and implement programs to reduce water usage.

Flow Metering: The inventory findings reported in Volume One of this report revealed a lack of definitive knowledge concerning total sewage flows within the Region. This lack is due in part to the existence of unmetered flows at points of sewage flow relief throughout local sewerage systems, and at bypasses located at sewage treatment plants. Effective design, operation, and maintenance of sanitary sewerage systems, as well as good water quality management practices, dictate that all sewage flows be metered. Accordingly, it is recommended that the following steps be taken toward achieving complete metering of sewage flows within the Region:

1. All sewage treatment facilities should be provided with metering equipment providing continuous data on rates and volumes of sewage flows. Such equipment should be of an adequate size to measure peak rates of flow and should be installed to permit accurate measurement of all inflows, including flows that must for whatever reason bypass the treatment plant. In addition, metering within the sewage treatment plant shall be provided as necessary for proper process control. Except in cases where a sewage treatment facility is recommended in the plan to be rebuilt or relocated by 1985, existing bypasses or relief pumping stations located at or just ahead of sewage treatment facilities should have meters installed to record volume and duration of bypassed flows until such bypasses and relief pumping stations can be eliminated through the provision of adequate treatment capacity.
2. All pumping stations within a sanitary sewerage system should be provided with metering equipment to provide data on rates and volumes of sewage flow, either on a continuous or on an adequate sampling basis, to determine volume and duration of pumping and to provide a basis for systems analysis, design, and operation.
3. All points of sewage flow relief within the sewer system should be provided with metering equipment to record volume and duration of bypassed flows, either on a continuous or on an adequate sampling basis.

Elimination of Flow Relief Points: There were in 1975, 619 known points of sewage flow relief in the sanitary sewerage systems in the Region.[20] Flow relief at these points was being affected by a number of different devices, all of which directly or indirectly result in the discharge of raw sewage to surface water bodies. Twenty-nine of the 619 flow relief points consisted of gravity flow bypass conduits or relief pumping stations located at or directly ahead of existing sewage treatment plants; 126 consisted of combined sewer overflows of various types; 271 consisted of gravity flow crossovers from the separate sanitary sewer system to a storm sewer system; 81 consisted of gravity flow bypasses from the separate sewer system to the surface watercourses; 40 consisted of stationary relief pumping stations discharging sewage from the separate sanitary sewer system directly to surface watercourses; and 72 consisted of portable pumping stations discharging sewage from the separate sewerage system directly to watercourses.[21]

The recommended point source pollution abatement plan as described in this chapter, if fully carried out, would directly permit the elimination of 208 of these 619 known sewage flow relief points. Construction of new or expanded sewage treatment facilities, as recommended, would permit the elimination of all of the 29 bypasses now located at sewage treatment plants. Although emergency bypass structures may be provided

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[20] *The Commission conducted an inventory of sewage flow relief points in 1975. During the inventory process, appropriate officials from each community having public sanitary sewerage systems were asked to identify all such known flow relief points. Several problems were encountered in the conduct of this inventory. In some instances, the local officials diligently responded to the request and reported accurately the existence of such devices where they were known. Other officials reluctantly reported limited information. Still other officials did not know if any flow relief devices existed. Consequently, the inventory data vary in reliability and, therefore, the number of sewage flow relief devices reported in the 1975 inventory cannot be assumed to be a reliable and accurate inventory of all such devices within the Region. Rather, the data presented represent only an approximation of the total number of such devices.*

at municipal sewage treatment plants to protect the facilities from flooding, the use of these bypasses in all but the most rare and unusual conditions should be precluded by proper collection system design, maintenance, and operation. Similarly, abatement of the combined sewer overflows in Kenosha, Milwaukee, and Racine would permit the elimination of all of the 126 combined sewer overflow devices that now discharge raw sewage during periods of wet weather directly to surface watercourses. In addition, construction of the trunk sewers recommended in the plan would permit the direct elimination of 53 points of flow relief, including 21 crossovers, 15 bypasses, 7 stationary relief pumping stations, and 10 portable pumping stations.

The remaining 411 known points of sewage flow relief identified in the inventories presented in Volume One of this report, as well as any other points of sewage flow relief that may exist within the local sanitary sewerage systems in the Region but which were not uncovered in the inventory, would not be directly eliminated by construction of the sewerage facilities contained in the recommended plan. However, the recommended sewerage facilities would, in many cases, represent a step toward elimination of these devices in that adequate treatment plant capacity would be made available. Additional local actions such as sewer system improvements and reductions in wastewater quantities represent an important adjunct to the recommended regional plan. Accordingly, it is recommended that each unit or agency of government responsible for the construction, operation, and maintenance of separate sanitary sewerage systems within the Region, if it has not already done so, conduct a detailed study of the local sanitary sewerage system to identify all points of sewage flow relief and to determine the steps needed to ensure the ultimate elimination of all 411 remaining flow relief points through construction of the sewerage facilities contained in the recommended plan, as well as of any other points of flow relief that may be uncovered in such detailed studies.

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[21] *Local sewerage facilities planning activities in the City of Kenosha as documented in the 1978 preliminary draft, Kenosha Service Area Combined Sewer Overflow/Facilities Plan Report, September 1978, identified 21 additional points of sewage flow relief. A total of 41 crossovers and bypasses were identified in this 1978 study, compared with 20 such devices identified in the 1975 inventory conducted under the regional water quality management planning program. Similarly, a 1978 preliminary report completed by the Milwaukee Metropolitan Sewerage District, Infiltration and Inflow Analysis, identified five additional points of sewage flow relief. That 1978 study identified a total of 384 sanitary sewerage system flow relief devices, compared with 379 such flow relief devices identified in the 1975 inventory conducted under the regional water quality management planning program. A total of 192 gravity bypasses and crossovers, 72 relief pumping stations, and 120 portable pumping stations were identified in the Milwaukee metropolitan subregional area under this later study.*

Industrial Pretreatment: The Federal Water Pollution Control Act mandates that all major industries that discharge to public sewage collection and treatment systems must pretreat their wastewaters to a quality compatible with the biological treatment processes used by the receiving public sanitary sewerage system. Specific pretreatment requirements are published, or are to be published, by the U. S. Environmental Protection Agency. Accordingly, it is recommended that, as appropriate, industries in the Region review their wastewater discharges and take such steps as may be necessary to ensure that adequate treatment, if required, is provided. In the development of the sludge management element of the regional water quality management plan, such pretreatment was found to be particularly essential to the control of heavy metals to sewage sludges to ensure the long-term safety of the disposal of such sludges on agricultural lands.

Sewage Treatment Plant Operation and Maintenance: Of particular importance in achieving the recommended water use objectives is the proper operation and maintenance of the existing and proposed sewage treatment plants within the Region. Proper operation and maintenance is essential for efficient and effective treatment. Proper operation and maintenance also serves to reduce future construction and equipment replacement costs. Inadequate attention to operation and maintenance, on the other hand, can result in plants failing to achieve the intended water pollution abatement objectives. Thus, attainment of the water use objectives will require a commitment on the part of the local units of government concerned to proper staffing and operational control of the recomended sewage treatment facilities.

Despite the recognized importance of operation and maintenance, a number of factors persist which generally contribute to operational problems. These factors may be grouped into the following four categories:

Industrial Loadings: This category includes poor operational results caused by the discharges of industrial wastes that may adversely affect the public treatment process or that discharge flows in periodically excessive quantities, thereby disrupting the treatment process.

Design: This category generally includes relatively minor design problems that affect the plant operation, despite the fact that major plant design considerations, such as detention time and aeration capacity, are adequate.

Operational: This category includes problems relating to the operational capabilities of the plant, including inadequate laboratory testing capability, lack of proper equipment maintenance, lack of adequate time to operate the facility, and inadequate staffing and training.

Infiltration and Inflow: This category includes reduced plant efficiency resulting from excessive hydraulic loadings to the plant.

Under current regulation, the Wisconsin Department of Natural Resources maintains a sewage treatment plant operator certification program. This program has been in effect since 1969, and in 1978 all of the 61 public sewage treatment facilities in the Region were operated under the supervision of an appropriately certified operator.

The Department of Natural Resources has recently modified the certification requirements. The modifications were prompted by studies which indicated that certification was not entirely indicative of an operator's ability to properly operate a given plant. The recently adopted rules [22] are intended to address this problem by providing for a more specific evaluation of the operator's competence as indicated by evaluations that consider the types of treatment unit processes employed and the level of treatment needed at the facility to which the operator is associated. The new program deletes the formal education requirements in the present code and substitutes for them a requirement of 12 hours of continuing education every two years as a condition for certification renewal. Sewage treatment plant operator certification also now includes a more specific point rating system based on the size of the facility, the degree of treatment, the types of wastewater, the types of treatment processes, and the effluent requirements.

Sewage treatment plants by their nature perform a vital community service that should not be interrupted under any foreseeable circumstances. It is expected that the treatment plant operation and maintenance manual now required as a condition for receiving federal construction grants will be helpful as a basis for establishing a fail-safe operation. It is recommended that every sewage treatment facility operator evaluate the need for standby equipment and any necessary emergency operating procedures.

In order to assist local public officials in providing for proper staffing and operational procedures at sewage treatment plants, Table 17 sets forth for typical plant sizes the recommended staffing and operational standards, including minimum personnel required, hours when personnel should be present at the plant, laboratory control, and recordkeeping. This table represents the minimum operation and staffing requirements for secondary level treatment facilities of various size treatment plants. Ideally, all municipal sewage treatment plants would be staffed or otherwise monitored on a 24-hour around-the-clock basis to provide continuous surveillance of the operation. However, for smaller facilities it may be more practical to provide such continuous surveillance at certain times through the use of monitoring and alarm equipment that can summon responsible persons in the case of operational problems.

The laboratory tests and procedures set forth in Table 17 are designed to provide the data needed to adequately assess the treatment plant operation and determine whether or not the recommended performance standards set forth in the plan are being met. These data should be considered the minimum necessary in this respect. Typical treatment levels recommended under the regional water quality management planning program are generally more stringent than secondary treatment and would require additional attention to each of the above categories according to specific recommended levels and local flow and waste strength conditions. The additional personnel requirements for various higher levels of treatment are provided in Table 18. These additional personnel estimates would be proportional to the nonadministrative staff recommended for secondary treatment plants in Table 17.

Refinement of Effluent Limits (Waste Load Allocation)

The foregoing recommendations for effluent limits are the result of systems level analyses. It is recognized that the development of precise technical specifications of wastewater characteristics to increase or decrease the stringency of the requirements is part of the process of preparing local facility planning studies to implement the systems level plan and to design the waste treatment facilities. Such refinement of the effluent limits should be based upon detailed field and simulation studies—for each public and private sewage treatment plant—of the response of the receiving waters to a specific waste loading. These studies are sometimes referred to by the Wisconsin Department of Natural Resources as "waste load allocation studies." The findings of such facility planning studies would properly serve to refine the areawide plan, but are not expected to result in major changes thereto. Such studies should consider the background condition of the receiving stream as a result of natural pollution sources; the potential water quality improvement associated with abatement of nonpoint source pollution; the presence of in-place pollutants; the slope, configuration, and biological characteristics of the receiving stream channel; the specific chemical composition of the wastewaters and receiving waters; and other localized factors which are typically beyond the scope of the systems level planning.

Although a more generalized characterization of the stream systems was used in the hydrologic-hydraulic water quality simulation modeling and in the areawide water quality management planning program, the resulting concentrations and flows recommended in this plan may be used to compute a "waste load allocation" of the sort required by the federal law and regulations for areawide water quality management planning. The waste loads developed under the regional water quality management planning program can be determined from Table 2. The table does not include allocations for specific industrial discharges because of the lack of precise information on loadings. Neither does the table include specific allocations for private wastewater treatment plants, since it is generally recommended that effluent from these plants be discharged to effluent land application systems. However, the analyses did consider loads from industries and private treatment plants, and the stream surface waters may also be expected to accept

[22] *See Chapter NR 114 of the Wisconsin Administrative Code.*

Table 17

RECOMMENDED STAFFING AND OPERATIONAL PROCEDURES FOR SECONDARY SEWAGE TREATMENT PLANTS BY TYPICAL PLANT SIZE

Typical Plant Size	Minimum Personnel[a]	Hours Personnel Are Present	Laboratory Control (as applicable)	Records
10 MGD	Superintendent Chemist 6 Operators 1 Maintenance Man 2 Laborers	24 hours daily	Sludge settleability pH of raw waste and effluent Dissolved oxygen of raw waste, effluent, and receiving stream BOD_5's of raw waste, primary effluent, and final effluent--24-hour composite samples Fixed and volatile suspended solids of raw wastes and effluents--24-hour composite samples pH of digested sludge where needed Total and volatile solids of digested sludge where needed Volatile acids of digested sludge where needed Chlorine residuals of effluent Nitrates--24-hour composite Sludge index where needed Mixed liquor dissolved oxygen where needed--each shift Sludge depth in primary and final settling tanks--each shift Fecal coliforms of raw sewage and effluent--daily Raw sewage temperature--hourly Return and waste sludge--suspended solids (fixed and volatile), total solids (fixed and volatile)--each shift Anaerobic digested sludge--temperature, pH, carbon dioxide, total alkalinity--each shift Digester supernatant--BOD, total solids (fixed and volatile), suspended solids (fixed and volatile)--each shift Aerobic digested sludge--temperature, BOD, total solids (fixed and volatile), suspended solids (fixed and volatile)--each shift Additional data and sampling of influent and effluent for total and soluble phosphorus, organic nitrogen, and ammonia-nitrogen, based on 24-hour composite samples as applicable for each plant's level of treatment	Keep daily records of all operations on a shift basis Personnel should attend short schools, operators meetings, and have access to current literature Typical records are: Weather Wind direction Adequate flow records Bypassing flow records Solids handled by weight Hours of primary and secondary settling tank cleanup Trickling filter maintenance if needed Activated sludge operations, if needed Sludge-handling operations
5 MGD	Superintendent 4 Operators 1 Maintenance Man 1 Laborer Laboratory Technician	24 hours daily	Same as 10 MGD	Same as 10 MGD

Table 17 (continued)

Typical Plant Size	Minimum Personnel[a]	Hours Personnel Are Present	Laboratory Control (as applicable)	Records
1 MGD	Superintendent and Laboratory Technician 2 Operators 1 Laborer	2 shifts, 16 hours per day 6 days per week	Fecal coliform–raw sewage and effluent--daily Raw sewage temperature--hourly Sludge settleability BOD--raw and effluent 3-hour composite taken at 11 a.m., 12 noon, and 1 p.m. Suspended solids--raw, mixed liquor and final effluent, 3-hour composite: 11 a.m., 12 noon, and 1 p.m. pH digested sludge--also raw sludge pH Total solids--digested sludge Depth of sludge in primary and final settling tanks Sludge index Dissolved oxygen receiving stream Dissolved oxygen mixed liquor Dissolved oxygen of raw waste and effluent Chlorine residual of effluent Additional data and sampling of influent and effluent for total and soluble phosphorus, organic nitrogen, and ammonia, nitrogen, based on 3-hour composites: 11 a.m., 12 noon, and 1 p.m. as applicable for each plant's level of treatment	Same as 10 MGD--6 days per week
0.5 MGD	Superintendent and Laboratory Technician 1 Operator 1 Laborer	6 days per week	Same as 1 MGD except Monday through Friday only	Same as 10 MGD--6 days per week
0.25 MGD	1 Operator	5 days per week	Fecal coliform–raw sewage and effluent (daily) Raw sewage temperature–hourly Sludge settleability Chlorine residual effluent--5 days Sludge index tests--5 days Dissolved oxygen raw and effluent--5 days + stream dissolved oxygen BOD raw and effluent--3 times per week on 3-hour composite raw and final effluent Suspended solids raw and effluent--3 times per week on 3-hour composite raw and final effluent Same as 1 MGD NOTE: These tests should be made weekly--pH digested sludge, total solids, digested sludge, total and soluble phosphorus, organic nitrogen, ammonia-nitrogen of influent and effluent based on 3-hour composites: 11 a.m., 12 noon, and 1 p.m.	Keep records of all operation on a 5-day basis plus automatic flow records daily Operator should attend short schools, and operator meetings Typical records--5 days are: Weather Wind direction Adequate flow records Bypass and flow records Hours of primary and secondary settling tank cleanup All maintenance records, as needed Activated sludge operation records, as needed

NOTE: The above recommendations for staffing sewage treatment plants assume the operation of a conventional sewage treatment plant and do not, therefore, reflect the potential effects of automation on plant staffing requirements. Even fully automated plants, however, require provision for surveillance and monitoring on a 24-hour basis. Staffing and operation of facilities discharging to land treatment are similar to those recommended above. However, such land treatment facilities require additional operation and testing concerning the holding lagoons, spreading facilities, and groundwater monitoring. The recommendations contained in this table are intended to serve as a guide to implementing agencies to aid in achieving a high quality of plant operation. It is not expected that all aspects of the recommendations set forth above would be included in the WPDES permits issued for sewage treatment plants.

[a] *Plant staffing requirements are based upon the minimum estimated needs for secondary treatment processes. Additional personnel as noted in Table 18 are expected to be required for treatment facilities incorporating advanced levels of treatment.*

Source: The Conference of State Sanitary Engineers, U. S. Public Health Service, and SEWRPC.

Table 18

ADDITIONAL STAFFING REQUIREMENTS FOR SEWAGE TREATMENT FACILITIES INCORPORATING TREATMENT OTHER THAN A SECONDARY LEVEL OF TREATMENT

Plant Hydraulic Design Capacity	Conventional Advanced Waste Treatment for Phosphorus Removal[a] (man years/year)	Conventional Advanced Waste Treatment for Phosphorus Removal and Nitrification[a] (man years/year)	High Level of Advanced Waste Treatment for Phosphorus Removal[b] (man years/year)	Conventional Advanced Waste Treatment for Nitrification With a High Level of Advanced Waste Treatment for Phosphorus Removal[b] (man years/year)	Effluent Land Application (man years/year)
0.25	0.5	1.0	2.5	3.5	0.5
0.50	0.5	1.5	3.0	4.0	1.0
1.00	0.5	2.0	4.5	6.0	1.5
5.00	1.5	4.0	6.0	8.5	6.0
10.00	2.5	6.0	8.5	12.0	12.0

[a] *Effluent concentration of 1.0 mg/l of total phosphorus.*

[b] *Effluent concentration of about 0.1 mg/l of phosphorus.*

Source: Stanley Consultants, Inc. and SEWRPC.

loadings from such facilities identified in the plan, provided that the concentrations of pollutants in the discharges are generally the same as those set forth for the nearby public treatment plants discharging to the same or similar surface watercourses. If forecast loadings from industrial discharges and private sewage treatment plants, as discussed in Volume Two, Chapter IV of this report, are provided with the recommended levels of treatment, the system level analyses indicate that the recommended water use objectives will be achieved. Site-specific intensive studies are recommended to be conducted for all point sources, with the results to be analyzed and incorporated as necessary into a continuing planning program as amendments to the initial water quality management plan. Where available, these study results should also form the basis for facilities planning and for Wisconsin Pollutant Discharge Elimination System permit issuance.

The areawide water quality management planning program has also recognized the dynamic nature of the hydrologic, biologic, and meteorologic phenomena which affect the waste assimilative capacity of the streams and watercourses of the Region. It is not practical to identify precisely a maximum daily load of any given pollutant—contributed at a specific point on the stream network—that will by itself maintain the desired water quality for dynamic aquatic systems. In addition, the continuing changes in point source loads and in nonpoint source loads will occur as development proceeds during the planning period. Attaining desired water use objectives in a dynamic water resource system requires dynamic specifications for allowable loads, but such specifications are administratively impractical. This problem has a precedent in the analysis of flood flows and stages in the Commission's comprehensive watershed planning programs. In these cases, the ongoing changes in the human activities in the land area tributary to a stream network comprise a basis for the change in the theoretical allocation of resource use. In order to overcome this problem, the Commission has long applied the approach of planning and designing projects to meet the planned future conditions anticipated by the comprehensive regional plan in all of its elements. Accordingly, the "waste load allocations" developed herein are based upon the design year 2000 plan. It is recommended that such considerations be incorporated into the analyses of results of field studies of waste load impacts.

It should be noted that the thermal loads are not included in Table 2, since no significant cases of thermal pollution were forecast for any of the streams studied in the Region. However, as previously noted, analyses of Lake Michigan and its estuary areas in the Region were not conducted under the planning program. Thus, the maximum allowable thermal loads were not able to be identified for the areas downstream from the large thermal discharges in the Region, which contribute primarily to the estuary reaches. It may be stated, however, that thermal loads recommended in this plan are not expected to exceed the maximum allowable thermal load, determined on a case-by-case basis under the WPDES permit program. The waste load allocations presented in Table 2, therefore, can be used as a guide to the allowable pollutant loading at various points in the surface water system. If these loads are not exceeded and if the nonpoint source recommendations in this plan were implemented, then the surface waters could still be expected to achieve the adopted water use objectives. Flexibility in these maximum loadings will exist in certain conditions such as during the early years of the plan implementation period, during certain seasonal periods when the impacts of specific pollutants are ameliorated by natural conditions, or in those cases where treatment processes recommended for control

of a specific parameter will effect a greater reduction in the concentrations of other pollutants than had been initially recommended.

Comparison of the Recommended Point Source Pollution Abatement Plan Element to the Present Requirements for Public Wastewater Treatment Plants

In Volume Two of this report, the current state-adopted water use objectives and supporting water quality standards were compared to the water use objectives and supporting water quality standards recommended in the regional water quality management plan. The level of wastewater treatment required at any wastewater treatment plant should be related to the objectives and supporting standards established for the receiving surface waters as well as to other factors such as stream flow and quality characteristics. The level of wastewater treatment needed at each major wastewater treatment facility to achieve the established water use objectives has been estimated in the areawide water quality management study on the basis of analyses that simultaneously considered the effects of both point and nonpoint sources of pollution on stream and lake water quality conditions.

Both the present and recommended water use objectives are aimed at achieving the national goal of "fishable and swimmable" waters within the Region to the maximum extent practicable. The analyses conducted under the regional water quality management planning program indicated that for reasons relating to natural conditions, to gross levels of in-place pollutants, or to essentially irreversible man-made improvements—such as concrete channelization—it would be impractical to meet the national goal of "fishable and swimmable" waters for all surface waters in the Region. However, the analyses also indicated that it would be possible to significantly improve the current water use objectives so that many more miles of streams could either fully meet the national goal, or meet a higher goal than the restricted and minimum use categories. The results of the analyses of the water use objectives for the surface waters of the Region are discussed in Volume Two, Chapter II of this report, which sets forth the Commission-recommended water use objectives for streams and lakes within the Region.

With two exceptions, the recommended water use objectives and standards do not vary significantly from the present state-established objectives and standards. The first major difference is that the adopted regional water quality standards associated with the recreation water use objective include a total phosphorus standard for streams of 0.1 mg/l, and of 0.02 mg/l for lakes. The present state standards do not specifically provide a phosphorus standard in support of surface water use objectives. However, a general category of standards relating to harmful substances can indirectly be considered to comprise a phosphorus standard. State standards are provided for phosphorus removal at wastewater treatment plants located in the Lake Michigan and Fox River watersheds. A second major difference between the existing state-established objectives and standards and those proposed under the regional water quality management plan involves the application of the standards. The present regulatory programs utilize an absolute low flow condition achievement requirement based upon the 7 day-10 year low flow conditions, while the areawide water quality management plan proposes a probabilistic application expressed in terms of the proportion of the time the standards should be met, while recognizing that low flow condition analyses must be used to supplement the percent-of-time analyses. The differences in these two approaches are discussed in a later section of this chapter.

The difference in water use objectives and standards, as well as the differences in interpretation of standards, results in some variations in recommendations for the level of treatment and effluent criteria at public wastewater treatment plants. A comparison of the plant effluent criteria based upon the existing state-established objectives and standards and the effluent criteria based upon the proposed areawide water use objectives and supporting standards is set forth in Table 19. The costs associated with the achievement of both the existing and the recommended attendant effluent criteria for the municipal wastewater treatment plants in the Region are also set forth in Table 19.

Comparison of Recommended Point Source Pollution Abatement Plan Element to the 1990 Regional Sanitary Sewerage System Plan

As noted earlier in this chapter, the point source pollution abatement element of the regional water quality management plan represents a modification and refinement of the design year 1990 regional sanitary sewerage system plan, adopted by the Commission in May 1974. The modifications and refinements made in the original plan resulted from the findings of local facilities planning studies and from the changes in future resident population, employment, and land use development patterns set forth in the new design year 2000 regional land use plan on which the regional plan is based. A comparison of the major differences between the 1990 plan and the new point source pollution abatement element of the areawide plan is set forth herein. The major differences relate to the population and area proposed to be served by sanitary sewers, the number and location of public sewage treatment facilities, the type and level of treatment to be provided at the public sewage treatment facilities within the Region, and the number and location of major intercommunity trunk sewers.

Population and Area Served: The 1990 regional sanitary sewerage system plan proposed that sanitary sewer service be provided to a design year population of about 2.6 million persons, representing 97 percent of the then forecast 1990 regional population of about 2.7 million persons. The new year 2000 water quality management plan recommends the provision of centralized sanitary sewer service to about 2.1 million persons, representing about 94 percent of the anticipated year 2000 population of about 2.2 million persons. In the 1990 plan, with a significantly greater population than now envisioned

Table 19

COMPARISON OF PLANT EFFLUENT CRITERIA BASED ON STATE WATER USE OBJECTIVES AND STANDARDS AND PLAN EFFLUENT CRITERIA BASED ON PROPOSED REGIONAL WATER QUALITY MANAGEMENT PLAN WATER USE OBJECTIVES AND STANDARDS

Sewage Treatment Plant (by subregional area)	Recommended Regional Water Quality Management Plan			Existing State Criteria		
	Performance Standards in Terms of Effluent Quality (all standards represent average monthly limits)	Estimated Cost of Achieving Standards 1975-2000[a,b]		Performance Standards in Terms of Effluent Quality[c]	Estimated Cost of Achieving Standards 1975-2000[b]	
		Total Capital	Average Annual Operation and Maintenance		Total Capital	Average Annual Operation and Maintenance
Milwaukee Metropolitan Subregional Area						
Milwaukee Metropolitan Sewerage District						
Jones Island Plant	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$50,000,000	$11,000,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$50,000,000	$11,000,000
Milwaukee Metropolitan Sewerage District						
South Shore Plant	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,400,000	$ 8,700,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,400,000	$ 8,700,000
City of South Milwaukee	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 450,000	$ 360,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 450,000	$ 360,000
Upper Milwaukee River Subregional Area						
Village of Kewaskum	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 10/20 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/4 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,442,000	$ 149,000		$ 764,000	$ 179,000
City of West Bend	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$ 9,075,000	$ 927,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 15-45 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 7,786,000	$ 897,000
Village of Jackson	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,275,000	$ 195,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 2,304,000	$ 166,000
Village of Newburg	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 30/30 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,456,000	$ 83,000		$ 1,156,000	$ 70,000
Village of Fredonia	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,335,000	$ 117,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,335,000	$ 117,000
Village of Grafton	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,005,000	$ 264,000	BOD_5 Discharge:15/15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/4 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 3,121,000	$ 271,000
City of Cedarburg	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,713,000	$ 432,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/4 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 200/100 ml	$ 710,000	$ 364,000
Village of Saukville	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,875,000	$ 143,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,875,000	$ 143,000
Sauk Creek Subregional Area						
City of Port Washington	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,123,000	$ 310,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 3,123,000	$ 310,000
Village of Belgium	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 20/20 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,071,000	$ 80,000		$ 1,035,000	$ 59,000
Kenosha-Racine Subregional Area						
City of Racine	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 8,200,000	$ 1,900,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 m	$ 8,200,000	$ 1,900,000
City of Kenosha	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$10,900,000	$ 2,000,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$10,900,000	$ 2,000,000

Table 19 (continued)

Sewage Treatment Plant (by subregional area)	Recommended Regional Water Quality Management Plan			Existing State Criteria		
	Performance Standards in Terms of Effluent Quality (all standards represent average monthly limits)	Estimated Cost of Achieving Standards 1975-2000[a,b]		Performance Standards in Terms of Effluent Quality[c]	Estimated Cost of Achieving Standards 1975-2000[b]	
		Total Capital	Average Annual Operation and Maintenance		Total Capital	Average Annual Operation and Maintenance
Root River Canal Subregional Area						
Village of Union Grove	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 4,160,000	$ 224,000	BOD_5 Discharge: 15/15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml	$ 3,222,000	$ 191,000
Town of Yorkville Sanitary District No. 1	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			No Standards Calculated		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal coliform Concentration: 200/100 ml	$ 735,000	$ 15,000		$ --	$ --
Des Plaines Subregional Area						
Town of Pleasant Prairie Sewer Utility District D	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 15/15 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,171,000	$ 99,000		$ 1,696,000	$ 99,000
Town of Pleasant Prairie Sanitary District No. 73-1	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 15/15 mg/l Phosphorus Discharge: 1.0 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 200/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 8.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,004,000	$ 59,000		$ 230,000	$ 61,000
Town of Salem Sewer Utility District No. 1	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 15/15 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 200/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,400,000	$ 96,000		$ 1,239,000	$ 98,000
Town of Bristol Sewer Utility District No. 1	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 20/20 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,689,000	$ 64,000		$ 1,092,000	$ 67,000
Upper Fox River Subregional Area						
City of Brookfield	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$12,989,000	$ 1,024,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$10,183,000	$ 956,000
City of Waukesha	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$14,238,000	$ 1,471,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/6 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$12,262,000	$ 1,361,000

Table 19 (continued)

Sewage Treatment Plant (by subregional area)	Recommended Regional Water Quality Management Plan			Existing State Criteria		
	Performance Standards in Terms of Effluent Quality (all standards represent average monthly limits)	Estimated Cost of Achieving Standards 1975-2000[a,b]		Performance Standards in Terms of Effluent Quality[b]	Estimated Cost of Achieving Standards 1975-2000[b]	
		Total Capital	Average Annual Operation and Maintenance		Total Capital	Average Annual Operation and Maintenance
Lower Fox River Subregional Area						
Village of Mukwonago	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,982,000	$ 241,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 2,929,000	$ 201,000
Village of East Troy	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 4,359,000	$ 144,000	BOD_5 Discharge: 20/30 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,273,000	$ 176,000
City of Lake Geneva	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 9,910,000	$ 272,000	BOD_5 Discharge: 10/16 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 4,140,000	$ 350,000
Town of Lyons Sanitary District No. 2	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,468,000	$ 51,000	BOD_5 Discharge: 30/30 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 891,000	$ 53,000
Village of Genoa City	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,673,000	$ 57,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 5/5 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,102,000	$ 66,000
Town of Norway Sanitary District No. 1	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 4,226,000	$ 238,000	BOD_5 Discharge: 10/10 mg/l Ammonia-Nitrogen Discharge: 1/2 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,185,000	$ 217,000
Town of Dover-Eagle Lake Sewer Utility District No. 1	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,825,000	$ 116,000	BOD_5 Discharge: 15/15 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,223,000	$ 89,000
Western Racine County Sewerage District	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml	$ 5,170,000	$ 151,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,390,000	$ 189,000
City of Burlington	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,147,000	$ 412,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,661,000	$ 344,000
Village of Silver Lake	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,151,000	$ 90,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,160,000	$ 93,000
Village of Twin Lakes	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,362,000	$ 157,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,082,000	$ 193,000
Town of Salem Sanitary District No. 2	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,918,000	$ 194,000	BOD_5 Discharge: 30/30 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 400/100 ml	$ 2,838,000	$ 157,000
Village of North Prairie	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentrations: 200/100 ml	$ 2,143,000	$ 52,000	No Standards Calculated	--	--

Table 19 (continued)

Sewage Treatment Plant (by subregional area)	Recommended Regional Water Quality Management Plan			Existing State Criteria		
	Performance Standards in Terms of Effluent Quality (all standards represent average monthly limits)	Estimated Cost of Achieving Standards 1975-2000[a,b]		Performance Standards in Terms of Effluent Quality[c]	Estimated Cost of Achieving Standards 1975-2000[b]	
		Total Capital	Average Annual Operation and Maintenance		Total Capital	Average Annual Operation and Maintenance
Upper Rock River Subregional Area						
Allenton Sanitary District No. 1	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			No Standards Calculated		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,092,000	$ 81,000		--	--
Village of Slinger	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,608,000	$ 158,000	BOD_5 Discharge: 15/15 mg/l Ammonia-Nitrogen Discharge: 3/6 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,677,000	$ 106,000
City of Hartford	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 3,966,000	$ 414,000	BOD_5 Discharge: 10/10 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 3,250,000	$ 382,000
Middle Rock River Subregional Area						
City of Oconomowoc	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 9,221,000	$ 662,000	BOD_5 Discharge: 10/10 mg/l Fecal Coliform Concentration: 400/100 ml	$ 6,036,000	$ 376,000
Delafield-Hartland Water Pollution Control Commission	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent; 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 6,711,000	$ 362,000	BOD_5 Discharge: 10/10 mg/l Ammonia-Nitrogen Discharge: 1/1.4 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 4,800,000	$ 242,000
Village of Dousman	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,746,000	$ 112,000	BOD_5 Discharge: 10/10 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 1,122,000	$ 83,000
Village of Wales	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			No Standards Calculated		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge. 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,924,000	$ 73,000		--	--
Lower Rock River Subregional Area						
City of Whitewater	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 5,216,000	$ 374,000	BOD_5 Discharge: 10/20 mg/l Ammonia-Nitrogen Discharge: 1/5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 4,081,000	$ 250,000
Walworth County Metropolitan Sewerage District	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent; 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 6,614,000	$ 529,000	BOD_5 Discharge: 10-20 mg/l Ammonia-Nitrogen Discharge: 2/3.5 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml	$ 5,230,000	$ 323,000
Village of Darien	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 20/20 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml	$ 2,071,000	$ 79,000		$ 948,000	$ 67,000
Village of Walworth	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 10/12 mg/l Ammonia-Nitrogen Discharge: 2/4 mg/l Dissolved Oxygen in Effluent: 6 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 8,061,000	$ 236,000		$ 3,502,000	$ 234,000
Village of Sharon	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml Land Application			BOD_5 Discharge: 20/20 mg/l Dissolved Oxygen in Effluent: 4 mg/l Fecal Coliform Concentration: 400/100 ml		
	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 0.1 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml	$ 1,957,000	$ 76,000		$ 946,000	$ 65,000

Indicates performance standards recommended if land application is not selected and implemented.

[a] *Costs assume implementation of the land application alternative where standards for both land application and a surface water discharge alternative are given.*

[b] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. Costs do not include those associated with sludge management, which are discussed in a later section.*

[c] *Effluent limits for the performance standards required under the Wisconsin Pollution Discharge Elimination System are in terms of: BOD_5 discharge--summer/winter monthly average; phosphorus discharge--monthly average; ammonia-nitrogen discharge--summer/winter weekly average; dissolved oxygen in effluent--daily minimum; and fecal coliform concentration--monthly average.*

Source: SEWRPC.

for the year 2000, it was anticipated that about 80,000 persons would remain unserved by centralized sanitary sewers in the design year of the plan. By contrast, it is estimated that in the year 2000, about 162,000 persons in the Region will remain unserved, reflecting the significant diffusion of urban development throughout the Region over the past 10 years, such development frequently being located in areas beyond planned sewer service areas.

In terms of the geographic area to which centralized sanitary sewer service would be provided, the 1990 plan envisioned a total service area of about 675 square miles, of which 216 square miles would consist of new urban development. The year 2000 plan, on the other hand, envisions a somewhat smaller service area of about 640 square miles, of which 163 square miles would consist of new urban development. This change reflects the redelineation of the sewer service areas to reflect the new year 2000 land use plan. Two sanitary sewer service areas proposed in the 1990 plan have been deleted in their entirety from the areawide water quality management plan—the Pike Lake and Tri-Lakes sewer service areas in Washington County—while four entirely new sewer service areas have been added—the Waubeka area in Ozaukee County, the North Prairie area in Waukesha County, the Yorkville area in Racine County, and the Walworth County Institutions area in Walworth County.

Public Sewage Treatment Plants: The design year 1990 plan envisioned a total of 50 public sewage treatment plants within the Region in the design year, while the year 2000 plan envisions a total of 48 public sewage treatment plants. This difference represents the net change resulting from the addition of two new public sewage treatment plants to serve the Village of North Prairie and the Town of Yorkville Sanitary District No. 1, and the deletion of four public sewage treatment plants, three of which—those serving the Villages of Paddock Lake, Fontana, and Williams Bay—currently exist and one—that serving the Bristol-IH 94 sewer service area—which was proposed in the old plan.

In the adopted regional sanitary sewerage system plan, 11 of the public sewage treatment facilities were recommended to provide a secondary level of treatment, with the remaining 39 recommended to provide an advanced level of treatment. No specific recommendations were made with respect to the land application of sewage effluent, although it was recognized in the plan that the smaller public treatment facilities located in the more rural areas of the Region could advantageously select land application as a means of disposal for treated effluent. The areawide water quality management plan recommends that all 48 public sewage treatment facilities required to serve the Region in the design year provide an advanced level of waste treatment, including more stringent levels of phosphorus removal than envisioned in the regional sanitary sewerage system plan, if wastes are to be discharged to the surface waters of the Region. The new plan specifically recommends that land application of sewage effluent following secondary treatment be considered at 21 of the 48 public sewage treatment plants. The recommendation in the new plan to provide more stringent levels of phosphorus removal at public treatment facilities results from analyses that indicate that, even with maximum practical control of nonpoint sources of water pollution, the recommended instream phosphorus standard will not be met in many stream reaches of the Region if treatment plants continue to discharge effluent with phosphorus concentrations envisioned in the 1990 plan.

In total, the 50 public sewage treatment plants envisioned in the 1990 plan would have provided an average hydraulic design capacity of about 508 mgd. The new year 2000 plan recommends a somewhat reduced aggregate capacity of about 470 mgd. This reduction in capacity of about 7 percent is proportionately less than the approximate 20 percent reduction in the design population levels used in preparation of the two plans. If the design criteria were applied to the design year 2000 population, an aggregate treatment plant capacity of about 396 mgd would be needed, a reduction in need of about 112 mgd from the year 1990 plan. The reduction, however, as noted above, is only about 38 mgd. This difference results from the existing hydraulic design capacities at the Jones Island and South Shore sewage treatment plants operated by the Milwaukee Metropolitan Sewerage District. These two plants have an existing collective capacity of about 320 mgd, significantly more than the 246 mgd capacity that would be required to serve the design population assumed to be residing in the service areas of these two plants by the year 2000. Theoretically, then, there would be an excessive capacity at the two Milwaukee plants of about 74 mgd. In view of the potential capacity needs, however, for treatment of sewage flows presently bypassed in the Milwaukee system via existing combined sewer overflows and separate sanitary sewer system flow relief devices, it would not appear to be practical to recommend a capacity reduction at the two Milwaukee plants. The local sewerage facilities planning effort now underway by the Milwaukee Metropolitan Sewerage District should consider in more detail the needed treatment plant capacity to serve the District, particularly as that needed capacity relates to flows presently bypassed without treatment.

Trunk Sewers: The construction of a series of intercommunity trunk sewers is recommended in both the 1990 and 2000 plans. One of these sewers recommended in the 1990 plan—the Ryan Creek sewer, which would serve the southern portions of the Cities of Franklin and Muskego—has been deleted from the year 2000 plan due to the reduced level of urban growth envisioned in that portion of the Region. Eleven new community trunk sewers have been added to the new plan. These consist of the Waubeka-Fredonia trunk sewer, designed to convey sewage from the Waubeka sewage treatment facility to the Fredonia treatment facility; the Paddock Lake-Salem trunk sewer, designed to convey sewage from the Village of Paddock Lake to the treatment facility operated by the Town of Salem Sewer Utility District No. 1; the Bristol-Pleasant Prairie trunk sewer, designed

to convey sewage from the Town of Bristol-IH 94 sewer service area to the treatment facility operated by the Town of Pleasant Prairie Sewer Utility District D; the Springdale, Duplainville, and Pewaukee Lake Sanitary District trunk sewers, designed to provide for intercommunity connections in the Upper Fox River subregional area and convey sewage to the Brookfield sewage treatment plant; the Como Lake-South trunk sewer, designed to convey sewage along the southern shoreline of Como Lake to the Lake Geneva treatment facilities; the Summit-Delafield trunk sewer, designed to convey sewage from the Nashotah-Nemahbin Lakes area in the Town of Summit to the Delafield-Hartland sewage treatment facility; the Walworth County Institutions trunk sewer, designed to connect the Walworth County Institutions in the Town of Geneva to the Walworth County Metropolitan Sanitary Sewerage System; and the Williams Bay-Fontana and Fontana-Walworth trunk sewers, designed to convey sewage from the Villages of Williams Bay and Fontana to the Village of Walworth for treatment at a new Walworth facility.

NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT

Nonpoint, or diffuse, sources of water pollution include urban sources—such as runoff from residential, commercial, industrial, transportation, and recreational land uses; construction activities; and onsite sewage disposal systems—and rural sources—such as runoff from cropland, pasture, and woodland, atmospheric contributions, and livestock wastes. These sources of pollutants discharge to surface waters by direct overland drainage, by drainage through natural channels, by drainage through engineered storm water drainage sys— tems, and by deep percolation into the ground and subsequent return flow to the surface waters.

The water quality analyses presented in Volume Two of this report indicated that a reduction in the transport of pollutants from nonpoint sources will be necessary in combination with the point source pollution abatement measures herein recommended if water use objectives are to be met. The analyses indicated that many streams in the Region will not meet the water use objectives and supporting water quality standards if adequate nonpoint source controls are not implemented, regardless of the level of point source controls applied. Accordingly, this section of the chapter describes the recommended pollution abatement measures that constitute the nonpoint source abatement plan element of the recommended areawide water quality management plan for southeastern Wisconsin.

It should be noted that in addition to the nonpoint source pollution abatement measures recommended below, the proper location and design of land use development projects is important to avoid the creation of future nonpoint source water pollution problems, and to maintain, thereby, a level of water quality consistent with the intended water uses once such quality is attained through abatement of the existing sources of water pollution. Of particular importance in this respect is implementation of the adopted design year 2000 regional land use plan previously described in this chapter and depicted in summary form on Map 1. This plan is recommended to be used as the basis for land use development and redevelopment decisions and related resource conservation decisions within the Region. The plan recommends the preservation in essentially natural open uses of the primary environmental corridors and the preservation in agricultural uses of the prime agricultural lands of the Region. Such preservation has particularly important implications for the practicality of rural nonpoint source pollution abatement measures. Thus, the importance of the regional land use plan to all water quality management planning and plan implementation efforts cannot be overemphasized. In addition, application of the planning principles and practices set forth in the Commission local planning guides on zoning, land subdivision control, official mapping, floodland and shoreland development, and the use of soils data in planning will be important to sound land use planning and development that can serve to protect and enhance water quality conditions in the Region.[23]

Types of Nonpoint Source Control Measures

A summary of the methods and estimated effectiveness of nonpoint source water pollution control measures is set forth in Table 20. These measures, which were discussed in Volume Two, Chapter IV of this report, have been grouped for planning purposes into two categories: minimum and additional. Application of the minimum practices can generally be expected to achieve up to a 25 percent reduction in pollutant runoff.[24] The additional category of nonpoint source control measures has been subdivided into three subcategories based upon the relative effectiveness and costs of the measures. The first subcategory of practices, when applied in combination with the minimum practices, can be expected to generally result in up to a 50 percent reduction in pollutant runoff. The second subcategory of practices, when applied in combination with the minimum and additional practices, can be expected to generally result in up to a 75 percent reduction in pollutant runoff. The third subcategory would consist of all of the preceding practices, plus those additional practices that would be required to achieve a reduction in ultimate runoff of more than 75 percent. The various individual nonpoint source control practices set forth in Table 20 are summarized by group in Table 21.

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[23] *See SEWRPC Planning Guide No. 1, Land Development Guide; No. 2, Official Mapping Guide; No. 3, Zoning Guide; No. 4, Organization of Planning Agencies; No. 5, Floodland and Shoreland Development Guide; and No. 6, Soils Development Guide.*

[24] *The term pollutant runoff is defined for the purposes of this report to mean the same as, and is used interchangeably with, the term pollutant loadings contained in runoff. The phrase "pollutant runoff controls" should not necessarily be taken to indicate recommended reductions in the amounts of storm water runoff.*

Table 20

GENERALIZED SUMMARY OF METHODS AND EFFECTIVENESS OF NONPOINT SOURCE WATER POLLUTION ABATEMENT

Applicable Land Use	Control Measures[a]	Summary Description[b]	Approximate Percent Reduction of Released Pollutants[c]	Assumptions for Costing Purposes
Urban	Litter and pet waste control ordinance	Prevent the accumulation of litter and pet wastes on streets and residential, commercial, industrial, and recreational areas	2-5	Ordinance administration and enforcement costs are expected to be funded by violation penalties and related revenues
	Improved timing and efficiency of street sweeping, leaf collection and disposal, and catch basin cleaning	Improve the scheduling of these public works activities, modify work habits of personnel, and select equipment to maximize the effectiveness of these existing pollution control measures	2-5	No significant increase in current expenditures is expected
	Management of onsite sewage treatment systems	Regulate septic system installation, monitoring, location, and performance; replace failing systems with new septic systems or alternative treatment facilities; develop alternatives to septic systems; eliminate direct connections to drain tiles or ditches; dispose of septage at sewage treatment facility	10-30	Replace one-half of estimated existing failing septic systems with properly located and installed systems and replace one-half with alternative systems, such as mound systems or holding tanks; all existing and proposed onsite sewage treatment systems are assumed to be properly maintained; assume system life of 25 years. The estimated cost of a septic tank system is $2,300 and the cost of an alternative system is $4,500. The annual maintenance cost of a disposal system is $45. A holding tank would cost $1,300 with an annual operation and maintenance cost of $1,200. However, because septic system management is an existing function necessary for the preservation of public health and the maintenance of drinking water supplies, these costs are not included as part of the areawide water quality management plan
	Increased street sweeping	On the average, sweep all streets in urban areas an equivalent of once or twice a week with vacuum street sweepers; require parking restrictions to permit access to curb areas; sweep all streets at least eight months per year; sweep commercial and industrial areas with greater frequency than residential areas	30-50	Estimate curb miles based on land use, estimated street acreage, and Commission transportation planning standards; assume one street sweeper can sweep 2,000 curb miles per year; assume sweeper life of 10 years; assume residential areas swept once weekly, commercial and industrial areas swept twice weekly. The cost of a vacuum street sweeper is approximately $38,000. The cost of the operation and maintenance of a sweeper is about $10 per curb/mile swept.
	Increased leaf and clippings collection and disposal	Increase the frequency and efficiency of leaf collection procedures in fall; use vacuum cleaners to collect leaves; implement ordinances for leaves, clippings, and other organic debris to be mulched, composted, or bagged for pickup	2-5	Assume one equivalent mature tree per residence plus five trees per acre in recreational areas; 75 pounds of leaves per tree; 20 percent of leaves in urban areas not currently disposed of properly. The cost of the collection of leaves in a vacuum sweeper and disposal is estimated at $25 per ton of leaves

Table 20 (continued)

Applicable Land Use	Control Measures[a]	Summary Description[b]	Approximate Percent Reduction of Released Pollutants[c]	Assumptions for Costing Purposes
Urban (continued)	Increased catch basin cleaning	Increase frequency and efficiency of catch basin cleaning; clean at least twice per year using vacuum cleaners; catch basin installation in new urban development not recommended as a cost-effective practice for water quality improvement	2-5	Determine curb miles for street sweeping; vary percent of urban area served by catch basins by watershed from Commission inventory data; assume density of 10 catch basins per curb mile; clean each basin twice annually by vacuum cleaner. The cost of cleaning a catch basin is approximately $8
	Reduced use of deicing salt	Reduce use of deicing salt on streets; salt only intersections and problem areas; prevent excessive use of sand and other abrasives	Negligible for pollutants addressed in this chapter but helpful for reducing chlorides and associated damage to vegetation	Increased costs, such as for slower transportation movement, are expected to be offset by benefits such as reduced automobile corrosion and damage to vegetation
	Improved street maintenance and refuse collection and disposal	Increase street maintenance and repairs; increase provision of trash receptacles in public areas; improve trash collection schedules; increase cleanup of parks and commercial centers	2-5	Increase current expenditures by approximately 15 percent. The annual cost per person is about $4
	Parking lot storm water temporary storage and treatment measures	Construct gravel-filled trenches, sediment basins, or similar measures to store temporarily the runoff from parking lots, rooftops, and other large impervious areas; if treatment is necessary, use a physical-chemical treatment measure such as screens, dissolved air flotation, or a swirl concentrator	5-10	Design gravel-filled trenches for 24-hour, five year recurrence interval storm; apply to off-street parking acreages. For treatment—assume four-hour detention time. The capital cost of storm water detention and treatment facilities is estimated at $9,000 per acre of parking lot area, with an annual operation and maintenance cost of about $100 per acre.
	Onsite storage—residential	Remove connections to sewer systems; construct onsite storm water storage measures for subdivisions	5-10	Remove roof drains and other connections to sewer system wherever needed; use lawn aeration if applicable; apply dutch drain storage facilities to 15 percent of residences. The capital cost would approximate $200 per house, with an annual maintenance cost of about $10

Table 20 (continued)

Applicable Land Use	Control Measures[a]	Summary Description[b]	Approximate Percent Reduction of Released Pollutants[c]	Assumptions for Costing Purposes
Urban (continued)	Storm water storage—urban	Store storm water runoff from urban land in surface storage basins or, where necessary, subsurface storage basins	10-35	Design all storage facilities for a 1.5 inch of runoff event, which corresponds approximately to a five-year recurrence interval event with a storm event being defined as a period of precipitation with a minimum antecedent and subsequent dry period of from 12 to 24 hours; apply subsurface storage tanks to intensively developed existing urban areas where suitable open land for surface storage is unavailable; design surface storage basins for proposed new urban land, existing urban land not storm sewered, and existing urban land where adequate open space is available at the storm sewer discharge site. The capital cost for storm water storage would range from $1,000-$10,000 per acre of tributary drainage area, with an annual operation and maintenance cost of about $20-$40 per acre
	Storm water treatment	Provide physical-chemical treatment which includes screens, microstrainers, dissolved air flotation, swirl concentrator, or high-rate filtration, and/or disinfection, which may include chlorination, high-rate disinfection, or ozonation to storm water following storage	10-50	To be applied only in combination with storm water storage facilities above; general cost estimates for microstrainer treatment and ozonation were used; same costs were applied to existing urban land and proposed new urban development. Storm water treatment has an estimated capital cost of from $900-$7,000 per acre of tributary drainage area, with an average annual operation and maintenance cost of about $35 per acre
Rural	Conservation practices	Includes such practices as strip cropping, contour plowing, crop rotation, pasture management, critical area protection, grading and terracing, grassed waterways, diversions, wood lot management, fertilization and pesticide management, and chisel tillage	Up to 50	Costs for Soil Conservation Service (SCS)-recommended practices are applied to agricultural and related rural land; the distribution and extent of the various practices were determined from an examination of 56 existing farm plan designs within the Region. The capital cost of conservation practices ranges from $0.30-$14 per acre of rural land, with an average annual operation and maintenance cost of from $2-$4 per rural acre

Table 20 (continued)

Applicable Land Use	Control Measures[a]	Summary Description[b]	Approximate Percent Reduction of Released Pollutants[c]	Assumptions for Costing Purposes
Rural (continued)	Animal waste control system	Construct stream bank fencing and crossovers to prevent access of all livestock to waterways; construct a runoff control system or a manure storage facility, as needed, for major livestock operations; prevent improper applications of manure on frozen ground, near surface drainage-ways, and on steep slopes; incorporate manure into soil	50-75	Cost estimated per animal unit; animal waste storage (liquid and slurry tank for costing purposes) facilities are costed for all major animal operations within 500 feet of surface water and located in areas identified as having relatively high potential for severe pollution problems. Runoff control systems costed for all other major animal operations. It is recognized that dry manure stacking facilities are significantly less expensive than liquid and slurry storage tanks and may be adequate waste storage systems in many instances. The estimated capital cost and average annual operation and maintenance cost of a runoff control system is $90 per animal unit and $10 per animal unit, respectively. The capital cost of a liquid and slurry storage facility is about $425 per animal unit, with an annual operation and maintenance cost of about $30 per unit. An animal unit is the weight equivalent of a 1,000-pound cow
	Base-of-slope detention storage	Store runoff from agricultural land to allow solids to settle out and reduce peak runoff rates. Berms could be constructed parallel to streams	50-75	Construct a low earthen berm at the base of agricultural fields, along the edge of a floodplain, wetland, or other sensitive area; design for 24-hour, 10-year recurrence interval storm; berm height about four feet. Apply where needed in addition to basic conservation practices; repair berm every 10 years and remove sediment and spread on land. The estimated capital cost of base-of-slope detention storage would be about $250 per tributary acre, with an annual operation and maintenance cost of $10 per acre
	Bench terraces	Construct bench terraces, thereby reducing the need for many other conservation practices on sloping agricultural land	75-90	Apply to all appropriate agricultural lands for a maximum level of pollution control. Utilization of this practice would exclude installation of many basic conservation practices and base-of-slope detention storage. The capital cost of bench terraces is estimated at $625 per acre, with an annual operation and maintenance cost of $45 per acre

Table 20 (continued)

Applicable Land Use	Control Measures[a]	Summary Description[b]	Approximate Percent Reduction of Released Pollutants[c]	Assumptions for Costing Purposes
Urban and Rural	Public education programs	Conduct regional- and county-level public education programs to inform the public and provide technical information on the need for proper land management practices on private land, the recommendations for management programs, and the effects of implemented measures; develop local awareness programs for citizens and public works officials; develop local contact and education efforts	Indeterminate	For first 10 years includes cost of one person, materials, and support for each 25,000 population. Thereafter, the same cost can be applied to for every 50,000 population. The cost of one person, materials, and support is estimated at $33,000 per year
	Construction erosion control practices	Construct temporary sediment basins; install straw bale dikes; use fiber mats, mulching and seeding; install slope drains to stabilize steep slopes; construct temporary diversion swales or berms upslope from the project	20-40	Assume acreage under construction is the average annual incremental increase in urban acreage; apply costs for a typical erosion control program for a construction site. The estimated capital cost and operation and maintenance cost for construction erosion control is $2,200 and $400 per acre under construction, respectively
	Materials storage and runoff control facilities	Enclose industrial storage sites with diversions; divert runoff to acceptable outlet or storage facility; enclose salt piles and other large storage sites in crib and dome structures	5-10	Assume 40 percent of industrial areas are used for storage and to be enclosed by diversions; assume existing salt storage piles enclosed by cribs and dome structures. The estimated capital cost of industrial runoff control is $1,100 per acre of industrial land. Material storage control costs are estimated at $30 per ton of material
	Stream protection measures	Provide vegetative buffer zones along streams to filter direct pollutant runoff to the stream; construct stream bank protection measures, such as rock riprap, brush mats, tree revetment, jacks, and jetted willow poles where needed	5-10	Apply a 50-foot-wide vegetative buffer zone on each side of 15 percent of the stream length; apply stream bank protection measures to 5 percent of the stream length. Vegetative buffer zones are estimated to cost $21,200 per mile of stream, and stream bank protection measures cost about $37,000 per stream mile
	Pesticide and fertilizer application restrictions	Match application rate to need; eliminate excessive applications and applications near or into surface water drainageways	0-3	Cost included in public education program
	Critical area protection	Emphasize control of areas bordering lakes and streams; correct obvious erosion and other pollution source problems	Indeterminate	Indeterminate

[a] *Not all control measures are recommended for each watershed. The characteristics of the watershed, the estimated required level of pollution reduction needed to meet the applicable water quality standards, and other factors will influence the estimation of costs of specific practices for any one watershed. Although the control measures costed represent the recommended practices developed at the regional level on the basis of the best available information, the local implementation process should provide more detailed data and identify more efficient and effective sets of practices to apply to local conditions.*

[b] *For a more detailed description of pollution control measures for diffuse sources, see SEWRPC Technical Report No. 18, State of the Art of Water Pollution Control for Southeastern Wisconsin, Volume Three, Urban Storm Water Runoff, and Volume Four, Rural Storm Water Runoff.*

[c] *The approximate effectiveness refers to the estimated amount of pollution produced by the contributing category (urban or rural) that could be expected to be reduced by the implementation of the practice. The effectiveness rates would vary greatly depending on the characteristics of the watershed and individual diffuse sources. It should be further noted that practices can have only a "sequential" effect, since the percent pollution reduction of a second practice can only be applied against the residual pollutant load which is not controlled by the first practice. For example, two practices of 50 percent effectiveness would achieve a theoretical total effectiveness of only 75 percent control of the initial load. Further, the general levels of effectiveness reported in the table are not necessarily the same for all pollutants associated with each source. Some pollutants are transported by dissolving in water and others by attaching to solids in the water; the methods summarized here reflect typical pollutant removal levels.*

Source: SEWRPC.

Table 21

ALTERNATIVE GROUPS OF NONPOINT SOURCE CONTROL MEASURES PROPOSED FOR STREAM AND LAKE WATER QUALITY MANAGEMENT

Pollution Control Category	Level of Pollution[b] Control	Practices to Control Nonpoint Source Pollution from Urban Areas	Practices to Control Nonpoint Source Pollution from Rural Areas
Minimum Nonpoint Source Control Practices[a]	Variable	Public education programs, litter and pet waste control, restricted use of fertilizers and pesticides, construction erosion control, septic tank system management, critical area area protection, improved timing and efficiency of street sweeping, leaf collection, and catch basin cleaning, and industrial and commercial material storage facilities and runoff control	Public education programs, fertilizer and pesticide management, critical area protection, crop residue management, chisel tillage, pasture management, contour plowing, livestock waste control, construction erosion control
Additional Nonpoint Source Control Practices[a]	50 percent	Above, plus: Increased street sweeping, improved street maintenance and refuse collection and disposal, increased catch basin cleaning, stream protection, increased leaf and vegetation debris collection and disposal	Above, plus: Crop rotation, contour strip-cropping, grassed waterways, diversions, wind erosion controls, terraces, stream protection
	75 percent	Above, plus: An additional increase in street sweeping, use of onsite storm water storage measures in residential areas, parking lot storm water runoff storage and treatment, use of urban storm water storage facilities	Above, plus: Base-of-slope detention storage
	More than 75 percent	Above, plus: Urban storm water treatment with physical-chemical and/or disinfection treatment measures	Bench terraces[d]

[a] *In addition to nonpoint source control measures, lake rehabilitation techniques may be required to satisfy lake water quality standards.*

[b] *The required level of nonpoint source reduction is identified for each watershed from the water quality simulation analyses and for each lake tributary area from annual phosphorus load analyses. The percent reduction refers to the portion of pollutant runoff from urban or rural land--excluding pollutants controlled by minimum practices--which can be controlled by the implementation of those practices.*

[c] *Groups of practices are presented here for general analysis purposes only. Not all practices are applicable to, or recommended for, all lake and stream tributary watersheds. For costing purposes, construction erosion control practices, public education programs, and material storage facilities and runoff control are considered urban control measures and stream protection is considered a rural control measure.*

[d] *The provision of bench terraces would exclude most basic conservation practices and base-of-slope detention storage facilities.*

Source: SEWRPC.

Minimum urban nonpoint source control practices include public education programs; improved timing and efficiency of street sweeping, leaf collection, and catch basin cleaning; litter and pet waste control; proper use of fertilizers and pesticides; construction erosion controls; septic tank system management; critical areas protection; and industrial and commercial material storage facilities and runoff control. Those additional urban nonpoint source control measures included in the 50 percent reduction category include increased street sweeping, improved street maintenance and refuse collection and disposal, increased leaf and vegetable debris collection, increased catch basin cleaning, streambank protection, and the placement of vegetative buffer strips along streams and shorelines. Those additional urban nonpoint source controls included in the 75 percent pollutant reduction category include a high level and frequency of street sweeping, the installation of storm water storage facilities, and the installation of parking lot storm water storage and treatment facilities. The single practice identified in the category of urban nonpoint source control that would result in a greater than 75 percent reduction in pollutant runoff is urban storm water treatment through the establishment of physical-chemical treatment and/or disinfection facilities at storm water outfalls.

The minimum rural nonpoint source controls include fertilizer and pesticide management, critical area protection, crop residue management, conservation tillage, pasture management, contour plowing, and livestock

waste control. The additional rural nonpoint source control practices that are included in the 50 percent runoff reduction category include crop rotation, contour stripcropping, grassed waterways, diversions, wind erosion control, gradient terraces, streambank protection, and vegetative buffer strips along streams and shorelines. The single additional rural nonpoint source control practice included in the 75 percent runoff reduction category consists of base-of-slope detention-storage facilities. The single additional rural nonpoint source control practice included in the category that would result in more than a 75 percent reduction in runoff is the construction of bench terraces.[25]

The foregoing groups of practices were used for analysis and costing purposes under the areawide water quality management planning program. The use of other practices that may be identified as practical and cost-effective in local planning and plan implementation is, of course, not precluded. It is recommended that the practices indicated as needed for nonpoint source pollutant control be refined by local level nonpoint source control practices planning, which would be analogous to sewerage facilities planning for point source pollution abatement. This recommendation is deemed appropriate for two reasons. First, the systems level planning, which is the subject of this report, is specifically intended to serve as a point of departure for more detailed local planning.[26] The design of nonpoint source pollution abatement practices should be a highly localized, detailed, and individualized effort, requiring, as it does, highly specific knowledge of the physical, managerial, social, and fiscal considerations which affect the landowners concerned. Second, the successful implementation of the areawide water quality management plan will require the active and dedicated efforts of the designated plan implementation or management agencies if the necessary local support is to be developed. The local level land management practices planning may identify local water pollution problems that have not been specifically addressed in the areawide plan, particularly problems relating to sediment and to hazardous and toxic materials. The agencies recommended to carry out such local planning will be set forth in the next chapter of this volume.

[25] *Bench terraces are gradient terraces with blind tile outlets, which provide a ponding area behind the benches.*

[26] *For a discussion of the distinction and relationship between the system planning, preliminary engineering, and final design phases of the public works development process, see SEWRPC Planning Report No. 26, A Comprehensive Plan for the Menomonee River Watershed, Volume Two, Alternative Plans and Recommended Plan, pages 308 through 310.*

Recommended Application of Nonpoint Source Control Measures to the Region

The recommended application of the foregoing groups of nonpoint source pollution abatement measures to the Region is graphically summarized on Map 8. Table 22 identifies the recommended nonpoint source pollution abatement practices for the land areas directly tributary to the streams in the Region, and Table 23 summarizes such practices for the areas directly tributary to the 100 major lakes in the Region. These nonpoint source pollution abatement recommendations are based upon the alternative analyses described in Volume Two, Chapter IV of this report.

As defined for the purposes of nonpoint source control planning, the land area proposed to be urbanized by the year 2000 totals about 671 square miles. This estimated urban land area includes, in addition to all land uses defined as urban in the adopted regional land use plan, land defined as rural mining and quarry land and rural residential land in that adopted plan. In the adopted regional land use plan, the total year 2000 urban land is estimated at about 635 square miles, such total excluding by definition mining and quarry land and rural residential land.

Minimum urban nonpoint source control practices, as identified in Table 21, are recommended to be implemented throughout the entire urban area of the Region with only one exception. In the Milwaukee and Shorewood combined sewer service area, the plan recommends no urban nonpoint source control if the deep tunnel conveyance, storage, and treatment alternative is selected, since storm water runoff would be treated. If the sewer separation alternative is selected, the local facilities planning effort in Milwaukee should determine the appropriate level of nonpoint source control required. As indicated in Table 24, minimum urban practices would be the only practices applied to about 540 square miles of land, representing about 81 percent of the year 2000 urban land area. About 22 square miles of urban land, or about 3 percent of the year 2000 urban land area, are within the Milwaukee combined sewer service area and therefore would not require nonpoint source pollution abatement if the conveyance, storage, and treatment alternative is selected. Additional urban nonpoint source controls designed to provide about a 50 percent reduction in pollutant runoff are recommended to be applied to the remaining 109 square miles of urban area. As shown on Map 8, the areas requiring a high level of nonpoint source control lie largely in the Oak Creek and Root River watersheds, in the Barnes Creek subwatershed portion of the drainage area directly tributary to Lake Michigan, and in the direct drainage areas tributary to Pewaukee Lake, Big and Little Muskego Lakes, Denoon Lake, Waubeesee Lake, Wind Lake, and Hooker Lake. These additional urban nonpoint source pollution abatement measures are needed to abate phosphorus pollution, which stimulates excessive aquatic plant growth. Such measures are also required to reduce excessive ammonia-nitrogen concentrations in some areas, particularly in the Oak Creek watershed.

Table 22

RECOMMENDED NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT FOR STREAMS IN THE REGION: 2000

Watershed	Pollutants Requiring Nonpoint Source Control[a]				
	Biochemical Oxygen Demand	Phosphorus	Ammonia-Nitrogen	Fecal Coliform	Other
Des Plaines River	X[d]	--	--	X	--
Fox River	X[d]	--	--	X	--
Kinnickinnic River	--	X	--	X	X[e,f]
Menomonee River	--	X	X	X	X[f]
Milwaukee River	X[d]	--	--	--	X[f]
Minor Streams Tributary to Lake Michigan					
Barnes Creek	X	X	--	X	--
Pike Creek	--	--	--	X	--
Sucker Creek	--	--	--	--	--
Oak Creek	--	X	X	X	--
Pike River	X[d]	--	--	X	--
Rock River	X[d]	--	--	X	--
Root River	X[d]	X	--	X	--
Sauk Creek	--	--	--	X	--
Sheboygan River	--	--	--	--	--
Direct Tributary Drainage Area to Lake Michigan[i]	--	--	--	--	--
Total	--	--	--	--	--

Watershed	Recommended Nonpoint Source Management Practices[b]								
	Urban					Rural			
	Minimum			Additional		Minimum		Additional	
	Septic System Management	Construction Erosion Control	Urban Land Practices (25 percent reduction)	Urban Land Practices (50 percent reduction)	Urban Land Practices (75 percent reduction)	Livestock Waste Control	Conservation Practices (25 percent reduction)	Conservation Practices (50 percent reduction)	Conservation Practices (75 percent reduction)
Des Plaines River	X	X	X	--	--	X	X	--	--
Fox River	X	X	X	--	--	X	X	--	--
Kinnickinnic River	--	X	X[f]	--	--	--	X	--	--
Menomonee River	X	X	X[g]	--	--	X	X	--	--
Milwaukee River	X	X	X	--	--	X	X	--	--
Minor Streams Tributary to Lake Michigan									
Barnes Creek	X	X	X	X	--	--	X	--	--
Pike Creek	X	X	X	--	--	--	X	--	--
Sucker Creek	X	X	X	--	--	X	X	--	--
Oak Creek	X	X	X	X	--	X	X	X	--
Pike River	X	X	X	--	--	X	X	--	--
Rock River	X	X	X	--	--	X	X	--	--
Root River	X	X	X	X	--	X	X	X[h]	--
Sauk Creek	X	X	X	--	--	X	X	--	--
Sheboygan River	X	X	X	--	--	X	X	--	--
Direct Tributary Drainage Area to Lake Michigan[i]	X	X	X	--	--	X	X	--	--
Total	--	--	--	--	--	--	--	--	--

Table 22 (continued)

Watershed	Estimated Cost[c]					
	Total Capital 1975-2000			Average Annual Operation and Maintenance: 1975-2000		
	Urban	Rural	Total	Urban	Rural	Total
Des Plaines River	$ 2,798,000	$ 1,217,000	$ 4,015,000	$ 30,000	$ 198,000	$ 228,000
Fox River	18,131,000	5,549,000	23,680,000	291,000	716,000	1,007,000
Kinnickinnic River	2,168,000	--	2,168,000	145,000	3,000	148,000
Menomonee River	18,627,000	352,000	18,979,000	354,000	80,000	434,000
Milwaukee River	23,959,000	4,873,000	28,832,000	435,000	568,000	1,003,000
Minor Streams Tributary to Lake Michigan						
Barnes Creek	1,622,000	--	1,622,000	99,000	3,000	102,000
Pike Creek	1,169,000	--	1,169,000	36,000	2,000	38,000
Sucker Creek	272,000	342,000	614,000	3,000	33,000	36,000
Oak Creek	9,392,000	176,000	9,568,000	517,000	25,000	542,000
Pike River	6,543,000	94,000	6,637,000	58,000	48,000	106,000
Rock River	22,563,000	4,858,000	27,421,000	197,000	691,000	888,000
Root River	14,184,000	1,748,000	15,932,000	1,687,000	290,000	1,977,000
Sauk Creek	601,000	902,000	1,503,000	11,000	94,000	105,000
Sheboygan River	246,000	134,000	380,000	3,000	20,000	23,000
Direct Tributary Drainage Area to Lake Michigan[i]	4,293,000	376,000	4,669,000	25,000	40,000	65,000
Total	$126,568,000	$20,621,000	$147,189,000	$3,891,000	$2,811,000	$6,702,000

NOTE: This table excludes the areas directly tributary to the 100 major lakes in the Region. Major lakes are located in the Des Plaines River, Fox River, Milwaukee River, and Rock River watersheds.

[a] *The identified pollutants that require nonpoint source control are based upon a generalized consideration of the entire watershed. For each watershed certain areas may require a greater or lesser level of control for a given pollutant than indicated in this table.*

[b] *The recommended practices were developed under the areawide water quality management planning program and were used for cost estimating purposes. Local planning activities are recommended to further refine the recommendation for specific practices.*

[c] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The estimated costs do not include costs for the management of septic tank systems. The proper maintenance and replacement of septic tank systems are recommended to help improve the water quality of the streams in southeastern Wisconsin. However, because septic tank systems management is an existing function necessary for the preservation of public health and the maintenance of drinking water supplies, this cost is not included in the water quality management plan. The estimated expenditures for septic tank system management for the stream plan element include a capital cost over the period of 1975-2000 of $25.3 million and an average annual operation and maintenance cost of $1.5 million.*

[d] *Dissolved oxygen problems, which are estimated to exist in portions of the Des Plaines, Fox, Milwaukee, Pike, Rock, and Root River watersheds, are caused by high oxygen demand from organic bottom deposits, benthic organisms, and algal respiration. These conditions are caused by existing and historical point source discharges, sewage flow relief devices, and nonpoint sources of pollutants.*

[e] *SEWRPC Planning Report No. 32, A Comprehensive Plan for the Kinnickinnic River Watershed, documented that excessive levels of toxic and hazardous materials exist in the Kinnickinnic River and its tributaries.*

[f] *Water quality management recommendations for the portions of the Kinnickinnic River, Menomonee River, and Milwaukee River watersheds within the combined sewer service area of the City of Milwaukee and Village of Shorewood are also being considered under the local sewerage facilities planning program being conducted by the Milwaukee Metropolitan Sewerage District. No nonpoint source control practices are assumed to be implemented in the combined sewer service area, since the plan assumes the provision of a deep tunnel conveyance, storage, and treatment system through which storm water runoff would be treated. The specific nonpoint source controls recommended for those areas may be refined based upon the findings of that local facilities planning program.*

[g] *Measures are included to abate creosote pollution in the Little Menomonee River stream channel as recommended in SEWRPC Planning Report No. 26, A Comprehensive Plan for the Menomonee River Watershed.*

[h] *Additional conservation practices to achieve a 50 percent reduction in rural land pollutant runoff are recommended only for the Root River Canal subwatershed of the Root River watershed.*

[i] *The water quality of the direct tributary drainage area to Lake Michigan was not simulated under the areawide water quality management planning program. It was assumed that minimum nonpoint source controls would be sufficient to alleviate any significant water pollution problems that may exist in these areas.*

Source: SEWRPC.

Table 23

RECOMMENDED NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT FOR MAJOR LAKES IN THE REGION: 2000

Lake Name (by watershed)	Recommended Nonpoint Source Management Practices[a]									Estimated Cost[b]	
	Urban					Rural					
	Minimum			Additional		Minimum		Additional			
	Septic System Management	Construction Erosion Control	Urban Land Practices (25 percent reduction)	Urban Land Practices (50 percent reduction)	Urban Land Practices (75 percent reduction)	Livestock Waste Control	Conservation Practices (25 percent reduction)	Conservation Practices (50 percent reduction)	Conservation Practices (75 percent reduction)	Total Capital 1975-2000	Average Annual Operation and Maintenance 1975-2000
Des Plaines River											
Benet-Shangrila	X	X	X	--	--	--	X	--	--	$ 143,000	$ 2,000
George	X	X	X	--	--	X	X	X	--	452,000	8,000
Hooker	X	X	X	X	--	X	X	X	X	338,000	16,000
Paddock	X	X	X	--	--	--	X	--	--	12,000	1,000
Subtotal	--	--	--	--	--	--	--	--	--	945,000	27,000
Fox River											
Army	X	--	X	--	--	X	X	--	--	$ 18,000	$ 2,000
Benedict/Tombeau	X	--	X	--	--	X	X	X	--	69,000	9,000
Beulah	X	--	X	--	--	X	X	--	--	15,000	8,000
Big Muskego	X	X	X	X	--	X	X	X	X	5,715,000	184,000
Bohner	X	--	X	--	--	X	X	--	--	6,000	2,000
Booth	X	--	X	--	--	--	X	--	--	100	300
Browns	--	X	X	--	--	--	X	--	--	93,000	1,000
Camp	X	X	X	--	--	X	X	--	--	882,000	10,000
Center	X	X	X	--	--	X	X	X	X	1,301,000	29,000
Como	X	--	X	--	--	X	X	--	--	5,000	6,000
Cross	--	X	X	--	--	--	X	--	--	148,000	2,000
Denoon	X	X	X	X	--	X	X	X	X	912,000	20,000
Dyer	X	--	--	--	--	X	X	X	--	20,000	4,000
Eagle	X	X	X	--	--	X	X	--	--	1,279,000	15,000
Eagle Spring	X	--	X	--	--	X	X	X	X	722,000	66,000
Echo	X	X	X	--	--	X	X	--	--	1,260,000	18,000
Elizabeth	X	X	X	--	--	X	X	--	--	1,170,000	16,000
Geneva	X	X	X	--	--	X	X	--	--	1,515,000	37,000
Kee Nong Go Mong	X	X	X	--	--	X	X	--	--	61,000	3,000
Lauderdale Lakes	X	--	X	--	--	X	X	--	--	36,000	9,000
Lilly	X	--	X	--	--	--	X	--	--	100	300
Little Muskego	X	X	X	X	--	X	X	X	X	4,038,000	118,000
Long	X	--	X	--	--	X	X	X	--	44,000	6,000
Lulu	X	--	X	--	--	X	X	X	--	188,000	31,000
Marie	--	X	X	--	--	X	X	--	--	859,000	9,000
North (Walworth County)	X	--	X	--	--	X	X	X	--	209,000	31,000
Pell	X	--	X	--	--	--	X	X	--	5,000	2,000
Peters	X	--	X	--	--	X	X	--	--	6,000	2,000
Pewaukee	X	X	X	X	--	X	X	X	X	8,002,000	248,000
Pleasant	X	--	X	--	--	--	X	--	--	200	2,000
Potter	--	X	X	--	--	--	--	--	--	370,000	3,000
Powers	X	--	X	--	--	X	X	--	--	16,000	4,000
Saylesville Millpond	X	X	X	--	--	X	X	X	--	1,167,000	45,000
Silver Lake (Kenosha County)	X	X	X	--	--	X	X	--	--	451,000	8,000
Silver Lake (Walworth County)	X	--	X	--	--	--	X	--	--	100	1,000
Spring	X	X	X	--	--	--	X	--	--	386,000	8,000
Upper and Lower Phantom	--	X	X	--	--	X	X	--	--	1,656,000	47,000
Voltz	--	X	X	--	--	--	X	--	--	203,000	2,000
Wandawega	X	--	X	--	--	--	X	--	--	100	1,000
Waterford Impoundment (Buena Lake)	X	X	X	--	--	X	X	--	--	2,200,000	41,000
Waubeesee	X	X	X	X	--	X	X	X	--	386,000	8,000
Wind	X	X	X	X	--	X	X	X	X	4,389.000	162,000
Subtotal	--	--	--	--	--	--	--	--	--	$35,409,000	$ 967,000
Milwaukee River											
Barton Pond	--	X	X	--	--	--	X	--	--	$ 786,000	$ 7,000
Big Cedar	X	--	X	--	--	X	X	--	--	51,000	11,000
Green	X	--	X	--	--	--	X	--	--	100	1,000
Little Cedar	X	--	X	--	--	X	X	--	--	10,000	3,000
Lucas	X	--	X	--	--	--	X	--	--	100	1,000
Mud	X	--	X	--	--	X	X	--	--	52,000	9,000
Silver	X	--	X	--	--	X	X	--	--	4,000	1,000
Smith	X	--	X	--	--	X	X	--	--	14,000	2,000
Spring	--	--	--	--	--	--	X	--	--	100	200
Twelve	X	--	X	--	--	--	X	X	X	20,000	2,000
Wallace	X	X	X	--	--	--	--	--	--	416,000	4,000
West Bend	--	X	X	--	--	--	X	--	--	462,000	4,000
Subtotal	--	--	--	--	--	--	--	--	--	$ 1,815,000	$ 45,000

Table 23 (continued)

Lake Name (by watershed)	Recommended Nonpoint Source Management Practices[a]									Estimated Cost[b]	
	Urban					Rural					
	Minimum			Additional		Minimum		Additional			
	Septic System Management	Construction Erosion Control	Urban Land Practices (25 percent reduction)	Urban Land Practices (50 percent reduction)	Urban Land Practices (75 percent reduction)	Livestock Waste Control	Conservation Practices (25 percent reduction)	Conservation Practices (50 percent reduction)	Conservation Practices (75 percent reduction)	Total Capital 1975-2000	Average Annual Operation and Maintenance 1975-2000
Rock River											
Ashippun	X	--	X	--	--	--	X	--	--	$ 100	$ 1,000
Bark	X	--	X	--	--	X	X	X	X	321,000	35,000
Beaver	X	X	X	--	--	--	X	--	--	933,000	8,000
Comus	X	--	X	--	--	X	X	--	--	15,000	3,000
Cravath	X	--	X	--	--	--	X	--	--	100	1,000
Crooked	X	--	X	--	--	--	X	--	--	100	1,000
Delavan	X	X	X	--	--	X	X	--	--	1,193,000	33,000
Druid	X	--	X	--	--	X	X	--	--	1,000	1,000
Five	X	--	X	--	--	--	X	--	--	68,000	9,000
Fowler	X	X	X	--	--	--	X	--	--	200	1,000
Friess	X	--	X	--	--	X	X	--	--	813,000	8,000
Golden	X	--	X	--	--	--	X	--	--	19,000	3,000
Hunters	X	--	X	--	--	X	X	--	--	100	1,000
Keesus	X	--	X	--	--	X	X	--	--	2,000	2,000
La Belle	X	X	X	--	--	X	X	--	--	60,000	7,000
La Grange	X	--	X	--	--	X	X	--	--	2,838,000	33,000
Loraine	X	--	X	--	--	X	X	--	--	12,000	3,000
Lower Genesee	X	--	X	--	--	--	X	--	--	100	300
Lower Nashotah	--	--	X	--	--	--	X	--	--	$ 100	$ 300
Lower Nemahbin	X	X	X	--	--	--	X	--	--	647,000	6,000
Middle Genesee	X	--	X	--	--	--	X	--	--	100	1,000
Moose	X	X	X	--	--	--	X	--	--	693,000	6,000
Nagawicka	X	X	X	--	--	X	X	--	--	2,312,000	27,000
North	X	X	X	--	--	X	X	--	--	1,029,000	11,000
Oconomowoc	X	X	X	--	--	--	X	--	--	878,000	9,000
Okauchee	X	X	X	--	--	X	X	-	--	1,877,000	23,000
Pike	X	--	X	--	--	X	X	--	--	41,000	6,000
Pine	X	X	X	--	--	--	X	--	--	1,017,000	10,000
Pretty	X	--	X	--	--	--	X	--	--	100	200
Rice	X	--	X	--	--	X	X	--	--	4,000	1,000
School Section	X	--	X	--	--	--	X	--	--	100	200
Silver	X	X	X	--	--	--	X	--	--	1,636,000	14,000
Tripp	X	X	X	--	--	--	X	--	--	319,000	3,000
Turtle	X	--	X	--	--	X	X	--	--	77,000	5,000
Upper Nashotah	X	X	X	--	--	X	X	--	--	485,000	7,000
Upper Nemahbin	--	X	X	--	--	X	X	--	--	1,676,000	15,000
Waterville	X	--	X	--	--	X	X	--	--	17,000	3,000
Whitewater	X	--	X	--	--	X	X	--	--	39,000	8,000
Subtotal	--	--	--	--	--	--	--	--	--	$19,023,000	$ 306,000
Total										$57,192,000	$1,345,000

[a] *The recommended practices were developed under the areawide water quality management planning program and were used for cost estimating purposes. Local planning activities are recommended to further refine the recommendations for specific practices.*

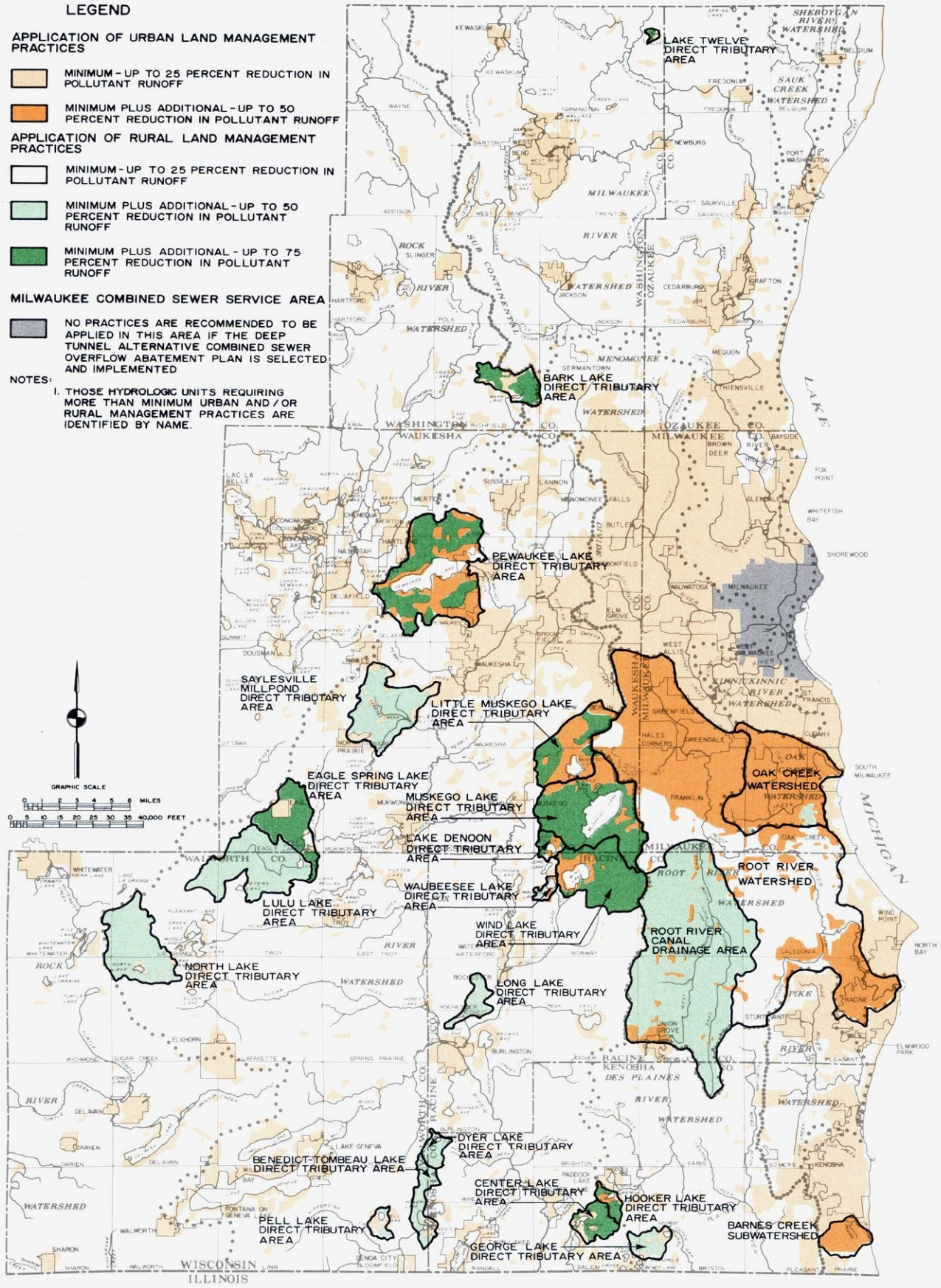
[b] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The estimated costs do not include costs for the management of septic tank systems. The proper maintenance and replacement of septic tank systems are recommended to help improve the water quality of lakes in southeastern Wisconsin. However, because septic tank systems management is an existing function necessary for the preservation of public health and the maintenance of drinking water supplies, this cost is not included in the water quality management plan. The estimated expenditures for septic tank system management for the lakes plan element include capital cost over the period of 1975-2000 of $116.6 million dollars and an average annual operation and maintenance cost of $1.4 million dollars.*

Source: SEWRPC.

Rural land uses—croplands, pasture lands, woodlands, and other open lands—are expected to occupy about 1,736 square miles of land within the Region in the year 2000.[27] Minimum rural nonpoint source pollution abatement practices are recommended to be carried out throughout this rural area. Such practices would be the only practices applied to about 1,560 of the 1,736 square miles. In addition, rural nonpoint source pollution abatement measures designed to achieve an approximate 50 percent reduction in runoff are recommended to be applied to about 118 square miles of rural land. As shown on Map 8, this land is located largely in the Root River Canal drainage area within the Root River watershed and, to a lesser extent, in the Oak Creek watershed. In addition, such relatively intensive rural nonpoint source pollution control practices are recommended to be applied in the direct drainage areas tributary to George Lake, Benedict/Tombeau Lake, Waubeesee Lake, Long Lake, Dyer Lake, Pell Lake, North Lake (Walworth County), Lulu Lake, and the Saylesville Mill Pond. Finally, additional rural nonpoint source pollution abatement measures designed to achieve about a 75 percent

[27] *The 1,736 square miles of rural agricultural land and the 671 square miles of urban land total 2,407 square miles. The remaining area of the Region—282 square miles—is comprised of water and wetlands.*

RECOMMENDED NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT IN THE REGION: 2000



Minimum urban and rural nonpoint source control practices, designed to provide about a 25 percent reduction in the pollutants contained in runoff, are recommended to be implemented throughout the entire urban and rural area of the Region. The only exception is in the combined sewer service area in Milwaukee and Shorewood, where no urban nonpoint source controls would be expected to be required if the deep tunnel conveyance, storage, and treatment alternative is selected for eliminating combined sewer overflow pollutant discharges. If the sewer separation alternative is selected, then the local facility planning study should determine the appropriate level of nonpoint source control required. Additional nonpoint source controls designed to provide about a 50 percent reduction in pollutants contained in runoff are recommended to be applied to a total of 109 square miles of urban area and about 118 square miles of rural land. In addition, rural nonpoint source pollution abatement measures designed to achieve an approximate 75 percent reduction in pollutants contained in runoff are recommended to be applied to about 58 square miles of rural land.

Source: SEWRPC.

Table 24

AREAL EXTENT OF THE APPLICATION OF RECOMMENDED NONPOINT SOURCE CONTROL MEASURES TO URBAN AND RURAL AREAS OF THE REGION BY WATERSHED: 2000

Watershed	Areal Extent of Recommended Nonpoint Source Pollution Abatement Measures													
	Urban Land[a]							Rural Land[a]						
	No Nonpoint Pollution Abatement Measures[b]		Minimum Land Management Practices (25 percent reduction)		Additional Land Management Practices (50 percent reduction)		Total	Minimum Land Management Practices (25 percent reduction)		Additional Land Management Practices (50 percent reduction)		Additional Land Management Practices (75 percent reduction)		Total
	Square Miles	Percent of Total	Square Miles	Percent of Total	Square Miles	Percent of Total	Square Miles	Square Miles	Percent of Total	Square Miles	Percent of Total	Square Miles	Percent of Total	Square Miles
Des Plaines River	--	--	15.6	96.2	0.6	3.8	16.2	101.6	96.6	2.4	2.3	1.2	1.1	105.2
Fox River	--	--	146.0	84.9	26.0	15.1	172.0	540.0	84.0	50.4	7.8	52.5	8.2	642.9
Kinnickinnic River	3.9	16.3	20.1	83.7	--	--	24.0	1.3	100.0	--	--	--	--	1.3
Menomonee River	8.4	10.0	76.0	90.0	--	--	84.4	46.8	100.0	--	--	--	--	46.8
Milwaukee River	8.8	7.3	111.8	92.7	--	--	120.6	259.5	99.9	--	--	0.3	0.1	259.8
Minor Streams Tributary to Lake Michigan														
Barnes Creek	--	--	--	--	2.9	100.0	2.9	1.5	100.0	--	--	--	--	1.5
Pike Creek	--	--	6.2	100.0	--	--	6.2	1.3	100.0	--	--	--	--	1.3
Sucker Creek	--	--	0.8	100.0	--	--	0.8	9.5	100.0	--	--	--	--	9.5
Oak Creek	--	--	--	--	18.5	100.0	18.5	--	--	7.7	100.0	--	--	7.7
Pike River	--	--	17.2	100.0	--	--	17.2	32.2	100.0	--	--	--	--	32.2
Rock River	--	--	95.9	100.0	--	--	95.9	434.7	99.1	--	--	4.0	0.9	438.7
Root River	--	--	--	--	60.7	100.0	60.7	68.8	54.3	57.8	45.7	--	--	126.6
Sauk Creek	--	--	3.9	100.0	--	--	3.9	29.7	100.0	--	--	--	--	29.7
Sheboygan River	--	--	0.8	100.0	--	--	0.8	9.6	100.0	--	--	--	--	9.6
Direct Tributary Drainage Area to Lake Michigan	1.3	2.8	45.8	97.2	--	--	47.1	23.2	100.0	--	--	--	--	23.2
Total	22.4	3.3	540.1	80.5	108.7	16.2	671.2	1,559.7	89.9	118.3	6.8	58.0	3.3	1,736.0

[a] *Excludes water and wetland areas totaling 282 square miles in areal extent.*

[b] *In the Milwaukee combined sewer area, the plan assumes no urban nonpoint source control if the deep tunnel conveyance, storage, and treatment alternative is selected, since storm water runoff would be treated. If the sewer separation alternative is selected, the results of the local facilities planning effort in Milwaukee should be utilized to determine the appropriate level of nonpoint source control required.*

Source: SEWRPC.

reduction in runoff are recommended to be applied in the direct drainage areas tributary to Lake Twelve, Bark Lake, Pewaukee Lake, Big and Little Muskego Lakes, Eagle Spring Lake, Denoon Lake, Center Lake, Wind Lake, and Hooker Lake. Together, these rural land areas total about 58 square miles.

In addition to the foregoing recommendations, it is recommended that the creosote pollution of the bottom deposits in that portion of the Little Menomonee River in Milwaukee County be abated through the excavation of a new channel and filling of the existing channel, as recommended in the comprehensive plan for the Menomonee River watershed adopted by the Commission on January 20, 1977. It should also be noted that the combined sewer overflow abatement study now being conducted in the Milwaukee area by the Milwaukee Metropolitan Sewerage District and discussed earlier in this chapter may result in recommendations for abating pollution caused by the bottom deposits in the estuary portions of the Kinnickinnic, Milwaukee, and Menomonee Rivers. When the recommendations of the preliminary engineering study of the combined sewer overflow problem are approved by the agencies concerned, those recommendations—which may include dredging and disposal of bottom sediments—will likely be incorporated into the areawide water quality management plan.

Analyses conducted under the areawide water quality management program identified instream dissolved oxygen problems in portions of the Des Plaines, Fox, Milwaukee, Pike, Rock, and Root River watersheds. These problems are believed to be generally caused by oxygen demand from organic bottom deposits, benthic organisms, and algal respiration. These conditions are in turn believed to have been caused by existing and historic point and nonpoint source pollution discharges. It is assumed that over time the foregoing recommendations for nonpoint source pollution abatement, together with the previously described recommendations for the abatement of pollution from point sources, will result in the satisfactory control of the oxygen demand from these sources without deposit removal. This initial

conclusion should, however, be reevaluated after the related point and nonpoint source abatement programs have been implemented.

An unusually high level of reduction in nonpoint source loading will be needed to achieve water use objectives and supporting water quality standards for Oak Creek. This need is attributed to existing loadings of phosphorus and ammonia-nitrogen from malfunctioning septic tank systems and unknown sanitary sewer system flow relief devices, conditions not specifically simulated but indirectly manifested in the nonpoint source loadings through the model calibration process. It is believed that the practices needed to achieve a 50 percent reduction in surface water pollution from both urban and rural lands in the Oak Creek watershed, together with the elimination of any malfunctioning septic tank systems through the provision of public sanitary sewer services and the elimination of all sanitary sewer system flow relief devices, should result in the achievement of the water use objectives in this watershed.

The nonpoint source pollution abatement plan element recommends that only minimum urban and rural nonpoint source pollution abatement practices be applied in the Menomonee River watershed. This recommendation is based on the results of analyses that indicate that the phosphorus standard for recreational use probably cannot be achieved in the Menomonee River watershed even at high levels of nonpoint source control. The heavily urbanized and industrialized character of this watershed together with the channelized nature of much of the stream network make it impractical to seek to achieve the phosphorus standard.

For the Root River Canal portion of the Root River watershed, analyses indicated that the very high existing and historic pollutant loadings make it highly unlikely that the national goal of "fishable and swimmable" waters can be met even with greatly reduced pollutant loadings to that stream system. As noted above, however, the plan recommendations do include for the Root River Canal portion of the watershed more than the minimum rural and urban nonpoint source controls. An approximate 50 percent reduction in nonpoint source pollutant runoff is considered essential to improving water quality conditions in that portion of the Root River watershed downstream from the confluence of the Root River Canal with the North Branch of the Root River in the City of Franklin. This level of pollutant runoff control in the Canal area will not only contribute toward achievement of improved water quality conditions downstream of the confluence with the North Branch, but will provide water quality in the canals which will permit a limited fishery and limited recreational use within the Canal itself. Moreover, upon construction of the proposed Oakwood Reservoir, the nonpoint controls will serve to improve the lake water quality.

It should be noted that the water quality of Lake Michigan was not analyzed under the areawide water quality management planning program. It was assumed, however, on the basis of the findings and recommendations of other studies, including the findings and recommendations of the International Joint Commission's Reference Group Study of Pollution From Land Use Activities (PLUARG), that a minimum level of urban and rural nonpoint source control would be sufficient for the area directly tributary to that Lake.[28] Refinements and reconsideration of this recommendation may be appropriate, depending upon the results of the study proposed in the SEWRPC Lake Michigan Estuary and Direct Drainage Area Subwatersheds Planning Program Prospectus, September 1978.

In addition, it should be noted that the estuary reaches of streams that discharge to Lake Michigan were not directly addressed under the areawide water quality management plan, because they require an evaluation of the complex effects of Lake Michigan on these reaches. The Commission has proposed the conduct of a study designed to address this problem.[29] Because the estuary drainage areas are limited in size, it is recommended that the nonpoint source pollution abatement measures required for the areas immediately upstream of the estuary drainage areas be initially undertaken within those drainage areas.

It is important to recognize that a relatively high level of pollution control can be achieved by controlling pollutant contributions from livestock, construction activities, and septic tank systems. The control of these pollution sources, which is recommended for the entire Region under the category of minimum nonpoint source controls, should, when combined with the recommended point source abatement measures, sufficiently reduce pollution in many areas of the Region to meet the established water use objectives.

The nonpoint source pollution control practices described above and directed principally to the control of biochemical oxygen demand, phosphorus, ammonia-nitrogen, and fecal coliform organisms are expected to result in the control of other pollutants as well; most notably, sediment and forms of nitrogen other than ammonia. The contribution of sediment loading to the streams in the Region has been estimated in Chapter V of SEWRPC Technical Report No. 21, Sources of Pollution in Southeastern Wisconsin: 1975. It was estimated in that report that approximately 45 percent of the sediment discharged to the streams of the Region is con-

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[28] *It was reported in the International Joint Commission report, Environmental Management Strategy for the Great Lakes, July 1978, that Lake Michigan is expected to meet target phosphorus loads with the implementation of point source controls only. However, localized coastal pollution problems are expected to require nonpoint source control in some areas.*

[29] *See SEWRPC's Lake Michigan Estuary and Direct Drainage Area Subwatersheds Planning Program Prospectus, September 1978. Additionally, a study is presently being conducted by the Milwaukee Metropolitan Sewerage District in cooperation with the University of Wisconsin to evaluate water quality conditions of the Milwaukee harbor estuary area.*

tributed by agricultural lands, with about 35 percent coming from construction areas, and the remaining 20 percent from other land uses. The nonpoint source control practices recommended herein are expected to reduce the sediment contribution to the streams by more than 50 percent. Significant reductions in the pollutant loadings of toxic and hazardous substances, including agricultural- or industrial-related chemicals, are also expected to be achieved by the plan recommendations. However, further study of the toxic and hazardous substances pollution problem is necessary to define the levels of reduction that would ensure achievement of the water use objectives and supporting standards.

Reduction of Atmospheric Sources of Pollution

Air quality both affects and is affected by water quality conditions and control actions. Air quality control programs currently address particulate matter, sulfur oxides, carbon monoxide, nitrogen oxides, photochemical oxidants, and hydrocarbons, which can affect ozone levels. Atmospheric fallout and precipitation washout may have an effect on water quality as a source of biochemical oxygen demand, nitrogen, and phosphorus in natural waters. Similarly, nitrogen dioxide can be provided to the natural waterways from atmospheric sources. Such sources of water pollution were found to be of little practical importance for the attainment of water quality objectives except in isolated cases. However, pollutants from the atmosphere do enter the Region's surface waters, and a cleaner atmosphere would result in less direct atmospheric deposition and improved water quality. It is, therefore, recommended that efforts to improve air quality be supported by the agencies designated to implement the areawide water quality management plan. Particularly for inland lake management, it is recommended that the recommendations of the regional air quality maintenance plan for suspended particulate matter be considered and implemented as a means of reducing nonpoint pollution from atmospheric washout and fallout.

Major Lake Considerations: The foregoing recommendations for nonpoint source pollution abatement include the direct tributary drainage areas to the 100 major lakes within the Region—lakes which have surface areas greater than 50 acres. More specific recommendations for each lake are set forth in Table 23. Because most of the known lake water quality problems in the Region are related to excessive aquatic plant growth, the nonpoint source control recommendations concern primarily the need to control phosphorus contributions to the lakes. Since phosphorus is believed to be the limiting plant nutrient in most of the Region's waters, plant growth can best be controlled through the control of phosphorus levels.

Much of the phosphorus entering lakes through nonpoint sources, particularly from failing septic tank systems, livestock operations, and construction sites, can be controlled through the application of the nonpoint source control practices identified in Table 20. The estimated costs of nonpoint source controls are presented in Table 23. These costs include all practices recommended for the direct tributary drainage area of each lake, but do not include costs for measures designed to reduce pollutant loads to major streams that discharge to the lake.

Implementation of the recommended control measures will probably not reduce phosphorus loads to levels required for full recreational use in the following lakes: Buena, Echo, and Kee Nong Go Mong Lakes in the Fox River watershed; Crooked Lake in the Rock River watershed, and Mud Lake in the Milwaukee River watershed. The analyses indicate that the excessive phosphorus loads to these lakes cannot be sufficiently reduced by currently available, economically practical techniques to achieve all of the desired water use objectives. Implementation of the recommended controls in these lakes is expected to reduce the phosphorus-related problems and retard aquatic plant growth, but the resultant improvement in lake quality is not expected to be sufficient to achieve the desired goal. These lakes, therefore, must be limited to a less than full recreational use objective.

Even in lakes where the desired reduction in phosphorus loadings can be achieved, the sediments that have been deposited on the lake bottoms may continue to provide a suitable bottom substrate and nutrient source for excessive macrophyte growth in some local areas, and may under certain conditions release nutrients to the water body. If such a problem is confirmed through more detailed study, the application of lake restoration or rehabilitation procedures, in addition to the recommended point and nonpoint source controls, should be considered. Possible rehabilitation measures for each lake were identified in Appendix C in Volume Two. Lake rehabilitation measures should not be implemented, however, until detailed local studies have been conducted to determine the need for and applicability of the measures and the specific means of achieving the recommended levels of nutrient input reductions.

SLUDGE MANAGEMENT PLAN ELEMENT

The preparation of a wastewater sludge management plan was an important part of the areawide water quality management planning program. The major findings and recommendations of the wastewater sludge management planning effort have been set forth in SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin. The sludge management plan was formally adopted by the Commission on September 14, 1978, as an element of the areawide wastewater management plan for southeastern Wisconsin. For the purposes of that report, the estimates of sludge quantities to be managed were derived from a preliminary point source pollution abatement plan. The final point source pollution abatement plan described earlier in this chapter differs in some respects from the preliminary plan, particularly in regard to the levels of phosphorus removal required at selected public sewage treatment plants and the recommendations for land disposal of sewage effluent in lieu of the provision of advanced treatment at other public treatment plants. This

section of the chapter summarizes the recommendations previously set forth in SEWRPC Planning Report No. 29, adjusting them as necessary to reflect the more refined estimates of sludge quantities derived from the final point source element recommendations set forth in this chapter. In addition, these adjusted recommendations reflect the completion of the initial sludge management component of the sewerage facilities plan under preparation by the Milwaukee Metropolitan Sewerage District.[30]

Conceptual Framework for Sludge Management Planning

Sludges are a natural and unavoidable by-product of liquid waste treatment. Increases in the quantity and changes in the chemical and physical characteristics of wastewater sludges can be expected, since implementation of water quality management plans results in higher volumes of wastes treated, changed wastewater characteristics, and higher levels of treatment. For example, primary treatment of municipal wastewaters typically produces 2,500 to 3,000 gallons of sludge, with a dry solids content of 2 to 6 percent per million gallons of wastewater treated. Five to eight times as much sludge volume, with a dry solids content of 1 to 3 percent, may result when secondary treatment is used. Use of chemicals for phosphorus removal—an advanced level of waste treatment—may add as much as 50 percent more to this amount and result in a total as high as 33,000 gallons of sludge per million gallons of wastewater treated.

Sludge-handling and -disposal costs can represent a significant portion of the total cost of wastewater treatment. For example, the capital, operation, and maintenance costs of providing secondary treatment for 10 million gallons per day (mgd) of municipal wastewater may be 20 to 25 cents per 1,000 gallons of wastewater treated, while the cost of treating and disposing of the resultant sludges may be 5 to 10 cents per 1,000 gallons of wastewater treated. Proper management of sludges is important to ensure that the pollutants contained in the sludges do not return to waterways in runoff from agricultural lands or as leachate from landfills to pollute surface or groundwater. Thus, the identification of cost-effective, environmentally acceptable, and technically feasible means of wastewater sludge management is an important consideration in any areawide water quality management planning effort.

The regional wastewater sludge management planning effort was based upon seven basic principles:

1. Sludge should be treated as a resource which, with proper management and control, can provide a valuable energy source, a valuable nutrient supplement, or a soil conditioner.

2. Sludge management system planning must be regional in scope, recognizing, however, as necessary subregional planning areas related to existing systems, potential management agencies, natural watershed boundaries, and urban concentrations with well-developed sewerage systems and related sludge-handling systems.

3. Sludge management system planning must be compatible with land use planning.

4. Land use, wastewater treatment facility, and sludge management planning must recognize the existence of a limited natural resource base to which rural and urban development must be adjusted to ensure the continuation of a pleasant and habitable environment.

5. Sludge management systems must have a minimum negative environmental impact and assist in attaining areawide land use, air quality, and water quality objectives. Accordingly, harmful constituents such as heavy metals and other toxic substances should be carefully monitored and controlled.

6. Sludge management facilities must be planned as integrated systems, or coordinated subsystems, with the capacity of each facility in the total system or subsystem carefully adjusted to present and probable future sludge loadings.

7. Primary emphasis should be placed on in-Region solutions to sludge management system development problems related to the environment, except in the sale of highly refined sludge products of value as fertilizers or soil conditioners in the economic marketplace.

Inventory Findings

The salient findings of the inventories conducted under the regional wastewater sludge management planning effort may be summarized as follows:

1. There were in 1975 within the seven-county Region 61 public sewage treatment plants; 67 private sewage treatment plants, using treatment processes similar to those used at the public plants; 80 industrial wastewater treatment facilities generating sludge by providing specialized treatment of industrial wastes; and 17 water supply treatment plants, all of which produced wastewater sludges. Altogether, these 225 sources generated about 390 dry tons of sludge per day (see Table 25). The 61 public sewage treatment plants generate about 350 dry tons per day, or 90 percent of the total sludge generated in the Region daily.

2. Burial of sewage sludge in landfills is used exclusively by only three of the 61 public sewage treatment plants. One of these three plants incinerates the sludge prior to disposal of residue

[30] *See Milwaukee Metropolitan Sewerage District, Total Solids Management Program, Volumes 1 through 4, September 15, 1978.*

Table 25

SUMMARY OF SLUDGE GENERATED IN THE REGION BY MAJOR SLUDGE GENERATING FACILITY: 1975

Sludge Generating Facility	Raw Sludge Quantity Produced (tons per day dry solids)
Major Municipal Sewage Treatment Plants (22 plants)	347.4
Other Municipal Sewage Treatment Plants (39 plants)	2.7
Private Sewage Treatment Plants (67 plants)	1.8
Subtotal	351.9
Industrial Treatment Facilities (80 plants)	
Tanneries	2.7
Metal Plating	3.6
Metal Machinery	17.1
Food Processing	1.4
Truck and Car Wash Operations	0.1
Subtotal	24.9
Municipal Water Treatment Plants (17 plants)	12.6
Septic and Holding Tanks[a] (estimated 68,600 tanks)	(6.2)
Total	389.4

NOTE: The data in this table differ slightly from those in similar tables, numbers 38, 50, 56, 97, and 98 in SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin. The differences reflect changes in the designation of "major plants" in the Lake Geneva area of Walworth County, where the City of Lake Geneva sewage treatment plant and the Village of Walworth sewage treatment plant have been identified in a local facilities plan–completed since Planning Report No. 29 was published–as areawide facilities serving multiple jurisdictions.

[a] *Discharged in part to municipal sewage treatment plants; value is included in municipal quantities and in total sludge quantity.*

Source: Camp, Dresser and McKee, Inc., and SEWRPC.

in a landfill. A total of 46 of these 61 public plants rely exclusively on land application or fertilizer and soil conditioner production for sludge disposal. The remaining 12 plants use a combination of the land application, landfill, and/or public pickup options for sludge disposal. The sludge disposal methods used by the 61 public sewage treatment plants in the Region are summarized on Map 9.

3. Land within the Region is undergoing a conversion from rural to urban use at a rate of about 10 square miles per year. Much of this land conversion is occurring in a discontinuous and highly diffuse pattern, consisting largely of scattered low-density residential development. If continued, this scattered growth will limit the availability of land acceptable for sludge application. Interpretive analyses conducted under the sludge management planning program indicate that about one-third of the Region is covered by soils that are severely limited for land spreading of sludge. Map 10 is a typical interpretive map on the suitability of land for sludge application.

Objectives and Design Standards

Six regional wastewater treatment sludge management objectives, together with supporting principles and standards, were formulated under the regional wastewater sludge management system planning effort. These six objectives and the supporting principles and standards are set forth in Table 26.

Although the wastewater sludge management system development objectives provide a broad framework for plan formulation and evaluation, it was also necessary in the program to select engineering design criteria to be utilized in the design of alternative system plans and in the comparison of such plans. These design criteria are set forth in SEWRPC Technical Report No. 18, State of the Art of Water Pollution Control in Southeastern Wisconsin, Volume Two, Sludge Management. That report describes techniques for sludge processing, transportation, utilization, and disposal, and sets forth criteria used in the analysis and screening of alternative system plans leading to the selection of the recommended regional sludge management system plan.

Alternative Plans

In preparing the recommended regional wastewater sludge management systems plan, a concerted effort was made to prepare and offer for public examination all reasonable and physically feasible alternative plan elements that might satisfy the stated sludge management objectives. Alternatives were considered for the various types of sludge handling, treatment, and disposal-utilization processes, as were geographic alternatives concerning the degree of centralization of sludge management facilities. The following six geographic alternatives were considered in the study:

1. Individual sludge management at each municipal sewage treatment plant.

2. Subregional sludge management centers at six major municipal sewage treatment plants.

3. Subregional sludge management centers at four major municipal sewage treatment plants.

4. A subregional sludge management center serving six major municipal sewage treatment plants, with individual sludge management at all other plants.

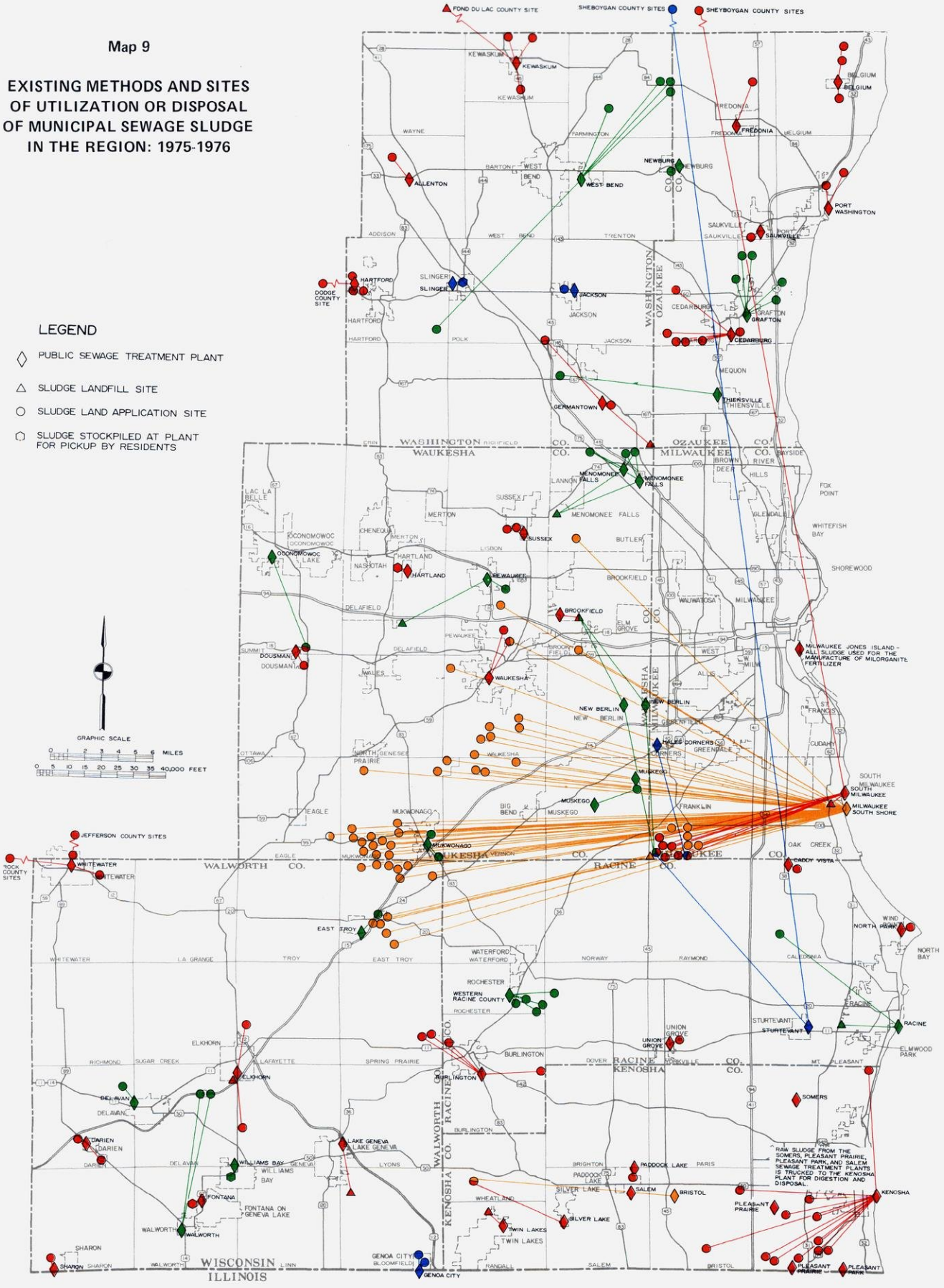
5. Subregional sludge management centers at seven major municipal sewage treatment plants, with one serving each county in the Region.

6. A single centralized sludge management facility for the entire Region.

One sludge processing alternative examined for each alternative geographic sludge management plan involved the land application of wastewater sludges. As already noted, land application is now practiced for disposal of at least part of the sludges generated by 58 of the 61 municipal sewage treatment plants in the Region. An analysis was made to determine whether all the sludge anticipated to be generated in the Region by the year 2000 could be disposed of through land application. Maps 11 and 12 summarize the results of this analysis. Map 11 identifies the general areas that would be needed to accommodate land application of sludge at 20 of the 22 large—having a design capacity greater than 0.8 mgd—sewage treatment plants in the Region, excluding, however, the Jones Island and South Shore plants of the Milwaukee Metropolitan Sewerage District. That area of the Region not otherwise identified represents the residual area that is recommended for potential land application of sludge from the Milwaukee Metropolitan

Map 9

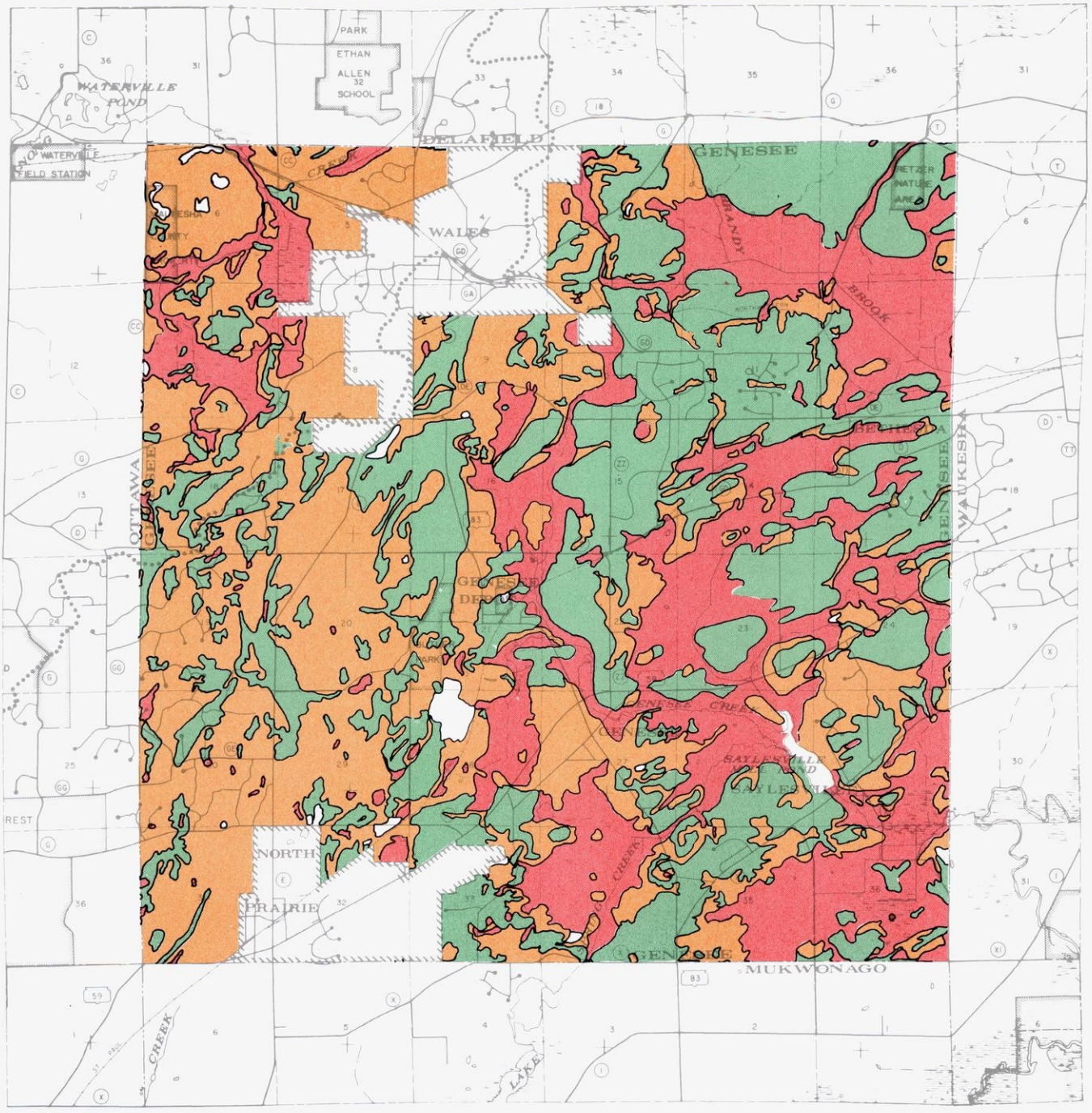
EXISTING METHODS AND SITES OF UTILIZATION OR DISPOSAL OF MUNICIPAL SEWAGE SLUDGE IN THE REGION: 1975-1976



Of the 61 municipal sewage treatment plants in the Region, 46 rely exclusively on land application or fertilizer production for sludge disposal, while burial in landfills is used exclusively by only 3 plants. The remaining 12 plants use a combination of the land application, landfill, and/or public pickup options for sludge disposal.

Source: SEWRPC.

SOIL SUITABILITY FOR LAND APPLICATION OF WASTEWATER SLUDGE IN THE TOWN OF GENESEE



LEGEND

- SLIGHT LIMITATIONS
- MODERATE LIMITATIONS
- SEVERE LIMITATIONS
- MADE LAND, WATER, AND INCORPORATED VILLAGES

GRAPHIC SCALE
0 1 MILE
0 2000 4000 6000 FEET

Soil slope, depth to bedrock and groundwater, soil chemistry, and soil permeability all affect the suitability of sites for land application of sludges. Soils within the Region were classified and mapped for their slight, moderate, or severe limitations for land application of wastewater sludges. The above map is a typical interpretive map showing the suitability of land for sludge application.

Source: SEWRPC.

Table 26

WASTEWATER SLUDGE MANAGEMENT SYSTEM PLANNING OBJECTIVES, PRINCIPLES, AND STANDARDS[a]

OBJECTIVE NO. 1

The development of a regional wastewater sludge management system which will effectively support the existing regional development pattern and serve to aid in the implementation of the regional land use plan while meeting the anticipated wastewater sludge management needs generated by the existing and proposed land uses.

PRINCIPLE

The generation of sludges is an unavoidable result of the treatment of wastewaters from residential, commercial, industrial, institutional, and other intensive land uses in an industrialized society. Such generation creates a need for land for treatment and application—a need which should be accommodated properly within the overall existing and desirable future land use pattern of the Region.

STANDARDS

1. To assure a continuing potential for sludge application on land, the spatial arrangement of suitable land uses should be compatible with the spatial arrangement of existing and planned urban land use, to provide at least 60 acres of suitable and accessible agricultural or silvicultural land per 1,000 residents.

2. Sludge processing and utilization facilities should be sized and located so as to efficiently and effectively serve the recommended future land use pattern of the Region, as well as the existing land use pattern within the Region.

3. Systems for processing and disposal of sludge should be available at a reasonable cost to all owners or operators of publicly or privately owned sanitary or combined storm and sanitary or industrial sewage treatment plants, stormwater treatment facilities, large[b] industrial wastewater pretreatment facilities, on-site sewage treatment systems, or holding tanks.

4. The location of new and replacement wastewater sludge processing, storage, and handling facilities should be properly related to the existing and proposed future urban development pattern, as reflected in the adopted regional land use plan and any community or neighborhood unit development plans prepared pursuant to and consistent with the regional land use plan; and, more specifically, should be located only in areas designated for industrial or public utility areas.

5. The location of new and replacement wastewater sludge utilization sites should be properly related to the existing and proposed future urban development patterns as reflected in the adopted regional land use plan in existence at the time of disposal, as reflected in local community plans and zoning prepared pursuant to and consistent with the regional land use planning objectives, principles, and standards; and should, more specifically, be located only in areas designated for agricultural, woodland, industrial, utility, transportation, or specially managed park and recreation uses.

OBJECTIVE NO. 2

The development of a regional wastewater sludge management system which will meet established air and water use objectives and supporting standards; which will not result in pollution of the land, impairing its desirable uses; and which will be properly related to the natural resource base and enhance the overall quality of the environment in the Region.

PRINCIPLE

Wastewater sludges contain physical, chemical, and biological substances which could potentially present a threat to human health and to the chemical, biological, and ecological integrity of the air, water, and land of the Region; and to desirable uses of these and other elements of the underlying and sustaining natural resource base.

Table 26 (continued)

STANDARDS

1. Wastewater sludges should be treated and utilized only in a manner compatible with and supportive of the water use objectives and supporting water quality standards for the surface waters of the Region; and, sludge application shall be conducted only on lands where good soil and water conservation practices are implemented in order to avoid pollution of lakes and streams.

2. Operations conducted for land utilization of solid or liquid sludges should provide for a minimum of six months of sludge storage, should be performed only on lands where good soil and water conservation practices are implemented, should be properly timed and performed to account for meteorological conditions—inclusive of moisture and temperature—and, where feasible, should include incorporating the sludge into the soil immediately following application in order to avoid pollution of lakes and streams.

3. Wastewater sludge application should occur only on suitable soils, as identified in detailed soil survey maps.

4. The continuous or recurring application of wastewater sludges to land or in sanitary landfills should be avoided unless the recurring land area has been carefully selected, designed, operated, and monitored to avoid creation of a pollution or a public health hazard in the groundwaters of the Region.

5. Incineration of wastewater sludges shall be practiced in such a manner as to assure that the air quality standards will be maintained within the Region.

6. New and replacement installations for wastewater sludge treatment, handling, storage, and disposal, as well as additions to existing facilities and operations, should be located outside of the 100-year recurrence interval floodplains of the Region. If, in order to maximize the use of existing facilities, it is necessary to use floodplain lands for wastewater sludge treatment, handling, or storage, the facilities should be located outside of the floodway so as not to increase the 100-year recurrence interval flood stage and should be floodproofed to a flood protection elevation of two feet above the 100-year recurrence interval flood stage, so as to assure adequate protection against flood damage and avoid disruption of the processes of wastewater handling and disposal during flood periods. In the event that a floodway has not been established, or if it is necessary to encroach upon an approved floodway, the hydraulic effect of such encroachment shall be evaluated on the basis of an equal degree of encroachment for a significant reach on both sides of the stream, and the degree of encroachment shall be limited so as not to raise the peak stage of the 100-year recurrence interval flood by more than 0.5 feet.

7. Existing wastewater sludge storage and handling facilities located in the 100-year recurrence interval flood plain should be floodproofed to a flood protection elevation of two feet above the 100-year recurrence interval flood stage so as to assure adequate protection against flood damage and avoid disruption of wastewater sludge management processes during flood periods.

OBJECTIVE NO. 3

The development of a regional wastewater sludge management system which will effectively protect the public health within the Region.

PRINCIPLE

Sanitary wastewater sludges contain pathogenic organisms and toxic substances harmful to human and other life. The improper handling and disposal of such sludges might, therefore, create serious public health hazards.

STANDARDS

1. All sludges derived from sanitary wastes to be handled, stored, or land-applied off the wastewater treatment site, or in any other way allowing for substantial, noncontrolled public contact, should be digested, heated, or otherwise processed to reduce the hazard from pathogenic organisms.

2. Wastewater sludge storage facilities and landfills used for sludge application should be provided with protective fencing, suitable buffer zones, and evergreen plantings for visual screening.

3. Wastewater sludge land application sites should be located a minimum of 1,000 feet from the nearest public water supply well and 200 feet from the nearest private water supply well when sludge is incorporated into soil immediately after spreading.

4. No sludges should be applied on land to be used in the same or following year for the production of root crops intended for direct and uncooked consumption by humans, or directly onto trees bearing fruit which is to be consumed uncooked by humans.

5. Animal grazing or the harvesting of silage or other animal feed crops should be avoided on land where sludge has recently been spread.

6. The soil pH at sludge application sites should be maintained at 6.5 or greater in order to minimize uptake of cadmium and other heavy metals by plants.

7. Toxic and hazardous substances which would be present in harmful quantities in wastewater sludges must be reduced to acceptable levels by pretreatment of the contributing wastewater to make the sludges amenable to safe handling and disposal.

OBJECTIVE NO. 4

The development of a regional wastewater sludge management system which will help to maintain or enhance the productivity of agricultural land within the Region.

PRINCIPLE

As one of the most important renewable natural resources in the Region, soil, with its complex chemical and living organic characteristics, constitutes a particularly valuable and increasingly precious resource. Except on engineered sites, designed specifically and only for the purpose, sludge application practices should not preclude the continued and essentially unconstrained use of the prime agricultural lands of southeastern Wisconsin for the safe and healthful production of food and fiber.

STANDARDS

1. Long-term sludge utilization activities should not limit the capacity of the land for the production of food and fibers and should not be located on prime agricultural lands, as identified in the regional land use plan.

2. Soil and sludge tests should be utilized together in the analysis of sludge application sites to avoid damage to the long-term productivity of the land, through the addition of sludges of known characteristics.

3. Written records of wastewater sludges applied to land should be maintained for long-term reference for the analysis of the total loadings which have been applied.

OBJECTIVE NO. 5

The development of a regional wastewater sludge management system which will maximize the recovery and utilization of resources in the handling and disposal of wastewater sludges.

PRINCIPLE

A substantial amount of energy is expended in the conduct of activities which precede and cause the generation of sludge, which then contains natural organic substances and concentrated chemicals and thereby presents an opportunity to reduce the net resources needed to conduct the activities of human society and economy within the Region.

Table 26 (continued)

STANDARDS

1. Wastewater sludge management systems should be designed and developed wherever feasible in coordination with the design and construction of solid waste disposal facilities.

2. Where technically feasible, consideration should be given to the reclamation, from wastewater sludges, of substances having economic value, or to the use of pretreatment of wastewaters to remove substances having economic value prior to discharge of those substances to sewerage systems.

3. Wastewater sludge management systems should be designed and developed to provide for maximum use of the organic and nutrient components of sludge through application to enhance soil fertility.

OBJECTIVE NO. 6

The development of a regional wastewater sludge management system which is both economical and efficient, meeting all other objectives at the lowest cost possible.

PRINCIPLE

The total resources of the Region are limited and any undue investment in wastewater sludge handling and utilization systems must occur at the expense of other public and private investment; total wastewater sludge management systems' costs, therefore, should be minimized while meeting, to the maximum extent practicable, all of the other system development operations.

STANDARDS

1. The sum of wastewater sludge management system operating and capital investment costs, inclusive of any revenues received from resource recovery, should be minimized.

2. Maximum feasible use should be made of all existing and committed wastewater sludge management facilities. Such facilities should be supplemented with additional facilities only as necessary, to meet the anticipated wastewater sludge demand generated by substantial implementation of the regional land use plan and the regional sanitary sewerage system plan, while meeting pertinent water quality use objectives and standards.

3. The use of new or improved methods for wastewater sludge handling and utilization should be allowed and encouraged if such methods are adequately monitored in a suitable environmental sampling program; offer economies in operational costs; or, by their superior performance, lead to the achievement of air quality and water quality standards at lesser costs, providing they do not detract from the achievement of other objectives set forth herein.

4. The development of wastewater sludge handling and utilization processes and facilities should be conducted in such a manner as to allow the maximum feasible flexibility in the provision of technical alternatives for sludge handling and utilization and should always provide, as a temporary measure and as a possible future alternative, at least one alternative to the primary method of sludge disposal.

5. When technically feasible and otherwise acceptable, the application of wastewater sludge on land should utilize existing public lands in order to minimize land acquisition or easement costs.

6. Wherever possible, wastewater sludge handling and utilization systems should be designed and developed concurrently with power generation facilities, in order to effect engineering and construction economies as well as to assure the separate function and integrity of wastewater sludge management systems and power generation facilities.

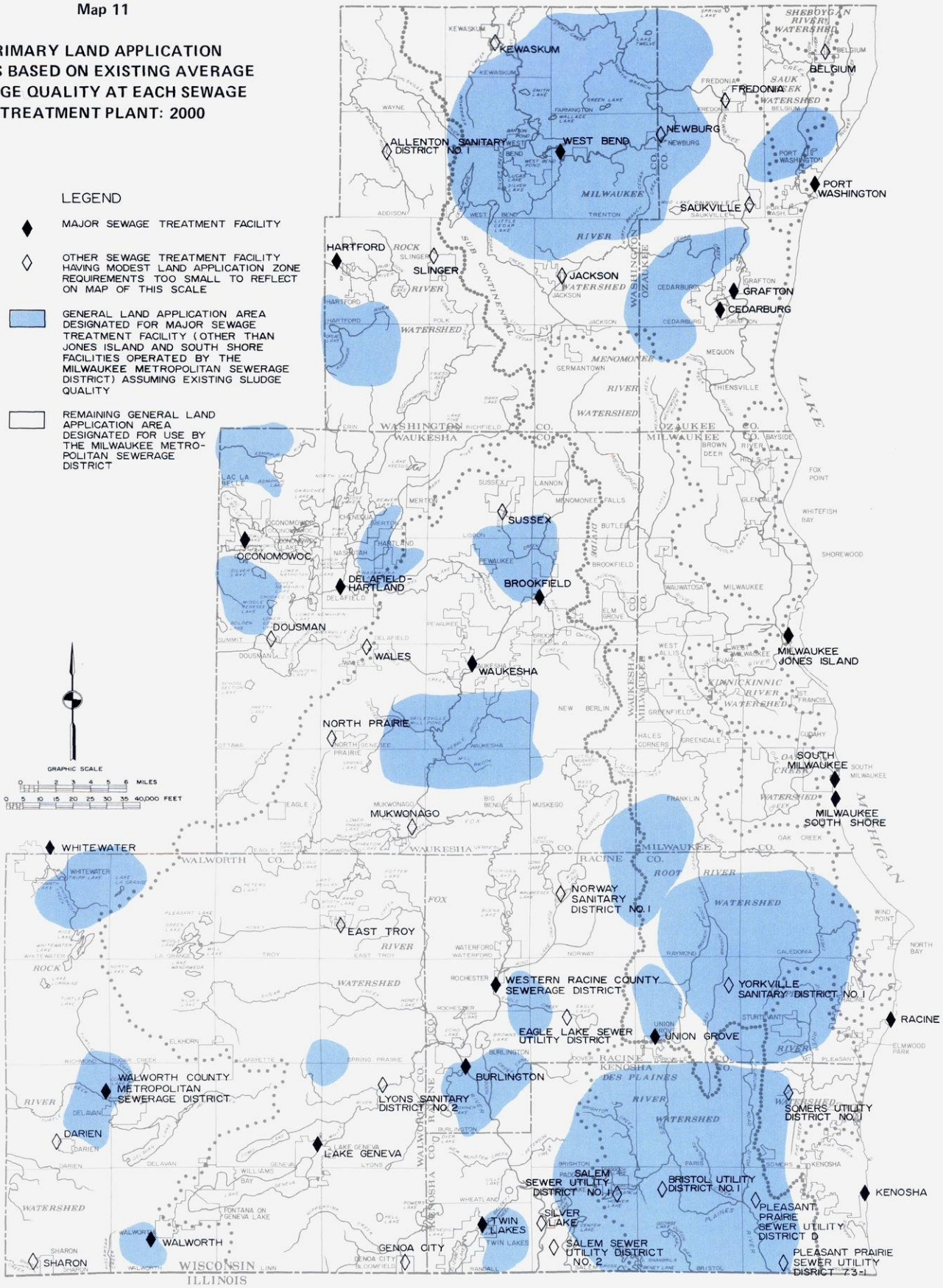
[a] *The standards presented here serve multiple roles. First they are used by the Commission to compare the suitability and relative performance of physical plan alternative. Second, they are technical standards advised by the Commission for use by local units of government. In this role, standards may be considered minimum standards by local units of government which desire to impose more stringent limitations on waste management activities.*

[b] *Large industrial pretreatment facilities are defined as those treating at least 10,000 gallons per day of waste.*

Source: Camp Dresser & McKee, Inc., and SEWRPC.

Map 11

PRIMARY LAND APPLICATION ZONES BASED ON EXISTING AVERAGE SLUDGE QUALITY AT EACH SEWAGE TREATMENT PLANT: 2000

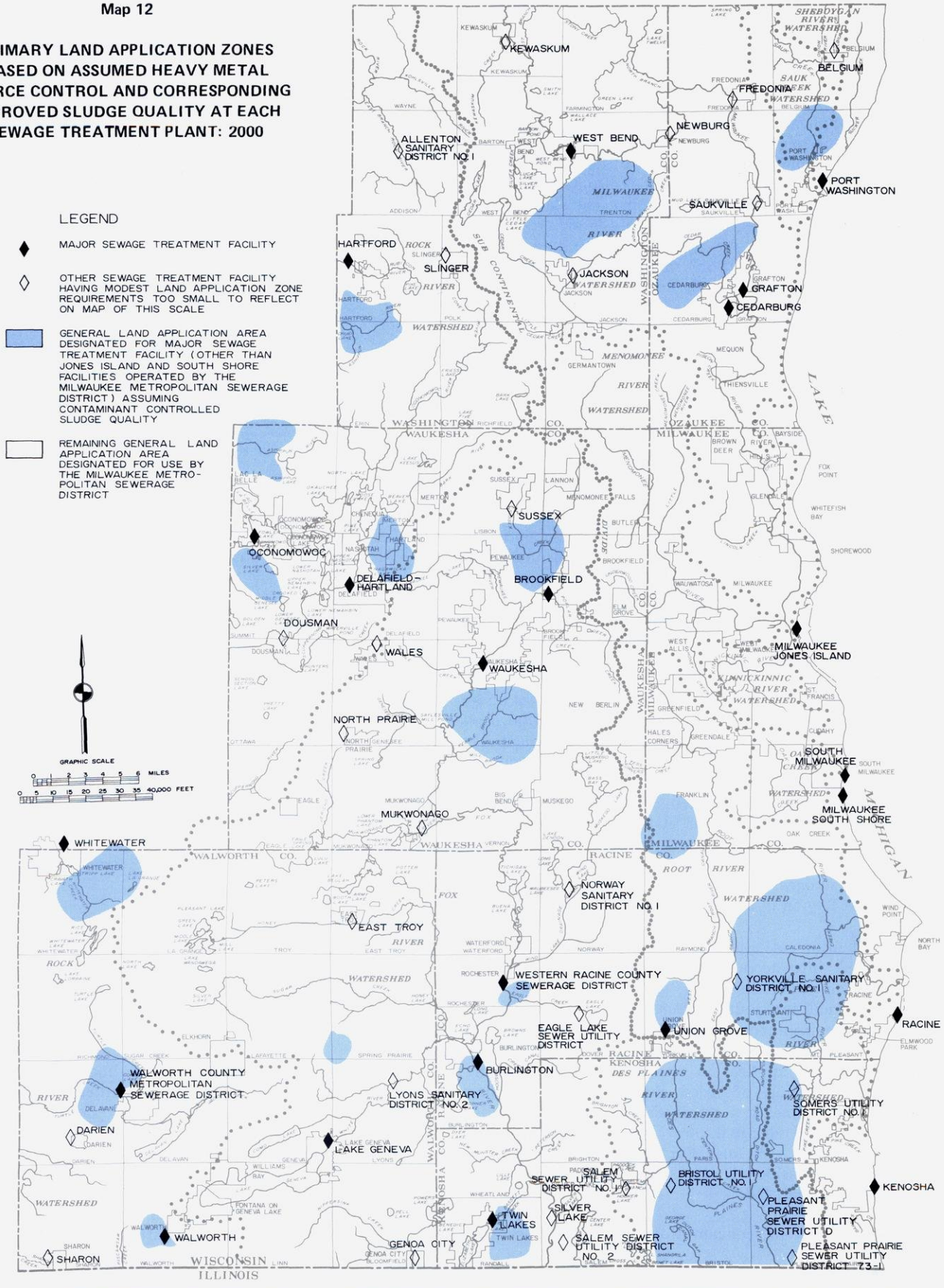


General areas were identified that would be needed to accommodate land application—on suitable soils and land parcels—of sludge from the 22 largest sewage treatment plants in the Region. That area of the Region not specifically identified represents the area that is recommended for potential land application of sludge from the Jones Island and South Shore plants of the Milwaukee Metropolitan Sewerage District and the smaller municipal and private sewage treatment plants scattered throughout the Region. Two key variables in determining the amount of land necessary for land spreading are the amount of heavy metals discharged to the sewage treatment plant and the crop uptake of nitrogen. The land application zones identified on this map assume continuation of the current practices by local industries to control the discharge of heavy metals into public sewerage systems. The land application zones identified also assume agricultural cropping conditions—including the selection of crops—that would result in relatively low crop yields and low nitrogen uptake by the crops and, thus, lower allowable land application rates.

Source: SEWRPC.

Map 12

PRIMARY LAND APPLICATION ZONES BASED ON ASSUMED HEAVY METAL SOURCE CONTROL AND CORRESPONDING IMPROVED SLUDGE QUALITY AT EACH SEWAGE TREATMENT PLANT: 2000



General areas were identified that would be needed to accommodate land application of sludge from the 22 largest sewage treatment plants in the Region. That area of the Region not specifically identified represents the area that is recommended for potential land application of sludge from the Jones Island and South Shore plants of the Milwaukee Metropolitan Sewerage District and the smaller municipal and private sewage treatment plants scattered throughout the Region. The land application zones identified on this map assume a significantly greater degree of control by local industries over the discharge of heavy metals into municipal sewage treatment plants as well as cropping practices and conditions that would result in increased nitrogen uptake in order to increase the amount of sludge that could be spread on the land.

Source: SEWRPC.

Sewerage District plants and the smaller municipal and private sewage treatment plants scattered throughout the Region.

The land application zones identified on Map 11 assume the continuation of the current practices by local industries to control the discharge of heavy metals into public sewerage systems. These zones also assume agricultural cropping conditions, including the selection of crops, that would result in relatively poor crop yields and low nitrogen uptake by the crops and thus lower allowable land application rates. Map 12 identifies similar, although significantly smaller, application zones for land spreading of sludge based upon a different set of assumptions. These assumptions include a significantly greater degree of control over the discharge by industries of heavy metals into the municipal sewerage systems, as well as different cropping conditions that result in increased nitrogen uptake in order to maximize the amount of sludge that can be spread on the land.

The key variables, then, in determining the amount of land necessary for land spreading of sludge in the Region are the amount of heavy metals discharged into municipal sewerage systems by industries, the efficiency of the treatment systems in removing those metals from the waste stream, and the crop uptake of nitrogen as determined in part by the soil characteristics and by the selection of the crops grown by farmers whose lands are used for sludge spreading. Maps 11 and 12 represent the probable extremes when considering these variables. As shown in Table 27, the amount of land required for spreading of sludge is estimated at 111,000 acres under the assumptions made on Map 11, and at 73,000 acres under the assumptions made on Map 12. As indicated in Table 27, the Region contains about 358,000 acres of land having only slight to moderate limitations for sludge application. Thus, even under the most limiting assumptions, it would appear that there exists within the seven-county Region at least three times the amount of land needed to accommodate land disposal of the amount of sewage sludges that can be expected to be generated within the Region in the year 2000.

The evaluation of alternative system plans under the study took into account not only the dollar costs of constructing, operating, and maintaining sludge management facilities, but certain noneconomic factors, including environmental and energy considerations. The specific sludge management processes evaluated included not only land application through sludge spreading, but public pickup of dried sludge, organic fertilizer production, incineration-pyrolysis with landfill disposal of ash, landfill disposal, and industrial waste source control of heavy metals. For the sludge management alternatives considered, the following environmental impacts were analyzed:

- Increase in consumption of energy resources.
- Increase in harmful emissions to the atmosphere.

Table 27

SUMMARY OF LAND AVAILABLE FOR APPLICATION OF SLUDGE TO AGRICULTURAL LAND IN THE REGION

Source of Sludge	Conditions of Load: Acres Required for Average Sludge Quality and "Poor" Crop Yield	Conditions of Load: Acres Required for Contaminant-Controlled Sludge Quality and "Better" Crop Yield
Milwaukee Metropolitan Sewerage District		
MSD-Jones Island[a]	72,900	52,000[b]
MSD-South Shore[a]	--	--
Other Major Plants	31,500	16,700
Other Plants	6,600	4,400
Total	111,000	73,100
Total Land Area With Slight and Moderate Limitations for Sludge Application: Acres Existing in Region After Subtracting a Portion of the Land as Needed for Incompatible Land Uses	358,000	358,000

[a] *Does not include combined sewer overflow solids land application or the effect of the possible 5.0 mg/l BOD_5 and suspended solids effluent criteria for the Milwaukee treatment plants. For all sewerage treatment plants, the land requirement estimates have been revised to reflect recommended treatment levels in this report, as refined from the assumptions in SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin.*

[b] *This estimate represents the refinement of a value reported in Planning Report No. 29. This estimate was developed in the total solids management plan, completed by the Milwaukee Metropolitan Sewerage District.*

Source: Milwaukee Metropolitan Sewerage District, and SEWRPC.

- Additional traffic volume and wear on existing transport routes.
- Potential construction requirements of roads, rail lines, or pipelines, depending on transport mode utilized.
- Increased potential for spills or leaks of sludge material during loading and transport operations.
- Commitment of transport resources, manpower, and construction resources.
- Required capacity of landfill sites for incineration-pyrolysis options.
- Commitment of land for structural development.

Recommended Plan

The recommended wastewater sludge management element contains proposals for the management and disposal of municipal sewage treatment plant sludges, private sewage treatment plant sludges, industrial facility sludges, water treatment plant sludges, and septage and holding tank wastes.

Public and Private Sewage Treatment Plants—Primary Recommendations: As noted earlier, six geographic alternative management plans were considered for sludge management at the public sewage treatment plants. The alternatives differed in the degree of centralization of sludge management. The evaluation of these plans included an analysis of the capital and operation and maintenance costs, as well as of noneconomic environmental considerations associated with each alternative. Based upon these analyses, which are set forth in full in SEWRPC Planning Report No. 29, it was apparent that

no substantial economies could be gained in considering any significant degree of centralization of sludge management for the public sewage treatment facilities. Accordingly, it was determined to refine and detail the alternative involving the provision of individual sludge management facilities at each municipal sewage treatment plant as the primary element of the final recommended regional sludge management plan.

The primary sludge management process recommendations contained in the plan for each of the 22 major public sewage treatment facilities are summarized in Tables 28 and 29. The following six sludge management processes were selected for use at plants throughout the Region:

1. Sludge dewatering, incineration, and landfill of residue.

2. Sludge digestion and land application in liquid form.

3. Sludge digestion, dewatering, and land application in partially dried form.

4. Sludge digestion, dewatering, and landfill in partially dried form.

5. Sludge dewatering , composting, and marketing of compost.

6. Sludge dewatering and production and marketing of commercial fertilizer.

The majority of the sludge generated in the Region is now and will continue to be generated at the Jones Island and South Shore sewage treatment plants operated by the Milwaukee Metropolitan Sewerage District. In SEWRPC Planning Report No. 29, it was recommended that four primary sludge management processes be examined in detail for the Jones Island plant: continued production of the commercial fertilizer Milorganite; sludge dewatering, incineration, and landfill of residue; sludge digestion, dewatering, and land application in partially dried form; and sludge digestion, dewatering, and landfill in partially dried form. The plan recommended that four primary management processes also be examined at the South Shore plant, with the four processes differing from the Jones Island plant with respect only to the substitution of dewatering, composting, and marketing of compost for the production of Milorganite. It was recognized that the volume of sludge produced at these two plants is too great to rely on only one primary management process. Accordingly, the plan recommended that the more detailed sewerage facilities planning program being conducted by the Milwaukee Metropolitan Sewerage District determine the optimum combination of the processes to be applied at each of the two plants, recognizing that optimization may result in an ultimate recommendation not to include one or more of the processes.

The facilities planning work with respect to sludge management for the Milwaukee Metropolitan Sewerage District has now been largely completed. The facilities plan recommends that about one-half of the year 2000 design sludge loading at the Jones Island plant continue to be dewatered and used in the production and marketing of Milorganite fertilizer, and that the remaining one-half of the sludge be digested, dewatered, and applied on agricultural land in a partially dried form. At the South Shore plant, the facilities plan recommends that about 20 percent of the year 2000 design sludge loading be dewatered and used in the production and marketing of compost, with the remaining 80 percent being digested, dewatered, and disposed of by landfill. These facility planning recommendations for the two major Milwaukee area sewage treatment facilities are hereby incorporated by reference into the areawide water quality management plan. Since the sludge management facilities planning is still in the process of being completed, there may be modifications to the recommendations set forth to date. Such modifications may result in refinement to the recommendations contained in the sludge management plan element of the areawide water quality management plan.

The sludge management recommendations may need to be expanded somewhat to reflect the increased levels of protection for combined sewer overflow storage, conveyance, and treatment or increased levels of sewage treatment at the two Milwaukee plants required by the court stipulation with the State of Illinois referenced earlier in this chapter. It is estimated that the sludge solids that may be generated from treatment of combined sewer overflows as well as from higher levels of treatment could result in a sludge production of 40 to 70 tons per day on an average annual basis, or less than 20 percent of the total sludge generated in the Region from all other sources. An estimate of solids produced is presented in Table 29. Cost estimates for the treatment and disposal of combined sewer overflow solids are included in this chapter. These estimates are based on the assumption that the combined sewer overflows in Milwaukee would be collected, stored, and subsequently treated. In Kenosha and Racine, where sewer separation was selected in pollution abatement programs, no significant amount of added solids is anticipated to be generated from the combined sewer overflows. Should sewer separation be the alternative ultimately selected in the Milwaukee area, it is probable that the additional sludge solids to be generated would be less than those generated under the storage and treatment alternative. In any case, the conclusions in the plan regarding the adequacy of the land in the Region for the application of sludge should remain valid, regardless of the outcome of the Milwaukee court stipulation.

Of the 20 largest public sewage treatment plants in the Region, excluding the two Milwaukee Metropolitan Sewerage District plants, one—Brookfield—is recommended to continue using a process involving sludge dewatering, incineration, and landfill of ash in combination with digestion, dewatering, and land application in

Table 28

SUMMARY OF PRIMARY SLUDGE MANAGEMENT PROCESS RECOMMENDATIONS AT THE MAJOR PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION

Major Public Wastewater Treatment Plant	Recommended Primary Sludge Management Process					
	Dewatering, Incineration, and Landfill of Residue	Digestion and Land Application in Liquid Form[a]	Digestion, Dewatering, and Land Application in Partially Dried Form[a]	Digestion, Dewatering, and Landfill in Partially Dried Form	Dewatering, Composting, and Marketing of Compost	Dewatering and Production and Marketing of Commercial Fertilizer
Kenosha County						
City of Kenosha	--	--	X	--	--	--
Village of Twin Lakes	--	X	X	--	--	--
Milwaukee County						
Milwaukee Metropolitan Jones Island[b]	--	--	X	--	--	X
Milwaukee Metropolitan South Shore[b]	--	--	--	X	X	--
City of South Milwaukee	--	--	X	--	--	--
Ozaukee County						
City of Cedarburg	--	--	X	--	--	--
Village of Grafton	--	--	X	--	--	--
City of Port Washington	--	X	--	--	--	--
Racine County						
City of Burlington	--	X	X	--	--	--
City of Racine	--	--	X	--	--	--
Village of Union Grove	--	--	X	--	--	--
Western Racine County Sewerage District	--	X	X	--	--	--
Walworth County						
Walworth County Metropolitan Sewerage District	--	X	--	--	--	--
City of Lake Geneva	--	--	X	--	--	--
Village of Walworth	--	X	X	--	--	--
City of Whitewater	--	--	X	--	--	--
Washington County						
City of Hartford	--	--	X	--	--	--
City of West Bend[c]	--	--	X	X	--	--
Waukesha County						
City of Brookfield	X	--	X	--	--	--
Delafield-Hartland	--	X	X	--	--	--
City of Oconomowoc	--	--	X	--	--	--
City of Waukesha	--	--	X	--	--	--

[a] *Sludge lagoons generally are included in the recommendations for treatment plant facilities under the category of sludge digestion and land application in liquid form. This allows the option of transporting partially dried sludge from the lagoon as an alternative to liquid sludge transport. Conversely, plants included under the category of transport of partially dried sludge following vacuum filters, filter presses, centrifuges, or sand beds generally will have the option of by-passing the dewatering step and then transporting sludge in liquid form.*

[b] *Recommendations represent a refinement to the recommendations set forth in SEWRPC Planning Report No. 29, which included in the list of potential processes dewatering, incineration, and landfill of residue, sludge digestion, dewatering, and land application in partially dried form, or sludge or sludge digestion, dewatering, and landfillin partially dried form for both the Jones Island and South Shore plants; dewatering, composting, and marketing of compost for the South Shore plant; and continued Milorganite production and marketing for the Jones Island plant. Several process options had been included for these plants with the recommendation that final selection be made at the local facility planning level. The selection of the processes noted above was reported in the Milwaukee Metropolitan Sewerage District report, Total Solids Management Program, Executive Summary, September 1978.*

[c] *Recommendations for the City of West Bend are revised from those set forth in Planning Report No. 29, which included digestion, dewatering, and landfill in partially dried form. The land application alternative was added as a result of conversations with city personnel and based upon more recent sludge sample data that indicate that the cadmium concentrations in the sludge have been significantly reduced in recent years.*

Source: Camp Dresser & McKee, Inc., Milwaukee Metropolitan Sewerage District, and SEWRPC.

Table 29

SUMMARY OF SPECIFIC SLUDGE PROCESSING FACILITIES RECOMMENDED AT MAJOR PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION

Major Public Sewage Treatment Plant	Recommendations in SEWRPC Planning Report No. 29		Amended Recommendations for Areawide Water Quality Management Plan	
	Recommended Sludge Processing Facilities	Required Additional Solids Capacity (dry tons per day)	Recommeded Sludge Processing Facilities	Required Additional Solids Capacity (dry tons per day)
Kenosha County				
City of Kenosha	Gravity Thickener (primary)	11.8	Gravity Thickener (primary)	11.8
	Anaerobic Digester	10.5	Anaerobic Digester	10.5
			Filter Press	20.9
Village of Twin Lakes	Gravity Thickener	1.0	Gravity Thickener	0.4
	Lagoon	0.6	Lagoon	0.3
Milwaukee County				
Milwaukee Metropolitan--Jones Island[a]	--[b]	--	Thickening[c]	
			Dewatering Units[c]	
			Milorganite Production Facilities[d]	150
			Thickening[c]	
			Storage	
			Anaerobic Digestion	
			Belt Filter Press[c,d,e]	142
Milwaukee Metropolitan--South Shore[a]	--[b]	--	Thickening[c]	
			Dewatering Units[c]	
			Compost Facility[c]	40.0
			Thickening[c]	
			Storage	
			Anaerobic Digestion	
			Filter Press[c,e]	147.5
Combined Sewer Overflow Treatment Facility	Degritting		Degritting	
	Gravity Thickening		Gravity Thickening	
	Digestion		Digestion	
			Belt Filters	--[f]
City of South Milwaukee	Belt Filters	2.5	Gravity Thickeners	2.5
	Gravity Thickeners	1.7	Vacuum Filters	1.7
	Vacuum Filters			
Ozaukee County				
City of Cedarburg	Lagoon	1.6	Lagoon	1.6
			Belt Filter Press	1.8
			Lime Recalcining	4.3
Village of Grafton	Gravity Thickeners	2.3	Gravity Thickeners	2.3
	Anaerobic Digester	1.3	Anaerobic Digester	1.3
	Lagoon	1.7	Lagoon	1.7
			Belt Filter Press	1.8
City of Port Washington	Gravity Thickener	2.0	Gravity Thickener	2.0
	Lagoon	1.5	Lagoon	1.5
Racine County				
City of Burlington	Gravity Thickeners	2.3	Gravity Thickeners	2.3
	Centrifuge	0.7	Centrifuge	0.7
			Lime Recalcining	3.8
City of Racine	Gravity Thickener (primary)	24.0	Gravity Thickener (primary)	24.0
	Dissolved Air Flotation Thickening (secondary)	6.0	Dissolved Air Flotation Thickening (secondary)	6.0
	Anaerobic Digester	18.6	Anaerobic Digester	18.6
Village of Union Grove	Aerobic Digester	1.0	Aerobic Digester	1.0
	Lagoon	0.8	Lagoon	0.8
			Lime Recalcining	1.9
Western Racine County Sewerage District	Gravity Thickener	0.9	Gravity Thickener	0.6
	Anaerobic Digester	0.9	Anaerobic Digester	0.6
	Lagoon	0.7	Lagoon	0.5

Table 29 (continued)

Major Public Sewage Treatment Plant	Recommendations in SEWRPC Planning Report No. 29		Amended Recommendations for Areawide Water Quality Management Plan	
	Recommended Sludge Processing Facilities	Required Additional Solids Capacity (dry tons per day)	Recommeded Sludge Processing Facilities	Required Additional Solids Capacity (dry tons per day)
Walworth County				
Walworth County Metropolitan Sewerage District	Gravity Thickeners	2.3	Gravity Thickeners	2.3
	Anaerobic Digesters	2.3	Anaerobic Digesters	2.3
	Holding Tanks (aerated)	150 days	Holding Tanks (aerated)	150 days
			Lime Recalcining	5.7
City of Lake Geneva	Thickening	3.9	Thickening	2.5
	Anaerobic Digestion	3.9	Anaerobic Digestion	2.5
	Lagoon	3.0	Lagoon	1.8
City of Whitewater	Dissolved Air Flotation Thickening	4.0	Dissolved Air Flotation Thickening	4.0
	Anaerobic Digesters	4.9	Anaerobic Digesters	4.9
	Belt Filter Presses	3.0	Belt Filter Presses	3.0
			Lime Recalcining	4.7
Village of Walworth	Thickening	[g]	Thickening	2.5
	Anaerobic Digesters		Anaerobic Digesters	2.0
	Lagoon Dewatering		Lagoon Dewatering	2.0
Washington County				
City of Hartford	Lagoon	0.8	Lagoon	0.8
			Lime Recalcining	4.2
City of West Bend	Gravity Thickener (primary)	8.8	Gravity Thickener (primary)	8.8
	Anaerobic Digester	4.5	Anaerobic Digester	4.5
	Vacuum Filters	6.6	Vacuum Filters	6.6
			Lime Recalcining	11.2
Waukesha County				
City of Brookfield	Gravity Thickener	9.8	Gravity Thickener	9.8
	Filter Press	5.6	Filter Press	5.6
			Lime Recalcining	18.8
Delafield-Hartland	Gravity Thickener	2.2	Gravity Thickener	2.2
	Anaerobic Digesters	2.2	Anaerobic Digesters	2.2
	Lagoon	1.6	Lagoon	1.6
			Lime Recalcining	4.7
City of Oconomowoc	Dissolved Air Flotation Thickening (secondary)	4.8	Dissolved Air Flotation Thickening (secondary)	4.8
	Anaerobic Digester	4.8	Anaerobic Digester	4.8
	Vacuum Filters	3.8	Vacuum Filters	3.8
			Lime Recalcining	9.1
City of Waukesha	Gravity Thickener (primary)	10.3	Gravity Thickener (primary)	10.3
	Dissolved Air Flotation Thickening (secondary)	4.0	Dissolved Air Flotation Thickening (secondary)	4.0
	Anaerobic Digester	5.9	Anaerobic Digester	5.9
	Lagoon	6.0	Lagoon	6.0
			Lime Recalcining	22.0

[a] *Data obtained from Milwaukee Metropolitan Sewerage District report, Total Solids Management Program, September 1978.*

[b] *For the Jones Island plant, it was recommended that four primary sludge management processes be examined in detail: continued Milorganite production; sludge dewatering, incineration, and landfill of residue; sludge digestion, dewatering, and landfill in partially dried form, and sludge digestion, dewatering, and land application in partially dried form. It was recognized that the volume of sludge produced is too great to rely on only one primary management process and the plan recommended that the detailed facilities planning program now underway for the Milwaukee Metropolitan Sewerage District determine the optimum combination of these four processes. For the South Shore plant, it was recommended that four primary sludge management processes be examined in detail: sludge dewatering, incineration, and landfill of residue; sludge digestion, dewatering, and landfill in partially dried torm; sludge digestion, dewatering, and land application in partially dried form; and sludge dewatering, composting, and marketing of the compost.*

[c] *Pilot tests are recommended as the initial step toward implementation of the plan.*

[d] *Total capacity of the proposed facility is given, including the capacity of existing units.*

[e] *Capacity is based upon total plant design solids loadings, less the designated capacity of Milorganite and composting units.*

[f] *Total solids loading is estimated to be 8,000 tons per year.*

[g] *No specific recommendation regarding unit sizing was included in SEWRPC Planning Report No. 29 for the Walworth Plant. Rather, that facility was included in a generalized categorical recommendation.*

Source: Camp Dresser & McKee, Inc., Milwaukee Metropolitan Sewerage District, and SEWRPC.

partially dried form. The recommendation to provide for land application of partially dried sludge was included in order to provide flexibility in the sludge management system at this plant and to provide capacity to handle sludge during periods of maintenance on the incineration system. At 11 plants—Kenosha, South Milwaukee, Cedarburg, Grafton, Racine, Union Grove, Lake Geneva, Whitewater, Hartford, Oconomowoc, and Waukesha—the plan recommends that the sludge be digested, dewatered, and applied to land in a partially dried form. At two plants—Port Washington and the Walworth County Metropolitan Sewerage District—the plan recommends that the sludge be digested and applied to land in a liquid form. At five plants—Twin Lakes, Burlington, the Western Racine County Sewerage District, Walworth, and the Delafield-Hartland Water Pollution Control Commission—the plan recommends an appropriate combination of two processes: sludge digestion and land application in liquid form, and sludge digestion, dewatering, and land application in a partially dried form. At the one remaining plant—West Bend—the plan recommends an appropriate combination of two processes: sludge digestion, dewatering, and land application in a partially dried form, and sludge digestion, dewatering, and landfill in a partially dried form.

It should be noted that the foregoing recommendation for the City of West Bend plant differs from that set forth in SEWRPC Planning Report No. 29. That plan recommended that the City continue exclusively the land filling of sludges because of the very high concentration of cadmium observed. As noted above, the plan has now been revised to recommend that the City supplement the landfill process with one that involves the application of sludge on land in partially dried form. Recent testing of the sludges from the City of West Bend plant has shown that the high concentrations of cadmium previously found no longer exist, and that the cadmium content of the sludge has been reduced to a level more typical of sludges produced elsewhere in the Region. This change in sludge content is attributed to the elimination of discharges from an industrial plating operation in the City of West Bend.

In addition to the foregoing recommendations for the 22 major sewage treatment facilities, the regional sludge management plan contains generalized recommendations for the remaining 26 public and 34 private plants. These general recommendations, based on the climatologic and soil characteristics of the Region, are set forth in Table 30. The plan recommends that the specific options for the management of sludge at each of the small public sewage treatment plants and at the private sewage treatment plants be selected in more detailed local studies.

Public and Private Sewage Treatment Plants—Auxiliary Recommendations: In addition to the foregoing primary sludge management plan recommendations, the plan contains the following auxiliary plan recommendations concerning sludge management.

1. Landfilling is recommended as a standby disposal process to be available in the event land spreading could not be carried on. At present, insufficient available landfill capacity exists in the Region to handle large volumes of sludge, should landfilling be required for extended periods of time. Accordingly, the plan recommends that "backup" landfill sites be identified under county solid waste management planning programs and ultimately be made available for sludge management use, particularly for short-term emergency situations.

2. Additional storage capacity for liquid or partially dried sludge should be developed on a case-by-case basis at plant sites or in remote locations near land spreading areas to accommodate problems that may arise as a result of severe weather conditions or special cropping practices.

3. Joint use of land spreading sites should be explored on a case-by-case basis by those municipal sludge management operations recommended to use land spreading for sludge management.

4. Contaminant control programs for heavy metals and toxic substances should be developed, implemented, and enforced by municipalities where such action will result in an improved sludge quality and thereby assist in long-term land application.

5. An information storage and retrieval system should be developed to produce a complete record of where, when, and in what amounts sludge of known composition has been applied to a given parcel of land.

Table 30

RECOMMENDATIONS FOR SLUDGE PROCESSING, TRANSPORTATION, AND UTILIZATION AT OTHER PUBLIC AND PRIVATE SEWAGE TREATMENT PLANTS IN THE REGION

Processing Options	Transportation Options	Utilization Disposal Options
Gravity Thickening Anaerobic or Aerobic Digestion Lagoons Vacuum Filters Sand Beds	Truck	Land Spreading Public Pickup Landfilling (generally as a backup)

NOTE: Specific unit process options for each plant are to be refined in locally developed facilities plans.

Source: Camp, Dresser & McKee, Inc., and SEWRPC.

Public and Private Sewage Treatment Plants—Concluding Remarks: As set forth in Table 31, 114 square miles of land are estimated to be required for the long-term application of sludge within the Region. The plan recommends that treatment plant operators take appropriate steps to ensure contaminant-controlled sludge. The recommended sludge management plan and the primary land application zones are shown on Map 13. It should be noted that an estimated additional 15 to 30 square miles would be required for land application of sludges generated in compliance with the Order of the U. S. District Court of Northern Illinois if the required effluent limit of 5.0 mg/l each of suspended solids and BOD_5 is upheld.

Table 31

LAND REQUIREMENTS FOR SEWAGE SLUDGE APPLICATION
FOR SEWAGE TREATMENT PLANTS IN THE REGION: 2000

Sewage Treatment Plant	Estimated Land Required for Sludge Disposal (acres)[a]	
	Assuming Disposal of Sewage Effluent Through Land Application as Recommended in Point Source Element	Assuming No Disposal of Sewage Effluent Through Land Application
Kenosha County		
City of Kenosha	5,260	5,260
Village of Twin Lakes	40	90
Other Public Plants and Private Plants	820	960
Subtotal	6,120	6,310
Milwaukee County		
Milwaukee Metropolitan Sewerage District--		
Jones Island	52,000[b]	52,000[b]
South Shore	--	--
Combined Sewer Overflow Treatment Facility	--[c]	--[c]
South Milwaukee	310	310
Subtotal	52,310	52,310
Ozaukee County		
City of Cedarburg	300	300
Village of Grafton	220	220
City of Port Washington	200	200
Other Public Plants and Private Plants	530	640
Subtotal	1,250	1,360
Racine County		
City of Burlington	660	660
City of Racine	3,060	3,060
Village of Union Grove	50	50
Western Racine County Sewerage District	30	50
Other Public Plants and Private Plants	800	830
Subtotal	4,600	4,650
Walworth County		
City of Lake Geneva	250	360
Walworth County Metropolitan Sewerage District	250	250
Village of Walworth	250	370
City of Whitewater	1,310	1,310
Other Public Plants and Private Plants	500	720
Subtotal	2,560	3,010

Table 31 (continued)

Sewage Treatment Plant	Estimated Land Required for Sludge Disposal (acres)[a]	
	Assuming Disposal of Sewage Effluent Through Land Application as Recommended in Point Source Element	Assuming No Disposal of Sewage Effluent Through Land Application
Washington County		
City of Hartford	190	190
City of West Bend	1,180	1,180
Other Public Plants and Private Plants	910	1,010
Subtotal	2,280	2,380
Waukesha County		
City of Brookfield	150	150
Delafield-Hartland Water Pollution Control Commission	110	110
City of Oconomowoc	880	880
City of Waukesha	1,960	1,960
Other Public Plants and Private Plants	810	890
Subtotal	3,910	3,990
Total	73,030	74,010

[a] *Assumes contaminant-controlled sludge conditions and application on soils well suited for sludge disposal.*

[b] *Estimates do not include the effects of the stipulation with the State of Illinois resulting from the Court Order of the U. S. District Court of Northern Illinois, requiring achievement of 5.0 mg/l each of suspended solids and BOD in the effluent from the facilities of the Milwaukee Metropolitan Sewerage District. If upheld, this stipulation would affect the quantities of sludge generated, but not the identified set of sludge management practices set forth in this plan. The currently estimated sludge generation—excluding combined sewer overflow sludges—for the year 2000 is 407 dry tons per day on an average daily loading basis from the Jones Island and South Shore treatment plants. An additional 20 to 40 dry tons per day would result if 5/5 limits are imposed. If all this sludge were landspread, 9,000-18,000 acres would be added to the land requirement. If combined sewer overflows are treated in accordance with the very stringent (5/5) court-ordered effluent requirements, it is estimated that an additional 7 dry tons per day would be generated in addition to the 22 dry tons per day estimated to be generated on an average daily loading basis from the treatment of combined sewer overflow under the recommended plan.*

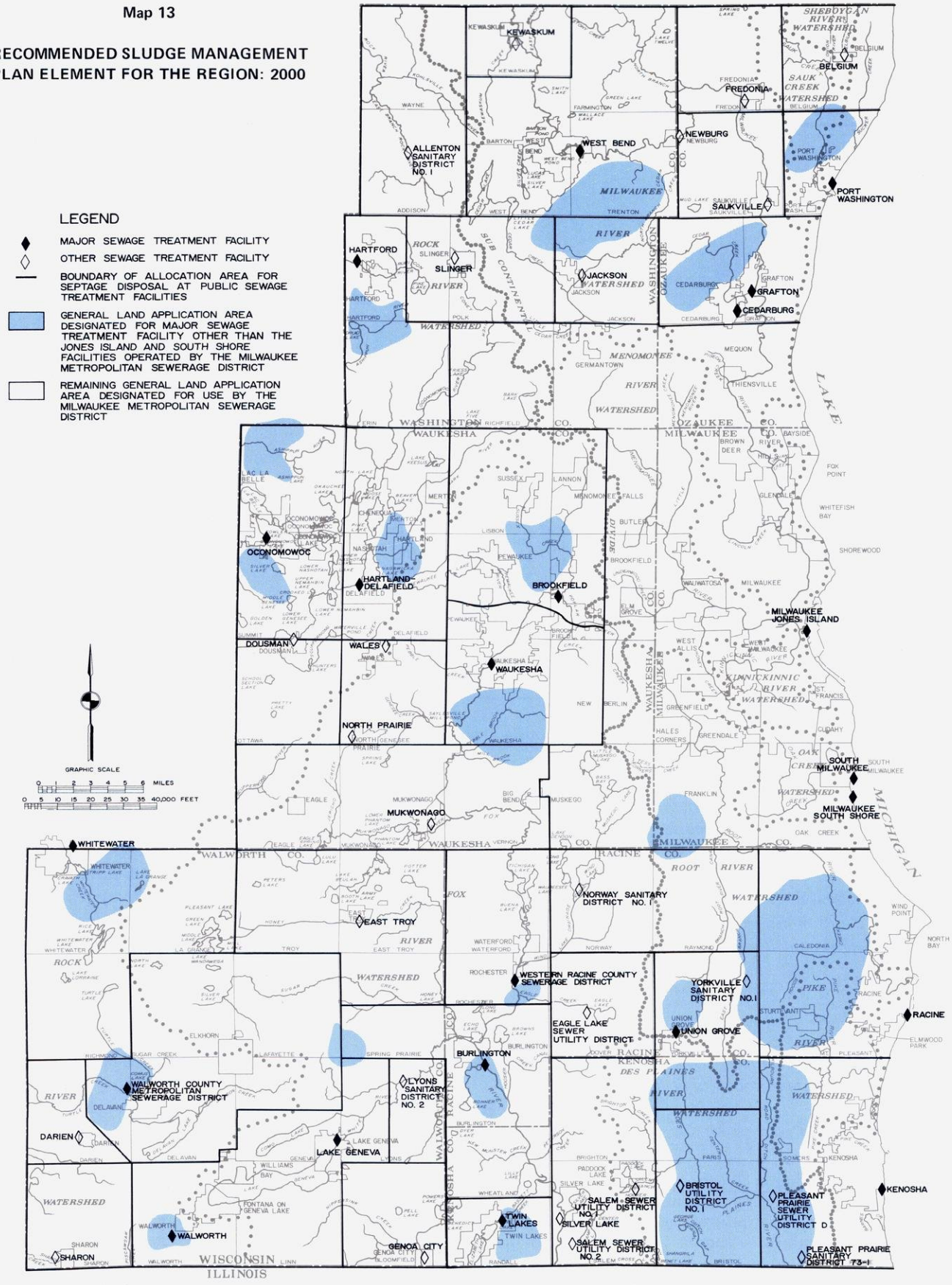
[c] *Because of the relatively inorganic nature and the expected high concentrations of many metals, combined sewer overflow sludges are recommended to be landfilled.*

Source: Camp Dresser & McKee, Inc., Milwaukee Metropolitan Sewerage District, and SEWRPC.

Industrial Wastewater Treatment Plant Sludges: Table 32 summarizes the general recommendations for the management of industrial pretreatment sludges. Recycling of materials by industries should be encouraged to reduce the material entering the pretreatment process and the sewerage system, to recover valuable materials wherever practicable, and to reduce the quantities of waste materials entering the environment. With proper pretreatment, source control, or other contaminant control measures, industries presently discharging to a municipal treatment facility generally may continue to do so; however, the operator of a municipal treatment plant should receive prior notice of any major industrial process change that might affect the existing treatment. Those sludges containing heavy metals or toxic substances in amounts sufficient to preclude land spreading should be landfilled at approved sites with proper measures to safeguard both groundwater and surface water quality.

Map 13

RECOMMENDED SLUDGE MANAGEMENT PLAN ELEMENT FOR THE REGION: 2000



The regional water quality management plan recommends that sludge processing and handling through the year 2000 continue at the site of each wastewater treatment plant. It recommends that processing equipment be upgraded, expanded, or replaced as required to meet the projected sludge loads at each individual facility. Water treatment plant sludges are recommended to be handled in centralized sewerage systems whenever centralized sanitary sewerage service is available. Septage and holding tank wastes are likewise to be received at each individual wastewater treatment plant. Industrial wastewater sludges are recommended to be processed and disposed of separately.

Source: SEWRPC.

Table 32

GENERAL RECOMMENDATIONS FOR DISPOSAL OF INDUSTRIAL WASTEWATER TREATMENT SLUDGES IN THE REGION

Industrial Category	Sludge Disposal Option[a]
Tannery Sludges	Landfill
Metal Plating	Landfill
Metal Machining	Landfill or incineration
Milk Processing and Other Dairy Wastes Sludges	Landfill or land spreading[b]
Meat Processing	Landfill or land spreading[b]
Vegetable Processing Wastes Sludges	Landfill or land spreading[b]
Battery Manufacturing Waste Sludges	Landfill
Truck and Car Wash Operations	Landfill
Power Plant Wastes Sludges	Landfill

[a] *Sludge not discharged to municipal system. Landfills are licensed by the Wisconsin Department of Natural Resources to accept hazardous and toxic wastes. These are currently Metro Disposal Service, Inc.–Franklin, Land Reclamation, Ltd. (Oakes landfill), and United Waste Systems (Lauer landfill).*

[b] *Following stabilization (digestion).*

Source: Camp Dresser & McKee, Inc.

Water Treatment Plant Sludges: Water treatment plant sludges do not at the present time and are not anticipated in the future to constitute a significant problem for disposal. The plan recommends that water treatment plant sludges be discharged to the nearest sewerage system if the rates of discharge are controlled to avoid disruption of the sewage treatment process. As of 1975, 11 of the 17 major municipal water treatment plants in the Region discharged sludge to a municipal sanitary sewerage system. Since all of the six remaining plants are located in areas served by sanitary sewers, it is recommended that these remaining plants dispose of the sludges through the sewer system.

Septage and Holding Tank Wastes: Septage constitutes a relatively small part of the total wastewater sludge generated within the Region, as shown in Table 25. In the year 2000, assuming substantial implementation of the regional land use plan and the point source pollution abatement element of the areawide water quality management plan, septage and holding tank wastes will approximate 70 tons of wet solid, or 2.8 tons of dry solids per day. All of the existing and proposed public treatment plants in the Region are capable of providing capacity to receive controlled quantities of septage and holding tank wastes, although no plant should receive more than 10 percent of its average influent flow from such wastes. It is recommended that the facilities plans developed for each public sewage treatment plant include consideration of the facilities needed to receive septage and holding tank wastes for treatment. The surface spreading of septage as an alternative to discharge of septage into public sewerage systems was rejected in the planning process, since septage can be only partially stabilized and could constitute a public health hazard. Accordingly, the plan recommends that all septage and holding tank wastes be discharged to public sanitary sewerage systems. Map 13 identifies general areas allocated for disposal of private septage to public sewage treatment plants. The plan recommends that septage and holding tank wastes be discharged from tank trucks directly into aerated holding tanks or into manholes within the larger sewer systems to ensure a gradual release to the plant influent at a percentage of the influent flow rate in order to minimize the "shock load" effects which can be especially important for smaller sewage treatment plants and for activated sludge-type sewage treatment plants.

Leachate Collection, Treatment, and Disposal
All landfills, particularly those accepting hazardous and toxic wastes, should be designed to minimize the production of leachate and to protect groundwater. Leachate that may be produced must be collected and treated before discharge to nearby watercourses. Treatment may be provided at a municipal wastewater facility or at a self-contained onsite facility. Detailed recommendations regarding the treatment and disposal of leachate should be developed in conjunction with solid waste management studies.

WATER QUALITY MONITORING PLAN ELEMENT

The already described land use, point source pollution abatement, nonpoint source pollution abatement, and wastewater sludge management elements of the recommended areawide water quality management plan contain proposed actions which, when taken together, should achieve the recommended water use objectives and supporting water quality standards in southeastern Wisconsin. It is also important that steps be taken to ensure the establishment of a sound program for continuing water quality monitoring to determine the extent to which those objectives and standards are being met over time. Toward this end, the areawide water quality management plan for southeastern Wisconsin includes recommendations for an areawide water quality monitoring program. This program includes elements concerning long-term water quality analyses, special analyses to determine the specific effects of water pollution abatement measures, and special lake water quality surveys.

Long-Term Water Quality Analyses
As documented in SEWRPC Technical Report No. 17, Water Quality of Lakes and Streams in Southeastern Wisconsin: 1964-1975, there have been conducted within the Region a variety of water quality sampling programs for both planning and regulatory purposes. The Commission itself conducted a benchmark stream water quality survey in 1964, and, in cooperation with the Wisconsin Department of Natural Resources, conducted an annual stream water quality monitoring program over the period 1966 through 1977. In addition, the Wisconsin Department of Natural Resources has conducted, and continues to conduct on a periodic basis, water quality sampling programs as part of stream basin surveys in connection with the issuance of pollution abatement orders and waste discharge permits.

It is important that a comprehensive, long-term water quality monitoring program be established within the Region that can serve the needs of both the Commission as an areawide water quality management planning agency and the Wisconsin Department of Natural Resources as a regulatory agency. Toward this end, the plan recommends that a study design be prepared for such a comprehensive water quality monitoring program. This study design should be prepared under the guidance of an advisory committee created by the Commission and comprised of representatives of the various agencies in Wisconsin concerned with water quality data collection

and analysis. The study design should specify a detailed ongoing comprehensive water quality data collection program, including confirmation of the number and location of monitoring sites; confirmation of the water quality indicators, including biological indicators, for which samples are to be analyzed; and analysis and specification of the type, frequency, and duration of sampling, including an evaluation of the statistical implications of the probabilistic approach to water quality standards evaluation utilized in the areawide water quality management planning program. In addition, the study design should specify an organizational structure for conducting the program, develop cost estimates for the program, and recommend sources of funding. The program should be submitted to and approved by the Southeastern Wisconsin Regional Planning Commission and the Wisconsin Natural Resources Board.

Based upon the analysis conducted by the Commission to date, it is recommended that the program be designed to include at least 116 sites of water quality samplings in and adjacent to the Region, as shown on Map 14. These sites include all of the 87 sites sampled by the Commission since 1964; 19 additional sites identified as necessary in the water quality trends analysis set forth in SEWRPC Technical Report No. 17; and 10 additional sites identified as necessary under the water quality simulation modeling effort of the areawide water quality management planning program. It is recommended that the water quality indicators to be measured include flow, temperature, dissolved oxygen, pH, specific conductance, total five-day biochemical oxygen demand (BOD_5), chemical oxygen demand, nitrate-nitrogen, organic nitrogen, ammonia-nitrogen, orthophosphate-phosphorus, total phosphorus, fecal coliform, fecal streptococcus, chloride, total suspended solids, total dissolved solids, and chlorophyll-a. In addition, it is recommended that phytoplankton, zooplankton, periphyton, and benthic organisms be surveyed and that an analysis be conducted for species identification, enumeration, and biomass measurement. The study design should specify any additional water quality parameters for which sampling should be conducted, with particular attention to hazardous and toxic substances. It is expected that local and areawide agencies with management responsibilities for water quality will provide input to the development of the study design.

Demonstration Water Quality Sampling Efforts

It is recommended that special water quality sampling efforts be designed and undertaken to demonstrate the effects of special water pollution abatement practices that may be undertaken, particularly with respect to nonpoint source pollution abatement practices. In effect, such water quality sampling efforts should be designed to establish the quality of storm water runoff before a special pollution abatement practice is implemented, and after implementation of the practice. Such special sampling should be conducted in a carefully controlled manner so as to ensure that the differences in runoff quality, if any, can be attributed to the implementation of a particular pollution abatement practice or continuation of practices. In addition, such special water quality sampling efforts should be undertaken as an integral part of selected nonpoint source pollution abatement programs, and the results documented in technical reports so as to contribute to the state-of-the-art of water quality planning and management. As noted in SEWRPC Technical Report No. 18, State of the Art of Water Pollution Control in Southeastern Wisconsin, Volume Three, Urban Storm Water Runoff, the state-of-the-art of pollution control, particularly from urban runoff, is relatively primitive, and such special water quality sampling studies are needed to document the effects of specific water pollution abatement practices.

Water Quality Standards Surveys

It is recommended that the Wisconsin Department of Natural Resources undertake, as necessary, special intensive water quality surveys in connection with the implementation of recommended point source abatement measures. Two types of such special surveys are envisioned. The first type of survey would be undertaken by the Department to refine and detail the effluent requirements for an individual public or private sewage treatment facility. Such a survey, termed a waste load allocation survey, would include detailed field studies of the physical, chemical, and biological characteristics of the receiving surface waters in the immediate vicinity of the treatment plant proposed to be constructed or improved. Such a survey is intended to result in the establishment of appropriate discharge permit limitations for the point source involved.

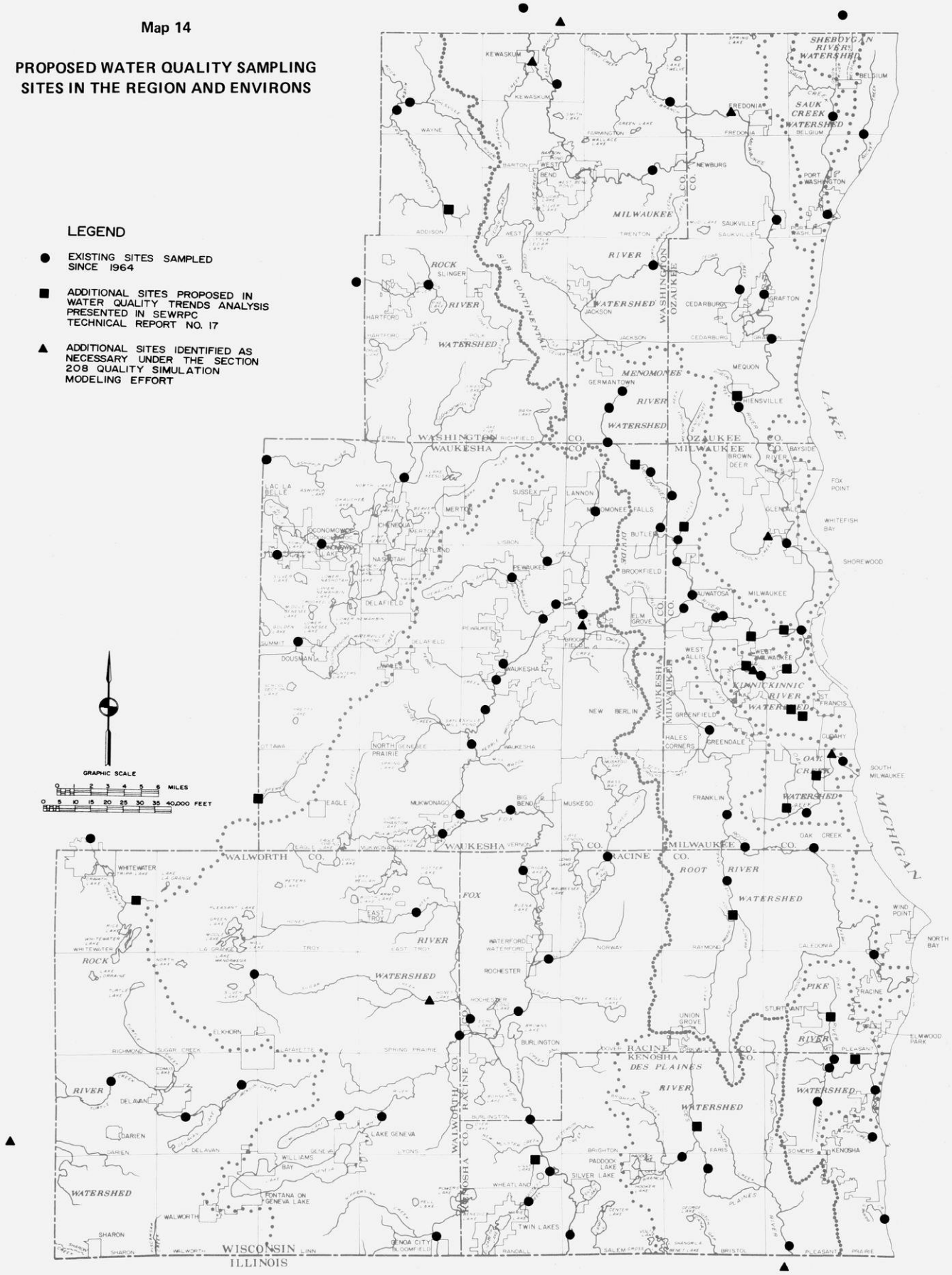
The second type of survey would involve the conduct of detailed field surveys to evaluate the potential for raising the water use objectives and supporting water quality standards that have been assigned to specific stream reaches. There are about 129 miles of streams in the Region that are currently classified by the Wisconsin Department of Natural Resources for uses lower than those envisioned in the national goal of "fishable and swimmable" waters, and for which the areawide water quality management plan recommends the establishment of higher use objectives. This areawide planning recommendation will have to be reevaluated, prior to Department action, through field investigations. If such field investigations confirm the areawide systems analysis findings, the Wisconsin Natural Resources Board should reclassify the affected stream reaches and work toward achievement of the higher water use objectives.

Lake Water Quality Monitoring

Sound lake water quality management planning requires the conduct of special water quality surveys. Under the areawide water quality management planning program, the Commission was able to collect water quality data for 13 of the 100 major lakes in the Region. In addition, the inland lake renewal program being conducted by the Wisconsin Department of Natural Resources had, as of the end of 1978, collected such data for an additional seven major lakes. The conduct of lake water quality surveys and the preparation of a lake water quality

Map 14

PROPOSED WATER QUALITY SAMPLING SITES IN THE REGION AND ENVIRONS



The regional water quality management plan recommends the establishment of a long-term water quality monitoring program within the Region. It is recommended that the program be designed to include at least 116 water quality sampling sites, including all of the 87 sites sampled by the Commission since 1964 as well as 29 additional sites identified in the analysis conducted under the regional water quality planning program.

Source: SEWRPC.

management plan are best accomplished under the aegis of a local lake management agency such as a lake protection and rehabilitation district, a special-purpose unit of local government whose primary function is to preserve and enhance lake water quality. It is, accordingly, recommended that the management agencies designated in the implementation chapter of this volume assume the lead in preparing local lake use plans, conducting the necessary water quality data collection activities required to prepare such plans, and establishing long-term water quality sampling programs to monitor the effects of plan implementation.

COST REVENUE ANALYSIS

In order to assist the public officials concerned, as well as concerned citizens, in evaluating the financial feasibility of the recommended regional water quality management plan, a schedule of capital and operation and maintenance costs was prepared, which, if followed, would result in total plan implementation over a 25-year period. This schedule of capital and operation and maintenance costs includes the staging of the necessary facility construction and the distribution of the attendant costs over the 25-year plan implementation period 1976 through 2000.[31] This schedule is presented in summary form for the Region as a whole in Table 33. In addition, Tables 34, 35, and 36 present the schedule in more detailed form by the three major plan elements: point source pollution abatement, nonpoint source pollution abatement, and sludge management, respectively. These costs are all expressed in terms of August 1976 dollars. This analysis does not reflect the impact of the agreements and stipulation with the State of Illinois in the Milwaukee, South Milwaukee, Kenosha, and Racine areas.

A series of more detailed capital and operation and maintenance cost tables is set forth in Chapter III of this volume. These detailed tables set forth the capital costs and the estimated operation and maintenance costs associated with implementation of each of the individual recommended plan elements by year and by private or public sector. Those detailed tables concerning plan elements in the public sector include individual recommendations by year and by unit or units of government concerned. The ultimate adoption of schedules of capital and operation and maintenance costs for implementation of the recommended plan will require a determination by responsible elected public officials of not only those individual plan elements to be implemented and the timing of such implementation, but of the available means of financing.[32]

The full capital investment cost of implementing the recommended regional water quality management plan is estimated at $1.26 billion over the 25-year plan implementation period. Of this total cost, about $855 million, or 68 percent, is required to fully implement the recommended point source plan element; about $209 million, or 16 percent, is required to fully implement the nonpoint source plan element; and about $199 million, or 16 percent, is required to fully implement the sludge management plan element. Of the total capital cost of about $1.26 billion, about $1.09 billion, or 87 percent, would be required for projects in the public sector, with the remaining $170 million, or 13 percent, required for projects in the private sector.

Of the estimated total capital cost of about $855 million required to fully implement the point source element of the recommended plan, about $841.4 million, or 98 percent, would be required for projects in the public sector, with the remaining $13.3 million, or 2 percent, for projects in the private sector. As shown in Figure 1, within the public sector, about $244.6 million, or 29 percent, would be required for construction of public sewage treatment plants; about $1.4 million, or less than 1 percent, would be required for the construction of publicly owned special-purpose sewage treatment plants; about $193.4 million, or 22 percent, would be required for the construction of intercommunity trunk sewers; and about $402 million, or 48 percent, would be required for projects designed to abate combined sewer overflows. Within the private sector, about $8.3 million, or 62 percent, would be required for the construction of privately owned special-purpose sewage treatment plants, with the remaining $5 million, or 38 percent, being required for projects designed to abate pollution from industrial waste discharges.

Of the estimated capital cost of about $208.8 million required to fully implement the nonpoint source pollution abatement element of the recommended plan, about $56 million, or 27 percent, would be required for projects in the public sector, with the remaining $152.5 million, or 73 percent, for projects in the private sector. The public sector costs include an assumed cost-sharing of 50 percent of the cost of carrying out recommended conservation practices and livestock waste control facilities on private land. Within the public sector, about $39.0 million, or 70 percent, would be required for the installation of construction erosion control practices on public lands; about $2 million, or 0.3 percent, would be required for those urban land practices designed to result in an approximate 25 percent reduction in pollutant runoff; about $2.6 million, or 5 percent, would be required for those urban land practices designed to

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[31] *The point source and sludge management elements have been estimated over the full 25-year period because significant capital investment in these facilities has been made since the 1975 sewerage facilities inventories. The nonpoint source element has been costed out over the 20-year period 1980-2000, reflecting the lead time required to begin an essentially new activity.*

[32] *Plan costs have not been estimated for the water quality monitoring element of the plan. As noted earlier in this chapter, this element needs to be designed in detail and then costed through the preparation of a formal study design and submitted to the appropriate units and agencies of government concerned.*

Table 33

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION BY MAJOR PLAN ELEMENT BY YEAR: 1976-2000

Calendar Year	Project Year	Point Source Plan Element[a]					
		Public Sector		Private Sector		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 6,400,000	$ 29,563,900	$ 1,320,000	$ 350,000	$ 7,720,000	$ 29,913,900
1977	2	19,451,000	29,570,800	1,320,000	420,000	20,771,000	29,990,800
1978	3	5,989,000	29,809,800	1,320,000	470,000	7,309,000	30,279,800
1979	4	14,280,000	29,855,200	1,320,000	530,000	15,600,000	30,385,200
1980	5	71,233,000	30,447,500	1,320,000	590,000	72,553,000	31,037,500
1981	6	80,378,000	30,653,500	1,320,000	650,000	81,698,000	31,303,500
1982	7	97,855,000	30,754,800	1,320,000	700,000	99,175,000	31,454,800
1983	8	127,348,000	31,627,600	1,320,000	760,000	128,668,000	32,387,600
1984	9	112,380,000	32,719,700	1,320,000	825,000	113,700,000	33,544,700
1985	10	83,459,000	35,977,800	1,375,000	880,000	84,834,000	36,857,800
1986	11	51,573,000	36,277,500	--	880,000	51,573,000	37,157,500
1987	12	39,856,000	36,603,600	--	880,000	39,856,000	37,483,600
1988	13	43,309,000	36,793,600	--	880,000	43,309,000	37,673,600
1989	14	60,829,000	36,983,600	--	880,000	60,829,000	37,863,600
1990	15	23,669,000	41,735,700	--	880,000	23,669,000	42,615,700
1991	16	1,594,000	41,739,000	--	880,000	1,594,000	42,619,000
1992	17	--	41,739,000	--	880,000	--	42,619,000
1993	18	182,000	41,739,000	--	880,000	182,000	42,619,000
1994	19	817,000	41,739,000	--	880,000	817,000	42,619,000
1995	20	817,000	41,742,100	--	880,000	817,000	42,622,100
1996	21	--	41,742,100	--	880,000	--	42,622,100
1997	22	--	41,742,100	--	880,000	--	42,622,100
1998	23	--	41,742,100	--	880,000	--	42,622,100
1999	24	--	41,742,100	--	880,000	--	42,622,100
2000	25	--	41,742,100	--	880,000	--	42,622,100
Total		$841,419,000	$916,783,200	$13,255,000	$19,375,000	$854,674,000	$936,158,200
Total Average		$ 33,656,760	$ 36,671,328	$ 530,200	$ 775,000	$ 34,186,960	$ 37,446,328

result in an approximate 50 percent reduction in pollutant runoff; about $11.2 million, or 20 percent, would be required for livestock waste control projects; about $0.2 million, or 0.3 percent, would be required for those rural land conservation practices designed to result in an approximate 25 percent reduction in pollutant runoff; about $0.9 million, or 1.6 percent, would be required for those additional rural land conservation practices designed to result in an approximate 50 percent reduction in pollutant runoff; and about $2.2 million, or 3.9 percent, would be required for those additional rural land conservation practices designed to result in an approximate 75 percent reduction in pollutant runoff. Within the private sector, about $117.2 million, or 77 percent of the total private sector capital cost, would be required for the design and installation of construction site erosion control practices on private lands; about $20.9 million, or 14 percent, would be required for those urban land practices designed to result in an approximate 25 percent reduction in pollutant runoff; about $11.2 million, or 7 percent, would be required for livestock waste control projects; about $0.2 million, or

Table 33 (continued)

Calendar Year	Project Year	Nonpoint Source Plan Element					
		Public Sector		Private Sector		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--
1978	3	--	--	--	--	--	--
1979	4	--	--	--	--	--	--
1980	5	5,064,000	2,777,000	11,330,000	3,182,000	16,394,000	5,959,000
1981	6	4,836,000	3,321,000	11,330,000	3,810,000	16,166,000	7,131,000
1982	7	4,836,000	3,856,000	11,330,000	4,438,000	16,166,000	8,294,000
1983	8	4,836,000	4,391,000	11,330,000	5,073,000	16,166,000	9,464,000
1984	9	4,836,000	4,926,000	11,330,000	5,701,000	16,166,000	10,627,000
1985	10	1,705,000	4,970,000	5,377,000	5,677,000	7,082,000	10,647,000
1986	11	1,922,000	5,057,000	6,028,000	5,771,000	7,950,000	10,828,000
1987	12	1,922,000	5,108,000	6,028,000	5,754,000	7,950,000	10,862,000
1988	13	1,922,000	5,151,000	6,028,000	5,731,000	7,950,000	10,882,000
1989	14	1,922,000	5,202,000	6,028,000	5,713,000	7,950,000	10,915,000
1990	15	2,197,000	4,199,000	6,028,000	5,692,000	8,225,000	9,891,000
1991	16	2,197,000	4,236,000	6,028,000	5,669,000	8,225,000	9,905,000
1992	17	2,197,000	4,271,000	6,028,000	5,652,000	8,225,000	9,923,000
1993	18	2,197,000	4,300,000	6,028,000	5,634,000	8,225,000	9,934,000
1994	19	2,197,000	4,330,000	6,028,000	5,610,000	8,225,000	9,940,000
1995	20	1,922,000	4,364,000	6,028,000	5,588,000	7,950,000	9,952,000
1996	21	1,922,000	4,398,000	6,028,000	5,570,000	7,950,000	9,968,000
1997	22	1,922,000	4,428,000	6,028,000	5,553,000	7,950,000	9,981,000
1998	23	1,922,000	4,459,000	6,028,000	5,531,000	7,950,000	9,990,000
1999	24	1,922,000	4,488,000	6,028,000	5,514,000	7,950,000	10,002,000
2000	25	1,922,000	4,518,000	6,028,000	5,497,000	7,950,000	10,015,000
Total		$56,318,000	$92,750,000	$152,447,000	$112,360,000	$208,765,000	$205,110,000
Annual Average		$ 2,252,720	$ 3,710,000	$ 6,097,880	$ 4,494,400	$ 8,350,600	$ 8,204,400

0.1 percent, would be required for those rural land conservation practices designed to result in an approximate 25 percent reduction in pollutant runoff; about $0.9 million, or 0.6 percent, would be required for those additional rural land conservation practices designed to result in an approximate 50 percent reduction in pollutant runoff; and about $2.2 million, or 1 percent, would be required for those additional rural land conservation practices designed to result in an approximate 75 percent reduction in pollutant runoff.

Of the estimated capital cost of $198.6 million to fully implement the sludge management element of the recommended plan, about $193.9 million, or 98 percent, would be required for projects in the public sector, with the remaining $4.7 million, or 2 percent, required for projects in the private sector. Within the public sector, about $182.5 million would be required for projects designed to result in the disposal of sludges from public sewage treatment plants, about $0.3 million would be required for projects designed to dispose of sludges from publicly owned special-purpose sewage treatment plants, and about $11 million would be required for projects designed to dispose of sludges from combined sewer overflows. Within the private sector, about $1.7 million would be required for projects designed to dispose of sludges from privately owned special-purpose sewage treatment plants, and about $3.0 million would be required for projects designed to dispose of sludges from industrial wastewater sources.

Table 33 (continued)

Calendar Year	Project Year	Sludge Management Plan Element[a]					
		Public Sector		Private Sector		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 2,507,000	$ 3,365,900	$ 370,000	$ 575,000	$ 2,877,000	$ 3,940,900
1977	2	3,359,000	3,467,900	370,000	580,000	3,729,000	4,047,900
1978	3	1,599,000	3,508,900	370,000	585,000	1,969,000	4,093,900
1979	4	5,681,000	3,622,900	370,000	590,000	6,051,000	4,212,900
1980	5	9,724,000	3,870,200	370,000	595,000	10,094,000	4,465,200
1981	6	25,464,000	4,097,400	370,000	600,000	25,834,000	4,697,400
1982	7	27,236,000	4,338,400	370,000	605,000	27,606,000	4,943,400
1983	8	29,974,000	4,566,500	370,000	610,000	30,344,000	5,176,500
1984	9	29,882,000	4,881,700	370,000	615,000	30,252,000	5,496,700
1985	10	18,472,000	5,046,600	370,000	620,000	18,842,000	5,666,600
1986	11	14,716,000	5,194,100	200,000	620,000	14,916,000	5,814,100
1987	12	1,276,000	5,245,100	200,000	620,000	1,476,000	5,865,100
1988	13	3,037,000	5,285,100	200,000	620,000	3,237,000	5,905,100
1989	14	9,933,000	5,325,100	200,000	620,000	10,133,000	5,945,100
1990	15	9,933,000	6,806,400	200,000	620,000	10,133,000	7,426,400
1991	16	1,106,000	6,846,400	--	620,000	1,106,000	7,466,400
1992	17	--	6,846,400	--	620,000	--	7,466,400
1993	18	--	6,846,400	--	620,000	--	7,466,400
1994	19	--	6,846,400	--	620,000	--	7,466,400
1995	20	--	6,846,400	--	620,000	--	7,466,400
1996	21	--	6,846,400	--	620,000	--	7,466,400
1997	22	--	6,846,400	--	620,000	--	7,466,400
1998	23	--	6,846,400	--	620,000	--	7,466,400
1999	24	--	6,846,400	--	620,000	--	7,466,400
2000	25	--	6,846,400	--	620,000	--	7,466,400
Total		$193,899,000	$137,086,200	$4,700,000	$15,275,000	$198,599,000	$152,361,200
Annual Average		$ 7,755,960	$ 5,483,448	$ 188,000	$ 611,000	$ 7,943,960	$ 6,094,448

The average annual cost of the total capital investment required to implement those projects in the public sector approximates $43.7 million, or about $22 per capita—the per capita cost being based on the anticipated regional population in 1985. The average annual capital costs and corresponding per capita costs of implementing the public sector portions of the point source, nonpoint source, and sludge management plan elements are, respectively, about $33.7 million, or about $17 per capita; $2.2 million, or about $1 per capita; and $7.7 million, or about $4 per capita.

The total average annual public and private cost of carrying out the recommended plan is estimated to be $102.2 million, expressed in constant 1976 dollars. Of this, $102.2 million, $50.5 million would be required for capital investment and $51.7 million for operation and maintenance costs.

The average annual public cost of carrying out the recommended plan, including not only the construction of needed new facilities but the operation and maintenance of the entire pollution abatement system, is estimated at $89.6 million in 1976 dollars. Of this total, $43.7 million, or about 49 percent, represents capital expenditures for plan implementation, with the remaining $45.9 million, or 51 percent, representing average annual operation and maintenance costs over the 25-year plan implementation period.

Table 33 (continued)

Calendar Year	Project Year	Total Plan[a]					
		Public Sector		Private Sector		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 8,907,000	$ 32,929,800	$ 1,690,000	$ 925,000	$ 10,597,000	$ 33,854,800
1977	2	22,810,000	33,038,700	1,690,000	1,000,000	24,500,000	34,038,700
1978	3	7,588,000	33,318,700	1,690,000	1,055,000	9,278,000	34,373,700
1979	4	19,961,000	33,478,100	1,690,000	1,120,000	21,651,000	34,598,100
1980	5	86,021,000	37,094,700	13,020,000	4,367,000	99,041,000	41,461,700
1981	6	110,678,000	38,071,900	13,020,000	5,060,000	123,698,000	43,131,900
1982	7	129,927,000	38,949,200	13,020,000	5,743,000	142,947,000	44,692,200
1983	8	162,158,000	40,585,100	13,020,000	6,443,000	175,178,000	47,028,100
1984	9	147,098,000	42,527,400	13,020,000	7,141,000	160,118,000	49,668,400
1985	10	103,636,000	45,994,400	7,122,000	7,177,000	110,758,000	53,171,400
1986	11	68,211,000	46,528,600	6,228,000	7,271,000	74,439,000	53,799,600
1987	12	43,054,000	46,956,700	6,228,000	7,254,000	49,282,000	54,210,700
1988	13	48,268,000	47,229,700	6,228,000	7,231,000	54,496,000	54,460,700
1989	14	72,684,000	47,510,700	6,228,000	7,213,000	78,912,000	54,723,700
1990	15	35,799,000	52,741,100	6,228,000	7,192,000	42,027,000	59,933,100
1991	16	4,897,000	52,821,400	6,028,000	7,169,000	10,925,000	59,990,400
1992	17	2,197,000	52,856,400	6,028,000	7,152,000	8,225,000	60,008,400
1993	18	2,379,000	52,885,400	6,028,000	7,134,000	8,407,000	60,019,400
1994	19	3,014,000	52,915,400	6,028,000	7,110,000	9,042,000	60,025,400
1995	20	2,739,000	52,952,500	6,028,000	7,088,000	8,767,000	60,040,500
1996	21	1,922,000	52,986,500	6,028,000	7,070,000	7,950,000	60,056,500
1997	22	1,922,000	53,016,500	6,028,000	7,053,000	7,950,000	60,069,500
1998	23	1,922,000	53,047,500	6,028,000	7,031,000	7,950,000	60,078,500
1999	24	1,922,000	53,076,500	6,028,000	7,014,000	7,950,000	60,090,500
2000	25	1,922,000	53,106,500	6,028,000	6,997,000	7,950,000	60,103,500
Total		$1,091,636,000	$1,146,619,400	$170,402,000	$147,010,000	$1,262,038,000	$1,293,629,400
Annual Average		$43,665,440	$ 45,864,776	$ 6,816,080	$ 5,880,400	$ 50,481,520	$ 51,745,176

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The point source and sludge costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

Projected average annual public revenues for water quality-related purposes within the Region, as documented in Volume Two, Chapter III of this report, are about $191 million per year. Of this amount, about $88 million represents revenues for point source pollution abatement, including sewage treatment plants and trunk sewers. The remaining $103 million represents revenues for land management-related items, such as refuse collection and disposal, street sweeping and maintenance, snow and ice control and removal, leaf and rubbish pickup and disposal, storm sewer cleaning and maintenance, and local water quality sampling and

Table 34

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS OF THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION BY MAJOR PLAN SUBELEMENT BY YEAR: 1976-2000

Calendar Year	Project Year	Public Sector[a]									
		Public Sewage Treatment Plants		Publicly Owned Special-Purpose Sewage Treatment Plants		Intercommunity Trunk Sewers		Abatement of Combined Sewer Overflows		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 4,530,000	$ 29,516,500	$ 141,000	$ 46,000	$ 1,729,000	$ 1,400	$ --	$ --	$ 6,400,000	$ 29,563,900
1977	2	6,238,000	29,516,500	141,000	52,000	13,072,000	2,300	--	--	19,451,000	29,570,800
1978	3	3,580,000	29,744,500	141,000	56,000	2,268,000	9,300	--	--	5,989,000	29,809,800
1979	4	6,166,000	29,779,500	141,000	59,000	6,373,000	16,700	1,600,000	--	14,280,000	29,855,200
1980	5	12,316,000	30,356,500	141,000	63,000	16,276,000	28,000	42,500,000	--	71,233,000	30,447,500
1981	6	16,864,000	30,474,500	141,000	68,000	20,873,000	111,000	42,500,000	--	80,378,000	30,653,500
1982	7	21,813,000	30,549,500	141,000	72,000	33,401,000	133,300	42,500,000	--	97,855,000	30,754,800
1983	8	39,560,000	31,282,500	141,000	76,000	45,147,000	269,100	42,500,000	--	127,348,000	31,627,600
1984	9	51,886,000	32,217,500	141,000	80,000	21,953,000	422,200	38,400,000	--	112,380,000	32,719,700
1985	10	35,455,000	34,437,500	141,000	83,000	9,463,000	507,300	38,400,000	950,000	83,459,000	35,977,800
1986	11	11,280,000	34,523,500	--	83,000	1,893,000	531,000	38,400,000	1,140,000	51,573,000	36,277,500
1987	12	1,316,000	34,654,500	--	83,000	140,000	536,100	38,400,000	1,330,000	39,856,000	36,603,600
1988	13	3,362,000	34,654,500	--	83,000	1,547,000	536,100	38,400,000	1,520,000	43,309,000	36,793,600
1989	14	15,122,000	34,654,500	--	83,000	7,307,000	536,100	38,400,000	1,710,000	60,829,000	36,983,600
1990	15	15,122,000	39,142,500	--	83,000	8,547,000	610,200	--	1,900,000	23,669,000	41,735,700
1991	16	--	39,142,500	--	83,000	1,594,000	613,500	--	1,900,000	1,594,000	41,739,000
1992	17	--	39,142,500	--	83,000	--	613,500	--	1,900,000	--	41,739,000
1993	18	--	39,142,500	--	83,000	182,000	613,500	--	1,900,000	182,000	41,739,000
1994	19	--	39,142,500	--	83,000	817,000	613,500	--	1,900,000	817,000	41,739,000
1995	20	--	39,142,500	--	83,000	817,000	616,600	--	1,900,000	817,000	41,742,100
1996	21	--	39,142,500	--	83,000	--	616,600	--	1,900,000	--	41,742,100
1997	22	--	39,142,500	--	83,000	--	616,600	--	1,900,000	--	41,742,100
1998	23	--	39,142,500	--	83,000	--	616,600	--	1,900,000	--	41,742,100
1999	24	--	39,142,500	--	83,000	--	616,600	--	1,900,000	--	41,742,100
2000	25	--	39,142,500	--	83,000	--	616,600	--	1,900,000	--	41,742,100
Total		$ 244,610,000	$ 876,929,500	$ 1,410,000	$ 1,900,000	$ 193,399,000	$ 10,403,700	$ 402,000,000	$ 27,550,000	$ 841,419,000	$ 916,783,200
Annual Average		$ 9,784,400	$ 35,077,180	$ 56,400	$ 76,000	$ 7,735,960	$ 416,148	$ 16,080,000	$ 1,102,000	$ 33,656,760	$ 36,671,328

enforcement programs. This latter amount may be thought of as a pool of public revenues, a portion of which could be directed toward the implementation of the public sector portion of the nonpoint source pollution abatement plan element.

On a gross basis, the projected average annual revenues, including state and federal grants, of about $88 million for point source items exceed somewhat the revenues needed to fully implement the public sector point source and sludge management elements of the recommended plan—about $84 million annually. While such a comparison does indicate that the plan implementation costs are reasonable, it is important to note that the two figures are not fully comparable. The recommended plan does not include, for example, the cost of constructing lateral, branch, or local trunk sewers. To the extent that these facilities are financed by public funds, public costs would be increased. However, to the extent that such facilities are financed by private landowners and developers, as recommended by the Commission, the public costs would not be increased.

As noted above, local units of government in the Region are projected to raise revenues totaling about $103 million annually over the next 25 years for nonpoint source pollution control activities. The $6 million average annual public cost associated with implementing the recommended nonpoint source pollution abatement measures represents, for the most part, a new cost to local governments, since essentially all of the activities represented in the projection will have to be continued, and the new activities called for in the plan also undertaken. It is possible that some existing activities can be redirected to carry out portions of the recommended plan. The extent to which this may be possible can only be determined upon completion of the more detailed nonpoint pollution source planning and engineering studies called for in the plan. New nonpoint pollution source activities will be required in both urban and rural areas. In the urban areas, budgets for local public works departments will likely have to be increased to carry out the plan. In rural areas, the long-term declining trend in public assistance through agricultural practices cost-sharing programs, such as the conservation programs

Table 34 (continued)

Calendar Year	Project Year	Private Sector[a]						Total Public and Private Sectors[a]	
		Privately Owned Special-Purpose Sewage Treatment Plants		Industrial Waste Discharges		Total Private Sector			
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 820,000	$ 320,000	$ 500,000	$ 30,000	$ 1,320,000	$ 350,000	$ 7,720,000	$ 29,913,900
1977	2	820,000	360,000	500,000	60,000	1,320,000	420,000	20,771,000	29,990,800
1978	3	820,000	390,000	500,000	80,000	1,320,000	470,000	7,309,000	30,279,800
1979	4	820,000	420,000	500,000	110,000	1,320,000	530,000	15,600,000	30,385,200
1980	5	820,000	450,000	500,000	140,000	1,320,000	590,000	72,553,000	31,037,500
1981	6	820,000	480,000	500,000	170,000	1,320,000	650,000	81,698,000	31,303,500
1982	7	820,000	510,000	500,000	190,000	1,320,000	700,000	99,175,000	31,454,800
1983	8	820,000	530,000	500,000	230,000	1,320,000	760,000	128,668,000	32,387,600
1984	9	820,000	565,000	500,000	260,000	1,320,000	825,000	113,700,000	33,544,700
1985	10	880,000	600,000	495,000	280,000	1,375,000	880,000	84,834,000	36,857,800
1986	11	--	600,000	--	280,000	--	880,000	51,573,000	37,157,500
1987	12	--	600,000	--	280,000	--	880,000	39,856,000	37,483,600
1988	13	--	600,000	--	280,000	--	880,000	43,309,000	37,673,600
1989	14	--	600,000	--	280,000	--	880,000	60,829,000	37,863,600
1990	15	--	600,000	--	280,000	--	880,000	23,669,000	42,615,700
1991	16	--	600,000	--	280,000	--	880,000	1,594,000	42,619,000
1992	17	--	600,000	--	280,000	--	880,000	--	42,619,000
1993	18	--	600,000	--	280,000	--	880,000	182,000	42,619,000
1994	19	--	600,000	--	280,000	--	880,000	817,000	42,619,000
1995	20	--	600,000	--	280,000	--	880,000	817,000	42,622,100
1996	21	--	600,000	--	280,000	--	880,000	--	42,622,100
1997	22	--	600,000	--	280,000	--	880,000	--	42,622,100
1998	23	--	600,000	--	280,000	--	880,000	--	42,622,100
1999	24	--	600,000	--	280,000	--	880,000	--	42,622,100
2000	25	--	600,000	--	280,000	--	880,000	--	42,622,100
Total		$ 8,260,000	$ 13,625,000	$ 4,995,000	$ 5,750,000	$ 13,255,000	$ 19,375,000	$ 854,674,000	$ 936,158,200
Annual Average		$ 330,400	$ 545,000	$ 199,800	$ 230,000	$ 530,200	$ 775,000	$ 34,186,960	$ 37,446,328

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

of the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, will have to be reversed.

From the foregoing, it may be concluded that there should be sufficient public revenue available over the next 20 to 30 years to implement the recommended areawide water quality management plan without significant shifts in local expenditure patterns. The cost of plan implementation must be viewed in terms of the substantial benefits—namely, achieving the recommended water use objectives and supporting water quality standards for the Region's surface waters; elimination of existing public health hazards through the timely extension of sanitary sewer service; and the avoidance of the creation of new public health hazards due to further use of septic tank sewage disposal systems in areas covered by soils poorly suited to the use of such systems. Importantly, in this respect, if the Congressionally mandated national water quality goal is to be met within the Region to the maximum extent practicable, the level of expenditure required to implement the recommended areawide water quality management plan will be necessary.

ABILITY OF THE RECOMMENDED PLAN TO MEET THE OBJECTIVES AND STANDARDS

In its most basic sense, planning is a rational process for establishing and meeting objectives. The objectives established for the areawide water quality management plan, together with supporting principles and standards, are set forth in Volume Two, Chapter II of this report. The objectives for the wastewater sludge management plan element are set forth in Chapter VII of SEWRPC Planning Report No. 29.

Table 35

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS OF THE NONPOINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION BY MAJOR PLAN SUBELEMENT BY YEAR: 1976-2000

Calendar Year	Project Year	Public Sector[a] — Urban — Construction Erosion Control — Capital	Construction Erosion Control — Operation and Maintenance	Urban Land Practices (25 Percent Reduction) — Capital	(25 Percent Reduction) — Operation and Maintenance	(50 Percent Reduction) — Capital	(50 Percent Reduction) — Operation and Maintenance	(75 Percent Reduction) — Capital	(75 Percent Reduction) — Operation and Maintenance	Total — Capital	Total — Operation and Maintenance
1976	1	--	--	--	--	--	--	$ --	$ --	--	--
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	1,705,000	304,000	228,000	1,936,000	253,000	537,000	--	--	2,186,000	2,777,000
1981	6	1,705,000	304,000	--	1,952,000	253,000	1,065,000	--	--	1,958,000	3,321,000
1982	7	1,705,000	304,000	--	1,965,000	253,000	1,587,000	--	--	1,958,000	3,856,000
1983	8	1,705,000	304,000	--	1,978,000	253,000	2,109,000	--	--	1,958,000	4,391,000
1984	9	1,705,000	304,000	--	1,991,000	253,000	2,631,000	--	--	1,958,000	4,926,000
1985	10	1,705,000	304,000	--	2,008,000	--	2,658,000	--	--	1,705,000	4,970,000
1986	11	1,922,000	344,000	--	2,023,000	--	2,690,000	--	--	1,922,000	5,057,000
1987	12	1,922,000	344,000	--	2,042,000	--	2,722,000	--	--	1,922,000	5,108,000
1988	13	1,922,000	344,000	--	2,058,000	--	2,749,000	--	--	1,922,000	5,151,000
1989	14	1,922,000	344,000	--	2,077,000	--	2,781,000	--	--	1,922,000	5,202,000
1990	15	1,922,000	344,000	--	1,048,000	275,000	2,807,000	--	--	2,197,000	4,199,000
1991	16	1,922,000	344,000	--	1,058,000	275,000	2,834,000	--	--	2,197,000	4,236,000
1992	17	1,922,000	344,000	--	1,067,000	275,000	2,860,000	--	--	2,197,000	4,271,000
1993	18	1,922,000	344,000	--	1,074,000	275,000	2,882,000	--	--	2,197,000	4,300,000
1994	19	1,922,000	344,000	--	1,083,000	275,000	2,903,000	--	--	2,197,000	4,330,000
1995	20	1,922,000	344,000	--	1,093,000	--	2,927,000	--	--	1,922,000	4,364,000
1996	21	1,922,000	344,000	--	1,103,000	--	2,951,000	--	--	1,922,000	4,398,000
1997	22	1,922,000	344,000	--	1,112,000	--	2,972,000	--	--	1,922,000	4,428,000
1998	23	1,922,000	344,000	--	1,121,000	--	2,994,000	--	--	1,992,000	4,459,000
1999	24	1,922,000	344,000	--	1,129,000	--	3,015,000	--	--	1,922,000	4,488,000
2000	25	1,922,000	344,000	--	1,138,000	--	3,036,000	--	--	1,922,000	4,518,000
Total		$39,060,000	$6,984,000	$228,000	$32,056,000	$2,640,000	$53,710,000	$ --	$ --	$41,928,000	$92,750,000
Annual Average		$ 1,562,400	$ 279,360	$ 9,120	$ 1,282,240	$ 105,600	$ 2,148,400	$ --	$ --	$ 1,677,120	$ 3,710,000

Calendar Year	Project Year	Public Sector[a] — Rural — Livestock Waste Control — Capital	Livestock Waste Control — Operation and Maintenance	Conservation Practices (25 Percent Reduction) — Capital	(25 Percent Reduction) — Operation and Maintenance	(50 Percent Reduction) — Capital	(50 Percent Reduction) — Operation and Maintenance	(75 Percent Reduction) — Capital	(75 Percent Reduction) — Operation and Maintenance	Total — Capital	Total — Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	2,237,000	--	32,000	--	174,000	--	435,000	--	2,879,000	--
1981	6	2,237,000	--	32,000	--	174,000	--	435,000	--	2,878,000	--
1982	7	2,237,000	--	32,000	--	174,000	--	435,000	--	2,878,000	--
1983	8	2,237,000	--	32,000	--	174,000	--	435,000	--	2,878,000	--
1984	9	2,237,000	--	32,000	--	174,000	--	435,000	--	2,878,000	--
1985	10	--	--	--	--	--	--	--	--	--	--
1986	11	--	--	--	--	--	--	--	--	--	--
1987	12	--	--	--	--	--	--	--	--	--	--
1988	13	--	--	--	--	--	--	--	--	--	--
1989	14	--	--	--	--	--	--	--	--	--	--
1990	15	--	--	--	--	--	--	--	--	--	--
1991	16	--	--	--	--	--	--	--	--	--	--
1992	17	--	--	--	--	--	--	--	--	--	--
1993	18	--	--	--	--	--	--	--	--	--	--
1994	19	--	--	--	--	--	--	--	--	--	--
1995	20	--	--	--	--	--	--	--	--	--	--
1996	21	--	--	--	--	--	--	--	--	--	--
1997	22	--	--	--	--	--	--	--	--	--	--
1998	23	--	--	--	--	--	--	--	--	--	--
1999	24	--	--	--	--	--	--	--	--	--	--
2000	25	--	--	--	--	--	--	--	--	--	--
Total		$ 11,185,000	$ --	$ 160,000	$ --	$ 870,000	$ --	$ 2,175,000	$ --	$ 14,390,000	$ --
Annual Average		$ 447,000	$ --	$ 6,000	$ --	$ 34,800	$ --	$ 87,000	$ --	$ 575,600	$ --

Table 35 (continued)

Calendar Year	Project Year	Private Sector[a] — Urban — Construction Erosion Control — Capital	Construction Erosion Control — Operation and Maintenance	Urban Land Practices (25 Percent Reduction) — Capital	Urban Land Practices (25 Percent Reduction) — Operation and Maintenance	Urban Land Practices (50 Percent Reduction) — Capital	Urban Land Practices (50 Percent Reduction) — Operation and Maintenance	Urban Land Practices (75 Percent Reduction) — Capital	Urban Land Practices (75 Percent Reduction) — Operation and Maintenance	Total — Capital	Total — Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	5,116,000	912,000	3,336,000	--	--	--	--	--	8,452,000	912,000
1981	6	5,116,000	912,000	3,336,000	--	--	--	--	--	8,452,000	912,000
1982	7	5,116,000	912,000	3,336,000	--	--	--	--	--	8,452,000	912,000
1983	8	5,116,000	912,000	3,336,000	--	--	--	--	--	8,452,000	912,000
1984	9	5,116,000	912,000	3,336,000	--	--	--	--	--	8,452,000	912,000
1985	10	5,116,000	912,000	261,000	--	--	--	--	--	8,452,000	912,000
1986	11	5,767,000	1,029,000	261,000	--	--	--	--	--	5,377,000	912,000
1987	12	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1988	13	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1989	14	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1990	15	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1991	16	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1992	17	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1993	18	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1994	19	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1995	20	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1996	21	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1997	22	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1998	23	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
1999	24	5,767,000	1,029,000	261,000	--	--	--	--	--	6,028,000	1,029,000
2000	25	5,767,000	1,029,000	261,000	--	--	--	--	--	6.028.000	1,029,000
Total		$117,201,000	$20,907,000	$20,856,000	$ --	$ --	$ --	$ --	$ --	$138,057,000	$20,907,000
Annual Average		$ 4,688,040	$ 836,280	$ 834,240	$ --	$ --	$ --	$ --	$ --	$ 5,522,280	$ 836,280

Calendar Year	Project Year	Private Sector[a] — Rural — Livestock Waste Control — Capital	Livestock Waste Control — Operation and Maintenance	Conservation Practices (25 Percent Reduction) — Capital	Conservation Practices (25 Percent Reduction) — Operation and Maintenance	Conservation Practices (50 Percent Reduction) — Capital	Conservation Practices (50 Percent Reduction) — Operation and Maintenance	Conservation Practices (75 Percent Reduction) — Capital	Conservation Practices (75 Percent Reduction) — Operation and Maintenance	Total — Capital	Total — Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	2,237,000	1,632,000	32,000	521,000	174,000	43,000	435,000	74,000	2,878,000	2,270,000
1981	6	2,237,000	1,632,000	32,000	1,039,000	174,000	85,000	435,000	142,000	2,878,000	2,898,000
1982	7	2,237,000	1,632,000	32,000	1,557,000	174,000	127,000	435,000	210,000	2,878,000	3,526,000
1983	8	2,237,000	1,632,000	32,000	2,080,000	174,000	170,000	435,000	279,000	2,878,000	4,161,000
1984	9	2,237,000	1,632,000	32,000	2,597,000	174,000	212,000	435,000	348,000	2,878,000	4,789,000
1985	10	--	1,632,000	--	2,578,000	--	210,000	--	345,000	--	4,765,000
1986	11	--	1,632,000	--	2,559,000	--	209,000	--	342,000	--	4,742,000
1987	12	--	1,632,000	--	2,545,000	--	208,000	--	340,000	--	4,725,000
1988	13	--	1,632,000	--	2,527,000	--	206,000	--	337,000	--	4,702,000
1989	14	--	1,632,000	--	2,512,000	--	205,000	--	335,000	--	4,684,000
1990	15	--	1,632,000	--	2,494,000	--	204,000	--	333,000	--	4,663,000
1991	16	--	1,632,000	--	2,475,000	--	202,000	--	331,000	--	4,640,000
1992	17	--	1,632,000	--	2,461,000	--	201,000	--	329,000	--	4,623,000
1993	18	--	1,632,000	--	2,447,000	--	199,000	--	327,000	--	4,605,000
1994	19	--	1,632,000	--	2,428,000	--	197,000	--	324,000	--	4,581,000
1995	20	--	1,632,000	--	2,409,000	--	196,000	--	322,000	--	4,559,000
1996	21	--	1,632,000	--	2,395,000	--	194,000	--	320,000	--	4,541,000
1997	22	--	1,632,000	--	2,381,000	--	193,000	--	318,000	--	4,524,000
1998	23	--	1,632,000	--	2,362,000	--	192,000	--	316,000	--	4,502,000
1999	24	--	1,632,000	--	2,348,000	--	191,000	--	314,000	--	4,485,000
2000	25	--	1,632,000	--	2,334,000	--	190,000	--	312,000	--	4,468,000
Total		$ 11,185,000	$34,272,000	$ 160,000	$47,049,000	$ 870,000	$ 3,834,000	$2,175,000	$6,298,000	$ 14,390,000	$ 91,453,000
Annual Average		$ 447,000	$ 1,371,000	$ 6,000	$ 1,882,000	$ 34,800	$ 153,360	$ 87,000	$ 251,920	$ 575,600	$ 3,658,120

Table 35 (continued)

Calendar Year	Project Year	Total Urban[a]									
		Construction Erosion Control		Urban Land Practices (25 Percent Reduction)		Urban Land Practices (50 Percent Reduction)		Urban Land Practices (75 Percent Reduction)		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	6,821,000	1,216,000	3,564,000	1,936,000	253,000	537,000	--	--	10,638,000	3,689,000
1981	6	6,821,000	1,216,000	3,336,000	1,952,000	253,000	1,065,000	--	--	10,410,000	4,233,000
1982	7	6,821,000	1,216,000	3,336,000	1,965,000	253,000	1,587,000	--	--	10,410,000	4,768,000
1983	8	6,821,000	1,216,000	3,336,000	1,978,000	253,000	2,109,000	--	--	10,410,000	5,303,000
1984	9	6,821,000	1,216,000	3,336,000	1,991,000	253,000	2,631,000	--	--	10,410,000	5,838,000
1985	10	6,821,000	1,216,000	261,000	2,008,000	--	2,658,000	--	--	7,082,000	5,882,000
1986	11	7,689,000	1,373,000	261,000	2,023,000	--	2,690,000	--	--	7,950,000	6,086,000
1987	12	7,689,000	1,373,000	261,000	2,042,000	--	2,722,000	--	--	7,950,000	6,137,000
1988	13	7,689,000	1,373,000	261,000	2,058,000	--	2,749,000	--	--	7,950,000	6,180,000
1989	14	7,689,000	1,373,000	261,000	2,077,000	--	2,781,000	--	--	7,950,000	6,231,000
1990	15	7,689,000	1,373,000	261,000	1,048,000	275,000	2,807,000	--	--	8,225,000	5,228,000
1991	16	7,689,000	1,373,000	261,000	1,058,000	275,000	2,834,000	--	--	8,225,000	5,265,000
1992	17	7,689,000	1,373,000	261,000	1,067,000	275,000	2,860,000	--	--	8,225,000	5,300,000
1993	18	7,689,000	1,373,000	261,000	1,074,000	275,000	2,882,000	--	--	8,225,000	5,329,000
1994	19	7,689,000	1,373,000	261,000	1,083,000	275,000	2,903,000	--	--	8,225,000	5,359,000
1995	20	7,689,000	1,373,000	261,000	1,093,000	--	2,927,000	--	--	7,950,000	5,393,000
1996	21	7,689,000	1,373,000	261,000	1,103,000	--	2,951,000	--	--	7,950,000	5,427,000
1997	22	7,689,000	1,373,000	261,000	1,112,000	--	2,972,000	--	--	7,950,000	5,457,000
1998	23	7,689,000	1,373,000	261,000	1,121,000	--	2,994,000	--	--	7,950,000	5,488,000
1999	24	7,689,000	1,373,000	261,000	1,129,000	--	3,015,000	--	--	7,950,000	5,517,000
2000	25	7,689,000	1,373,000	261,000	1,138,000	--	3,036,000	--	--	7,950,000	5,547,000
Total		$156,261,000	$27,891,000	$21,084,000	$32,056,000	$2,640,000	$53,710,000	$ --	$ --	$179,985,000	$113,657,000
Annual Average		$ 6,250,440	$ 1,115,640	$ 843,360	$ 1,282,240	$ 105,600	$ 2,148,400	$ --	$ --	$ 7,199,400	$ 4,546,280

Calendar Year	Project Year	Total Rural[a]									
		Livestock Waste Control		Conservation Practices (25 Percent Reduction)		Conservation Practices (50 Percent Reduction)		Conservation Practices (75 Percent Reduction)		Total[a]	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--	--	--
1980	5	4,474,000	1,632,000	64,000	521,000	348,000	43,000	870,000	74,000	5,756,000	2,270,000
1981	6	4,474,000	1,632,000	64,000	1,039,000	348,000	85,000	870,000	142,000	5,756,000	2,898,000
1982	7	4,474,000	1,632,000	64,000	1,557,000	348,000	127,000	870,000	210,000	5,756,000	3,526,000
1983	8	4,474,000	1,632,000	64,000	2,080,000	348,000	170,000	870,000	279,000	5,756,000	4,161,000
1984	9	4,474,000	1,632,000	64,000	2,597,000	348,000	212,000	870,000	348,000	5,756,000	4,789,000
1985	10	--	1,632,000	--	2,578,000	--	210,000	--	345,000	--	4,765,000
1986	11	--	1,632,000	--	2,559,000	--	209,000	--	342,000	--	4,742,000
1987	12	--	1,632,000	--	2,545,000	--	208,000	--	340,000	--	4,725,000
1988	13	--	1,632,000	--	2,527,000	--	206,000	--	337,000	--	4,702,000
1989	14	--	1,632,000	--	2,512,000	--	205,000	--	335,000	--	4,684,000
1990	15	--	1,632,000	--	2,494,000	--	204,000	--	333,000	--	4,663,000
1991	16	--	1,632,000	--	2,475,000	--	202,000	--	331,000	--	4,640,000
1992	17	--	1,632,000	--	2,461,000	--	201,000	--	329,000	--	4,623,000
1993	18	--	1,632,000	--	2,447,000	--	199,000	--	327,000	--	4,605,000
1994	19	--	1,632,000	--	2,428,000	--	197,000	--	324,000	--	4,581,000
1995	20	--	1,632,000	--	2,409,000	--	196,000	--	322,000	--	4,559,000
1996	21	--	1,632,000	--	2,395,000	--	194,000	--	320,000	--	4,541,000
1997	22	--	1,632,000	--	2,381,000	--	193,000	--	318,000	--	4,524,000
1998	23	--	1,632,000	--	2,362,000	--	192,000	--	316,000	--	4,502,000
1999	24	--	1,632,000	--	2,348,000	--	191,000	--	314,000	--	4,485,000
2000	25	--	1,632,000	--	2,334,000	--	190,000	--	312,000	--	4,468,000
Total		$ 22,370,000	$34,272,000	$ 320,000	$47,049,000	$1,740,000	$ 3,834,000	$4,350,000	$6,298,000	$ 28,780,000	$ 91,453,000
Annual Average		$ 895,000	$ 1,371,000	$ 13,000	$ 1,882,000	$ 69,600	$ 153,360	$ 174,000	$ 251,920	$ 1,151,200	$ 3,658,120

Table 35 (continued)

Calendar Year	Project Year	Nonpoint Source Plan Element					
		Public Sector		Private Sector		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--
1978	3	--	--	--	--	--	--
1979	4	--	--	--	--	--	--
1980	5	5,064,000	2,777,000	11,330,000	3,182,000	16,394,000	5,959,000
1981	6	4,836,000	3,321,000	11,330,000	3,810,000	16,166,000	7,131,000
1982	7	4,836,000	3,856,000	11,330,000	4,438,000	16,166,000	8,294,000
1983	8	4,836,000	4,391,000	11,330,000	5,073,000	16,166,000	9,464,000
1984	9	4,836,000	4,926,000	11,330,000	5,701,000	16,166,000	10,627,000
1985	10	1,705,000	4,970,000	5,377,000	5,677,000	7,082,000	10,647,000
1986	11	1,922,000	5,057,000	6,028,000	5,771,000	7,950,000	10,828,000
1987	12	1,922,000	5,108,000	6,028,000	5,754,000	7,950,000	10,862,000
1988	13	1,922,000	5,151,000	6,028,000	5,731,000	7,950,000	10,882,000
1989	14	1,922,000	5,202,000	6,028,000	5,713,000	7,950,000	10,915,000
1990	15	2,197,000	4,199,000	6,028,000	5,692,000	8,225,000	9,891,000
1991	16	2,197,000	4,236,000	6,028,000	5,669,000	8,225,000	9,905,000
1992	17	2,197,000	4,271,000	6,028,000	5,652,000	8,225,000	9,923,000
1993	18	2,197,000	4,300,000	6,028,000	5,634,000	8,225,000	9,934,000
1994	19	2,197,000	4,330,000	6,028,000	5,610,000	8,225,000	9,940,000
1995	20	1,922,000	4,364,000	6,028,000	5,588,000	7,950,000	9,952,000
1996	21	1,922,000	4,398,000	6,028,000	5,570,000	7,950,000	9,968,000
1997	22	1,922,000	4,428,000	6,028,000	5,553,000	7,950,000	9,981,000
1998	23	1,922,000	4,459,000	6,028,000	5,531,000	7,950,000	9,990,000
1999	24	1,922,000	4,488,000	6,028,000	5,514,000	7,950,000	10,002,000
2000	25	1,922,000	4,518,000	6,028,000	5,497,000	7,950,000	10,015,000
Total		$56,318,000	$92,750,000	$152,447,000	$112,360,000	$208,765,000	$205,110,000
Annual Average		$ 2,252,720	$ 3,710,000	$ 6,097,880	$ 4,494,400	$ 8,350,600	$ 8,204,400

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation.*

Source: SEWRPC.

A summary of the objectives and standards is set forth in Table 37, together with comments on the extent to which the recommended areawide water quality management plan, including the sludge management element, meets those objectives and standards. In some cases the standards have been used as a design input in the preparation of the recommended plan. In such cases the comment noted in Table 37 simply indicates that the standard has been met. In other cases the standard has been partially met, and a quantitative measure of the degree to which the standard has been met is set forth in the table. In the remaining cases the table simply indicates that the standard could be met, meaning that the particular standard is primarily directed toward plan implementation and becomes meaningful only in the selection of specific sites and the construction of specific facilities.

One of the most important objectives concerns the development of a water quality plan that would result in the construction of facilities and the institution of practices that would abate water pollution so as to meet the recommended water use objectives and supporting water quality standards and, in turn, meet the national goal of "fishable and swimmable" waters as set by the U. S. Congress in Public Law 92-500. While the areawide water quality management plan has been designed to fully meet the recommended water use objectives and supporting water quality standards that are set forth in Volume Two, Chapter II of this report, it is important to reiterate here that full implementation of the plan would not result in fully meeting the national goal for all surface waters in the Region. Of the total 1,180 miles of stream within the Region to which use objectives were assigned and for which analyses were completed, 1,054 miles, or about 89 percent of the total, were assigned water use objectives fully compatible with the national goal. The remaining 126 miles, or about 11 percent, were assigned use objectives that were lower than the national goal of "fishable and swimmable" waters. Of these 126 miles, 56 miles, or 44 percent, were found to have nutrient levels caused by urban runoff that cannot be sufficiently reduced to meet the national goal except at an excessive cost. Thirty one miles, or 25 percent, have, as a result of natural conditions and drainage modifications, a substandard level of dissolved oxygen that cannot be sufficiently increased to support the maintenance of desired aquatic life. The remaining 39 miles, or 31 percent, lie within intensively urbanized portions of the Region and have been permanently and irreversibly altered through channelization with concrete lining, thus making application of the national goal impractical. While the analyses indicated that the water quality in these 126 stream miles will be improved over current

Table 36

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS OF THE SLUDGE MANAGEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION BY MAJOR PLAN SUBELEMENT BY YEAR: 1976-2000

Calendar Year	Project Year	Public Sector[a]							
		Public Sewage Treatment Plants		Publicly Owned Special-Purpose Sewage Treatment Plants		Combined Sewer Overflow Sludges		Total	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 2,477,000	$ 3,354,900	$ 30,000	$ 11,000	$ --	$ --	$ 2,507,000	$ 3,365,900
1977	2	3,329,000	3,455,900	30,000	12,000	--	--	3,359,000	3,467,900
1978	3	1,569,000	3,495,900	30,000	13,000	--	--	1,599,000	3,508,900
1979	4	5,651,000	3,608,900	30,000	14,000	--	--	5,681,000	3,622,900
1980	5	9,694,000	3,855,200	30,000	15,000	--	--	9,724,000	3,870,200
1981	6	25,434,000	4,081,400	30,000	16,000	--	--	25,464,000	4,097,400
1982	7	26,100,000	4,281,400	30,000	17,000	1,106,000	40,000	27,236,000	4,338,400
1983	8	28,838,000	4,468,500	30,000	18,000	1,106,000	80,000	29,974,000	4,566,500
1984	9	28,746,000	4,742,700	30,000	19,000	1,106,000	120,000	29,882,000	4,881,700
1985	10	17,336,000	4,866,600	30,000	20,000	1,106,000	160,000	18,472,000	5,046,600
1986	11	13,610,000	4,974,100	--	20,000	1,106,000	200,000	14,716,000	5,194,100
1987	12	170,000	4,985,100	--	20,000	1,106,000	240,000	1,276,000	5,245,100
1988	13	1,931,000	4,985,100	--	20,000	1,106,000	280,000	3,037,000	5,285,100
1989	14	8,827,000	4,985,100	--	20,000	1,106,000	320,000	9,933,000	5,325,100
1990	15	8,827,000	6,426,400	--	20,000	1,106,000	360,000	9,933,000	6,806,400
1991	16	--	6,426,400	--	20,000	1,106,000	400,000	1,106,000	6,846,400
1992	17	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1993	18	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1994	19	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1995	20	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1996	21	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1997	22	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1998	23	--	6,426,400	--	20,000	--	400,000	--	6,846,400
1999	24	--	6,426,400	--	20,000	--	400,000	--	6,846,400
2000	25	--	6,426,400	--	20,000	--	400,000	--	6,846,400
Total		$182,539,000	$130,831,200	$ 300,000	$ 455,000	$11,060,000	$ 5,800,000	$193,899,000	$137,086,200
Annual Average		$ 7,301,560	$ 5,233,248	$ 12,000	$ 18,200	$ 442,400	$ 232,000	$ 7,755,960	$ 5,483,448

conditions by implementation of the plan recommendations, the waters involved still would not meet the national goal. The 126 miles of stream reach concerned are shown on Map 15. Of the 126 miles, 70 miles, or 56 percent, have been assigned the water use objective of "limited fishery and aquatic life and limited recreational use," and 56 miles, or 44 percent, have been assigned the water use objective of "warmwater fishery and aquatic life and limited recreational use." Similarly, of the 100 major lakes in the Region, five are not expected to meet the national goal of "fishable and swimmable" waters either because of natural bog conditions, or because of nutrient loadings to the lake that cannot be sufficiently reduced except at an excessive cost. These lakes are identified on Map 15.

In summary, implementation of the recommended areawide water quality management plan, including the sludge management element, would result in substantial achievement of the recommended water quality and sludge management objectives and supporting standards, and in achievement of the national goal of "fishable and swimmable" waters. As a result, implementation of the plan may be expected to provide a safer, more healthful, and more pleasant, as well as more orderly and efficient, environment for all life within the Region. Implementation of the recommendations in the plan would abate many of the existing water quality problems, would avoid development of new problems, and would do much to protect and enhance the underlying and sustaining natural resource base of the Region. An environmental assessment of the recommended plan has been published separately.

MAJOR ISSUES IDENTIFIED IN THE DEVELOPMENT OF THE AREAWIDE WATER QUALITY MANAGEMENT PLAN

A number of major issues deserving explicit discussion in this report were raised during the conduct of the

Table 36 (continued)

Calendar Year	Project Year	Private Sector[a]						Public and Private	
		Privately Owned Special-Purpose Sewage Treatment Plant Sludges		Industrial Wastewater Sludges		Total		Total[a]	
		Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance	Capital	Operation and Maintenance
1976	1	$ 170,000	$ 75,000	$ 200,000	$ 500,000	$ 370,000	$ 575,000	$ 2,877,000	$ 3,940,900
1977	2	170,000	80,000	200,000	500,000	370,000	580,000	3,729,000	4,047,900
1978	3	170,000	85,000	200,000	500,000	370,000	585,000	1,969,000	4,093,900
1979	4	170,000	90,000	200,000	500,000	370,000	590,000	6,051,000	4,212,900
1980	5	170,000	95,000	200,000	500,000	370,000	595,000	10,094,000	4,465,200
1981	6	170,000	100,000	200,000	500,000	370,000	600,000	25,834,000	4,697,400
1982	7	170,000	105,000	200,000	500,000	370,000	605,000	27,606,000	4,943,400
1983	8	170,000	110,000	200,000	500,000	370,000	610,000	30,344,000	5,176,500
1984	9	170,000	115,000	200,000	500,000	370,000	615,000	30,252,000	5,496,700
1985	10	170,000	120,000	260,000	500,000	370,000	620,000	18,842,000	5,666,600
1986	11	--	120,000	200,000	500,000	200,000	620,000	14,916,000	5,814,100
1987	12	--	120,000	200,000	500,000	200,000	620,000	1,476,000	5,865,100
1988	13	--	120,000	200,000	500,000	200,000	620,000	3,237,000	5,905,100
1989	14	--	120,000	200,000	500,000	200,000	620,000	10,133,000	5,945,100
1990	15	--	120,000	200,000	500,000	200,000	620,000	10,133,000	7,426,400
1991	16	--	120,000	--	500,000	--	620,000	11,106,000	7,466,400
1992	17	--	120,000	--	500,000	--	620,000	--	7,466,400
1993	18	--	120,000	--	500,000	--	620,000	--	7,466,400
1994	19	--	120,000	--	500,000	--	620,000	--	7,466,400
1995	20	--	120,000	--	500,000	--	620,000	--	7,466,400
1996	21	--	120,000	--	500,000	--	620,000	--	7,466,400
1997	22	--	120,000	--	500,000	--	620,000	--	7,466,400
1998	23	--	120,000	--	500,000	--	620,000	--	7,466,400
1999	24	--	120,000	--	500,000	--	620,000	--	7,466,400
2000	25	--	120,000	--	500,000	--	620,000	--	7,466,400
Total		$ 1,700,000	$ 2,775,000	$3,000,000	$12,500,000	$ 4,700,000	$15,275,000	$198,599,000	$152,361,200
Annual Average		$ 68,000	$ 111,000	$ 120,000	$ 500,000	$ 188,000	$ 611,000	$ 7,943,960	$ 6,094,448

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

areawide water quality management planning program for southeastern Wisconsin. The conclusions pertaining to these issues have helped to shape the plan recommendations. Some of the issues are particularly important because they concern proposed changes in the existing water quality management policies and programs. The issues concern interpretation of water quality standards, the relative cost of control of point and nonpoint sources of pollution, phosphorus removal at sewage treatment plants, advanced waste treatment at sewage treatment plants, land disposal of sewage effluent, sewer extension policies, the effect of the plan's sewerage component on internal migration patterns, and the design of major sewerage facilities, particularly with respect to the provision of capacity for anticipated growth beyond the plan design year. This section of the chapter is intended to discuss briefly each of these issues and summarize the position of the Commission regarding each issue.

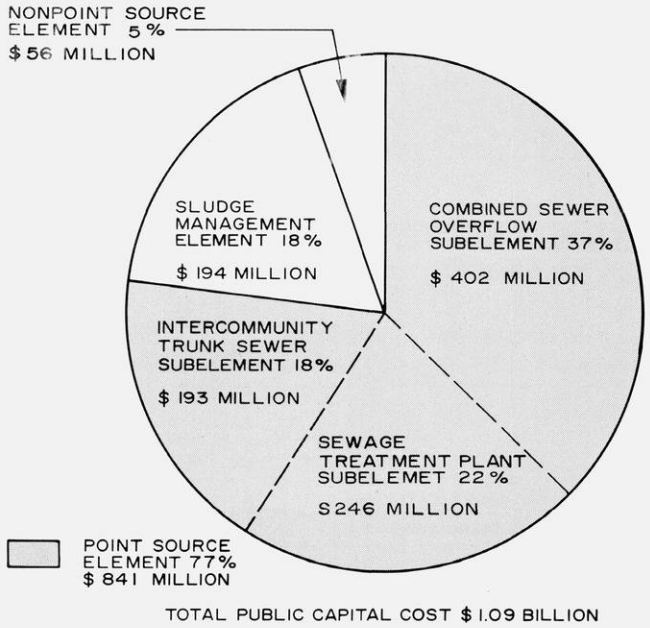
Interpretation of Water Quality Standards

The selection and interpretation of water quality standards represents one of the most important issues in the water quality planning process. Only through the application of standards can water use objectives be defined and meaning be given to the national goal of "fishable and swimmable" waters established by the U. S. Congress in Public Law 92-500.

Historically, water quality management efforts have been based upon the belief that water pollution is essentially a dry weather, low streamflow problem. Accordingly, such efforts have been oriented toward determining effluent limitations for major point sources of pollution, primarily public and private sewage treatment plants. Since such plants normally discharge sewage effluent at a relatively constant rate and of a relatively uniform quality, water pollution problems can be created when

Figure 1

PUBLIC SECTOR CAPITAL COSTS OF IMPLEMENTING THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR SOUTHEASTERN WISCONSIN



Source: SEWRPC.

streamflows decline significantly. This belief has also lead to the consideration of dissolved oxygen as the most critical indicator of water quality conditions. Thus, water quality management programs have been designed to attempt to control point sources of pollution by specifying appropriate sewage treatment plant effluent limitations. These limitations are intended to ensure that the instream water quality standards are met during all but the very lowest flow conditions, such conditions being defined as flows less than those experienced as the 7-day average, 1 in 10-year recurrence interval low flow. This type of analysis formed the basis for the effluent limits recommended in the adopted regional sanitary sewerage system plan and utilized as the minimum levels of treatment for a point of departure for the development of recommendations in this areawide water quality management plan.

Recent water quality monitoring programs, however, have tended to change the belief that water pollution is only a dry weather, point source-related problem. As evidenced by the water quality monitoring results documented in SEWRPC Technical Report No. 17, Water Quality of Lakes and Streams in Southeastern Wisconsin: 1964-1975, numerous violations of water quality standards have been known to occur in streams under conditions other than of dry weather low flow, and from sources other than point sources. Accordingly, it was determined in the areawide water quality management planning program for southeastern Wisconsin that the recommended plan must focus on resolving surface water quality problems during high as well as low flow conditions.

In order to identify an appropriate technique for interpreting the applicable water quality standards, an analysis was made of water quality monitoring data from streams in the Region that have relatively clean water and healthy fisheries and for which the water use objectives are considered to be met at the present time. Review of these data indicated that even in such relatively clean streams, the specified water quality standards are not met all of the time. Violations of standards were found on occasion, but such violations were generally of short duration and of low intensity and, consequently, would not be expected to adversely affect fish and aquatic life and the beneficial use by humans of the surface waters. Therefore, it was concluded that it would be impractical to interpret the water quality standards on an absolute basis; that is, as being required to be met 100 percent of the time. Accordingly, it was determined to assess water quality conditions against the water quality standards on a probabilistic basis, specifying, in effect, the percent of total time the water quality conditions were to be in compliance with the standards, subject only to the requirement that point source pollution abatement measures continue to be designed to meet the standards during the 7-day average, 1 in 10-year recurrence interval low flow condition in the receiving stream. Thus, a proper interpretation of the water quality standards would permit the standards to be violated under extremely low flow conditions; that is, those conditions under which flows are less than the 7-day 1 in 10-year recurrence low flow, and for a specified proportion of the time under relatively high flow conditions.

Analyses were made to determine the percent of the time a given standard should be allowed to be violated except under specified conditions. A 95 percent compliance level was selected as the criterion for meeting the water quality standards for those indicators which directly affect desirable forms of aquatic life; namely, dissolved oxygen, temperature, un-ionized ammonia-nitrogen, and pH. A 90 percent compliance level was selected as the criterion for those indicators which do not directly affect desirable forms of aquatic life; namely, phosphorus and fecal coliform organisms. The analyses indicated that if these compliance levels were met during periods other than extreme low flow conditions, the duration of the violation could be expected to be relatively short and the intensity of the violation to be relatively low, so that desirable forms of aquatic life should not be adversely affected. The selection of this probabilistic approach to the interpretation and application of the water quality standards formed an important basis for the evaluation of alternative plans and the selection of a recommended plan, particularly with respect to nonpoint sources of pollution. It is recommended that this probabilistic approach to water quality standards and interpretation be considered a supplement to the current exemption in the standards for low flow conditions of less than the 7-day average 1 in 10-year recurrence low flow. This approach should be applied to all of the standards supporting the water use objectives used in the preparation of the areawide water quality management plan for southeastern Wisconsin.

Table 37

ABILITY OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN TO MEET THE WATER QUALITY AND SLUDGE MANAGEMENT OBJECTIVES AND STANDARDS

Water Quality Management Objectives			
Objective		Standard	Degree to Which Standard Is Met
Number	Description		
1	The development of land management and water quality control practices and facilities--inclusive of sanitary sewerage systems--that will effectively serve the existing regional urban development pattern and promote implementation of the regional land use plan, meeting the anticipated need for sanitary and industrial wastewater disposal and the need for storm water runoff control generated by the existing and proposed land uses	Provide sanitary sewer service to medium- and high-density urban development	Met
		Provide sanitary sewer service to contiguous low-density urban development	Met
		Provide storm water management facilities to areas of low-, medium-, and high-density urban development	Could be met
		Provide sanitary sewer service to areas where public health hazards due to malfunctioning septic tank systems have been declared	Met
		Size sanitary sewerage facilities so that capacity is not provided for development in primary environmental corridors	Met
		Size sanitary sewerage facilities so that capacity is not provided for development in floodlands	Met
		Size sanitary sewerage facilities so that capacity is not provided for development of lands covered by significant concentrations of soils having very severe limitations for urban development	Met
		Promote urban development in a series of complete neighborhood units through the timing of the extension of sanitary sewerage facilities	Could be met
		Size sanitary sewerage and storm water management facilities in accordance with the land use development pattern set forth in the adopted regional land use plan	Met
		Discharge industrial wastes to the extent feasible to municipal sanitary sewer systems for ultimate treatment and disposal	Met
		Give priority in the application of rural land management practices to prime agricultural lands	Could be met
2	The development of land management and water quality control practices and facilities--inclusive of sanitary sewerage systems--so as to meet the recommended water use objectives and supporting water quality standards	Determine the level of treatment to be provided at sewage treatment plants and industrial wastewater outfalls through water quality analyses directly related to the recommended water use objectives	Met
		Determine nonpoint source pollutant control practices through water quality analyses directly related to the recommended water use objectives	Met
		Fence out domestic livestock from lakes and streams and avoid direct storm water runoff from livestock feeding areas to lakes and streams	Met
		Avoid the discharge of sewage treatment plant effluent directly to inland lakes	Met
		Incorporate sewage treatment plant effluent limitations established by the Federal Lake Michigan Enforcement Conference to plans	Met
		Require existing sewage treatment plants scheduled to be abandoned to provide the degree of treatment needed to meet the recommended water use objectives	Could be met

Table 37 (continued)

Water Quality Management Objectives			
Objective		Standard	Degree to Which Standard Is Met
Number	Description		
2 (continued)		Require any interim sewage treatment plants deemed necessary to implement the long-range regional land use plan to provide a level of treatment required to meet the recommended water use objectives	Could be met
		Prohibit bypassing of sewage to storm sewer systems, open channel drainage courses, and streams	Could be met
		Eliminate or adequately treat combined sewer overflows	Met
		Require sewage treatment plants to perform without bypassing influent sewage	Could be met
		Provide by 1983, best available wastewater treatment at industrial sewage treatment plants	Could be met
		Provide by 1983, best practicable wastewater treatment at all sanitary sewage treatment plants	Could be met
		Avoid by 1985, the discharge of pollutants by sanitary or industrial sewage treatment plants in amounts which would preclude the achievement of the recommended water use objectives	Partially Met: 30 of 48 public sewage treatment plants discharging 85 percent of the year 2000 design flow in the Region could meet this standard
		Plan, design, and conduct the transition of lands from rural to urban use so as to contribute to the achievement of the recommended water use objectives	Could be met
3	The development of land management and water quality control practices and facilities--inclusive of sanitary sewerage systems--that are properly related to and will enhance the overall quality of the natural and man-made environments	Locate new sewage treatment plants outside of the 100-year recurrence interval floodplain	Met
		Where necessary, floodproof existing sewage treatment plants in the 100-year recurrence interval floodplain	Could be met
		Design and develop new sewage treatment plants and storm water storage and treatment facilities so as to relate well to the urban development pattern as reflected in regional and local plans	Could be met
		Locate new sewage treatment plants on sites adequate for expansion to ultimate capacity	Could be met
		Dispose of sludge from sewage treatment plants consistent with rules and regulations pertaining to air quality control and solid waste disposal	Met
		Locate devices used for long-term or short-term storage of pollutants collected through treatment of wastewater or through the application of land management practices to the greatest extent possible on sites lying outside of the 100-year recurrence interval floodplain	Could be met
		Eliminate the discharge of heavy metals, pesticides, industrial chemicals, or other substances in quantities known to be toxic or hazardous to fish and aquatic life	Could be met
		Avoid the degradation of existing water quality levels	Met

Table 37 (continued)

Water Quality Management Objectives			
Objective		Standard	Degree to Which Standard Is Met
Number	Description		
4	The development of land management and water quality control practices and facilities--inclusive of sanitary sewerage systems--that are economical and efficient, meeting all other objectives at the lowest possible cost	Minimize the sum of sanitary sewerage system operating and capital investment costs	Met
		Minimize the sum of storm water control facility and related land management practice operating and capital investment costs	Could be met
		Minimize the total number of sanitary sewerage systems and sewage treatment facilities in order to effect economies of scale and concentrate responsibility for water quality management	Met
		Maximum feasible use of all existing and committed water pollution control facilities	Met
		Allow and encourage the use of new or improved materials and management practices	Could be met
		Design sanitary sewerage systems, sewage treatment plants, and storm water management facilities for staged or incremental construction where feasible and economical	Could be met
		Avoid alignments for new sewer construction outside of existing public rights-of-way	Partially Met
		Minimize infiltration and clear water inflows to the sanitary sewerage system	Could be met
		Design and develop concurrently wherever possible sanitary sewerage systems and storm water management systems to effect engineering and construction economies, and to ensure the separate function and integrity of each of the two systems	Could be met
5	The development of water quality management institutions--inclusive of the governmental units and their responsibilities, authorities, policies, procedures, and resources--and supporting revenue-raising mechanisms that are effective and locally acceptable, and that will provide a sound basis for plan implementation including the planning, design, construction, operation, maintenance, repair, and replacement of water quality control practices and facilities, inclusive of sanitary sewerage systems, storm water management systems, and land management practices.	Development by designated management agencies of a system of user charges and industrial cost recovery	Could be met
		Utilize to the maximum extent possible the existing institutional structure for water pollution abatement	Met
		Concentrate to the greatest extent possible the responsibility for water pollution control and abatement in the most immediate local public agency or the most directly involved private entity	Met
		Ensure that each designated management agency has appropriate legal authority, financial resources, technical capability, and practical autonomy sufficient to carry on its responsibilities	Could be met

Cost-Effectiveness of Point vs. Nonpoint Source Pollution Abatement Measures

One of the issues raised in the planning process concerned the extent to which it might be possible to substitute what are perceived by some to be less expensive nonpoint source pollution abatement measures for more expensive point source pollution abatement measures. Most water quality planning efforts in past years have concentrated on the control of water pollution from point sources, and have largely ignored nonpoint sources of pollution. This has resulted in some cases in recommendations calling for advanced levels of waste treatment at sewage treatment plants.

Table 37 (continued)

Sludge Management Objectives			
Objective		Standard	Degree to Which Standard Is Met
Number	Description		
1	The development of a regional wastewater sludge management system that will effectively support the existing regional development pattern and serve to aid in the implementation of the regional land use plan while meeting the anticipated wastewater sludge management needs generated by the existing and proposed land uses	Provide at least 60 acres of suitable and accessible agricultural or silvicultural land per 1,000 residents in order to ensure a continuing potential for sludge application on land	Met
		Locate and size sludge processing and utilization facilities so as to effectively serve the recommended future land use pattern of the Region	Met
		Make available to all owners and operators of treatment plants and onsite sewage treatment systems, facilities for the processing and disposal of sludge	Could be met
		Construct new wastewater sludge processing, storage, and handling facilities in a manner consistent with the adopted regional land use plan and local plans	Could be met
		Locate new wastewater sludge utilization sites in a manner consistent with the future rural and urban patterns as reflected in the adopted regional land use plan and local plans	Could be met
2	The development of a regional wastewater sludge management system that will meet established air and water use objectives and supporting standards; that will not result in pollution of the land impairing its desirable uses; and that will be properly related to the natural resource base and enhance the overall quality of the environment in the Region	Utilize wastewater sludges in a manner compatible with and supportive of the recommended water use objectives	Met
		Provide for a minimum of six months sludge storage at operations conducting land utilization of solid or liquid sludges	Met
		Apply wastewater sludge on land only where soils are suitable for such application	Met
		Design, operate, and monitor applications of wastewater sludges to land or sanitary landfills in such a way as to avoid the creation of pollution or a public health hazard in the Region	Could be met
		Incinerate wastewater sludges in such a manner as to ensure that the air quality standards will be met	Met
		Locate new wastewater sludge treatment, handling, storage, and disposal facilities and operations outside of the 100-year recurrence interval floodplains	Met
		Floodproof any existing wastewater sludge storage and handling facilities located in the 100-year recurrence interval floodplain	Could be met
3	The development of a regional wastewater sludge management system that will effectively protect the public health within the Region	Properly process sludges from sanitary wastes to reduce the hazard from pathogenic organisms	Met
		Provide protective fencing, plantings, and buffer zones around wastewater sludge storage facilities and landfills	Could be met
		Locate wastewater sludge land application sites at least 1,000 feet from the nearest public water supply well and 200 feet from the nearest private water supply well	Could be met

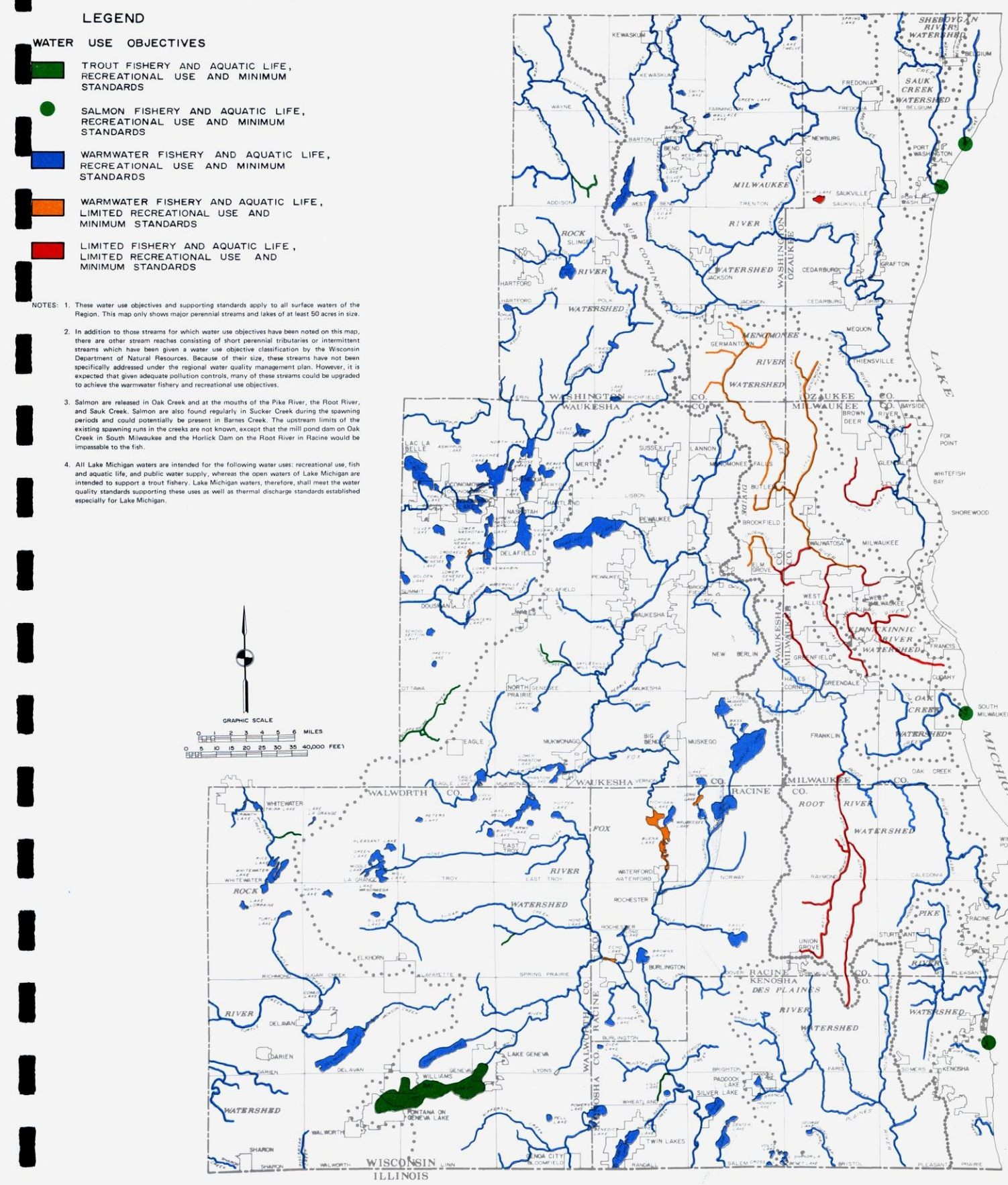
Table 37 (continued)

Sludge Management Objectives			
Objective		Standard	Degree to Which Standard Is Met
Number	Description		
3 (continued)		Avoid application of sludges on land to be used in the same or following year for the production of root crops intended for direct and uncooked consumption by humans	Met
		Avoid animal grazing or the harvesting of silage or other animal feed crops on land where sludge has recently been spread	Could be met
		Maintain the soil pH at sludge application sites at 6.5 or greater in order to minimize uptake of cadmium and other heavy metals by plants	Could be met
		Reduce harmful quantities of toxic and hazardous substances in wastewater sludges to acceptable levels	Met
4	The development of a regional wastewater sludge management system that will help to maintain or enhance the productivity of agricultural land within the Region	Long-term sludge utilization activities should not limit the capacity of the land for the production of food and fiber	Could be met
		Soil and sludge tests should be utilized to avoid damage to the long-term productivity of the land	Met
		Written records of wastewater sludges applied to land should be maintained for long-term reference	Met
5	The development of a regional wastewater sludge management system that will maximize the recovery and utilization of resources in the handling and disposal of wastewater sludges	Wastewater sludge management systems should be developed wherever possible in coordination with solid waste disposal facilities	Could be met
		Consideration should be given to the reclamation from wastewater sludges of substances having economic value	Met
		Sludge management systems should provide for the maximum use of the organic and nutrient components of sludge	Met
6	The development of a regional wastewater sludge management system that is both economical and efficient, meeting all other objectives at the lowest possible cost	The sum of sludge management system operating and capital investment costs should be minimized	Met
		Maximum use should be made of all existing and committed sludge management facilities	Met
		The use of new or improved methods for wastewater sludge handling and utilization should be allowed and encouraged	Could be met
		The development of sludge management processes and facilities should allow for maximum flexibility in the provision of technical alternatives	Met
		To the maximum extent possible, wastewater sludge should be applied to existing public lands	Could be met
		Sludge handling and utilization systems should be designed and developed concurrently with power generation facilities wherever possible	Could be met

Source: SEWRPC.

Map 15

RECOMMENDED WATER USE OBJECTIVES FOR LAKES AND STREAMS IN SOUTHEASTERN WISCONSIN: 2000



Under the regional water quality management planning program, analyses were conducted to determine the feasibility of achieving a level of water quality that would make all surface waters "fishable and swimmable" as envisioned by the U. S. Congress in Public Law 92-500. The results of these analyses indicated that of the 1,180 stream miles analyzed, about 1,054, or 89 percent, could be brought to "fishable and swimmable" standards by implementation of the recommended plan, thereby fully meeting the national goal. The remaining 126 miles, or 11 percent, would not be able to meet the goal because of excessive nutrient levels which cannot as a practical matter be sufficiently reduced, because of the significant and irreversible alteration of the stream channels through concrete lining, or because of natural conditions and drainage modifications which preclude the maintenance of desired aquatic life. Of the 100 major lakes in the Region, 95 could be brought to, or kept at, "fishable and swimmable" standards through plan implementation. The remaining five could not fully meet this national goal, primarily because of excessive nutrient loadings which cannot as a practical matter be sufficiently reduced, or because conditions of inherently high fertility or relatively large tributary areas preclude the satisfaction of "fishable and swimmable" standards.

Source: SEWRPC.

Accordingly, this issue was examined in the water quality management planning effort for the Region. This resulted in a conclusion that there are no significant substitutions to be made between point and nonpoint source water pollution abatement measures. Several factors were observed in the analyses leading up to this conclusion. First, the point sources and nonpoint sources of pollution tend to affect different water quality standards and different flow conditions and, accordingly, result in water quality standards violations of different types. More specifically, point sources of water pollution result more frequently in water quality problems related to phosphorus, ammonia-nitrogen, and dissolved oxygen. Nonpoint sources of pollution tend to result in water quality problems related to fecal coliform contamination, sediment pollution, and, occasionally, phosphorus and ammonia-nitrogen. In addition, it was noted that most stream reaches in the Region do not meet the water quality standards at the present time, including many stream reaches that are not affected by significant levels of point source pollution, thus indicating that both point and nonpoint source pollution abatement will be required to meet the standards.[33] Finally, it was noted that point sources of pollution tend to result in water quality problems under low streamflow, dry weather conditions, whereas nonpoint sources of water pollution tend to result in water quality problems under high streamflow, wet weather conditions, although diffuse source contributions to bottom sediment pollutant materials also will affect low flow conditions.

Consequently, as demonstrated in Volume Two of this report, one of the major conclusions of the water quality management planning program for southeastern Wisconsin is that the recommended water use objectives can not be met through an intensive point source pollution abatement control effort alone, or an intensive nonpoint source pollution abatement control effort alone. Rather, an appropriate combination of both point and nonpoint source pollution abatement measures has to be identified in synthesizing a cost-effective plan which will meet the established water use objectives. The recommended plan set forth in this chapter represents the results of such a plan synthesis process for the Region.

Control of Phosphorus

One of the issues raised in the water quality management planning program for southeastern Wisconsin was the need for a level of phosphorus removal at sewage treatment plants beyond that presently practiced at such plants. At the present time, sewage treatment plants in that portion of the Region tributary to Lake Michigan and in the Fox River watershed routinely provide for phosphorus removal, with the plants designed to achieve an effluent concentration of 1.0 mg/l of phosphorus. Commission studies indicate, however, that a higher level of phosphorus removal at some of the sewage treatment plants in the Region will be required if the water quality standards supporting the water use objectives are to be met.

In considering this matter, it must be recognized that the use of many of the lakes and streams of the Region is impaired by excessive plant growth. Such plant growth may have an adverse effect on fish populations, either by impairing the aquatic environment or by causing dissolved oxygen problems as the plants die and decay and consume oxygen in the water. In addition, aquatic plant growth impairs the aesthetic appeal and interferes with the recreational use of lakes and streams, including use for swimming, fishing, boating, and water skiing. Motorboat propellers and fishing tackle can become ensnarled in overabundant plant growth. In addition to being obnoxious, such growth can also present a serious safety hazard to swimmers.

Nitrogen and phosphorus are the two most important plant nutrients, assuming all other essential elements necessary for aquatic plant growth are present. Nitrogen is readily available in the atmosphere, moves freely with rainwater, snowmelt, and groundwater, and, therefore, can be controlled only to a very limited extent. Moreover, nitrogen can be fixed by certain organisms, including blue-green algae, that actively remove the nitrogen from the atmosphere and release the nutrient into the aquatic system. In contrast, phosphorus is not so readily available and is generally more controllable by virtue of its affinity for soil particles and relatively low soluability. The water quality management planning guidance materials promulgated by the U. S. Environmental Protection Agency and referred to in the state water quality standards adopted by the Wisconsin Natural Resources Board indicate high phosphorus concentrations are undesirable and will tend to cause obnoxious plant growth if they exceed 0.01 mg/l as phosphate-phosphorus in lakes, 0.05 mg/l as total phosphorus in streams entering lakes, or 0.10 mg/l as total phosphorus in streams not entering lakes. In spite of these guidelines referenced in the Wisconsin Administrative Code,[34] there is no explicit phosphorus standard set forth in the Wisconsin Administrative Code.

Analyses conducted by the Commission under the water quality management planning program indicate that, in order to meet the recommended 0.10 mg/l total phosphorus standard for streams, it is necessary in some instances for sewage treatment plants to limit the discharge concentration of phosphorus to that of the instream standard. This is particularly true for some of

[33] *This conclusion is reaffirmed by national findings presented in a publication of the Comptroller General of the United States (General Accounting Office) entitled, Report to the Congress: National Water Quality Goals Cannot Be Attained Without More Attention to Pollution From Diffused or "Nonpoint" Sources, December 20, 1977 (CED-78-6).*

[34] *See Wisconsin Administrative Code, Chapter NR 102.02(1) and NR 102.02(3)(d).*

the minor streams in the Region under low flow conditions or larger streams that have a relatively large discharge of treatment plant effluent. Such streams tend to have phosphorus concentrations that already approach the recommended instream standard. Accordingly, there is none or very little assimilative capacity in the stream for sewage effluent that has a phosphorus concentration exceeding the instream standard.

The recommended plan envisions a total of 48 public sewage treatment plants within the Region in the design year. Of that total, 21 plants are recommended to discharge sewage effluent to land through irrigation, rather than to surface waters. No phosphorus removal is necessary in those cases, the phosphorus being discharged to, held in, and utilized from the soil. At 9 of the 27 remaining sewage treatment plants, a conventional level of phosphorus removal has been recommended, which results in effluent discharges having a phosphorus concentration of about 1.0 mg/l. This is the level of phosphorus removal now being routinely achieved in the Region and the level recommended in the currently adopted regional sanitary sewerage system plan. For the remaining 18 treatment facilities, a significantly higher level of phosphorus removal is recommended—a level which would result in an effluent limitation of 0.1 mg/l of total phosphorus. In the aggregate, these 18 plants would have a design capacity of about 72 mgd, or only about 15 percent of the total design year 2000 treatment plant design capacity in the Region of about 470 mgd. It should be noted that the most important difference between the recommended areawide water quality management plan and the current effluent limitations being required by the Wisconsin Department of Natural Resources (DNR) is that the plan generally recommends that sewage treatment plant effluent have a phosphorus concentration of 0.1 mg/l, whereas the DNR recommends a concentration of 1.0 mg/l.

In order to identify the incremental costs that would be entailed if the higher level of phosphorus removal recommended in the plan were to be adopted by the Wisconsin Natural Resources Board, an alternative plan was prepared that would provide instead the conventional level of phosphorus removal at the 18 individual sewage treatment plants for which the higher level of phosphorus removal has been recommended. The results of the comparison are set forth in Table 38. The additional average annual capital and operation and maintenance cost required to fully implement the plan with a high level of phosphorus removal at 18 sewage treatment plants is estimated at $5.6 million. This represents an increase of about 42 percent over the cost associated with a conventional level of phosphorus removal.

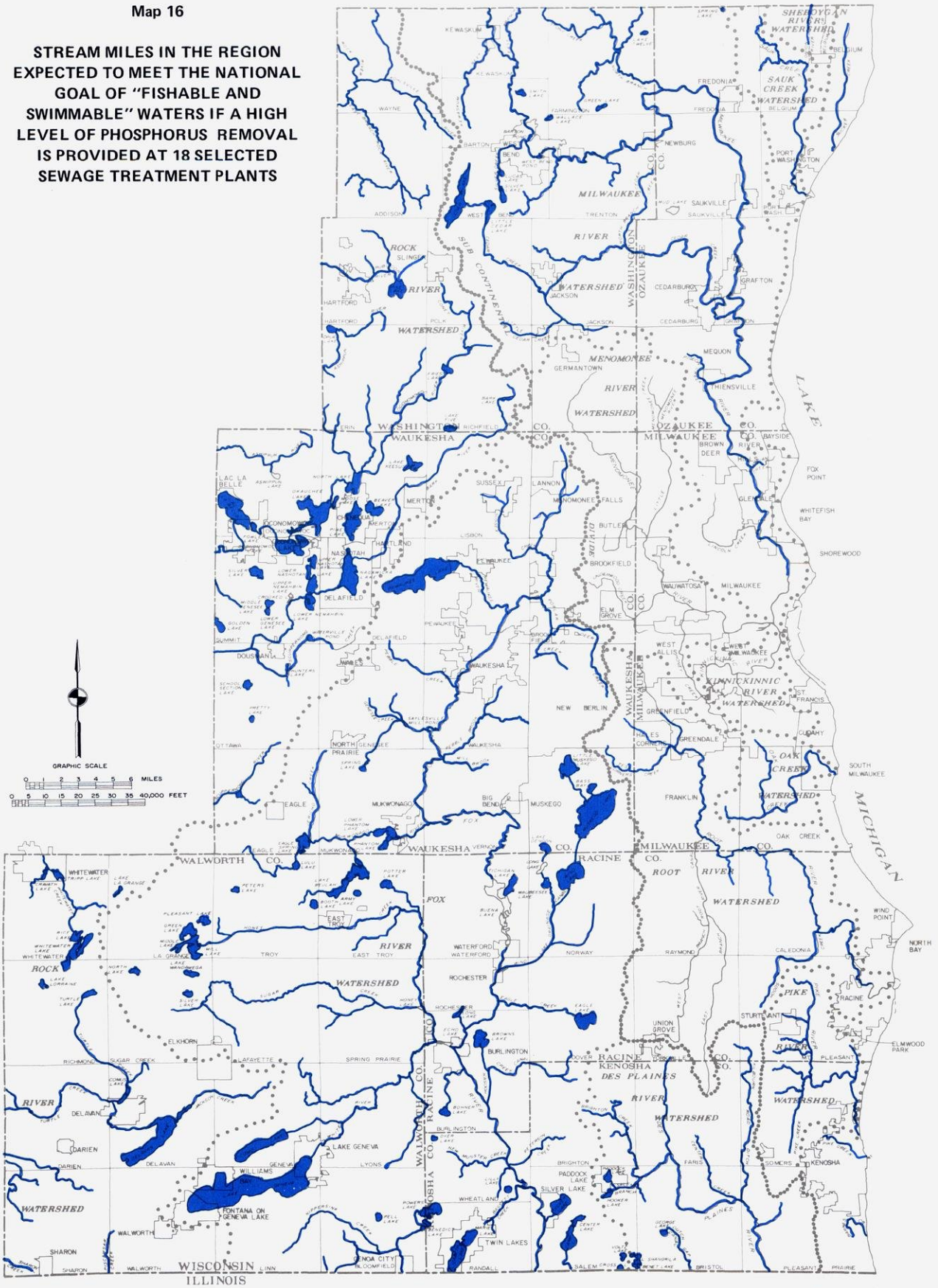
If the high level of phosphorus removal recommended for 18 individual sewage treatment plants is implemented, it is estimated that about 1,054 stream miles, or 89 percent of the total 1,180 stream miles considered in the study, would meet the national goal of "fishable and swimmable" waters. These stream miles are identified on Map 16. If only the conventional level of phosphorus removal is implemented at the 18 plants, only about 867 stream miles, or 71 percent of the stream miles studied, would meet these standards, as shown on Map 17. Thus, an incremental average annual expenditure of $5.6 million, including both capital and operation and maintenance costs required to implement the high level of phosphorus removal recommended in the plan for 18 sewage treatment plants, would result in the achievement of the national goal of "fishable and swimmable" waters for an additional 187 miles of streams in the Region, including such important streams as the main stems of the Fox and Milwaukee Rivers, Cedar Creek, and portions of the Rubicon, Oconomowoc, and Bark Rivers and Turtle Creek. This $5.6 million represents about 8 percent of the total estimated average annual cost of carrying out the point source pollution abatement plan element.

It should be noted that in Chapter 375 of the Laws of 1977, the Wisconsin Legislature has prohibited the sale of household cleaning agents that contain phosphorus in excess of 0.5 percent by weight. Assuming a 50 percent reduction in the influent concentration of total phosphorus, it is estimated that the effect of this law over time will be to reduce the phosphorus levels of the influent sewage from an average of about 10 mg/l to an average of about 5.0 mg/l. Assuming this change in influent conditions and a corresponding reduction in chemical use for phosphorus removal, this law will have the effect of reducing the cost of treating the sewage to achieve an effluent phosphorus concentration of approximately 1.0 mg/l where recommended in the plan. The current cost of chemicals providing such phosphorus removal is estimated at $60 per million gallons. It is estimated that the new legislation will result in a cost reduction to about $30 per million gallons. Thus, a net reduction in treatment costs in the Region of about $4.7 million per year can be anticipated based upon year 2000 flows. It is not expected, however, that this new legislation will have any impact upon the incremental cost of achieving an effluent limitation of 0.1 mg/l of phosphorus, because this incremental cost concerns the treatment process utilized to achieve the required phosphorus removal. The process used to reduce the phosphorus concentration of the influent to an effluent concentration of 1.0 mg/l is distinct and separate from the process that would be required to reduce the phosphorus concentration in the effluent from 1.0 mg/l to 0.1 mg/l. Thus, the new legislation can only affect the initial cost of reducing the phosphorus concentration to a level of about 1.0 mg/l. Accordingly, the above-noted plan implementation cost estimates should remain unaffected by this recent change in state policy.

It is important that the above-cited cost reduction be compared with the additional costs incurred when such a phosphorus ban is imposed. In a 1977 U. S. Environmental Protection Agency study, $5 per household per year was estimated as the incremental cost of soap and softening to compensate for the unavailability of phos-

Map 16

STREAM MILES IN THE REGION EXPECTED TO MEET THE NATIONAL GOAL OF "FISHABLE AND SWIMMABLE" WATERS IF A HIGH LEVEL OF PHOSPHORUS REMOVAL IS PROVIDED AT 18 SELECTED SEWAGE TREATMENT PLANTS

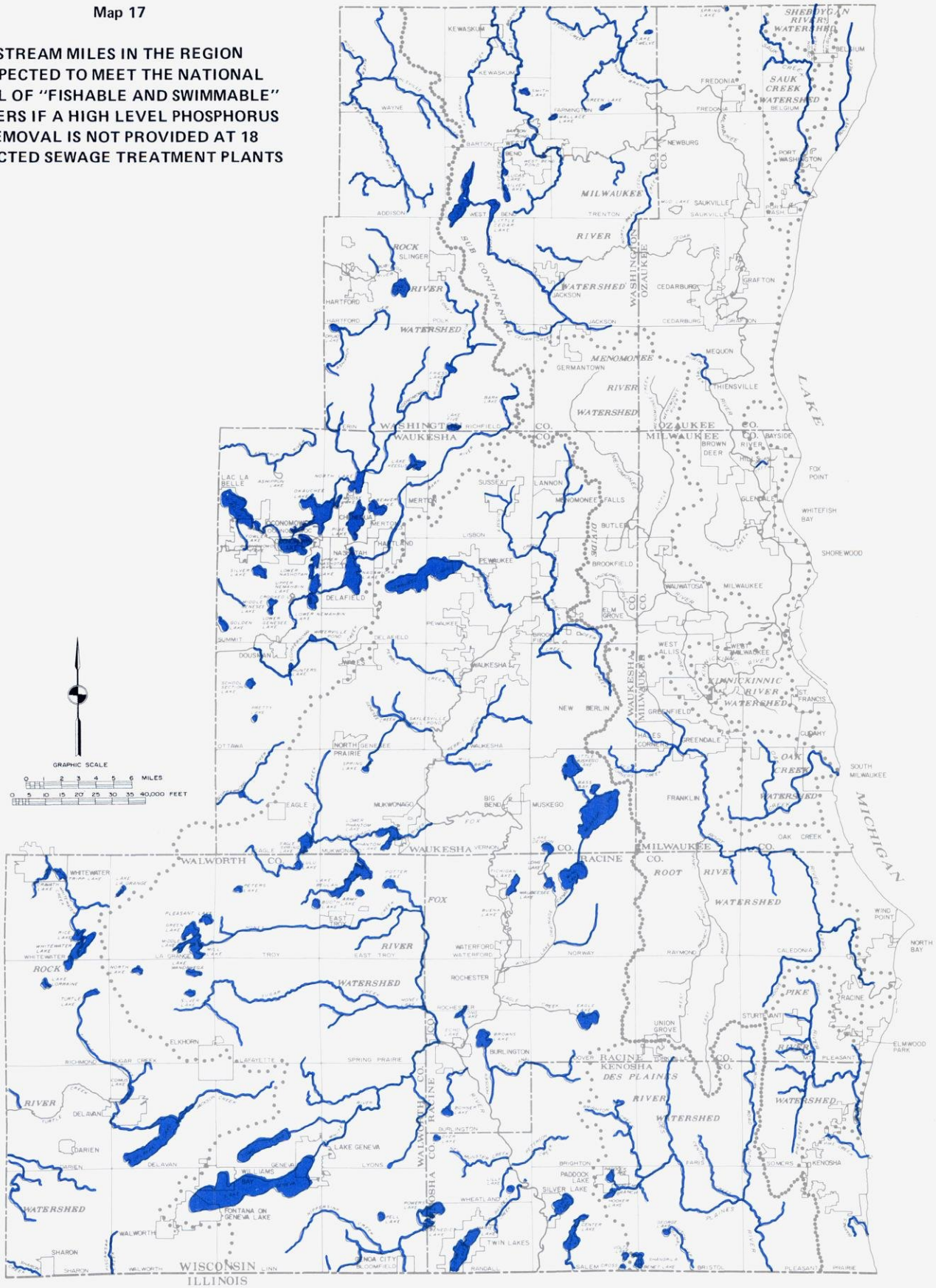


By implementing the recommended regional water quality management plan, including the provision for a high level of advanced waste treatment for phosphorus removal at 18 sewage treatment plants, about 1,054, or 89 percent, of the 1,180 miles of stream analyzed would meet the national goal of "fishable and swimmable" waters.

Source: SEWRPC.

Map 17

STREAM MILES IN THE REGION EXPECTED TO MEET THE NATIONAL GOAL OF "FISHABLE AND SWIMMABLE" WATERS IF A HIGH LEVEL PHOSPHORUS REMOVAL IS NOT PROVIDED AT 18 SELECTED SEWAGE TREATMENT PLANTS



By implementing the recommended plan with one exception—excluding the provision of a high level of advanced waste treatment for phosphorus removal at 18 treatment plants—867, or 73 percent, of the 1,180 miles of stream analyzed would meet the national goal of "fishable and swimmable" waters. This represents a decrease of 187 miles of stream when compared to full implementation of the recommended plan. These 187 miles include such streams as the main stems of the Fox and Milwaukee Rivers, Cedar Creek, and portions of the Rubicon, Oconomowoc, and Bark Rivers and Turtle Creek.

Source: SEWRPC.

Table 38

ESTIMATED COSTS OF PROVIDING HIGH LEVELS OF ADVANCED WASTE TREATMENT FOR PHOSPHORUS REMOVAL AT SELECTED SEWAGE TREATMENT PLANTS IN THE REGION

Sewage Treatment Facility	Average Annual Capital[a] and Operation and Maintenance[b] Costs[c] During the Period 1990-2000 for Point Source and Sludge Management Plan Elements					
	Recommended Plan (0.1 mg/l phosphorus)		Cost of Treatment With Conventional Advanced Waste Treatment for Phosphorus Removal (1.0 mg/l phosphorus)		Difference Between Recommended and Alternative Plan	
	Total	Per Capita[d]	Total	Per Capita[d]	Total	Per Capita[d]
West Bend	$ 2,022,000	49	$ 1,614,000	39	$ 408,000	10
Jackson	535,000	89	377,000	63	158,000	26
Cedarburg	825,000	45	513,000	28	312,000	17
Union Grove	606,000	80	432,000	52	231,000	21
Brookfield	2,527,000	37	1,727,000	25	800,000	12
Waukesha	2,903,000	37	2,230,000	29	673,000	8
Mukwonago	639,000	69	370,000	40	269,000	29
Norway	649,000	88	456,000	62	193,000	26
Eagle Lake	307,000	171	214,000	119	93,000	52
Burlington	849,000	51	523,000	32	326,000	19
Salem Sewer Utility District No. 2	629,000	82	422,000	55	207,000	27
Slinger	430,000	98	299,000	68	131,000	30
Hartford	908,000	59	651,000	45	257,000	17
Oconomowoc	1,770,000	53	1,307,000	39	463,000	14
Delafield-Hartland	609,000	33	286,000	16	323,000	18
Dousman	299,000	150	201,000	101	98,000	49
Whitewater	1,049,000	49	737,000	34	312,000	15
Walworth County Metropolitan Sewerage District	1,277,000	54	857,000	36	420,000	18
Total	$18,833,000	49	$13,216,000	35	$5,617,000	15

[a] *Average annual cost of capital was computed by dividing the total capital cost by 25 years based upon the life of the facility to be constructed.*

[b] *Operation and maintenance is the average cost during the years when the facilities would be installed to achieve a high level of phosphorus removal (1990-2000).*

[c] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

[d] *Per capita costs based upon year 2000 population levels.*

Source: SEWRPC.

phate detergents. Thus, the sewered population of the Region in the year 2000 would expend an estimated $3 million per year, assuming a relatively soft water supply. A higher expense would be expected where water supplies were relatively hard.

Advanced Waste Treatment

An issue closely related to the phosphorus removal issue discussed above is the provision of advanced waste treatment itself; that is, the control of municipal point sources of water pollution at levels beyond what is normally defined as a secondary level of treatment. A particular concern over the inclusion of advanced waste treatment in sewerage facility plans has been voiced in a report prepared for the U. S. Environmental Protection Agency, based upon a review of six projects from across the nation, that questions whether advanced waste treatment facilities result in benefits that are fully justifiable in terms of water quality.[35] In addition, the study notes that advanced waste treatment recommendations have been made in some cases with inadequate technical documentation for such recommendations. In considering this matter during the conduct of the water quality management planning effort, the Commission decided to identify—as noted earlier—any possible substitutions for advanced waste treatment, particularly in terms of nonpoint source pollution abatement. As noted above, there were no significant substitutions found possible in this respect. Consequently, if the national goal of "fishable and swimmable" waters is indeed to be met, then it will be necessary within the Southeastern Wisconsin Region to provide for advanced levels of waste treatment, particularly in terms of phosphorus removal. It would not normally be necessary to require treatment plants in the Region to provide a tertiary level of waste treatment. This is due in part to the recommendations for the provision of phosphorus removal which result in slight reductions of biochemical oxygen demand. Furthermore, as noted in the discussion below, every effort was made to avoid advanced waste treatment by instead recommending land disposal of sewage effluent. Finally, the plan recommends herein that the Wisconsin Department of Natural Resources continue to conduct detailed field surveys of the waste load assimilative capacity of each receiving stream in order to specify design criteria for wastewater treatment facilities.

Land Application of Sewage Effluent

To date, land application of sewage effluent as an alternative to surface water disposal has found relatively little acceptance in southeastern Wisconsin. As identified in the inventories conducted as part of the water quality management planning program, there are only three public sewage treatment plants in the Region that use land disposal in the form of seepage lagoons for wastewater disposal, and none that use spray, ridge and furrow, or other forms of irrigation. About 30 private sewage treatment facilities utilize some form of land disposal of sewage effluent, either in the form of seepage lagoons or irrigation. There are, however, no large-scale applications of sewage effluent to land in the Region.

Objections frequently raised to land application of sewage effluent include the limited suitability of soils in the Region for such wastewater disposal, the potential for the impairment of soil productivity, the loss of crop production or reduced crop production on lands subject to such effluent disposal, the aesthetic problems which can be engendered by such wastewater disposal in areas of mixed urban and rural land uses, the harsh winter climate which essentially prohibits irrigation of sewage effluent during six months of the year, the potential for groundwater pollution, the high land values in the Region, and the loss of tax base to local units of government if farmland is publicly acquired and used primarily for a "sewage farm."

There are many reasons, however, why land application of sewage effluent is desirable. These reasons include the recycling of nutrients and organic matter in wastes through land application, local groundwater recharge, the use of the soil mantle to provide an advanced level of treatment as opposed to the energy-intensive application of chemical treatment in treatment facilities, and, in some cases, the reduced overall costs of sewage treatment and disposal.

In conducting the regional water quality management planning program, the Commission determined that the use of land application of sewage effluent can be a practical technique at some locations in southeastern Wisconsin. As noted earlier in this chapter, it is recommended that 21 of the 48 public sewage treatment plants carefully consider the disposal of sewage effluent through land application. These 21 plants generally serve small urban communities in the more rural areas of the Region, where an adequate amount of suitable land exists for convenient disposal of sewage effluent. Collectively, these 21 public sewage treatment plants would have a capacity of about 17 mgd, or about 4 percent of the total 470 mgd of sewage treatment capacity needed in the Region in the plan design year 2000. Unfortunately, the great bulk of the required sewage treatment plant capacity already exists at the six sewage treatment plants located on Lake Michigan, which together serve concentrated urban development along the Lake Michigan shoreline. Together, these six sewage treatment plants would have a capacity of about 380 mgd in the design year. Analyses conducted in preparing the regional sanitary sewerage system plan indicate that it would be impractical and prohibitively costly to consider the transport of wastes from these six sewage treatment facilities to rural lands. Together, these six plants would

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[35] *See Jerome Horowitz and Larry Bazel, An Analysis of Advanced Wastewater Treatment (AWT), Draft Final Report, EPA Contract No. 68-01-4338, July 1977, and U. S. Comptroller General Report to Congress, Better Data Collection and Planning is Needed to Justify Advanced Waste Treatment Construction, Report No. CED-77-12, U. S. General Accounting Office, Washington, D. C., December 21, 1976.*

require an estimated 110,000 acres of suitable rural land for effluent disposal. Consequently, although a heavy emphasis was placed in the program on identifying potential candidates for land disposal of sewage effluent, as a practical matter only a relatively small portion of the total sewage generated in the Region can be expected to be treated in this manner.

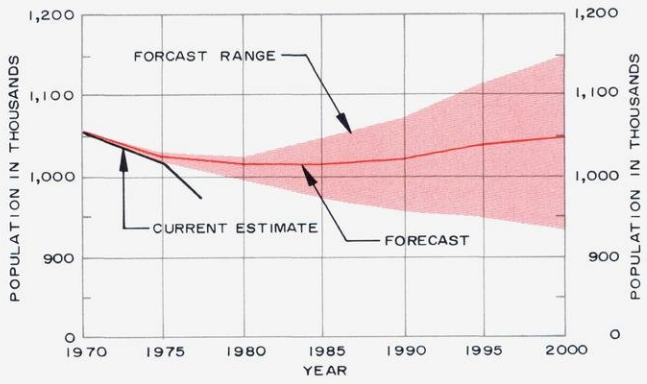
Effect of Sewerage Component of Plan on Internal Migration Patterns

One of the issues raised upon completion of the 1990 regional sanitary sewerage system plan and that continues to be raised in light of declining populations in the central cities of the Region concerns the effect of the sewerage component of the areawide water quality management plan on intraregional population migration and the continued diffusion of urban development in the Region. In this respect, it should be noted that the sewerage element of the water quality management plan is based on the adopted design year 2000 regional land use plan and seeks to help to implement that plan. The regional land use plan and the population forecasts upon which that plan was in part based were subject to extensive public review prior to adoption. The plan selected is, in terms of regional settlement patterns, the most highly centralized plan of all alternative land use plans considered by the Commission, including previous consideration of a corridor development plan, a satellite cities development plan, a controlled trends development plan, and an uncontrolled trends development plan. The recommended land use plan envisions converting only about 113 square miles of land from rural to urban use over the next two decades, substantially less than the approximately 235 square miles that would have to be converted under a continuation of existing development trends within the Region. The degree of centralization envisioned in the plan is evidenced by the fact that more than 60 percent of all new urban residential land and nearly half of the incremental population would be located within 20 miles of the Milwaukee central business district. In effect, the plan seeks to halt and reverse the pattern of intraregional migration that has been observed within the Region in the recent past.

With respect to Milwaukee County, as shown in Figure 2, the plan seeks to halt the population decline presently being experienced by the mid-1980's and to then gradually increase the population to the year 2000, returning by then to a population level of slightly over one million persons. Also, as shown in Figure 2, the actual trend in population change is departing significantly from the normative trend proposed in the plan, with the 1978 population of Milwaukee County estimated at about 954,100 persons—65,900 persons, or 6 percent, below the proposed 1978 level. Every effort will have to be made by all concerned to curtail the further diffusion of low-density, unsewered urban development into the outlying areas of the Region if the current pattern of intraregional migration is to be reversed as envisioned in the plan. Provision of centralized sanitary sewer service in accordance with the plan recommendations will aid in achieving that objective. The plan seeks to eliminate further urban sprawl and direct

Figure 2

POPULATION FORECAST AND CURRENT POPULATION ESTIMATE FOR MILWAUKEE COUNTY



Source: SEWRPC.

all new urban growth into the rational urban service areas of the established urban centers of the Region. In so doing, the plan encourages higher land use development densities, with new urban development to occur primarily at densities exceeding 5,000 persons per gross square mile. If the decline in population density is not arrested in the manner envisioned in the plan, the average population density in the urban area of the Region can be expected to decline to about 2,300 persons per square mile by the year 2000.

An ancillary issue to the foregoing involves the potential effect on land use development of locating trunk sewers in and along primary environmental corridor lands. It should be noted in this respect that many of the primary environmental corridors lie along stream valleys that are also frequently the most cost-effective locations for gravity drainage trunk sewers. Accordingly, it is almost inevitable that some major trunk sewer construction will have to take place in primary environmental corridors. This does not mean, however, that the agencies concerned will be forced to commit to urban development the primary environmental corridor lands traversed. Quite the contrary should be true if the recommended land use plan standards are carried out. In the regional water quality management plan, the recommended trunk sewers were sized so as to exclude from development all primary environmental corridor lands. This principle should be carried over into the detailed sewerage facilities plans for the affected trunk sewers. In addition, recent state legislation authorizes the Wisconsin Department of Natural Resources to consider whether sewer proposals are in full accordance with approved delineations of future sanitary sewer service areas. Consequently, the exclusion of primary environmental corridor lands from sewer service areas should effectively preclude their development for urban land use purposes. In addition, at the local level of government, public officials can further ensure the protection of primary environmental corridor lands through appro-

priate zoning, including in many instances floodland, shoreland, and conservancy zoning; through public acquisition as recommended in the regional park and open space plan; and through official mapping.

Excess Capacity in Sewerage Facilities

Another issue raised in the areawide water quality management planning effort concerns the integration of any excess capacity that may exist within components of the sewerage system. This issue has two facets. The first involves assurances that the existing capacity in sewerage facilities is fully utilized before making new capital investments in additional capacity. The second involves the design of new sewerage facilities and, in particular, whether such designs should provide capacity for growth beyond the normal 20- to 25-year plan design period used in regional land use and facilities planning. The first facet of this issue was explicitly addressed in the preparation of the regional land use and regional water quality management plans. In the design of the regional land use plan, new urban growth was first assigned to that undeveloped land that has already been committed for urban development and where the necessary urban facilities and services are in place. The plan recommends that local units of government take appropriate steps to encourage the infilling of passed over parcels of land, in accordance with the plan, before extending facilities to serve additional land. In this way, full use is made of all capital investment in public facilities. Only after the supply of underutilized and undeveloped urban land has been exhausted do the regional land use and regional water quality management plans recommend extension of sewerage facilities to support new urban development.

The regional water quality management plan also recommends that local communities conduct as part of their sewerage facilities planning infiltration and inflow studies. The major purpose of these studies is to determine the most cost-effective approach to the problem of clear water in sanitary sewerage systems. In many cases, it has been determined to be more cost-effective to remove the clear water than to convey and treat it. In such cases, previously used capacity is made available to accommodate new urban growth and thereby to avoid, at least to some degree, the construction of new facilities. The Commission views such efforts as positive steps toward ensuring that all available sewerage system capacity is used before commitments are made to expand the physical plant and provide new capacity. In some cases, the extent of the infiltration and inflow problem is such that it is more cost-effective to treat a significant portion of the infiltration and inflow. In these cases, the potential for having excess capacity is reduced since a portion of the capacity is needed for treatment of infiltration and inflow.

The second part of this issue pertains to the design of new sewerage facilities. In the regional sewerage system planning effort, all of the recommended trunk sewers and sewage treatment facilities included in the point source pollution abatement element of the plan were designed to serve only planned growth and development through the design year 2000. It is recognized, however, that it may sometimes be more cost-effective to provide sewerage system capacity, particularly in major trunk sewers, for urban growth and development beyond that envisioned in the plan by the year 2000. In such cases, the plan recommends that the local facilities planning explicitly include a cost-effectiveness analysis to determine whether to initially build a large sewer designed to serve development beyond the year 2000, or to initially build a smaller sewer to serve only that development envisioned in the plan by the year 2000 and to later build a parallel facility to serve development beyond 2000. It should be noted here that in the previous cycle of systems and project planning, several of these cost-effectiveness analyses with respect to trunk sewers have been made. The results of these analyses are reflected in the new regional water quality management plan.

WATER QUALITY MANAGEMENT CONSIDERATIONS FOR PROPOSED OAKWOOD LAKE

Background

In September 1966 the Regional Planning Commission adopted a comprehensive plan for the Root River watershed.[36] One of the major findings of the Root River watershed study was that lowlands in the City of Franklin lying near the confluence of the North Branch of the Root River and the Root River Canal form a natural reservoir during flood periods, the outflow of which is regulated by a narrow cross section of the Root River channel and floodplain near W. County Line Road. The adopted plan recommends the construction of a permanent lake at this natural reservoir site. This lake, which has been named Oakwood Lake, would be a multipurpose reservoir that would artificially increase the flood regulation effect of the natural reservoir and would provide a water body for recreation, conservation, and low flow augmentation purposes.

As proposed in the adopted Root River watershed plan, the normal water surface area of the lake would be about 660 acres. It was proposed that about 400 acres of land underlying the lake be excavated to provide for such recreational pursuits as boating and fishing. The remaining 260 acres of lake area were envisioned to provide shallow water for fish and wildlife habitat. The normal water surface of the lake would be held between elevations of 679 feet and 680 feet Mean Sea Level Datum (M.S.L.), also referred to as the National Geodetic Vertical Datum, by means of a low rock dam. Water stored between these elevations would be available for release for streamflow augmentation at a rate varying from three to five cubic feet per second (cfs), depending upon lake level. A flow of three cubic feet per second would result in a stream 24 feet wide and 6 inches deep flowing at a velocity of 0.25 foot per second. In the

[36] *See SEWRPC Planning Report No. 9, A Comprehensive Plan for the Root River Watershed, September 1966.*

recreation portion of the proposed lake, a mean bottom elevation of 675 feet would be established to provide a mean water depth of four to five feet. As proposed in the plan, the lake would have a normal shoreline of about five miles. The plan envisioned that a portion of the shoreline would be developed for recreational use with the remainder left in a natural state. A general layout of the proposed lake is shown on Map 18.

The proposed Oakwood Lake would also have modest flood damage benefits. During a 100-year recurrence interval flood the lake would have a flood pool elevation of 686 feet M.S.L. and a water surface area of about 1,000 acres, with a storage volume—that is, the amount of flood water that would be stored on top of the normal pool—of 4,076 acre-feet. It is estimated in the Root River watershed plan that the proposed Oakwood reservoir would reduce the 100-year recurrence interval flood peak stage in the City of Racine by 0.4 foot.

The plan also found that the lake would have extensive intangible benefits. The area surrounding the lake includes wetlands and woodlands and attractive topographic features, all of which would be enhanced by the lake. The lake and its surroundings would constitute a major wildlife habitat adjacent to a heavily urbanized area. Recreational activities on and near the lake would include rowing, sailing, canoeing, fishing, and picnicking. The lake would be four times the size of the combined area of all the existing lakes (165 acres) in Milwaukee County, and would provide more publicly accessible shoreline than do such large natural inland lakes as Pewaukee or Oconomowoc.

The direct cost of the proposed Oakwood Lake was estimated in the Root River watershed plan in 1965 dollars at $2,416,000. This included an estimated construction cost of $1,493,000 plus the present worth at 6 percent interest of estimated annual operation and maintenance costs of $30,000. Expressed in 1976 dollars as used in the areawide water quality management planning program, the capital cost equals about $4.6 million, and the operation and maintenance equals about $70,000 per year. The costs do not include land acquisition because all of the land required for the reservoir was either owned by the Milwaukee County Park Commission or was proposed to be purchased by the Park Commission as part of a long-range program for acquisition of floodplain lands along the Root River. As of May 1979, the Milwaukee County Park Commission owned 1,366 acres of floodplain land at the Oakwood Lake site, representing 83 percent of the total required site acquisition of 1,638 acres. Only 272 acres, or 17 percent of the required land, remained to be acquired by the County Park Commission.

In 1977 the Regional Planning Commission adopted a regional park and open space plan.[37] One of the major needs in Milwaukee County identified in that planning study is water-oriented recreational facilities in the southern part of Milwaukee County. Accordingly, the regional park and open space plan recommended that an inland swimming beach and associated outdoor recreational facilities be provided at the proposed Oakwood Lake, thus reinforcing the recommendation made a decade earlier in the Root River watershed plan.

Reevaluation of Water Quality in Oakwood Lake

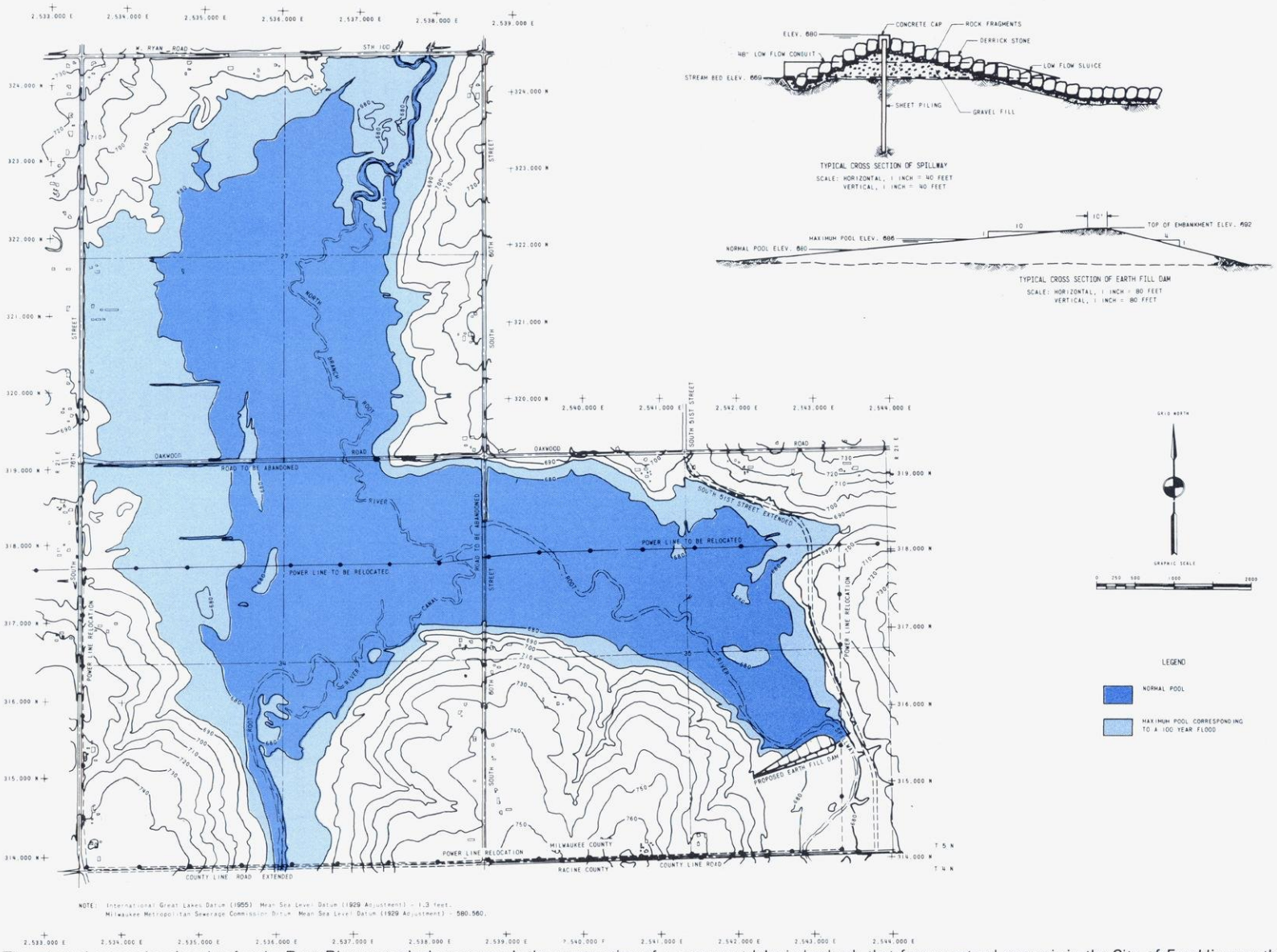
Under the areawide water quality management planning program, analyses were conducted with respect to water quality in the main stem of the Root River, in the Root River canal system, and in the proposed Oakwood Lake itself. The Root River canals were found to be among the streams with the most severe dissolved oxygen and phosphorus problems within the Region under probable future land use and water quality management conditions and it was determined that the canals could not, as a practical matter, be made fully fishable and swimmable, given the available technologies for point and nonpoint source control. This conclusion is discussed in Volume Two, Chapter IV of this report. Consequently, the water use objectives recommended for the canals were those of limited recreation and maintenance of a limited fishery and aquatic life. The water quality analyses relied upon technical analytic procedures not available at the time of the initial watershed study, and indicated that with the design initially proposed in the Root River watershed plan, the lake would be too shallow to preclude heavy aquatic weed growth over the approximately 400 acres of the lake that were intended to be used for boating and fishing. At a mean depth of about five feet over this area, sunlight could be expected to penetrate to the lake bottom and support heavy rooted aquatic growth. If the lake were to be designed for greater depths—at least 15 feet mean depth—in the recreational portion, nutrients would tend to be trapped in sediment and not be resuspended. At the initially proposed depth, however, the phosphorus loading could be expected to be readily available for plant growth. Inlake phosphorus concentration in the spring could be expected to approximate 0.04 mg/l total phosphorus, or about two times the maximum phosphorus concentration recommended to prevent excessive nuisance aquatic plant growth. This phosphorus concentration assumes a high level of both point and nonpoint source pollution control to be exercised throughout the tributary watershed to the lake. This was the level of nonpoint source control recommended in the preliminary areawide water quality management plan. An analysis of the phosphorus loads to Oakwood Lake under planned future conditions indicated that about 51 percent of the total phosphorus load of about 16,000 pounds per year would be contributed from the Root River canals. If point source effluents of up to 1.0 mg/l of total phosphorus are considered, an estimated 73 percent of the phosphorus load of 37,000 pounds per year to Oakwood Lake would be contributed by the Root River canals.

Since excessive plant growth and accompanying turbidity in the lake could be expected to interfere with the proposed recreational uses of the lake for the full range

[37] *See SEWRPC Planning Report No. 27, A Regional Park and Open Space Plan for Southeastern Wisconsin, November 1977.*

Map 18

GENERAL PLAN OF OAKWOOD LAKE AS PROPOSED IN THE COMPREHENSIVE PLAN FOR THE ROOT RIVER WATERSHED



The adopted comprehensive plan for the Root River watershed recommends the construction of a permanent lake in lowlands that form a natural reservoir in the City of Franklin near the confluence of the North and South Branches of the Root River. This lake, which has been called Oakwood Lake, is envisioned as a multipurpose reservoir that would artificially increase the flood regulation effect of the natural reservoir and would provide a water body for recreation, conservation, and low flow augmentation purposes. Studies conducted under the areawide water quality management planning program indicated that water quality conditions in the proposed lake would probably not be fully "fishable and swimmable" since phosphorus concentrations in the lake would exceed the recommended levels and consequently excessive plant and algae growth might limit the lake uses. However, it was recognized that design features could be incorporated into the lake to reduce the potential water quality problems, and that these problems were outweighed by the benefits that would be attendant to the construction of the reservoir.

Source: SEWRPC.

of boating and fishing uses, an analysis was conducted to determine the potential for modifying the design of the proposed reservoir to overcome the potential water quality problems of the lake, and to provide a level of water quality suitable for selected recreational uses, as well as for the maintenance of at least a limited warmwater fishery. The water use objectives for the proposed lake would thus consist of a limited recreational use and the maintenance of limited fish and aquatic life, the limitations resulting from the inability of the lake to meet the recommended phosphorus standard and potential dissolved oxygen problems.

To overcome some of the water quality management problems of the lake, the mean depth of about 100 acres of the 400-acre portion of the lake proposed to be devoted to recreational pursuits could be increased from about 5 feet to about 20 feet. Rooted aquatic weed growth in areas greater than 10 feet in depth could be expected to be minimal due to the limitations of light penetration. The remaining portions of the lake would continue to be left shallow as initially proposed to provide for fish and wildlife habitat, which would be enhanced by aquatic weed growth. In about 100 acres of this remaining area, the substrata could be lined with clay overlain with sand or other relatively nutrient-poor materials. This would minimize the plant use of sediment nutrients and maximize the use of nutrients from the water column. While such steps would significantly reduce rooted aquatic weed growth in the reservoir, it is unlikely that nutrient concentrations in the lake as a whole would be reduced sufficiently to significantly limit growth of algae and other floating aquatic plants, and some form of chemical control of algae growth may be necessary. Such chemical control is generally recommended only as a last resort. Maintenance dredging would be required in the recreational portion of the lake at about 25-year intervals.

Although not able to be fully evaluated at the systems planning level, other alternatives that could be considered for the control of algae growth include the establishment and encouragement by design of heavy growths of aquatic plants in selected areas of the reservoir to screen, filter, or assimilate selected pollutants, and the use of sedimentation basins at the inlets to the lake to limit the inflow of sediment and attached nutrients. In this respect, it should be noted that any pollutants, such as sediment or phosphorus, that were trapped or removed at the reservoir would not reach Lake Michigan.

The construction cost of additional deepening, lining, maintenance dredging, aquatic plant features, and sediment basins required to control algal growth factors is estimated in 1976 dollars at $5.4 million (see Table 39). The present worth at 6 percent interest of the estimated incremental annual operation and maintenance costs of $11,000 is $200,000. No land costs are included in the figures, as is consistent with the assumptions of the adopted Root River watershed plan.

The construction of Oakwood Lake in the manner discussed above would provide a surface water body that could support limited recreational use and provide limited habitat for fish and aquatic life. Even with these design factors, however, the lake would not be expected to meet fully the "fishable and swimmable" goal established by the U. S. Congress in the Federal Water Pollution Control Act. Under severe plant growth conditions, some lakes generate offensive odors that actually reduce public recreational use. In severe winter conditions, dissolved oxygen problems could potentially occur as aquatic plants decay. However, the lake would be expected to have a water quality comparable to other lakes in the Region, such as Wind Lake and Big Muskego Lake. Moreover, special design features could fully meet the "fishable and swimmable" goal in limited portions of the lake.

Table 39

ESTIMATED COST OF CONSTRUCTION AND WATER QUALITY MANAGEMENT MEASURES FOR PROPOSED OAKWOOD LAKE

Plan Element	Estimated Cost[a]		Economic Analysis	
	Total Capital	Average Annual Operation and Maintenance	Present Worth 1976	Equivalent Annual Cost (1975-2025)
Lake Construction	$ 4,600,000	$70,000	$ 5,703,000	$362,000
Water Quality Measures				
Dredge Deep Pool[b]	$ 4,800,000	$ --	$ 4,800,000	$305,000
Sediment Lining[c]	300,000	--	300,000	19,000
Sedimentation Basins[d]	325,000	11,000	498,000	32,000
Subtotal	$ 5,425,000	$11,000	$ 5,598,000	$356,000
Total	$10,025,000	$81,000	$11,301,000	$718,000

[a] *All costs presented in 1976 dollars.*

[b] *Cost estimated to dredge 100 acres to a mean depth of 20 feet.*

[c] *Cost estimated to cover or line 100 acres.*

[d] *Cost estimated to dredge two 20-acre sedimentation basins to a mean depth of 10 feet and remove the accumulated sediment.*

Source: SEWRPC.

Another water quality impact of the proposed lake may be noted. Other analyses reported in Chapter IV of this volume indicate that the reservoir would have a beneficial effect on downstream phosphorus and dissolved oxygen concentrations in the Root River. In the event that a high level of phosphorus control to achieve an effluent concentration of 0.1 mg/l of total phosphorus at the Union Grove sewage treatment plant were not implemented, then the reservoir would trap pollutants and provide for the achievement of fully "fishable and swimmable" water quality below the proposed reservoir, a level of water quality not achievable without the reservoir in place.

Other Considerations Relating to Oakwood Lake

In addition to water quality management considerations, there are several other aspects of the proposal to construct Oakwood Lake that deserve consideration. One aspect involves the loss of wetlands, woodlands, and associated plant communities at the reservoir site. Any effort to construct the proposed reservoir would of necessity involve consideration of such a loss as part of an overall environmental impact evaluation.

The flood control aspects of the reservoir were reevaluated by the Commission in conjunction with work being done for the U. S. Department of Housing and Urban Development as part of a flood insurance study for Racine County. This work, which involved the estimation of revised flood discharges and stages associated with the 100-year recurrence interval flood for the Root River, confirmed the determination of the earlier Root River watershed study that the flood control effects of the reservoir are quite modest. Under this most recent work it is estimated that the reservoir would reduce the 100-year recurrence interval peak flood stage in the City of Racine by no more than 0.5 foot, an estimate essentially the same as the value noted in the adopted watershed plan. Consequently, as found in the original watershed study, there are no major flood damage-abatement benefits that could be attributed to the construction of the reservoir.

The low flow augmentation benefits of the reservoir were also reconsidered as part of the areawide water quality management planning program. Increased flows under dry weather conditions enhance public recreational use potential for swimming, fishing, picnicking, sight-seeing, canoeing, and fishing. Commission analyses estimated the 7-day average, 1 in 10-year recurrence interval low flow just upstream from the confluence with Hoods Creek, under year 2000 land use conditions in the tributary area, to be about 0.3 cfs without the reservoir and about 3.5 cfs with the reservoir. These flows do not include approximately 3.5 cfs of sewage effluent discharged upstream by seven sewage treatment plants as of 1975 and recommended to be reduced to about 2.2 cfs by the year 2000 through the elimination of some of these plants and the provision of service by the Milwaukee Metropolitan Sewerage District. A base flow of 3.6 cfs in the Root River would have a 90 percent chance of being equaled or exceeded in any given year if the reservoir were built, but only a 35 percent chance without the reservoir. Thus, selected uses of the downstream reaches could be expected to be enhanced by flow augmentation effected by the reservoir.

Action by Root River Watershed Committee

On May 30, 1979, the Commission's Root River Watershed Committee met to consider the water quality management and related aspects of the proposed Oakwood reservoir. The Committee noted the pending consideration of the Oakwood reservoir site by the Wisconsin Department of Natural Resources for operation as a state facility, as requested by a resolution of the Milwaukee County Board. After careful consideration of both the costs—as set forth in Table 39—and potential water quality problems associated with the construction of the reservoir, as well as the potential benefits, as set forth in Table 40, the Committee acted to reaffirm the inclusion of the reservoir in the adopted Root River watershed plan. The Committee further endorsed incorporating features in the design of the reservoir that would minimize potential water quality problems. In making this determination, the Committee recognized that certain water quality management problems may be expected to occur if the reservoir is constructed, and that the water quality would not likely be fully "fishable and swimmable" over all of the reservoir. It was recognized, however, that by careful design and management such conditions may be achievable in selected parts of the proposed reservoir. The Committee concluded, therefore, that the potential water quality management problems were outweighed by the aesthetic, recreational. low flow augmentation, flood control, and energy use benefits that would be attendant to the construction of the reservoir. The conclusion concerning energy use benefits was based upon the fact that the reservoir would provide the fifteenth largest body of surface water within the Region, with 5.5 miles of undeveloped shoreline in close proximity to the largest population concentration in the State, thus reducing the need for travel in seeking the kinds of recreational experiences that could be provided by the reservoir and attendant park and open space lands.

SUMMARY

This chapter has presented a recommended plan for the abatement of water pollution from all known sources in the Region. The plan has been designed to meet a set of recommended water use objectives and supporting water quality standards. These objectives and standards in turn have been designed to ensure that the national goal of "fishable and swimmable" waters established by the U. S. Congress in Public Law 92-500 is met in the Region to the maximum extent practicable.

The recommended water quality management plan consists of five major elements. The first element consists of a regional land use plan prepared in a program conducted concurrently with the areawide water quality management planning program. This plan contains

Table 40

POSITIVE AND NEGATIVE EFFECTS OF CONSTRUCTING OAKWOOD LAKE

Positive Effects	Negative Effects
1. Low flow augmentation	1. Probable excessive weed and algae growths, along with associated nuisance, odor, and winter dissolved oxygen problems
2. A major recreation resource in Milwaukee County with major public shoreland access for fishing, scenic use, and boating	2. The lake could be expected to support only limited recreational uses and a limited fishery and other aquatic life
3. Flood stage reduction of 0.4 foot at the Root River downstream to Racine	3. A high cost of $4.6 million for construction and $70,000 for annual operation and maintenance. Implementing water quality management measures would involve an additional capital cost of $5.4 million, with an annual operation and maintenance cost of $11,000
4. Provision of shallow water habitat for fish and wildlife	4. Algae control chemicals may be required
5. Reduction in phosphorus and sediment levels in the Root River downstream and delivered to Lake Michigan	5. The inundation of wetland and woodland areas at the lake site, including portions of some of the largest remaining wetlands in the County
6. Enhancement of the Root River Parkway corridor, and nearby property values	
7. Improved dissolved oxygen conditions downstream	

Source: SEWRPC.

recommendations on the spatial and temporal location and intensity of urban development within the Region, the preservation in essentially natural open uses of the primary environmental corridors of the Region, and the preservation in agricultural use of the prime agricultural lands of the Region. The second element is a point source pollution abatement element and consists of recommendations on the location and extent of sanitary sewer service areas; the location, type, and capacity of sewage treatment facilities and the level of treatment recommended at such facilities; the location, configuration, and size of trunk sewers; the abatement of pollution from separate and combined sewer overflows; and the abatement of pollution from miscellaneous point source discharges, including industrial discharges. The third element is a nonpoint source pollution abatement plan element and consists of recommendations for the establishment of practices designed to control pollutant runoff from both urban and rural lands. The fourth element is a sludge management plan element and consists of recommendations for the handling and disposal of sludge generated at public sewage treatment plants, industrial wastewater treatment facilities, and water supply treatment plants. The fifth element consists of a proposal to establish a continuing water quality monitoring program.

In addition to describing each of the foregoing elements of the plan, this chapter includes a discussion of the costs of implementing the plan, as well as a discussion of the extent to which the plan achieves the objectives and standards established as a basis for plan design and evaluation. The chapter concludes with a discussion of the major issues raised in the formulation of the regional water quality management plan, particularly including issues concerning the need for advanced waste treatment and the removal of phosphorus from sewage treatment plant effluent. A complete summary of the recommended plan, together with a summary of the plan implementation recommendations, is set forth in Chapter IV of this volume.

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Chapter III

PLAN IMPLEMENTATION

INTRODUCTION

The recommended areawide water quality management plan for the seven-county Southeastern Wisconsin Region, as described in Chapter II of this volume, provides a design for the most cost-effective means of abating water pollution in the Region and thereby attaining agreed-upon water use objectives and supporting water quality standards. The recommended areawide water quality management plan consists of five major elements: a land use plan element, a point source pollution abatement plan element, a nonpoint source pollution abatement plan element, a sludge management plan element, and a water quality monitoring plan element. While the recommended plan is designed to achieve the recommended regional water use objectives and supporting water quality standards, the plan is not complete in a practical sense until the steps required to implement the plan—that is, to convert the plan into action policies and programs—are specified. In addition, Section 208 of the Federal Water Pollution Control Act requires that specific designations be made as a part of the Congressionally mandated areawide water quality management planning program of the water quality management agencies required to implement the water quality management plan, and requires that the plan implementation responsibilities of such agencies be identified. This chapter, accordingly, presents recommendations for such management agency designations and sets forth the various actions that must be taken by these agencies in order for the recommended plan to be fully carried out by the plan design year 2000. Those units and agencies of government that have plan adoption and plan implementation powers applicable to the areawide water quality management plan are identified; necessary or desirable formal plan adoption actions specified; and specific implementation actions recommended for each of the units and agencies of government concerned. In addition, financial and technical assistance programs available to the designated management agencies in the implementation plan are discussed. The chapter concludes with recommendations for the establishment of a continuing areawide water quality management planning program as required by federal law.

Because of the ever present possibility of unforeseen changes in economic conditions, state and federal legislation, case law decisions, governmental organization, and tax and fiscal policies, it is not possible to declare once and for all time exactly how a process as complex as areawide water quality management plan implementation should be administered and financed. In the continuing areawide water quality management planning program for southeastern Wisconsin it will be necessary, therefore, to reevaluate from time to time and, as may be found necessary, revise not only the recommendations constituting the plan itself, but also the data and forecasts on which the plan is based, and the recommendations contained herein for its implementation over time.

BASIC CONCEPTS AND PRINCIPLES RELATING TO PLAN IMPLEMENTATION

Before identifying specific plan implementation responsibilities, it is useful to consider certain basic concepts and principles that relate to implementation of the areawide water quality management plan. These include the use of the existing institutional structure wherever possible, the importance of formal plan adoption, the extensive intergovernmental nature of the plan implementation process and attendant need for coordination and cooperation in plan implementation, the importance of implementation of the regional land use plan, and the importance of conducting more detailed local planning and engineering studies.

Use of Existing Institutional Structure

As a regional planning agency created by the county boards of the constituent seven counties, the Southeastern Wisconsin Regional Planning Commission has emphasized in its regional planning program the promotion of close cooperation among the various governmental agencies concerned with land use development and with the development and operation of supporting public works facilities. The Commission believes that wherever possible, plan implementation recommendations should be based upon, and related to, the existing governmental structure and existing governmental programs. In addition, the Commission believes that wherever possible such plan implementation recommendations should be predicated upon existing enabling legislation. Consequently, the plan implementation recommendations contained in this chapter, including management agency designations, are to the maximum extent possible related to the existing governmental institutional structure and programs, and to existing enabling legislation. Where necessary, modifications to the existing governmental structure are recommended, as are proposals for new enabling legislation. Such modifications and proposals, however, are of a relatively minor nature and would seek to ensure that that structure is fully capable of carrying out the plan recommendations.

Importance of Formal Plan Adoption

As an initial step in the plan implementation process, the Commission believes that all designated management agencies and other affected units and agencies of government should formally endorse, adopt, or acknowledge the areawide water quality management

plan. Such formal endorsement, adoption, or acknowledgement by local legislative bodies and local areawide, state, and federal agencies serves to signify agreement with the recommendations contained in the plan. Furthermore, such formal action should serve as notice to governmental unit and agency staffs to begin the process of integrating the plan recommendations with the ongoing programs of such agencies and units of government. In the absence of such formal action, neither the staffs of the agencies and units of government nor the general public at large know what the formal position of the agency or unit of government is with respect to this important matter.

It should be noted that under the rules for areawide water quality management planning promulgated by the U.S. Environmental Protection Agency (EPA), a favorable recommendation on adoption of the plan by a local unit of government is assumed if no written comments are filed within 30 days of receipt of the draft plan. As discussed in the next chapter of this report, all local units of government in the Region were provided a detailed summary of the draft report as part of the public review process.

Intergovernmental Nature of the Plan Implementation Process

It is important to recognize that implementation of a plan as complex as the areawide water quality management plan for southeastern Wisconsin will necessarily require the designation of literally hundreds of management agencies. Consequently, a great deal of intergovernmental coordination and cooperation will be necessary to effectively and efficiently implement the plan. It is important in this respect that all public officials and concerned citizens recognize that failure by one unit of government to implement any one element of the recommended areawide plan may adversely affect many other units and agencies of government, and detract from the ability of the entire Region to serve as a pleasant, safe, and healthful place in which to live. Particularly with respect to water quality, it may do little good for one municipality to fully implement the plan if a neighboring municipality fails to take steps to similarly implement the plan. It is expected that the Commission, in serving as a center for the coordination of planning and plan implementation activities within the Region, will carry some of the responsibility for the necessary intergovernmental and interagency coordination. The Wisconsin Department of Natural Resources (DNR) will also bear significant responsibility for intergovernmental coordination. Such coordination, however, requires a positive and receptive attitude on the part of all of the implementing agencies concerned.

Importance of Land Use Plan Implementation

Fundamental to implementation of the areawide water quality management plan is an understanding of the underlying regional land use plan upon which the water quality plan is based. Hence, Chapter II of this volume includes a summary description of the adopted regional land use plan. To a large degree, implementation of the water quality management plan will be directly related to implementation of the regional land use plan. The land use plan and the other elements of the water quality management plan are mutually supportive. The sewerage system development recommendations of the point source pollution abatement plan element are designed to support and promote the land use pattern proposed in the land use plan element. The land use plan element in turn permits the development of more economic sewerage facilities, makes practicable sludge management and in some cases sewage effluent by land disposal, and makes rural nonpoint source pollution abatement efforts practicable by identifying those areas of the Region that should remain permanently in agricultural use. In a similar manner, achievement of the recommended water use objectives through implementation of the recommended water quality management plan will be important to the full and beneficial use of the environmental corridor lands and outdoor recreation facilities identified in the regional land use plan.

Importance of Detailed Planning and Engineering Studies

Full implementation of the areawide water quality management plan requires that more detailed local planning and engineering studies be undertaken by the designated management agencies. As noted in Chapter II of this volume, the completion of the areawide water quality management plan marks the beginning of the second cycle of facilities planning for water pollution control in southeastern Wisconsin. The detailed local facilities planning efforts are expected to result in modifications to, and refinements of, the recommendations contained in the areawide water quality management plan. It is envisioned that such detailed studies will be required with respect to all five of the elements of the recommended plan. Local units and agencies of government having land use planning and plan implementation responsibilities should refine and detail the regional land use plan through the preparation of county, community, and neighborhood level land use plans. In a similar manner, the designated management agencies for point source pollution abatement will need to complete detailed facilities planning and engineering studies concerning the sewage treatment and trunk sewer facilities identified in the areawide plan. In the nonpoint source pollution abatement area, such detailed studies will be essential to identifying, in a site-specific manner, the locations and types of urban and rural land management practices to be applied to achieve the desired level of pollutant runoff control specified in the areawide plan. Detailed preliminary engineering plans will also be required for the sludge management element of the plan in order to identify the specific means to be used for sludge reduction, handling, recycling, and disposal. Finally, more detailed planning needs to be accomplished to aid in identifying the long-term water quality monitoring network and sampling program to be developed over the coming years.

PLAN IMPLEMENTATION ORGANIZATIONS

Although the Regional Planning Commission can promote and encourage plan implementation in various ways, the advisory role of the Commission makes actual

implementation of the recommended areawide water quality management plan entirely dependent upon actions by other local, areawide, state, and federal agencies of government. These agencies include general-purpose local units of government, such as cities and villages; special-purpose districts, such as metropolitan sewerage districts and inland lake protection and rehabilitation districts; state agencies, such as the Wisconsin Department of Natural Resources; and federal agencies, such as the U.S. Environmental Protection Agency. Because of the many and varied agencies in existence, it becomes exceedingly important to identify those agencies having the legal authority and financial capability to most effectively implement the recommended plan. Accordingly, those agencies whose actions will have a significant effect either directly or indirectly upon the successful implementation of the recommended plan, and whose full cooperation in plan implementation will be essential, are listed and discussed below.

For convenience, the agencies are discussed herein by level of government. However, the interdependence between the various levels of agencies and the need for close intergovernmental cooperation cannot be overemphasized. Most of the agencies needed for implementation of the plan are already in existence within the Region. In some cases, however, it may be desirable to create new agencies and, in such cases, the new agencies should be created in such form as to complement and supplement most effectively the plan implementation activities of the agencies already in existence. In some cases it may also be desirable to add to the legal authority of existing agencies.

Continuing Commission Advisory Committee Structure

Since planning at its best is a continuing function, a public body should remain on the scene to coordinate and advise on the execution of the areawide water quality management plan, and should undertake plan updating and renovation as necessitated by changing events. Although the Regional Planning Commission has been designated the areawide water quality management planning agency, and is charged by State Statute with a continuing areawide planning function, the Commission cannot properly perform such function without the active participation and support of concerned federal, state, and local governmental officials, as well as of concerned citizens, through an appropriate advisory committee structure.

In the design of the initial areawide water quality management planning effort, three committees were envisioned. A Technical Advisory Committee on Areawide Water Quality Management Planning was envisioned and created to actively involve, through technical representatives and elected officials, the various governmental, business, and technical universities and agencies in the Region in the planning process, and thereby to assist the Commission in determining and coordinating the basic technical policy involved in the conduct of the program. In addition to serving a technical function, the committee members were called upon to assist in familiarizing the political, business, industrial, and private citizen leadership within the Region with the plan findings and recommendations. A Citizens Advisory Panel for Public Participation was envisioned and created to provide an opportunity for representatives of citizen interest groups and knowledgeable individual citizens to become familiar with and influence the planning program, the resultant plan, and the plan implementation measures proposed. Finally, an Intergovernmental Coordinating Committee on Areawide Water Quality Management Planning was envisioned and created to provide guidance in those aspects of the program having important intergovernmental and interagency policy implications of a statewide nature.

Both the Technical Advisory Committee and the Citizens Advisory Panel were active over the entire planning program and both contributed significantly to the formulation of the recommended plan and the identification of the means for its implementation. The Intergovernmental Coordinating Committee, however, although created and organized through an initial meeting, was not actually called upon to assist in the planning program. The issues with which this committee was to have dealt, particularly statewide funding of both point and nonpoint source pollution abatement programs, were instead dealt with by the Statewide Water Quality Advisory Committee and the State Nonpoint Source Coordinating Committee, committees created by the Secretary of the Department of Natural Resources. The Chairman of the Southeastern Wisconsin Regional Planning Commission serves on both committees. During the conduct of the areawide water quality management planning program for southeastern Wisconsin, these committees dealt with such statewide issues as sewer service area regulations and funding for point and nonpoint source pollution abatement measures, the latter resulting in the creation of the Wisconsin Fund.

For the continuing areawide water quality management planning program, it is recommended that the Technical Advisory Committee be reconstituted as a continuing advisory committee to assist the Commission in promoting effective implementation of the plan, as well as to assist in mounting any work necessary to revise that plan. The Technical Advisory Committee on Areawide Water Quality Management Planning would thus continue to be a creation of the Southeastern Wisconsin Regional Planning Commission pursuant to Section 66.945(7) of the Wisconsin Statutes and would report directly to the Commission. It is recommended that all agency representatives and individuals currently serving on the committee be given an opportunity to remain as members of the continuing committee, and that the question of committee membership be left open so that additional members may be added to the committee from time to time as appropriate.

It is also recommended that the Citizens Advisory Panel for Public Participation be dissolved with the grateful appreciation of the Commission. It is envisioned that the citizens' participation efforts in water quality management planning during the continuing phase of the

program will be focused largely at the subregional level and in particular on the recommended detailed facilities planning programs needed for refinement and detailing of both the point and nonpoint source pollution abatement plan elements. Citizen participation efforts have already been actively mounted in a number of local sewerage facilities planning programs. Such efforts are to be encouraged and to be particularly extended into the detailed local nonpoint source pollution abatement planning effort.

Finally, it is recommended that the Intergovernmental Coordinating Committee on Areawide Water Quality Management Planning be dissolved. As noted above, the functions originally intended to be handled by this committee have instead been handled by the Statewide Water Quality Advisory Committee and the State Nonpoint Source Coordinating Committee.

Local Level Agencies

As described in greater detail in Volume One, Chapter IV of this report, there are several different local level agencies which, under the provisions of the Wisconsin Statutes, may become involved in the implementation of areawide water quality management plans. These local level agencies include cities, villages, towns, sanitary districts, utility districts, inland lake protection and rehabilitation districts, drainage districts, counties, and soil and water conservation districts.

Cities and Villages: Cities and villages possess adequate authority to implement both the point and urban nonpoint source pollution abatement plan elements. Cities and villages possess general home rule authority and have specific authority to provide sanitary sewer service to construct, operate, and maintain a sanitary sewerage system. In addition, cities and villages have authority to convey and treat storm waters, including construction, operation, and maintenance of urban storm water conveyance, storage, and treatment facilities. Cities and villages can undertake nonpoint source pollution abatement activities in conjunction with traditional public works activities, including litter and leaf control, animal waste control, and street sweeping and cleaning. Thus, cities and villages are granted all of the powers required to implement the point and nonpoint source pollution abatement elements of the plan in urban areas. Those powers may be exercised in the promulgation of construction erosion control ordinances, the construction and operation of storm water management systems, the development and enforcement of urban sanitation and refuse control ordinances, and the construction, operation, and maintenance of sanitary sewerage systems and attendant sewage treatment works.

Towns: Like cities and villages, towns have authority to undertake a wide variety of activities with respect to the abatement of pollution from both point and nonpoint sources. Towns that contain both urban and rural areas generally have elected to establish separate sanitary and utility districts for the provision of services to urban development, particularly including sanitary sewer and storm water management services. Towns may also undertake stream and lake improvements and watershed protection projects.

Sanitary Districts: Sanitary Districts may be created under Section 66.30 of the Wisconsin Statutes to plan, construct, and maintain centralized sanitary sewerage systems. Town sanitary districts have limited authority to construct and maintain storm sewer systems and provide garbage and refuse collection and disposal.

Utility Districts: Section 66.072 of the Wisconsin Statutes permits towns, villages, and cities of the third and fourth class to establish utility districts for a limited number of functions, including the provision of sanitary sewer service. Section 66.072 does not include any authority for utility districts to engage in nonpoint source pollution abatement activities.

Inland Lake Protection and Rehabilitation Districts: Inland lake protection and rehabilitation districts are authorized by Chapter 33 of the Wisconsin Statutes to implement lake protection and rehabilitation plans. As part of such implementation, a lake district may perform tasks such as: aeration, nutrient diversion, nutrient removal or inactivation, soil erosion and land runoff control, and sediment and bottom dredging. In addition, inland lake protection and rehabilitation districts may choose to exercise the powers of a sanitary district.

Drainage Districts: Drainage districts are authorized under Chapter 88 of the Wisconsin Statutes to plan, design, construct, and operate all types of facilities for the facilitation of drainage and the control of flooding, including such facilities as reservoirs, silt basins, and holding basins that may have water quality benefits.

Counties: Counties are granted limited authority to provide sanitary sewer service. Limited home rule authority, which includes the provision of sanitary sewer service, is granted to counties having a population of 250,000 or more. Such authority may be exercised by the county board only upon the request of a town, city, or village to have the county provide such service. Counties are authorized to engage in soil and water conservation projects, lake and river improvements, property acquisitions, water protection, and solid waste management. In addition, counties may regulate nonpoint source pollution through their planning, zoning, subdivision, building, and health code authorities. Counties are also important to the functioning of the soil and water conservation districts. Not only are such districts fiscally dependent upon county boards, but in effect the districts are governed by a county board committee. In implementation of the areawide water quality management plan, therefore, it will be necessary for county boards and the soil and water conservation districts to work cooperatively.

Soil and Water Conservation Districts: Soil and water conservation districts, as authorized under Section 92.05 of the Wisconsin Statutes, have the authority to develop plans for the conservation of soil and water resources and for the prevention of soil erosion. In addition, the districts have authority to request the County Board of Supervisors to adopt special land use regulations that would implement such plans in unincorporated areas. Such adoption, however, requires a referendum in which a simple majority of the eligible electors who voted and were residents of the area affected approve the proposed

regulations. Soil and water conservation districts have the authority to acquire through eminent domain proceedings any property or rights therein for watershed protection, soil and water conservation, flood prevention works, and fish and wildlife conservation and recreational works.

Areawide Level Agencies

Statutory provisions exist for the creation of several areawide agencies that have specific planning and plan implementation powers important to the implementation of the areawide water quality management plan. These areawide agencies include the Milwaukee Metropolitan Sewerage District, other metropolitan sewerage districts, joint sewerage commissions, cooperative contract commissions, and the Regional Planning Commission itself.

Milwaukee Metropolitan Sewerage District: The Metropolitan Sewerage District of the County of Milwaukee operates under the provisions of Section 59.96 of the Wisconsin Statutes and through the joint agency of the Sewerage Commission of the City of Milwaukee and the Metropolitan Sewerage Commission of the County of Milwaukee. The sanitary sewerage system operated by the District, by its constituent municipalities, and by its contract communities constitutes by far the largest and most important sanitary sewerage system in the Region. Because the District serves the great majority of the resident population of the entire Region, it may be expected that the District will play an extremely important role in the implementation of the recommended areawide water quality management plan. In addition, it is noted that the District has major legal authority in the development and operation of storm water and flood management facilities.

Other Metropolitan Sewerage Districts: Sections 66.20 to 66.26 of the Wisconsin Statutes provide for the creation of metropolitan sewerage districts outside Milwaukee County. Proceedings to create such a district may be initiated by a resolution of the governing body of any municipality. Upon receipt of such a resolution, the Wisconsin Department of Natural Resources is required to schedule a public hearing on the matter and, based upon statutory criteria, either order or deny the creation of the proposed district. Two such districts have been created in the Region: the Western Racine County Sewerage District serving the Villages of Rochester and Waterford and a portion of the Town of Rochester, and the Walworth County Sewerage District serving the Cities of Delavan and Elkhorn, the Delavan Lake Sanitary District, and the Walworth County Institutions. The areawide nature of some of the recommended sanitary sewerage systems in the Region lends itself to the formation of potential additional metropolitan sewerage districts.

Joint Sewerage Commissions: Section 144.07 of the Wisconsin Statutes provides authority for the creation of joint sewerage commissions. The Department of Natural Resources may order the sewerage system of any town, village, or city to be planned or constructed so that it may be connected with the sewerage system of another town, village, or city, and after appropriate hearings may further order that proper connections be made. Under this statute, jointly acting governmental units may formally create an areawide sewerage system upon approval of the Department of Natural Resources and may choose to provide for a sewerage commission to conduct the affairs of the system in much the same manner as a metropolitan sewerage commission is created to carry out areawide sewerage functions under a metropolitan sewerage district. The key difference between a joint sewerage system and a metropolitan sewerage district is that under a joint sewerage system all of the governing bodies of the local units of government that initially formed the system must annually approve budgets and appropriations, whereas under a metropolitan sewerage district a special unit of government with its own taxing and appropriations powers is created. To date, no joint sewerage commissions have been created in the Southeastern Wisconsin Region.

Cooperative Contract Commissions: Section 66.30 of the Wisconsin Statutes permits the joint exercise by municipalities of any power or duty required of, or authorized to, such municipalities by statute. Accordingly, local units of government with equivalent powers may contract on a cooperative basis to provide jointly what each unit of government can provide individually. The exercise of this cooperative power may or may not include the formulation of a separate commission to conduct the municipal activities. This power has significant potential for use in southeastern Wisconsin with respect to implementation of the areawide water quality management plan. To date, five formal cooperative contract commissions have been created in the Region for the purpose of constructing areawide sewerage facilities, including the Underwood Sewerage Commission jointly created by contract between the City of Brookfield and the Village of Elm Grove; the Menomonee South Sewerage Commission jointly created by contract between the City of Brookfield and the Village of Menomonee Falls; the Springdale Sewerage Commission jointly created by contract between the City of Brookfield, the Town of Brookfield, and the Town of Pewaukee; the Poplar Creek Sewerage Commission jointly created by contract between the City of Brookfield, the Town of Brookfield, and the City of New Berlin; and the Delafield-Hartland Water Pollution Control Commission jointly created by contract between the City of Delafield and the Village of Hartland.

Regional Planning Commissions: The Regional Planning Commission has no statutory plan implementation powers. In its role as a coordinating agency for planning and development activities within the Southeastern Wisconsin Region, however, using the certified plan element as a basis for review, the Commission may promote plan implementation through community assistance planning services and through the review of federal and state grants-in-aid, discharge permits, and sanitary sewer extensions. In addition, the Commission provides a basis for the creation and continued functioning of the Technical Advisory Committee on Areawide Water Quality Management Planning, which, as noted above, is recommended to remain as an important continuing public planning organization in the Region.

State Level Agencies

There exist at the state level the following agencies that have either general or specific planning authority and certain plan implementation powers or educational responsibilities important to the adoption and implementation of the areawide water quality management plan: the Wisconsin Department of Natural Resources; the Wisconsin Department of Health and Social Services, Division of Health; the Wisconsin Department of Administration; the Wisconsin Department of Transportation; the Wisconsin Department of Agriculture, Trade, and Consumer Protection; the University of Wisconsin-Extension; and the State Board of Soil and Water Conservation Districts. The functions of these agencies as they relate to implementation of the plan are summarized below.

In addition, there are other state agencies that have powers and responsibilities that are more indirectly related to the areawide water quality management plan but that deserve brief mention. These agencies include the Wisconsin Department of Local Affairs and Development, which provides technical assistance to local units of government in planning and planning-related matters in addition to reviewing subdivision plats; the Wisconsin Department of Justice, which initiates legal action on behalf of the State concerning water pollution control matters; the Wisconsin Department of Revenue, which administers statutory provisions for tax exemptions for pollution abatement investments for industries; the Wisconsin Department of Industry, Labor and Human Relations, which promulgates and enforces building regulations and codes, including provisions for plumbing fixtures and devices; the Wisconsin Public Service Commission, which has certain responsibilities relating to the review of utility rates for the provision of sewer service; and the State Historical Society of Wisconsin, which has the responsibility to ensure that important sites of architectural, historic, or archaeological significance are properly protected or preserved. These agencies are expected to play a more minor role in implementation than those agencies discussed below.

Wisconsin Department of Natural Resources: As discussed in detail in Volume One, Chapter VI of this report, the responsibility for water pollution control in Wisconsin is centered in the Department of Natural Resources. The basic authority and accompanying responsibilities relating to the water pollution control functions of the Department are set forth in Chapter 144 of the Wisconsin Statutes. Under this chapter, the Department is given broad authority to prepare as well as to approve or endorse water quality management plans; to establish water use objectives and supporting water quality standards; to review and approve all plans and specifications for components of sanitary sewerage systems; to conduct research and demonstration projects on sewerage and waste treatment matters; to operate an examining program for the certification of sewage treatment plant operators; to order the installation of centralized sanitary sewerage systems; to review and approve the creation of joint sewerage systems and metropolitan sewerage districts; and to administer a financial assistance program for the construction of pollution prevention and abatement facilities, or for the application of land management measures. The Wisconsin Statutes also authorize the Department to consider conformance with an approved areawide water quality management plan when reviewing locally proposed sanitary sewer extensions. This permissive authority is in addition to the Department's mandatory review for engineering soundness and for relation to public health and safety.

Under Chapter 147 of the Wisconsin Statutes, the Department is given broad authority to establish and carry out a pollutant discharge elimination program in accordance with the policy guidelines set forth by the U. S. Congress under the Federal Water Pollution Control Act. Pursuant to this authority, the Department has established a waste discharge permit system. No permit may be issued by the Department for any discharge from a point source of pollution that is in conflict with any areawide water quality management plan approved by the Department. Also under this authority, the Department has rule-making powers to establish effluent limitations, water quality-related limitations, performance standards related to classes or categories of pollution, and toxic and pretreatment effluent standards. All permits issued by the Department must include conditions that waste discharges are to meet, in addition to effluent limitations, performance standards, effluent prohibitions, pretreatment standards, and any other limitations needed to meet the adopted water use objectives and supporting water quality standards. As appropriate, the permits may include a timetable for appropriate action on the part of the owner or operator of any point source waste discharge.

Wisconsin Department of Health and Social Services, Division of Health: In performing its functions relating to the maintenance and promotion of public health, the Wisconsin Division of Health is charged with the responsibility of regulating the installation and operation of private septic tank sewage disposal systems. The Division reviews plats of all land subdivisions not served by public sanitary sewerage systems and may object to such plats if onsite sanitary waste disposal facilities are not properly provided for in the plat layout.

Wisconsin Department of Administration: The Department of Administration performs many state level planning functions, including the integration of functional plans prepared by state agencies, and serves as the state clearinghouse under the U. S. Office of Management and Budget (OMB) Circular A-95 for all applications for federal grants and related approvals as set forth in the circular.

Wisconsin Department of Transportation: The Wisconsin Department of Transportation is authorized to provide the State with an integrated highway transportation system. In so doing, the Department has important nonpoint source pollution abatement responsibilities with regard to highway construction and maintenance.

Wisconsin Department of Agriculture, Trade, and Consumer Protection: The Wisconsin Department of Agriculture is empowered by Chapter 94 of the Wisconsin Statutes to regulate pesticides. All pesticides distributed, sold, or offered for sale within the State of Wisconsin must be registered annually with the Department of Agriculture. Department regulations have been adopted that control the use, sale, labeling, distribution, and storage of pesticides within the State. Specified pesticides are prohibited or restricted to the extent that they may only be sold with a permit. The Department of Agriculture is also authorized to adopt rules and regulations regarding the application, use, and disposal of those pesticides authorized for use within the Region. The Department of Agriculture serves as the regulatory agency for inspecting and verifying sanitary conditions for dairy and meat production operations. The Department of Agriculture is also able to provide technical assistance to counties and other state agencies in the areas of nonpoint source pollution programs and sludge management, particularly in the land application of sludges. Finally, the Department is the lead agency responsible for the Wisconsin farmland preservation program, a program that combines planning and zoning provisions with tax incentives for the purpose of ensuring the long-term preservation of prime agricultural lands.

University of Wisconsin-Extension: The Extension Service operates on a contractual basis with counties to provide technical and educational assistance within the counties. Of particular importance to implementation of the areawide water quality management plan is the provision of technical assistance by the Extension Service to county soil and water conservation districts, county boards, and county zoning and planning committees. In addition, the Extension Service is well equipped to provide educational services, especially in the areas of nonpoint source pollution and sludge management.

Wisconsin State Board of Soil and Water Conservation Districts: This board, on behalf of the State, coordinates and assists the programs of the county soil and water conservation districts concerned with the proper development, use, and protection of soil, water, and related natural resources; apportions among the districts any funds allotted from state or federal sources; approves district sponsorship of federally assisted watershed projects authorized under Public Law 566; and approves the participation of drainage boards in federally assisted water management projects.

Federal Level Agencies

There exists at the federal level the following agencies that administer federal programs that can have important effects upon implementation of the areawide water quality management plan: the U. S. Environmental Protection Agency; the U. S. Department of Agriculture, Farmers Home Administration, Soil Conservation Service, and Agricultural Stabilization and Conservation Service; the U. S. Department of the Interior, Geological Survey, Fish and Wildlife Service, and Heritage Conservation and Recreation Service; the U. S. Department of Housing and Urban Development; the U. S. Department of Transportation, Federal Highway Administration; and the U. S. Department of the Army, Corps of Engineers.

U. S. Environmental Protection Agency: The U. S. Environmental Protection Agency has broad powers under the Federal Water Pollution Control Act to administer federal grants-in-aid for the construction of publicly owned waste treatment works and related sewerage facilities; to promote and fund areawide waste treatment planning and management; to set and enforce water quality standards, including effluent limitations, through the establishment of water use objectives and supporting water quality standards and the conduct of water quality inventories and inspection and monitoring programs; and to establish a national pollutant discharge elimination system. The Environmental Protection Agency, thus, acts as the key federal water pollution control agency and must approve all basin and areawide water quality management plans as certified to it by appropriate state agencies.

U. S. Department of Agriculture, Farmers Home Administration: The U. S. Department of Agriculture, Farmers Home Administration, administers programs providing for waste disposal construction grants and loans in rural areas. Such grants can be important to implementation of the areawide water quality management plan, particularly with respect to the provision of centralized sanitary sewer service to small villages and lake-oriented communities in the more rural parts of the Region.

U. S. Department of Agriculture, Soil Conservation Service: The U. S. Department of Agriculture, Soil Conservation Service, administers resource conservation and development projects under Public Law 566 and provides technical and financial assistance through soil and water conservation districts to landowners in the planning and construction of measures for land treatment, agricultural water management, and flood prevention, and for public fish, wildlife, and recreational development. The Soil Conservation Service also conducts detailed soils surveys and provides interpretations as a guide to the use of soil survey data in local planning and development. The technical assistance programs of the Soil Conservation Service are of great importance to implementation of the areawide water quality management plan. In addition, the Soil Conservation Service has relatively new authority under Section 208(J) of the Federal Water Pollution Control Act to administer a cost-sharing grant program for the purpose of installing and maintaining agricultural measures found needed to control nonpoint source pollution.

U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service: The U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, administers the federal Agricultural Conservation Program (ACP), which provides grants to rural landowners in partial support of carrying out approved soil, water, woodland, wildlife, and other conservation practices. These grants are awarded under yearly and

long-term assistance programs, providing guaranteed funds for carrying out approved conservation work plans. Grants from the federal Agricultural Conservation Program are important to implementation of the areawide water quality management plan.

U. S. Department of the Interior, Geological Survey: The U. S. Department of the Interior, Geological Survey, conducts continuing programs on water resources appraisal and monitoring. The programs of the Geological Survey are particularly important to carrying out continuous stream gaging efforts, which provide a necessary input to the streamflow analyses so essential to the design of the areawide water quality management plan.

U. S. Department of the Interior, Fish and Wildlife Service: The U. S. Department of the Interior, Fish and Wildlife Service, is the lead federal agency concerned with the maintenance of a healthy fish and aquatic life in the nation's surface waters. While the Fish and Wildlife Service has no direct regulatory authority itself with regard to the setting of water quality standards that would support a healthy fishery, the agency does provide technical assistance to the U. S. Environmental Protection Agency in this matter. Furthermore, the Fish and Wildlife Service provides review comments concerning Section 404 permits for the filling of wetlands that are issued by the U. S. Army Corps of Engineers. This agency can perform an important function in plan implementation, particularly with respect to the land use element.

U. S. Department of the Interior, Heritage Conservation and Recreation Service: This agency administers park and open space acquisition and development grants through the federal Land and Water Conservation fund program. Grants under this program can be particularly important to the implementation of the land use element of the areawide water quality management plan, particularly in the protection and preservation of primary environmental corridors.

U. S. Department of Housing and Urban Development: This agency administers the federal flood insurance program, the federal community development block grant program, and the federal urban development action grant program. The latter two grant programs are available to local units of government for a broad range of activities, including the provision of public sanitary sewerage facilities, and thus can be important to implementation of the areawide water quality management plan. The federal flood insurance program can also be important in implementation of the plan, particularly as it may result in local land use control regulations that ensure that improper development does not take place on natural floodlands, where the potential for water pollution is high.

U. S. Department of Transportation, Federal Highway Administration: This agency administers all federal aid highway programs working through the Wisconsin Department of Transportation. As such, this agency has important nonpoint source pollution abatement responsibilities with regard to the setting of standards for highway construction and maintenance.

U. S. Army Corps of Engineers: The U. S. Army Corps of Engineers has review authority over all permits for waste outfalls discharging to navigable waters. The Corps of Engineers also has authority under Section 208 of the Federal Water Pollution Control Act to consult with and provide technical assistance to states and areawide planning agencies in the development of areawide waste treatment management plans for urban areas, when requested to do so. The Corps of Engineers also has authority to issue permits under Section 404 of the Federal Water Pollution Control Act for the filling of wetlands.

PLAN ADOPTION AND INTEGRATION

Upon adoption of the areawide water quality management plan by formal resolution of the Southeastern Wisconsin Regional Planning Commission in accordance with Section 66.945(10) of the Wisconsin Statutes, the Commission will transmit a certified copy of the resolution adopting the plan, together with a copy of the plan itself, to all local legislative bodies within the Southeastern Wisconsin Region and to all of the aforelisted existing local, state, and federal agencies that have potential plan implementation functions. In accordance with Section 208 of the Federal Water Pollution Control Act as amended, a certified copy will be transmitted to the Wisconsin Natural Resources Board with a request that the Board adopt the plan as the official areawide water quality management plan for southeastern Wisconsin and recommend to the Governor that the plan be approved by him and transmitted as the state-approved plan to the U. S. Environmental Protection Agency for that agency's approval.

Adoption, endorsement, or formal acknowledgement of the areawide water quality management plan by the local legislative bodies and the existing local, areawide, state, and federal level agencies concerned is highly desirable, if not absolutely essential, to ensure a common understanding among the several governmental levels and to enable their staffs to program the necessary plan implementation work. As a part of the adopting or endorsing action, the policymaking body or individual of the designated unit or agency should direct its staff to fully integrate the areawide water quality management plan elements into the plans and programs of that unit or agency of government. It is important to understand that adoption of the areawide water quality management plan by any unit or agency of government pertains only to the statutory duties and functions of the adopting agencies, and such adoption does not and cannot in any way preempt or commit action by another unit or agency of government acting within its own area of functional and geographic jurisdiction.

Local Level Agencies

1. It is recommended that the governing bodies of all cities, villages, and towns within the Region formally adopt the areawide water quality management plan by resolution, pursuant to

Section 66.945(12) of the Wisconsin Statutes, after a report and recommendation by appropriate committees and local plan commissions.

2. It is recommended that the governing bodies of all town sanitary and all utility districts formally adopt the areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, and inform their respective governing bodies of such action.

3. It is recommended that the plan commissions of all cities, villages, and towns in the Region formally adopt the areawide water quality management plan as it affects them by resolution, pursuant to Sections 66.945(12) and 66.23(3)(b) of the Wisconsin Statutes, and certify such adoption to their respective governing bodies.

4. It is recommended that the governing bodies of all inland lake protection and rehabilitation districts now existing in the Region and all such districts created in the future in the Region formally adopt the areawide water quality management plan as it affects them by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes.

5. It is recommended that the governing body of the Geneva Lake Environmental Watershed Agency, an agency created pursuant to the intergovernmental provisions set forth in Section 66.30 of the Wisconsin Statutes, formally adopt the areawide water quality management plan as it affects that agency and by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, certify such adoption to the respective governing bodies that created the agency.

6. It is recommended that the Milwaukee County Board of Supervisors formally adopt the areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, after review and recommendation by the County Planning Commission.

7. It is recommended that the Kenosha, Ozaukee, and Racine County Boards of Supervisors formally adopt the areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, after review and recommendation by their respective county planning and zoning committees.

8. It is recommended that the Walworth, Washington, and Waukesha County Boards of Supervisors formally adopt the areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, after review and recommendations by their respective county park and planning commissions.

9. It is recommended that the seven county soil and water districts within the Region formally adopt the areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, inform their respective county boards of such action, and incorporate the plan recommendations as appropriate into the long-range conservation plans and the annual work plans of the districts.

Areawide Level Agencies

1. It is recommended that the Metropolitan Sewerage Commission of the County of Milwaukee and the Sewerage Commission of the City of Milwaukee, acting jointly on behalf of the Metropolitan Sewerage District of the County of Milwaukee, adopt the recommended areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, and inform its constituent and contract municipalities of such action. Such adoption cannot, of course, preclude the District from taking any actions necessary to meet court-ordered requirements.

2. It is recommended that the Western Racine County Sewerage Commission, the Walworth County Metropolitan Sewerage Commission, and any other metropolitan sewerage commission that may be created within the Region in the future adopt the recommended areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, and inform their constituent municipalities of such action.

3. It is recommended that the Underwood Sewerage Commission, the Menomonee South Sewerage Commission, the Springdale Sewerage Commission, the Poplar Creek Sewerage Commission, the Delafield-Hartland Water Pollution Control Commission, and any other joint sewerage commission or cooperative contract commission formed for sewerage purposes in the future formally adopt the recommended areawide water quality management plan by resolution, pursuant to Section 66.945(12) of the Wisconsin Statutes, and inform their respective governing bodies of such action.

State Level Agencies

1. It is recommended that the Wisconsin Natural Resources Board endorse the areawide water quality management plan, recommend to the Governor that he certify the plan as the official areawide water quality management plan for the seven-county Southeastern Wisconsin Region to the U. S. Environmental Protection Agency, and direct its staff in the Wisconsin Department of Natural Resources to integrate the land use,

the point source pollution abatement, the nonpoint source pollution abatement, the sludge management, and the water quality monitoring plan elements into its broad range of water pollution control agency responsibilities, and to assist in coordinating plan implementation activities.

2. It is recommended that the Wisconsin Department of Health and Social Services endorse the recommended areawide water quality management plan and direct its staff in the Division of Health to utilize the plan recommendations as appropriate in the exercise of its septic tank regulatory authority.

3. It is recommended that the Wisconsin Department of Transportation endorse the recommended areawide water quality management plan and utilize the plan findings and recommendations as a frame of reference and source of information in the development of techniques for the control of pollution from highway construction and maintenance activities.

4. It is recommended that the Wisconsin Department of Agriculture endorse the recommended areawide water quality management plan and utilize the plan recommendations, particularly in the control and regulation of pesticides and pesticide applications and in the administration of the Wisconsin farmland preservation program.

5. It is recommended that the University of Wisconsin-Extension Service endorse the recommended plan and utilize the plan recommendations as appropriate in the development and direction of its work programs, particularly with regard to the provision of county office staff activities, adult education programs, and short courses pertaining to the operation and maintenance of sewage treatment facilities, the importance of appropriate land management practices for urban and rural nonpoint source pollution control, and the proper management and utilization of sewage sludges.

6. It is recommended that the Wisconsin Board of Soil and Water Conservation Districts endorse the recommended areawide water quality management plan and utilize the plan in the coordination of the county soil and water conservation district programs and projects, as required in Section 92.04(4)(c) of the Wisconsin Statutes, and in advising the Wisconsin Department of Natural Resources on matters relating to the sludge management and nonpoint source pollution abatement plan elements.

Federal Level Agencies

1. It is recommended that the U. S. Environmental Protection Agency formally accept and endorse the recommended areawide water quality management plan upon State of Wisconsin certification by the Governor and utilize the plan recommendations in the performance of its broad range of agency responsibilities relating to water quality management.

2. It is recommended that the U. S. Department of Agriculture, Farmers Home Administration, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations in its administration and granting of loans and grants-in-aid for rural waste disposal and treatment facilities.

3. It is recommended that the U. S. Department of Agriculture, Soil Conservation Service, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations in its administration and granting of federal aids for resource conservation and development and multiple-purpose watershed projects, in its provision of technical assistance to landowners and operators in land and water conservation projects, and in its administration of cost-sharing programs for agricultural nonpoint source water pollution control.

4. It is recommended that the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations in its administration of the agricultural conservation program, with particular respect to the agricultural land management measures and practices that most directly affect water quality.

5. It is recommended that the U. S. Department of the Interior, Geological Survey, formally acknowledge the recommended areawide water quality management plan and continue, in cooperation with the various agencies concerned, its entire water resources investigation program.

6. It is recommended that the U. S. Department of the Interior, Fish and Wildlife Service, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations in its administration of programs related to the use of surface waters, wetlands, floodlands, and shorelands for fish and other wildlife habitat.

7. It is recommended that the U. S. Department of the Interior, Heritage Conservation and Recreation Service, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations as appropriate in the administration of grant programs related to the preservation of land having high natural resource values.

8. It is recommended that the U. S. Department of Housing and Urban Development formally

acknowledge the recommended areawide water quality management plan and utilize the plan recommendations as appropriate in the administration of its broad range of grant and loan programs and its federal flood insurance program.

9. It is recommended that the U. S. Department of Transportation, Federal Highway Administration, formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations as appropriate in the setting of standards for highway construction and maintenance activities.

10. It is recommended that the U. S. Army Corps of Engineers formally acknowledge the recommended areawide water quality management plan and utilize the plan recommendations in carrying out its responsibilities relating to the issuance of permits for waste outfalls to navigable waters, for dredge and fill projects, and for the disposal of dredged or fill materials.

SUBSEQUENT ADJUSTMENT OF THE PLAN

No plan can be permanent in all of its aspects or precise in all of its elements. The very definition and characteristics of areawide planning suggest that an areawide plan, to be viable and of use to local, state, and federal units and agencies of government, must be continually adjusted through formal amendments, extensions, additions, and refinements to reflect changing conditions. Amendments, extensions, and additions to the areawide water quality management plan may be expected to be forthcoming not only from the work of the Commission under the continuing areawide water quality management planning program, but also from state agencies as they adjust and refine statewide plans and from federal agencies as national policies are established or modified, as new programs are created, or as existing programs are expanded or curtailed. Adjustments must also come from local planning programs that, of necessity, must be prepared in greater detail and may, therefore, be expected to result in refinement and amendment of the areawide water quality management plan. This is particularly true of the land management elements of the areawide plan. Areawide adjustments may also come from subsequent regional or state planning programs, which may include additional comprehensive or special-purpose planning efforts such as the preparation of groundwater management plans, regional water supply plans, and solid waste management plans.

All of these adjustments and refinements will require the utmost cooperation by the local, areawide, state, and federal agencies of government, as well as coordination by the Southeastern Wisconsin Regional Planning Commission, which has been empowered under Section 66.945(8) of the Wisconsin Statutes to act as a coordinating agency for programs and activities of the local units of government. To achieve this coordination between local, state, and federal programs most effectively and efficiently and, therefore, to assure the timely adjustments of the areawide water quality management plan, it is recommended that all of the state, areawide, and local agencies having various planning and plan implementation powers transmit all subsequent planning studies, plan proposals and amendments, and proposed plan implementation devices to the Southeastern Wisconsin Regional Planning Commission for consideration as to integration into and, as may be needed, adjustment of the areawide water quality management plan. Of particular importance in this respect will be the continuing role of the Technical Advisory Committee on Areawide Water Quality Management Planning in governmental coordination, and the role of the Regional Planning Commission itself under the review authority set forth in the U. S. Office of Management and Budget Circular A-95.

LAND USE PLAN ELEMENT IMPLEMENTATION

As noted in Volume Three, Chapter II of this report, the most fundamental and basic element of the areawide water quality management plan is the land use element. The various recommended means of implementing the regional land use plan have been discussed in detail in Chapter IX of SEWRPC Planning Report No. 25, A Regional Land Use Plan and a Regional Transportation Plan for Southeastern Wisconsin: 2000, Volume Two, Alternative and Recommended Plans. These various methods of land use plan implementation will not be repeated here, but rather are hereby directly incorporated by reference into the plan implementation scheme for the areawide water quality management plan.

POINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT IMPLEMENTATION

Designation of Management Agencies

Section 208 of the Federal Water Pollution Control Act requires that management agencies be designated and responsibilities defined for all aspects of the areawide water quality management plan. The local governmental management agencies for the point source pollution abatement element of the recommended areawide water quality management plan are identified in Table 41. These designations are comprised of all of the units and agencies of government that currently provide centralized sanitary sewer service in the Region, together with proposed new agencies where such action is deemed necessary to carry out the plan recommendations.

In Kenosha County, a total of 19 management agencies have been designated. Of this total, 17 are existing agencies and two would be new agencies. The two new agencies would consist of sanitary and/or utility districts that would be created to provide centralized sanitary sewer service to urban development in the IH 94 service area in the Town of Bristol and the Pleasant Park service area in the Town of Pleasant Prairie. Of the 17 designated agencies now in existence, 16 already provide sanitary sewer service. The 17th agency is the Town of Salem Sewer Utility District No. 2, which has completed all facilities planning for a new sanitary sewerage system and which is seeking state and federal aids to begin construction of the system.

Table 41

LOCAL GOVERNMENTAL MANAGEMENT AGENCY DESIGNATIONS AND SELECTED RESPONSIBILITIES FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Point Source Management Agency	Refine and Detail Sewer Service Area	Construct, Maintain, and Operate Sewage Treatment Plant	Abandon Sewage Treatment Plant	Construct and Maintain Intercommunity Trunk Sewer	Construct and Maintain Local Sewer System	Abate Combined Sewer Overflow	Evaluate the Need to Reduce Clear Water Infiltration and Inflow	Encourage Reduction in Water Use	Meter All Sewage Flows	Eliminate All Points of Sewage Flow Relief	Cooperate With Industries in Pretreatment Programs	Upgrade as Necessary Sewage Treatment Plant Operation
KENOSHA COUNTY												
City of Kenosha	X	X	--	X	X	X	X	X	X	X	X	X
Village of Paddock Lake	X	--	X	X	X	--	X	X	X	X	X	--
Village of Silver Lake	X	X	--	--	X	--	X	X	X	X	--	X
Village of Twin Lakes	X	X	--	--	X	--	X	X	X	--	--	X
Town of Bristol												
Utility District No. 1	X	X	--	--	X	--	X	X	X	X	--	X
New District—IH 94	X	--	--	X	X	--	--	X	X	--	--	--
Town of Pleasant Prairie												
Sewer Utility District No. 1	X	--	--	--	X	--	X	X	X	--	X	--
Sewer Utility District No. 2	X	--	--	--	X	--	X	X	X	--	--	--
Sewer Utility District A	X	--	--	--	X	--	X	X	X	--	--	--
Sewer Utility District B	X	--	--	--	X	--	X	X	X	--	--	--
Sewer Utility District C	X	--	--	--	X	--	X	X	X	--	--	--
Sewer Utility District D	X	X	--	X	X	--	X	X	X	X	--	X
Sewer Utility District E	X	--	--	--	X	--	X	X	X	--	--	--
Sanitary District No. 73-1	X	X	--	--	X	--	X	X	X	--	X	X
New District—Pleasant Park	X	--	X	X	X	--	X	X	X	X	--	--
Town of Salem												
Sewer Utility District No. 1	X	X	--	X	X	--	X	X	X	--	--	X
Sewer Utility District No. 2	X	X	--	X	X	--	X	X	X	--	--	X
Town of Somers												
Sanitary District No. 1	X	--	--	--	X	--	X	X	X	--	--	X
Utility District No. 1	X	--	X	X	X	--	X	X	X	X	--	X
MILWAUKEE COUNTY												
Milwaukee Metropolitan Sewerage District	X	X	X	X	--	X	X	X	X	X	X	X
City of Cudahy	--	--	--	--	X	--	X	X	X	X	X	--
City of Franklin	X	--	X	--	X	--	X	X	X	--	X	--
City of Glendale	--	--	--	--	X	--	X	X	X	X	X	--
City of Greenfield	X	--	--	--	X	--	X	X	X	X	X	--
City of Milwaukee	X	--	--	--	X	X	X	X	X	X	X	--
City of Oak Creek	X	--	--	--	X	--	X	X	X	X	X	--
City of St. Francis	--	--	--	--	X	--	X	X	X	X	X	--
City of South Milwaukee	--	X	--	--	X	--	X	X	X	X	X	X
City of Wauwatosa	--	--	--	--	X	--	X	X	X	X	X	--
City of West Allis	--	--	--	--	X	--	X	X	X	X	X	--
Village of Bayside	--	--	--	--	X	--	X	X	X	X	--	--
Village of Brown Deer	--	--	--	--	X	--	X	X	X	X	X	--
Village of Fox Point	--	--	--	--	X	--	X	X	X	X	--	--
Village of Greendale	--	--	--	--	X	--	X	X	X	--	--	--
Village of Hales Corners	--	--	X	--	X	--	X	X	X	X	--	--
Village of River Hills	--	--	--	--	X	--	X	X	X	X	--	--
Village of Shorewood	--	--	--	--	X	X	X	X	X	X	--	--
Village of West Milwaukee	--	--	--	--	X	--	X	X	X	--	X	--
Village of Whitefish Bay	--	--	--	--	X	--	X	X	X	X	--	--
OZAUKEE COUNTY												
City of Cedarburg	X	X	--	--	X	--	X	X	X	X	X	X
City of Mequon	X	--	--	X	X	--	X	X	X	X	X	--
City of Port Washington	X	X	--	--	X	--	X	X	X	X	X	X
Village of Belgium	X	X	--	X	X	--	X	X	X	X	--	X
Village of Fredonia	X	X	--	X	X	--	X	X	X	X	X	X
Village of Grafton	X	X	--	--	X	--	X	X	X	--	X	X
Village of Saukville	X	X	--	--	X	--	X	X	X	X	X	X
Village of Thiensville	--	--	X	X	X	--	X	X	X	X	X	--
Town of Belgium												
New District—Lake Church	X	--	--	X	X	--	--	X	X	--	--	--
Town of Fredonia												
Waubeka Area Sanitary District	X	--	--	X	X	--	--	X	X	--	--	--
RACINE COUNTY												
Wisconsin Department of Health and Social Services	--	--	X	X	X	--	X	X	X	--	--	--
Western Racine County Sewerage District	--	X	--	--	--	--	--	X	X	--	X	X
City of Burlington	X	X	--	--	X	--	X	X	X	--	X	X
City of Racine	X	X	--	X	X	X	X	X	X	X	X	X
Village of Elmwood Park	--	--	--	--	X	--	X	X	X	--	--	--
Village of North Bay	--	--	--	--	X	--	X	X	X	X	--	--
Village of Rochester	X	--	--	--	X	--	X	X	X	--	--	--
Village of Sturtevant	X	--	X	X	X	--	X	X	X	X	X	--
Village of Union Grove	X	X	--	X	X	--	X	X	X	X	X	X
Village of Waterford	X	--	--	--	X	--	X	X	X	--	X	--
Town of Burlington												
Browns Lake Sanitary District	X	--	--	--	X	--	X	X	X	--	--	--
Town of Caledonia												
Sewer Utility District No. 1	X	--	--	X	X	--	X	X	X	X	X	--
Caddy Vista Sanitary District	X	--	X	X	X	--	X	X	X	X	--	--
Crestview Sanitary District	X	--	--	X	X	--	X	X	X	--	--	--
North Park Sanitary District[a]	X	--	X	X	X	--	X	X	X	--	X	--
Town of Dover												
Eagle Lake Sewer Utility District	X	X	--	--	X	--	--	X	X	--	--	X
Town of Mt. Pleasant												
Sewer Utility District No. 1	X	--	--	--	X	--	X	X	X	X	X	--
Town of Norway												
Sanitary District No. 1	X	X	--	--	X	--	--	X	X	--	--	X
Town of Rochester												
Sewer Utility District No. 1	X	--	--	--	X	--	X	X	X	--	--	--
Town of Waterford												
Sanitary District No. 1	X	--	--	X	X	--	--	X	X	--	--	--
Town of Yorkville												
Sanitary District No. 1	X	X	--	--	X	--	--	X	X	--	X	X

Table 41 (continued)

Point Source Management Agency	Refine and Detail Sewer Service Area	Construct, Maintain, and Operate Sewage Treatment Plant	Abandon Sewage Treatment Plant	Construct and Maintain Intercommunity Trunk Sewer	Construct and Maintain Local Sewer System	Abate Combined Sewer Overflow	Evaluate the Need to Reduce Clear Water Infiltration and Inflow	Encourage Reduction in Water Use	Meter All Sewage Flows	Eliminate All Points of Sewage Flow Relief	Cooperate With Industries in Pretreatment Programs	Upgrade as Necessary Sewage Treatment Plant Operation
WALWORTH COUNTY												
Walworth County	--	--	X	X	X	--	X	X	X	--	--	--
Walworth County Metropolitan Sewerage District	--	X	--	X	--	--	--	X	X	--	X	X
City of Delavan	X	--	X	--	X	--	X	X	X	X	X	--
City of Elkhorn	X	--	X	X	X	--	X	X	X	X	X	--
City of Lake Geneva	X	X	--	X	X	--	X	X	X	X	X	--
City of Whitewater	X	X	--	--	X	--	X	X	X	X	X	--
Village of Darien	X	X	--	--	X	--	X	X	X	X	X	--
Village of East Troy	X	X	--	--	X	--	X	X	X	X	X	--
Village of Fontana	X	--	X	X	X	--	X	X	X	--	--	X
Village of Genoa City	X	X	--	--	X	--	X	X	X	X	X	--
Village of Sharon	X	X	--	--	X	--	X	X	X	X	X	--
Village of Walworth	X	X	--	X	X	--	X	X	X	X	--	X
Village of Williams Bay	X	--	X	X	X	--	X	X	X	--	--	X
Town of Delavan Delavan Lake Sanitary District[b]	X	--	--	X	X	--	--	X	X	--	--	--
Town of East Troy Sanitary District No. 2	X	--	--	X	X	--	--	X	X	--	--	--
Town of Geneva New District—Lake Como	X	--	--	X	X	--	--	X	X	--	--	--
Town of Linn Sanitary District No. 1	X	--	--	X	X	--	--	X	X	--	--	--
Town of Lyons Sanitary District No. 2	X	X	--	--	X	--	--	X	X	--	--	--
WASHINGTON COUNTY												
City of Hartford	X	X	--	--	X	--	X	X	X	--	X	X
City of West Bend	X	X	--	--	X	--	X	X	X	X	X	X
Village of Germantown	X	--	X	X	X	--	X	X	X	--	X	--
Village of Jackson	X	X	--	--	X	--	X	X	X	X	X	X
Village of Kewaskum	X	X	--	--	X	--	X	X	X	--	X	X
Village of Newburg	X	X	--	--	X	--	X	X	X	X	--	X
Village of Slinger	X	X	--	--	X	--	X	X	X	--	X	X
Town of Addison Allenton Sanitary District	X	X	--	--	X	--	X	X	X	--	X	X
Town of Trenton Wallace Lake Sanitary District[c]	X	--	--	--	X	--	X	X	X	--	--	--
WAUKESHA COUNTY												
Delafield-Hartland Water Pollution Control Commission	--	X	--	X	--	--	X	X	X	--	X	X
Menomonee South Sewerage Commission	--	--	--	X	--	--	X	X	X	--	--	--
Poplar Creek Sewerage Commission	--	--	--	X	--	--	X	X	X	--	--	--
Springdale Sewerage Commission	--	--	--	X	--	--	X	X	X	--	--	--
Underwood Sewerage Commission	--	--	--	X	--	--	X	X	X	--	--	--
City of Brookfield	X	X	--	X	X	--	X	X	X	X	X	--
City of Delafield	X	--	--	X	X	--	--	X	X	--	--	X
City of Muskego	X	--	X	X	X	--	X	X	X	X	X	--
City of New Berlin	X	--	X	X	X	--	X	X	X	--	X	--
City of Oconomowoc	X	X	--	X	X	--	X	X	X	X	X	X
City of Waukesha	X	X	--	--	X	--	X	X	X	X	X	X
Village of Butler	--	--	--	--	X	--	X	X	X	X	X	--
Village of Chenequa	X	--	--	X	X	--	--	X	X	--	--	--
Village of Dousman	X	X	--	--	X	--	X	X	X	X	--	X
Village of Elm Grove	--	--	--	--	X	--	X	X	X	X	--	--
Village of Hartland	X	--	X	X	X	--	X	X	X	X	X	--
Village of Lac La Belle	X	--	--	X	X	--	--	X	X	--	--	--
Village of Lannon	X	--	--	X	X	--	--	X	X	--	--	--
Village of Menomonee Falls	X	--	X	X	X	--	X	X	X	X	X	--
Village of Mukwonago	X	X	--	--	X	--	X	X	X	--	X	X
Village of Nashotah	X	--	--	X	X	--	--	X	X	--	--	--
Village of North Prairie	X	X	--	--	X	--	--	X	X	--	X	X
Village of Oconomowoc Lake	X	--	--	X	X	--	--	X	X	--	--	--
Village of Pewaukee	X	--	X	X	X	--	X	X	X	X	X	--
Village of Sussex	X	--	X	X	X	--	X	X	X	X	X	--
Village of Wales	X	X	--	--	X	--	--	X	X	--	--	X
Town of Brookfield	X	--	--	X	X	--	--	X	X	--	--	--
Town of Lisbon New District	X	--	--	X	X	--	--	X	X	--	--	--
Town of Merton New District—North Lake	X	--	--	X	X	--	--	X	X	--	--	--
New District—Beaver Lake	X	--	--	X	X	--	--	X	X	--	--	--
Town of Oconomowoc New District—Lac La Belle	X	--	--	X	X	--	--	X	X	--	--	--
New District—Okauchee[d]	X	--	--	X	X	--	--	X	X	--	--	--
Town of Pewaukee Sanitary District No. 3	X	--	--	X	X	--	--	X	X	--	--	--
Pewaukee Lake Sanitary District[e]	X	--	--	X	X	--	--	X	X	--	--	--
Town of Summit New District—Nashotah-Nemahbin Lakes	X	--	--	X	X	--	--	X	X	--	--	--
New District—Silver Lake	X	--	--	X	X	--	--	X	X	--	--	--

[a] *The North Park Sanitary District also serves the Village of Wind Point.*

[b] *The Delavan Lake Sanitary District also serves part of the Town of Walworth.*

[c] *The Wallace Lake Sanitary District also serves part of the Town of Barton.*

[d] *This new District would also serve part of the Town of Merton.*

[e] *The Pewaukee Lake Sanitary District also serves part of the Town of Delafield.*

Source: SEWRPC.

In Milwaukee County, a total of 20 agencies have been designated. All 20 of these agencies, which consist of the 19 local units of government in the County and the Milwaukee Metropolitan Sewerage District, already provide centralized sanitary sewer service.

In Ozaukee County, a total of 10 agencies have been designated. Nine of the agencies currently exist. One new agency is proposed to be formed, that being a sanitary or utility district in the Town of Belgium to provide centralized sanitary sewer service to the Lake Church and Harrington Beach areas of the Town. Of the nine existing management agencies, eight currently provide centralized sanitary sewer service. One agency—the Waubeka Area Sanitary District in the Town of Fredonia—has been recently created and is currently completing facilities planning work that would lead to the construction of a local sewer system in the Waubeka area of the Town of Fredonia, with treatment to be provided at the Village of Fredonia sewage treatment plant.

In Racine County, a total of 21 management agencies have been designated, all of which currently exist. Of the 21 agencies, 18 already provide centralized sanitary sewer service. One additional agency—the Eagle Lake Sewer Utility District in the Town of Dover—currently has a new sewerage system under construction. Two additional agencies—the Town of Yorkville Sanitary District No. 1 and the Town of Waterford Sanitary District No. 1—do not yet provide sanitary sewer service but are recommended in the plan to construct sewerage systems.

In Walworth County, a total of 18 management agencies have been designated. Of these 18 agencies, all but one—the proposed new sanitary or utility district to serve the Lake Como area in the Town of Geneva—currently exist. Of the 17 existing agencies, 12 currently provide centralized sanitary sewer service. Existing agencies that do not now provide sewer service but that are recommended to provide such service in the future include the Walworth County Metropolitan Sewerage District, the Delavan Lake Sanitary District, the Town of East Troy Sanitary District No. 2, the Town of Linn Sanitary District No. 1, and the Town of Lyons Sanitary District No. 2.

A total of nine agencies have been designated in Washington County. All nine of these agencies currently exist, and all but one—the Wallace Lake Sanitary District in the Town of Trenton—currently provide sanitary sewer service. It is proposed that a local sewerage system be constructed by the Wallace Lake Sanitary District, with conveyance of sewage for treatment to the City of West Bend sewage treatment plant.

In Waukesha County, a total of 36 management agencies have been designated. Of this total, 29 agencies currently exist. Seven new agencies would be created, consisting of sanitary and/or utility districts in the Town of Lisbon, in the North Lake and Beaver Lake portions of the Town of Merton, in the Lac La Belle and Okauchee areas of the Town of Oconomowoc, and in the Nashotah-Nemahbin Lakes and Silver Lake areas of the Town of Summit. Of the 29 existing management agencies in Waukesha County, 18 currently provide centralized sanitary sewer service. The 11 agencies which do not yet provide such service but which are recommended to provide such service in the plan consist of: the Delafield-Hartland Water Pollution Control Commission, the Menomonee-South Sewerage Commission, the Poplar Creek Sewerage Commission, the City of Delafield, the Village of Chenequa, the Village of Lac La Belle, the Village of Lannon, the Village of Nashotah, the Village of North Prairie, the Village of Oconomowoc Lake, and the Village of Wales. Of these 11 agencies, four—the Delafield-Hartland Water Pollution Control Commission, the Poplar Creek Sewerage Commission, the City of Delafield, and the Village of Nashotah—currently have systems under construction or nearing construction.

For the Region as a whole, then, a total of 133 management agencies have been designated for point source pollution abatement purposes. Of this total, all but 11 agencies currently exist. The 11 new agencies would be sanitary and/or utility districts created to provide centralized sanitary sewer service to urban development in various towns throughout the Region. Of the 122 existing management agencies, 100 already provide centralized sanitary sewer service.

In addition to the foregoing local government management designations for point source pollution abatement purposes, the Wisconsin Department of Natural Resources is designated as the management agency with primary responsibility for ensuring the full implementation of the entire point source pollution abatement plan element. It is envisioned that the primary mechanism to be used by the Department to ensure plan implementation would be the waste discharge permit process established under the Wisconsin Pollutant Discharge Elimination System (WPDES). Certain other important tasks would, however, be attendant to the role of the Department in implementation of the plan. The development of detailed sewerage facilities plans will require effluent limitation (waste load allocation) studies by the Department to refine and detail the allowable effluent limits for specific sewage treatment plants so that the recommended water use objectives and supporting standards in the plan are met. The Department may need to review its administrative rules and procedures with regard to the application of the recommended phosphorus standard to the lakes and streams of the Region, and to attainment of that standard through the regulation of the design of facilities to abate point sources of pollution.

The major responsibilities of the designated management agencies in carrying out the areawide water quality management plan are also identified in Table 41. As shown in the table, these management agency responsibilities include the refinement and detailing of sanitary sewer service areas; the construction, maintenance, and operation of sewage treatment plants; the abandonment of sewage treatment plants; the construction and maintenance of intercommunity trunk sewers; the construction

and maintenance of local sewer collection systems; the abatement of combined sewer overflows; the determination of the best means of reducing clear water infiltration and inflow; educational programs to encourage reduction in water use; the metering of all sewage flows; the elimination of all overflows of raw sewage; the mounting of pretreatment programs in cooperation with industries; and the improvement of sewage treatment plant operation. Not all agencies will be assigned all of these responsibilities. A more detailed discussion of the specific responsibilities assigned to the designated management agencies with regard to the point source pollution abatement element of the plan is set forth below.

Sewer Service Areas

The recommended areawide water quality management plan described in the previous chapter of this volume includes a map showing the proposed year 2000 sanitary sewer service areas (see Map 4). The sewer service areas shown on this plan map represent general delineations based upon the objectives set forth in the adopted regional land use plan. It is recommended that those management agencies identified in Table 41 as needing to refine and detail the sewer service areas do so through the preparation of detailed sewerage facilities plans. In many cases such plans are currently under preparation or have recently been completed. In other cases it will be necessary for the management agencies to undertake the preparation of such plans and thereby refine and detail the recommended sewer service areas, taking into account local needs and objectives that cannot be properly addressed at the areawide level of planning. All local planning efforts that result in the preparation of more refined and detailed sanitary sewer service areas should be transmitted to the Southeastern Wisconsin Regional Planning Commission and the Wisconsin Department of Natural Resources so that the Commission and the Department can make a determination as to the conformance of the refined and detailed sewer service areas with the areawide water quality management plan and incorporate the refined and detailed plans into the continuing areawide water quality management plan implementation effort.

Implementation Schedules—Public Sewage Treatment Plants, Intercommunity Trunk Sewers, and Abatement of Combined Sewer Overflows

In order to provide a point of departure for intergovernmental discussions and negotiations involving the development of necessary areawide sanitary sewerage systems and to further provide a basis for federal and state agency programming, including the issuance of waste discharge permits and the allocation of grant-in-aid monies, a series of implementation schedules for the sewerage facility recommendations of the point source pollution abatement element of the recommended plan was prepared. One schedule was prepared for each subregional area as those areas are shown on Map 4 in Chapter II of this volume. These schedules include recommended dates for the implementation of each individual plan component, including those relating to sewage treatment plant construction and abandonment, intercommunity trunk sewer construction, and abatement of combined sewer overflows. While these schedules set forth dates for the completion of each individual recommended plan component, it should be recognized that the actual timing of implementation will vary from the schedule, depending upon the rate of urban growth and development in various subareas of the Region, upon the availability of local matching, as well as federal and state grant-in-aid, monies, and upon the phasing of the five-year cycle embodied in the waste discharge permits issued by the Department of Natural Resources to operators of sewage treatment plants.

It is accordingly recommended that each identified management agency use the schedule provided as a point of departure in the preparation of a refined schedule for the programming of needed facility construction. It is further recommended that the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency utilize the timetable set forth in the implementation schedules in preparing schedules of compliance for each owner and operator of a waste source seeking a waste discharge permit under the Wisconsin Pollutant Discharge Elimination System. The recommendations contained in each implementation schedule are summarized by subregional area in the following discussion.

Milwaukee Metropolitan Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Milwaukee metropolitan subregional area is set forth in Table 42. To the extent possible this schedule has been coordinated with the sewerage facilities planning program being undertaken by the Milwaukee Metropolitan Sewerage District. As that planning program culminates in the completion of a detailed facilities plan, the proposed implementation schedule may have to be revised.

With respect to sewage treatment plants, the schedule recommends that the Milwaukee Metropolitan Sewerage District complete improvements of the existing secondary facilities at the South Shore plant by 1984 and the Jones Island plant by 1986. Additional improvements at the Jones Island plant to provide improved effluent disinfection and the construction of an outfall sewer to convey and discharge treated effluent outside the Milwaukee harbor area are also envisioned in the schedule to be completed by 1986.

With regard to needed treatment plant improvements, interstate litigation has resulted in the potential for an increased level of treatment at the Jones Island and South Shore treatment plants. The judgment order issued by the U. S. District Court as a result of that litigation requires that the Jones Island and South Shore plants achieve an effluent quality of 5.0 milligrams per liter (mg/l) of BOD and 5.0 mg/l of suspended solids. As discussed in Chapter II of this report, these requirements are being appealed, and have important cost implica-

Table 42

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE MILWAUKEE METROPOLITAN SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element							Trunk Sewer Plan Element[b,c]	Combined Sewer Overflow Abatement Plan Element
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment			
		Nitrification	Phosphorus Removal 1.0 mg/l	Phosphorus Removal 0.1 mg/l	Land Application	Effluent Aeration	Effluent Disinfection		
Milwaukee Metropolitan Sewerage District	South Shore—Upgrading as required by 1984 Jones Island—Upgrading as required by 1986	Not Applicable Not Applicable	South Shore—Already provided for Jones Island—Already Provided for	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Applicable Not Applicable	South Shore—Already provided for Jones Island—Upgrading as required by 1986	Northridge (875)—1986 Northeast Side Relief—North Branch (939)—1980 Northeast Side Relief—North Branch (246, 250, 867)—1983 Northeast Side Relief—East Branch (247, 251, 252, 255, 256, 257, 868)—1983 Milwaukee River Relief (278)—1983 Menomonee Falls-Germantown (813 part)—1981 (abandon Menomonee Falls sewage treatment plants) Menomonee Falls-Germantown (813 remainder, 921, 922)—1983 Menomonee River (233, 239)—1977 Underwood Creek (275, 276)—1984 Root River (241, 242, 243)—1983 Hales Corners (237 part)—1981 (abandon Hales Corners sewage treatment plant) Hales Corners (237 remainder)—1984 Franklin-Muskego (238, 266)—1984 Franklin—Northeast (261, 262, 263)—1985 Oak Creek—Southwest (267)—1990 Oak Creek—North (264, 265)—1985 Oak Creek—South (273)—1990 Mitchell Field—South (272)—1985 Caddy Vista (271)—1990	Complete facility planning by 1980 Implement recommendations of facility plan by 1990
Caddy Vista Sanitary District	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Caddy Vista Sanitary District—1980 (abandon Caddy Vista sewage treatment plant)	Not Applicable
Menomonee South Sewerage Commission	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Brookfield-Menomonee Falls—1981	Not Applicable
City of Muskego	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Muskego—1984 (abandon Muskego sewage treatment plants)	Not Applicable
City of New Berlin	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	New Berlin—1984 (abandon Regal Manors sewage treatment plant)	Not Applicable
Village of Germantown	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Germantown—1983 (abandon Germantown sewage treatment plant)	Not Applicable
Village of Thiensville and City of Mequon	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Thiensville-Mequon—1984 (abandon Thiensville sewage treatment plant)	Not Applicable
City of South Milwaukee	Already Provided	Not Applicable	Already Provided	Not Applicable	Not Applicable	Not Applicable	Already Provided	Not Applicable	Not Applicable

NOTES: 1. This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

2. Numbers in parentheses are Milwaukee Metropolitan Sewerage District contract numbers.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 6, Chapter II of this volume.*

[c] *The clear water infiltration/inflow studies being conducted as part of the local facilities planning program by the Milwaukee Metropolitan Sewerage District may result in the recommendation for construction of additional relief sewers as part of the sewer system rehabilitation program. One such sewer—the Hampton Avenue relief sewer—has been tentatively identified by the District as of December 1978.*

Source: SEWRPC.

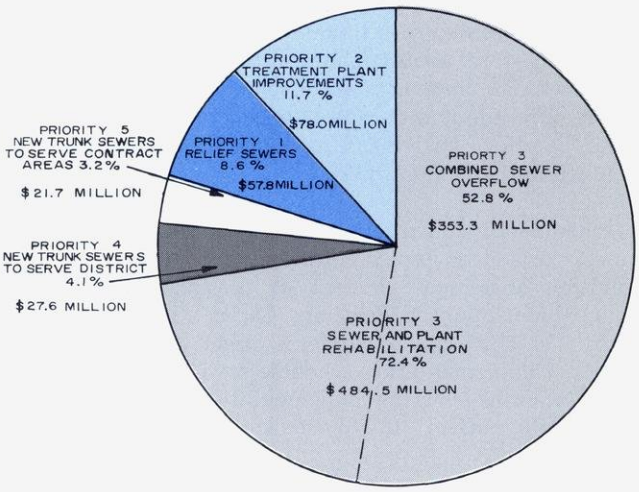
tions in the Milwaukee metropolitan subregional area.[1] No significant improvements except for the construction of an outfall sewer are envisioned at the treatment plant serving the City of South Milwaukee. Other than the foregoing sewage treatment plant facility improvements and the construction of any additional treatment facilities that may be needed to treat combined sewer overflows, no further treatment plant improvements are anticipated to be required in this subarea by 2000.

The proposed time schedule for completion of the long-range Metropolitan District trunk and relief intercepting sewer construction program is shown in Table 42 and on Map 6 in Chapter II of this volume. The Metropolitan District trunk sewers are identified by name and by District-assigned contract numbers. Local intercommunity trunk sewers needed to fully implement the plan recommendations are also included by name in Table 42 and on Map 6. Based upon this implementation schedule, it is anticipated that abandonment of existing public sewage treatment plants would occur as follows: Caddy Vista plant—1980; Hales Corners plant—1981; two Menomonee Falls plants—1981; Germantown plant—1983; Muskego plants—1984; New Berlin Regal Manors plant—1984; and Thiensville plant—1984. This schedule of sewage treatment plant abandonment reflects the phased construction of trunk sewers in the manner set forth in the implementation schedule. In a staff memorandum entitled "SEWRPC Staff Analysis of Milwaukee Metropolitan Sewerage District Capital Projects," dated July 19, 1976, and prepared before the establishment of the Milwaukee Water Pollution Abatement Program Office, the SEWRPC staff analyzed the then-existing capital expenditures program of the Metropolitan Sewerage District. As set forth in Figures 3 and 4, taken from that document, the planned extension of new trunk sewers to serve contract areas outside the District constituted only 3.2 percent of the total estimated capital improvement needs, a maximum of 10.8 percent of the then-planned annual expenditures schedule, and an average of 6.7 percent of the seven-year expenditures schedule of construction for those sewers.

[1] *On April 26, 1979, the U. S. Court of Appeals for the Seventh Circuit issued a decision, affirming parts of the judgment order issued by Judge John F. Grady of the U. S. District Court of Northern Illinois, and reversing and remanding other parts. Among other elements affirmed were the orders to eliminate combined sewer overflows that would occur during the largest storm of record, and to require the Jones Island and South Shore sewage treatment plants, as well as any treatment facilities for combined sewer overflows, to provide an effluent having a level of phosphorus of 1.0 mg/l measured on a monthly average basis. Reversed and remanded back to the District Court for modification were the court-ordered suspended solids, BOD, fecal coliform, and free chlorine residuals limitations more stringent than those prescribed in the discharge permits for the two plants involved.*

Figure 3

RELATIVE PROPORTION OF SEWERAGE IMPROVEMENT REQUIREMENTS–METROPOLITAN SEWERAGE DISTRICT OF THE COUNTY OF MILWAUKEE

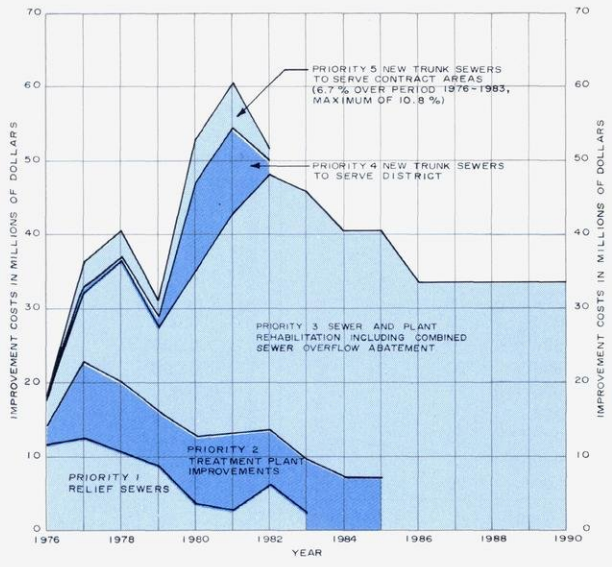


TOTAL $669.7 MILLION

Source: SEWRPC.

Figure 4

DISTRIBUTION OF SEWERAGE IMPROVEMENT COSTS–1976-1990 : METROPOLITAN SEWERAGE DISTRICT OF THE COUNTY OF MILWAUKEE



Source: SEWRPC.

With respect to abatement of combined sewer overflows in the Milwaukee area, the proposed implementation schedule calls for completion of the facilities planning work now underway by 1980. This step should include adoption by the Milwaukee Metropolitan Sewerage District, the Regional Planning Commission, and all other agencies concerned of a final set of recommendations as to how best to abate pollution from combined sewer overflows. The implementation schedule envisions that it will require about a decade to carry out the combined sewer overflow abatement recommendations ultimately included in the facilities plan.

A schedule of construction and operation and maintenance costs for implementation of the point source pollution abatement element of the plan in the Milwaukee Metropolitan Sewerage District is set forth in Table 43. This cost schedule is directly related to the proposed implementation schedule set forth in Table 42. Any deviations from the implementation schedule would, accordingly, affect the cost schedule set forth in Table 43.

Upper Milwaukee River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Upper Milwaukee River subregional area is set forth in Table 44. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 45.

With respect to sewage treatment plants, the schedule envisions that the plant expansion program now underway at the City of West Bend treatment facility will be completed by 1980. Additional treatment units at the West Bend plant to achieve an effluent concentration of 0.1 mg/l of phosphorus are called for by 1990. The schedule calls for completion of the new Village of Jackson sewage treatment plant by 1981, with addition by 1990 of treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus. For the plants serving the Villages of Fredonia and Saukville, the schedule calls for expansion by 1983, with the Fredonia plant being expanded to sufficiently accommodate sewage from the Waubeka Area Sanitary District, as well

Table 43

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE MILWAUKEE METROPOLITAN SUBREGIONAL AREA: 1976-2000[a]

		Sewage Treatment Plant Element							
		Milwaukee Metropolitan Sewerage Commission Jones Island Plant		Milwaukee Metropolitan Sewerage Commission South Shore Plant		South Milwaukee		Subtotal Sewage Treatment Plant Plan Element	
Calendar Year	Project Year	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 11,000,000	$ --	$ 8,700,000	$ --	$ 360,000	$ --	$ 20,060,000
1977	2	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1978	3	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1979	4	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1980	5	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1981	6	5,000,000	11,000,000	200,000	8,700,000	--	360,000	5,200,000	20,060,000
1982	7	9,000,000	11,000,000	400,000	8,700,000	50,000	360,000	9,450,000	20,060,000
1983	8	9,000,000	11,000,000	400,000	8,700,000	200,000	360,000	9,600,000	20,060,000
1984	9	9,000,000	11,000,000	400,000	8,700,000	200,000	360,000	9,600,000	20,060,000
1985	10	9,000,000	11,000,000	--	8,700,000	--	360,000	9,000,000	20,060,000
1986	11	9,000,000	11,000,000	--	8,700,000	--	360,000	9,000,000	20,060,000
1987	12	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1988	13	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1989	14	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1990	15	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1991	16	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1992	17	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1993	18	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1994	19	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1995	20	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1996	21	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1997	22	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1998	23	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
1999	24	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
2000	25	--	11,000,000	--	8,700,000	--	360,000	--	20,060,000
Total		$ 50,000,000	$275,000,000	$ 1,400,000	$217,500,000	$ 450,000	$ 9,000,000	$ 51,850,000	$501,500,000
Annual Average		$ 2,000,000	$ 11,000,000	$ 56,000	$ 8,700,000	$ 18,000	$ 360,000	$ 2,074,000	$ 20,060,000

Table 43 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Northridge		Northeast Side Relief-North Branch		Northeast Side Relief-East Branch		Milwaukee River Relief	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	73,000	--	--	--	--	--
1979	4	--	--	324,000	--	--	--	--	--
1980	5	--	--	324,000	100	--	--	--	--
1981	6	--	--	1,707,000	100	1,637,000	--	168,000	--
1982	7	--	--	7,684,000	100	7,361,000	--	750,000	--
1983	8	--	--	7,684,000	100	7,361,000	14,000	750,000	500
1984	9	85,000	--	--	100	--	14,000	--	500
1985	10	381,000	--	--	100	--	14,000	--	500
1986	11	381,000	400	--	100	--	14,000	--	500
1987	12	--	400	--	100	--	14,000	--	500
1988	13	--	400	--	100	--	14,000	--	500
1989	14	--	400	--	100	--	14,000	--	500
1990	15	--	400	--	100	--	14,000	--	500
1991	16	--	400	--	100	--	14,000	--	500
1992	17	--	400	--	100	--	14,000	--	500
1993	18	--	400	--	100	--	14,000	--	500
1994	19	--	400	--	100	--	14,000	--	500
1995	20	--	400	--	100	--	14,000	--	500
1996	21	--	400	--	100	--	14,000	--	500
1997	22	--	400	--	100	--	14,000	--	500
1998	23	--	400	--	100	--	14,000	--	500
1999	24	--	400	--	100	--	14,000	--	500
2000	25	--	400	--	100	--	14,000	--	500
Total		$ 847,000	$ 6,000	$ 17,796,000	$ 2,100	$ 16,359,000	$ 252,000	$ 1,668,000	$ 9,000
Annual Average		$ 33,880	$ 240	$ 711,840	$ 84	$ 654,360	$ 10,080	$ 66,720	$ 360

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Menomonee Falls Germantown		Menomonee River		Underwood Creek		Root River	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ 1,324,000	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	11,916,000	900	--	--	--	--
1978	3	--	--	--	900	--	--	--	--
1979	4	493,000	--	--	900	--	--	--	--
1980	5	2,218,000	--	--	900	--	--	--	--
1981	6	3,037,000	500	--	900	--	--	909,000	--
1982	7	3,680,000	500	--	900	449,000	--	4,087,000	--
1983	8	3,680,000	1,500	--	900	2,015,000	--	4,087,000	2,000
1984	9	--	1,500	--	900	2,015,000	1,300	--	2,000
1985	10	--	1,500	--	900	--	1,300	--	2,000
1986	11	--	1,500	--	900	--	1,300	--	2,000
1987	12	--	1,500	--	900	--	1,300	--	2,000
1988	13	--	1,500	--	900	--	1,300	--	2,000
1989	14	--	1,500	--	900	--	1,300	--	2,000
1990	15	--	1,500	--	900	--	1,300	--	2,000
1991	16	--	1,500	--	900	--	1,300	--	2,000
1992	17	--	1,500	--	900	--	1,300	--	2,000
1993	18	--	1,500	--	900	--	1,300	--	2,000
1994	19	--	1,500	--	900	--	1,300	--	2,000
1995	20	--	1,500	--	900	--	1,300	--	2,000
1996	21	--	1,500	--	900	--	1,300	--	2,000
1997	22	--	1,500	--	900	--	1,300	--	2,000
1998	23	--	1,500	--	900	--	1,300	--	2,000
1999	24	--	1,500	--	900	--	1,300	--	2,000
2000	25	--	1,500	--	900	--	1,300	--	2,000
Total		$ 13,108,000	$ 28,000	$ 13,240,000	$ 21,600	$ 4,479,000	$ 22,100	$ 9,083,000	$ 36,000
Annual Average		$ 524,320	$ 1,120	$ 529,600	$ 864	$ 179,160	$ 884	$ 363,320	$ 1,440

Table 43 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Hales Corners		Franklin-Muskego		Franklin-Northeast		Oak Creek-Southwest	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	400,000	--	--	--	--	--	--	--
1980	5	1,798,000	--	--	--	--	--	--	--
1981	6	1,798,000	700	--	--	--	--	--	--
1982	7	119,000	700	497,000	--	--	--	--	--
1983	8	529,000	700	2,239,000	--	660,000	--	--	--
1984	9	529,000	900	2,239,000	1,300	2,967,000	--	--	--
1985	10	--	900	--	1,300	2,967,000	2,100	--	--
1986	11	--	900	--	1,300	--	2,100	--	--
1987	12	--	900	--	1,300	--	2,100	--	--
1988	13	--	900	--	1,300	--	2,100	188,000	--
1989	14	--	900	--	1,300	--	2,100	842,000	--
1990	15	--	900	--	1,300	--	2,100	842,000	500
1991	16	--	900	--	1,300	--	2,100	--	500
1992	17	--	900	--	1,300	--	2,100	--	500
1993	18	--	900	--	1,300	--	2,100	--	500
1994	19	--	900	--	1,300	--	2,100	--	500
1995	20	--	900	--	1,300	--	2,100	--	500
1996	21	--	900	--	1,300	--	2,100	--	500
1997	22	--	900	--	1,300	--	2,100	--	500
1998	23	--	900	--	1,300	--	2,100	--	500
1999	24	--	900	--	1,300	--	2,100	--	500
2000	25	--	900	--	1,300	--	2,100	--	500
Total		$ 5,173,000	$ 17,400	$ 4,975,000	$ 22,100	$ 6,594,000	$ 33,600	$ 1,872,000	$ 5,500
Annual Average		$ 206,920	$ 696	$ 199,000	$ 884	$ 263,760	$ 1,344	$ 74,880	$ 220

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Oak Creek		Oak Creek-South		Mitchell Field-South		Caddy Vista	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--
1980	5	--	--	--	--	--	--	--	--
1981	6	--	--	--	--	--	--	--	--
1982	7	--	--	--	--	--	--	--	--
1983	8	291,000	--	--	--	282,000	--	--	--
1984	9	1,307,000	--	--	--	1,263,000	--	--	--
1985	10	1,307,000	900	--	--	1,263,000	900	--	--
1986	11	--	900	--	--	--	900	--	--
1987	12	--	900	--	--	--	900	--	--
1988	13	--	900	184,000	--	--	900	353,000	--
1989	14	--	900	828,000	--	--	900	1,586,000	--
1990	15	--	900	828,000	500	--	900	1,586,000	1,100
1991	16	--	900	--	500	--	900	--	1,100
1992	17	--	900	--	500	--	900	--	1,100
1993	18	--	900	--	500	--	900	--	1,100
1994	19	--	900	--	500	--	900	--	1,100
1995	20	--	900	--	500	--	900	--	1,100
1996	21	--	900	--	500	--	900	--	1,100
1997	22	--	900	--	500	--	900	--	1,100
1998	23	--	900	--	500	--	900	--	1,100
1999	24	--	900	--	500	--	900	--	1,100
2000	25	--	900	--	500	--	900	--	1,100
Total		$ 2,905,000	$ 14,400	$ 1,840,000	$ 5,500	$ 2,808,000	$ 14,400	$ 3,525,000	$ 12,100
Annual Average		$ 116,200	$ 576	$ 73,600	$ 220	$ 112,320	$ 576	$ 141,000	$ 484

Table 43 (continued)

Calendar Year	Project Year	Subtotal Milwaukee Metropolitan Sewerage District Intercommunity Trunk Sewer Plan Element		Local Intercommunity Trunk Sewer Plan Element					
				Caddy Vista Sanitary District		Muskego		New Berlin	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ 1,324,000	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	11,916,000	900	--	--	--	--	--	--
1978	3	73,000	900	52,000	--	--	--	--	--
1979	4	1,217,000	900	229,000	--	--	--	--	--
1980	5	4,340,000	1,000	229,000	8,500	--	--	--	--
1981	6	9,256,000	2,200	--	8,500	--	--	--	--
1982	7	24,627,000	2,200	--	8,500	226,000	--	136,000	--
1983	8	29,578,000	19,700	--	8,500	1,017,000	--	607,000	--
1984	9	10,405,000	22,500	--	8,500	1,017,000	1,670	607,000	1,600
1985	10	5,918,000	26,400	--	8,500	--	1,670	--	1,600
1986	11	381,000	26,800	--	8,500	--	1,670	--	1,600
1987	12	--	26,800	--	8,500	--	1,670	--	1,600
1988	13	725,000	26,800	--	8,500	--	1,670	--	1,600
1989	14	3,256,000	26,800	--	8,500	--	1,670	--	1,600
1990	15	3,256,000	28,900	--	8,500	--	1,670	--	1,600
1991	16	--	28,900	--	8,500	--	1,670	--	1,600
1992	17	--	28,900	--	8,500	--	1,670	--	1,600
1993	18	--	28,900	--	8,500	--	1,670	--	1,600
1994	19	--	28,900	--	8,500	--	1,670	--	1,600
1995	20	--	28,900	--	8,500	--	1,670	--	1,600
1996	21	--	28,900	--	8,500	--	1,670	--	1,600
1997	22	--	28,900	--	8,500	--	1,670	--	1,600
1998	23	--	28,900	--	8,500	--	1,670	--	1,600
1999	24	--	28,900	--	8,500	--	1,670	--	
2000	25	--	28,900	--	8,500	--	1,670	--	1,600
Total		$106,272,000	$ 501,800	$ 510,000	$ 178,500	$ 2,260,000	$ 28,390	$ 1,350,000	$ 27,200
Annual Average		$ 4,250,880	$ 20,072	$ 20,400	$ 7,140	$ 90,400	$ 1,136	$ 54,000	$ 1,088

Calendar Year	Project Year	Local Intercommunity Trunk Sewer Plan Element						Subtotal Local Intercommunity Trunk Sewer Plan Element	
		Brookfield Menomonee Falls		Germantown		Thiensville-Mequon			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	52,000	--
1979	4	58,000	--	--	--	--	--	287,000	--
1980	5	261,000	--	--	--	--	--	490,000	8,500
1981	6	261,000	800	410,000	--	--	--	671,000	9,300
1982	7	--	800	1,840,000	--	80,000	--	2,282,000	9,300
1983	8	--	800	1,840,000	57,400	355,000	--	3,819,000	66,700
1984	9	--	800	--	57,400	355,000	1,100	1,979,000	71,070
1985	10	--	800	--	57,400	--	1,100	--	71,070
1986	11	--	800	--	57,400	--	1,100	--	71,070
1987	12	--	800	--	57,400	--	1,100	--	71,070
1988	13	--	800	--	57,400	--	1,100	--	71,070
1989	14	--	800	--	57,400	--	1,100	--	71,070
1990	15	--	800	--	57,400	--	1,100	--	71,070
1991	16	--	800	--	57,400	--	1,100	--	71,070
1992	17	--	800	--	57,400	--	1,100	--	71,070
1993	18	--	800	--	57,400	--	1,100	--	71,070
1994	19	--	800	--	57,400	--	1,100	--	71,070
1995	20	--	800	--	57,400	--	1,100	--	71,070
1996	21	--	800	--	57,400	--	1,100	--	71,070
1997	22	--	800	--	57,400	--	1,100	--	71,070
1998	23	--	800	--	57,400	--	1,100	--	71,070
1999	24	--	800	--	57,400	--	1,100	--	71,070
2000	25	--	800	--	57,400	--	1,100	--	71,070
Total		$ 580,000	$ 16,000	$ 4,090,000	$ 1,033,200	$ 790,000	$ 18,700	$ 9,580,000	$ 1,301,990
Annual Average		$ 23,200	$ 640	$ 163,600	$ 41,328	$ 31,600	$ 748	$ 383,200	$ 52,080

Table 43 (continued)

Calendar Year	Project Year	Combined Sewer Overflow Abatement Plan Element: Combined Sewer Overflow — Facility Construction	Combined Sewer Overflow — Operation and Maintenance	Subtotal Combined Sewer Overflow Plan Element — Facility Construction	Subtotal Combined Sewer Overflow Plan Element — Operation and Maintenance	Total — Facility Construction	Total — Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ 1,324,000	$ 20,060,000
1977	2	--	--	--	--	11,916,000	20,060,900
1978	3	--	--	--	--	125,000	20,060,900
1979	4	--	--	--	--	1,504,000	20,060,900
1980	5	38,400,000	--	38,400,000	--	43,230,000	20,069,500
1981	6	38,400,000	--	38,400,000	--	53,527,000	20,071,500
1982	7	38,400,000	--	38,400,000	--	74,759,000	20,071,500
1983	8	38,400,000	--	38,400,000	--	81,397,000	20,146,400
1984	9	38,400,000	--	38,400,000	--	60,384,000	20,153,570
1985	10	38,400,000	950,000	38,400,000	950,000	53,318,000	21,107,470
1986	11	38,400,000	1,140,000	38,400,000	1,140,000	47,781,000	21,297,870
1987	12	38,400,000	1,330,000	38,400,000	1,330,000	38,400,000	21,487,870
1988	13	38,400,000	1,520,000	38,400,000	1,520,000	39,125,000	21,677,870
1989	14	38,400,000	1,710,000	38,400,000	1,710,000	41,656,000	21,867,870
1990	15	--	1,900,000	--	1,900,000	3,256,000	22,059,970
1991	16	--	1,900,000	--	1,900,000	--	22,059,970
1992	17	--	1,900,000	--	1,900,000	--	22,059,970
1993	18	--	1,900,000	--	1,900,000	--	22,059,970
1994	19	--	1,900,000	--	1,900,000	--	22,059,970
1995	20	--	1,900,000	--	1,900,000	--	22,059,970
1996	21	--	1,900,000	--	1,900,000	--	22,059,970
1997	22	--	1,900,000	--	1,900,000	--	22,059,970
1998	23	--	1,900,000	--	1,900,000	--	22,059,970
1999	24	--	1,900,000	--	1,900,000	--	22,059,970
2000	25	--	1,900,000	--	1,900,000	--	22,059,970
Total		$384,000,000	$ 27,550,000	$384,000,000	$ 27,550,000	$551,702,000	$530,853,790
Annual Average		$ 15,360,000	$ 1,102,000	$ 15,360,000	$ 1,102,000	$ 22,068,080	$ 21,234,152

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

as from the Village. At the Village of Newburg, the schedule recommends that the plant be expanded by 1984, with effluent to be discharged to land. At the Village of Grafton, the schedule recommends that the plant be expanded by 1984, including the provision of an advanced level of waste treatment for nitrification. At the City of Cedarburg, the schedule recommends that plant modifications be made by 1984 to provide an advanced level of waste treatment for nitrification and an auxiliary level of waste treatment for effluent aeration, with further treatment units to be provided by 1990 to achieve an effluent concentration of 0.1 mg/l of phosphorus. At the plant serving the Village of Kewaskum, the schedule recommends that by 1985 sewage effluent be discharged to land.

Two trunk sewers are included in this subregional area in the recommended plan. The implementation schedule calls for the completion of the Village of Jackson trunk sewer from the existing sewage treatment plant site to the new sewage treatment plant site by 1981. By 1983 the schedule recommends that the new trunk sewer required to connect the Waubeka Area Sanitary District with the Village of Fredonia treatment facility be completed. This will enable the Waubeka Area Sanitary District to provide local sanitary sewer service at that time.

Sauk Creek Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Sauk Creek subregional area is set forth in Table 46. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 47.

With respect to sewage treatment plants, the schedule recommends that the City of Port Washington treatment facility be expanded by 1985, including the provision of a new outfall sewer. Also by 1985, the schedule recommends that the plant expansion program called for

Table 44

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER MILWAUKEE RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
City of Cedarburg	Already Provided	By 1984	Already Provided	By 1990	Not Applicable	By 1984	Already Provided	Not Applicable
Village of Fredonia	Expansion as required by 1983	Not Applicable	By 1983	Not Applicable	Not Applicable	Not Applicable	Expansion as required by by 1983	Cooperate with Waubeka Area Sanitary District in provision of Waubeka-Fredonia trunk sewer
Village of Grafton	Expansion as required by 1984	By 1984	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	Expansion as required by 1984	Not Applicable
Village of Saukville	Expansion as required by 1983	Not Applicable	By 1983	Not Applicable	Not Applicable	Not Applicable	Expansion as required by 1983	Not Applicable
Town of Fredonia Waubeka Area Sanitary District	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Waubeka to Fredonia sewage treatment plant—by 1983
City of West Bend	Expansion as required by 1980	By 1980	Expansion as required by 1980	By 1990	Not Applicable	Not Applicable	Expansion as required by 1980	Not Applicable
Village of Jackson	New plant by 1981	By 1981	Replacement as required by 1981	By 1990	Not Applicable	By 1981	Replacement as required by 1981	Existing sewage treatment plant site to new sewage treatment plant site—by 1981
Village of Kewaskum	Already Provided	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Already Provided	Not Applicable
Village of Newburg	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicalbe	By 1984	Not Applicable	Expansion as required by 1984	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 45

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER MILWAUKEE RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Kewaskum		West Bend		Jackson		Newburg	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 117,000	$ --	$ 543,000	$ --	$ 80,000	$ --	$ 73,000
1977	2	--	117,000	--	543,000	--	80,000	--	73,000
1978	3	--	117,000	624,000	543,000	--	80,000	--	73,000
1979	4	--	117,000	2,808,000	543,000	230,000	80,000	--	73,000
1980	5	--	117,000	2,808,000	730,000	1,036,000	80,000	--	73,000
1981	6	--	117,000	--	730,000	1,036,000	138,000	--	73,000
1982	7	--	117,000	--	730,000	--	138,000	246,000	73,000
1983	8	244,000	117,000	--	730,000	--	138,000	1,105,000	73,000
1984	9	1,099,000	117,000	--	730,000	--	138,000	1,105,000	88,000
1985	10	1,099,000	167,000	--	730,000	--	138,000	--	88,000
1986	11	--	167,000	--	730,000	--	138,000	--	88,000
1987	12	--	167,000	--	730,000	--	138,000	--	88,000
1988	13	--	167,000	283,000	730,000	91,000	138,000	--	88,000
1989	14	--	167,000	1,276,000	730,000	411,000	138,000	--	88,000
1990	15	--	167,000	1,276,000	1,245,000	411,000	295,000	--	88,000
1991	16	--	167,000	--	1,245,000	--	295,000	--	88,000
1992	17	--	167,000	--	1,245,000	--	295,000	--	88,000
1993	18	--	167,000	--	1,245,000	--	295,000	--	88,000
1994	19	--	167,000	--	1,245,000	--	295,000	--	88,000
1995	20	--	167,000	--	1,245,000	--	295,000	--	88,000
1996	21	--	167,000	--	1,245,000	--	295,000	--	88,000
1997	22	--	167,000	--	1,245,000	--	295,000	--	88,000
1998	23	--	167,000	--	1,245,000	--	295,000	--	88,000
1999	24	--	167,000	--	1,245,000	--	295,000	--	88,000
2000	25	--	167,000	--	1,245,000	--	295,000	--	88,000
Total		$ 2,442,000	$ 3,725,000	$ 9,075,000	$ 23,167,000	$ 3,215,000	$ 4,887,000	$ 2,456,000	$ 2,080,000
Annual Average		$ 97,680	$ 149,000	$ 363,000	$ 926,680	$ 128,600	$ 195,480	$ 98,240	$ 83,200

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Fredonia		Grafton		Cedarburg		Saukville	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 73,000	$ --	$ 157,000	$ --	$ 249,000	$ --	$ 60,000
1977	2	--	73,000	--	157,000	--	249,000	--	60,000
1978	3	--	73,000	--	157,000	--	249,000	--	60,000
1979	4	--	73,000	--	157,000	--	249,000	--	60,000
1980	5	--	73,000	--	157,000	--	249,000	--	60,000
1981	6	133,000	73,000	--	157,000	--	249,000	188,000	60,000
1982	7	601,000	73,000	301,000	157,000	72,000	249,000	844,000	60,000
1983	8	601,000	134,000	1,352,000	157,000	319,000	249,000	844,000	175,000
1984	9	--	134,000	1,352,000	314,000	319,000	377,000	--	175,000
1985	10	--	134,000	--	314,000	--	377,000	--	175,000
1986	11	--	134,000	--	314,000	--	377,000	--	175,000
1987	12	--	134,000	--	314,000	--	377,000	--	175,000
1988	13	--	134,000	--	314,000	101,000	377,000	--	175,000
1989	14	--	134,000	--	314,000	451,000	377,000	--	175,000
1990	15	--	134,000	--	314,000	451,000	596,000	--	175,000
1991	16	--	134,000	--	314,000	--	596,000	--	175,000
1992	17	--	134,000	--	314,000	--	596,000	--	175,000
1993	18	--	134,000	--	314,000	--	596,000	--	175,000
1994	19	--	134,000	--	314,000	--	596,000	--	175,000
1995	20	--	134,000	--	314,000	--	596,000	--	175,000
1996	21	--	134,000	--	314,000	--	596,000	--	175,000
1997	22	--	134,000	--	314,000	--	596,000	--	175,000
1998	23	--	134,000	--	314,000	--	596,000	--	175,000
1999	24	--	134,000	--	314,000	--	596,000	--	175,000
2000	25	--	134,000	--	314,000	--	596,000	--	175,000
Total		$ 1,335,000	$ 2,923,000	$ 3,005,000	$ 6,594,000	$ 1,713,000	$ 10,810,000	$ 1,876,000	$ 3,570,000
Annual Average		$ 53,400	$ 116,920	$ 120,200	$ 263,760	$ 68,520	$ 432,400	$ 75,040	$ 142,800

Table 45 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Subtotal Sewage Treatment Plant Plan Element		Jackson		Waubeka-Fredonia		Subtotal Intercommunity Trunk Sewer Plan Element	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 1,352,000	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	1,352,000	--	--	--	--	--	--
1978	3	624,000	1,352,000	--	--	--	--	--	--
1979	4	3,038,000	1,352,000	20,000	--	--	--	20,000	--
1980	5	3,844,000	1,539,000	92,000	--	--	--	92,000	--
1981	6	1,357,000	1,597,000	92,000	400	39,000	--	131,000	400
1982	7	2,064,000	1,597,000	--	400	172,000	--	172,000	400
1983	8	4,465,000	1,773,000	--	400	172,000	3,900	172,000	4,300
1984	9	3,875,000	2,073,000	--	400	--	3,900	--	4,300
1985	10	1,099,000	2,123,000	--	400	--	3,900	--	4,300
1986	11	--	2,123,000	--	400	--	3,900	--	4,300
1987	12	--	2,123,000	--	400	--	3,900	--	4,300
1988	13	475,000	2,123,000	--	400	--	3,900	--	4,300
1989	14	2,138,000	2,123,000	--	400	--	3,900	--	4,300
1990	15	2,138,000	3,014,000	--	400	--	3,900	--	4,300
1991	16	--	3,014,000	--	400	--	3,900	--	4,300
1992	17	--	3,014,000	--	400	--	3,900	--	4,300
1993	18	--	3,014,000	--	400	--	3,900	--	4,300
1994	19	--	3,014,000	--	400	--	3,900	--	4,300
1995	20	--	3,014,000	--	400	--	3,900	--	4,300
1996	21	--	3,014,000	--	400	--	3,900	--	4,300
1997	22	--	3,014,000	--	400	--	3,900	--	4,300
1998	23	--	3,014,000	--	400	--	3,900	--	4,300
1999	24	--	3,014,000	--	400	--	3,900	--	4,300
2000	25	--	3,014,000	--	400	--	3,900	--	4,300
Total		$ 25,117,000	$ 57,756,000	$ 204,000	$ 8,000	$ 383,000	$ 70,200	$ 587,000	$ 78,200
Annual Average		$ 1,004,680	$ 2,310,240	$ 8,160	$ 320	$ 15,320	$ 2,808	$ 23,480	$ 3,128

Calendar Year	Project Year	Total	
		Facility Construction	Operation and Maintenance
1976	1	$ --	$ 1,352,000
1977	2	--	1,352,000
1978	3	624,000	1,352,000
1979	4	3,058,000	1,352,000
1980	5	3,936,000	1,539,000
1981	6	1,488,000	1,597,400
1982	7	2,236,000	1,597,400
1983	8	4,637,000	1,777,300
1984	9	3,875,000	2,077,300
1985	10	1,099,000	2,127,300
1986	11	--	2,127,300
1987	12	--	2,127,300
1988	13	475,000	2,127,300
1989	14	2,138,000	2,127,300
1990	15	2,138,000	3,018,300
1991	16	--	3,018,300
1992	17	--	3,018,300
1993	18	--	3,018,300
1994	19	--	3,018,300
1995	20	--	3,018,300
1996	21	--	3,018,300
1997	22	--	3,018,300
1998	23	--	3,018,300
1999	24	--	3,018,300
2000	25	--	3,018,300
Total		$ 25,704,000	$ 57,834,200
Annual Average		$ 1,028,160	$ 2,313,368

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

Table 46

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE SAUK CREEK SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
City of Port Washington	Expansion as required by 1985	Not Applicable	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	Expansion as required by 1985	Not Applicable
Village of Belgium	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Cooperate with Town of Belgium in provision of Lake Church-Belgium trunk sewer
Town of Belgium New District—Lake Church	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Lake Church to Belgium sewage treatment plant—by 1985

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

at the Village of Belgium treatment facility be completed, including the provision of sufficient capacity to serve the Lake Church and Harrington Beach areas of the Town of Belgium. The schedule also calls for the Belgium facility to dispose of sewage effluent on land by 1985. The schedule recommends the completion of the Lake Church to Belgium trunk sewer by 1985 in order to provide service to existing urban development in the Lake Church and Harrington Beach areas of the Town of Belgium at that time.

Kenosha-Racine Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Kenosha-Racine subregional area is set forth in Table 48. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 49.

With respect to sewage treatment plants, the schedule recommends that the City of Kenosha complete expansion of its plant by 1985. No expansion is called for in the plan at the City of Racine treatment facility. The schedule also recommends the completion during 1979 of an interim expansion of the treatment facility serving the Town of Somers Utility District No. 1.

With respect to trunk sewers in the Racine portion of the subregional area, the schedule recommends that the Sturtevant-Mt. Pleasant trunk sewer be completed by 1981, thus permitting abandonment of the Sturtevant sewage treatment plant; that the initial portion of the Caledonia-Crestview-North Park trunk sewer from the Racine sewage treatment plant to Johnson Park be completed by 1983; and that the remaining portion of the Caledonia-Crestview-North Park trunk sewer be completed by 1990, thus permitting abandonment of the North Park sewage treatment facility.

Table 47

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE SAUK CREEK SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element					
		Port Washington		Belgium		Subtotal Sewage Treatment Plant Plan Element	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 272,000	$ --	$ 51,000	$ --	$ 323,000
1977	2	--	272,000	--	51,000	--	323,000
1978	3	--	272,000	--	51,000	--	323,000
1979	4	--	272,000	--	51,000	--	323,000
1980	5	--	272,000	--	51,000	--	323,000
1981	6	--	272,000	--	51,000	--	323,000
1982	7	--	272,000	--	51,000	--	323,000
1983	8	313,000	272,000	207,000	51,000	520,000	323,000
1984	9	1,405,000	272,000	932,000	51,000	2,337,000	323,000
1985	10	1,405,000	332,000	932,000	96,000	2,337,000	428,000
1986	11	--	332,000	--	96,000	--	428,000
1987	12	--	332,000	--	96,000	--	428,000
1988	13	--	332,000	--	96,000	--	428,000
1989	14	--	332,000	--	96,000	--	428,000
1990	15	--	332,000	--	96,000	--	428,000
1991	16	--	332,000	--	96,000	--	428,000
1992	17	--	332,000	--	96,000	--	428,000
1993	18	--	332,000	--	96,000	--	428,000
1994	19	--	332,000	--	96,000	--	428,000
1995	20	--	332,000	--	96,000	--	428,000
1996	21	--	332,000	--	96,000	--	428,000
1997	22	--	332,000	--	96,000	--	428,000
1998	23	--	332,000	--	96,000	--	428,000
1999	24	--	332,000	--	96,000	--	428,000
2000	25	--	332,000	--	96,000	--	428,000
Total		$ 3,123,000	$ 7,760,000	$ 2,071,000	$ 1,995,000	$ 5,194,000	$ 9,755,000
Annual Average		$ 124,920	$ 310,400	$ 82,840	$ 79,800	$ 207,760	$ 390,200

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element		Subtotal Intercommunity Trunk Sewer Plan Element		Total	
		Lake Church-Belgium					
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ 323,000
1977	2	--	--	--	--	--	323,000
1978	3	--	--	--	--	--	323,000
1979	4	--	--	--	--	--	323,000
1980	5	--	--	--	--	--	323,000
1981	6	--	--	--	--	--	323,000
1982	7	--	--	--	--	--	323,000
1983	8	47,000	--	47,000	--	567,000	323,000
1984	9	212,000	--	212,000	--	2,549,000	323,000
1985	10	212,000	4,000	212,000	4,000	2,549,000	432,000
1986	11	--	4,000	--	4,000	--	432,000
1987	12	--	4,000	--	4,000	--	432,000
1988	13	--	4,000	--	4,000	--	432,000
1989	14	--	4,000	--	4,000	--	432,000
1990	15	--	4,000	--	4,000	--	432,000
1991	16	--	4,000	--	4,000	--	432,000
1992	17	--	4,000	--	4,000	--	432,000
1993	18	--	4,000	--	4,000	--	432,000
1994	19	--	4,000	--	4,000	--	432,000
1995	20	--	4,000	--	4,000	--	432,000
1996	21	--	4,000	--	4,000	--	432,000
1997	22	--	4,000	--	4,000	--	432,000
1998	23	--	4,000	--	4,000	--	432,000
1999	24	--	4,000	--	4,000	--	432,000
2000	25	--	4,000	--	4,000	--	432,000
Total		$ 471,000	$ 64,000	$ 471,000	$ 64,000	$ 5,665,000	$ 9,819,000
Annual Average		$ 18,840	$ 2,560	$ 18,840	$ 2,560	$ 226,600	$ 392,760

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

Table 48

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE KENOSHA-RACINE SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]	Combined Sewer Overflow Abatement Plan Element
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment			
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection		
			1.0 mg/l	0.1 mg/l					
City of Racine	Expansion as required by 1977	Not Applicable	Expansion as required by 1977	Not Applicable	Not Applicable	Not Applicable	Expansion as required by 1977	Cooperate with Village of Sturtevant and Town of Mt. Pleasant Sewer Utility District No. 1 in provision of Sturtevant-Mt. Pleasant-Racine trunk sewer; Cooperate with Town of Caledonia Sewer Utility District No. 1, Crestview Sanitary District and North Park Sanitary District in provision of Caledonia-Crestview-North Park-Racine trunk sewer	Complete facility planning by 1979 Implement recommendations of facility plan by 1983
Village of Sturtevant and Town of Mt. Pleasant Sewer Utility District No. 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sturtevant and Mt. Pleasant to Racine sewage treatment plant—by 1981 (abandon Sturtevant sewage treatment plant)	Not Applicable
Town of Caledonia Sewer Utility District No. 1, Crestview Sanitary District, and North Park Sanitary District	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Initial portion of Caledonia, Crestview, North Park to Racine sewage treatment plant—by 1983 Remaining portion of Caledonia, Crestview, North Park to Racine sewage treatment plant—by 1990 (abandon North Park sewage treatment plant)	Not Applicable
City of Kenosha	Expansion as required by 1985	Not Applicable	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	Expansion as required by 1985	Cooperate with Town of Pleasant Prairie in provision of Pleasant Prairie-Kenosha trunk sewer; Cooperate with Town of Somers Utility District No. 1 in provision of Somers-Kenosha trunk sewer	Complete facility planning by 1979 Implement recommendations of facility plan by 1983
Town of Pleasant Prairie Sewer Utility Districts A, B, C, E, and Nos. 1 and 2 and New District—Pleasant Park	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Pleasant Prairie to Kenosha sewage treatment plant—by 1984 (abandon Pleasant Park sewage treatment plant)	Not Applicable
Town of Somers Utility District No. 1	Interim expansion by 1979	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Interim expansion by 1979	Initial portion of Somers to Kenosha sewage treatment plant—by 1980 Second portion of Somers to Kenosha sewage treatment plant—by 1990 (abandon Somers sewage treatment plant) Remaining portion of Somers to Kenosha sewage treatment plant—by 1995	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 49

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE KENOSHA-RACINE SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element				Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element	
		Racine		Kenosha				Caledonia, Crestview, North Park - Racine	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ 4,100,000	$ 1,900,000	$ --	$ 2,000,000	$ 4,100,000	$ 3,900,000	$ --	$ --
1977	2	4,100,000	1,900,000	--	2,000,000	4,100,000	3,900,000	--	--
1978	3	--	1,900,000	--	2,000,000	--	3,900,000	--	--
1979	4	--	1,900,000	--	2,000,000	--	3,900,000	--	--
1980	5	--	1,900,000	--	2,000,000	--	3,900,000	--	--
1981	6	--	1,900,000	--	2,000,000	--	3,900,000	352,000	--
1982	7	--	1,900,000	--	2,000,000	--	3,900,000	1,583,000	--
1983	8	--	1,900,000	1,090,000	2,000,000	1,090,000	3,900,000	1,583,000	14,600
1984	9	--	1,900,000	4,905,000	2,000,000	4,905,000	3,900,000	--	14,600
1985	10	--	1,900,000	4,905,000	2,000,000	4,905,000	3,900,000	--	14,600
1986	11	--	1,900,000	--	2,000,000	--	3,900,000	--	14,600
1987	12	--	1,900,000	--	2,000,000	--	3,900,000	--	14,600
1988	13	--	1,900,000	--	2,000,000	--	3,900,000	150,000	14,600
1989	14	--	1,900,000	--	2,000,000	--	3,900,000	674,000	14,600
1990	15	--	1,900,000	--	2,000,000	--	3,900,000	674,000	37,800
1991	16	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1992	17	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1993	18	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1994	19	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1995	20	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1996	21	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1997	22	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1998	23	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
1999	24	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
2000	25	--	1,900,000	--	2,000,000	--	3,900,000	--	37,800
Total		$ 8,200,000	$ 47,500,000	$ 10,900,000	$ 50,000,000	$ 19,100,000	$ 97,500,000	$ 5,016,000	$ 518,000
Annual Average		$ 328,000	$ 1,900,000	$ 436,000	$ 2,000,000	$ 764,000	$ 3,900,000	$ 200,640	$ 20,720

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element						Subtotal Intercommunity Trunk Sewer Plan Element	
		Sturtevant, Mt. Pleasant - Racine		Somers-Kenosha		Pleasant Prairie-Kenosha			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	439,000	--	--	--	439,000	--
1979	4	1,060,000	--	1,975,000	--	--	--	3,035,000	--
1980	5	4,800,000	--	1,975,000	2,400	--	--	6,775,000	2,400
1981	6	4,800,000	15,200	--	2,400	--	--	5,152,000	17,600
1982	7	--	15,200	--	2,400	283,000	--	1,866,000	17,600
1983	8	--	15,200	--	2,400	1,274,000	--	2,857,000	32,200
1984	9	--	15,200	--	2,400	1,274,000	6,300	1,274,000	38,500
1985	10	--	15,200	--	2,400	--	6,300	--	38,500
1986	11	--	15,200	--	2,400	--	6,300	--	38,500
1987	12	--	15,200	--	2,400	--	6,300	--	38,500
1988	13	--	15,200	230,000	2,400	--	6,300	380,000	38,500
1989	14	--	15,200	1,038,000	2,400	--	6,300	1,712,000	38,500
1990	15	--	15,200	1,038,000	5,100	--	6,300	1,712,000	64,400
1991	16	--	15,200	--	5,100	--	6,300	--	64,400
1992	17	--	15,200	--	5,100	--	6,300	--	64,400
1993	18	--	15,200	85,000	5,100	--	6,300	85,000	64,400
1994	19	--	15,200	383,000	5,100	--	6,300	383,000	64,400
1995	20	--	15,200	383,000	7,100	--	6,300	383,000	66,400
1996	21	--	15,200	--	7,100	--	6,300	--	66,400
1997	22	--	15,200	--	7,100	--	6,300	--	66,400
1998	23	--	15,200	--	7,100	--	6,300	--	66,400
1999	24	--	15,200	--	7,100	--	6,300	--	66,400
2000	25	--	15,200	--	7,100	--	6,300	--	66,400
Total		$ 10,660,000	$ 304,000	$ 7,546,000	$ 92,100	$ 2,831,000	$ 107,100	$ 26,053,000	$ 1,021,200
Annual Average		$ 426,400	$ 12,160	$ 301,840	$ 3,684	$ 113,240	$ 4,284	$ 1,042,120	$ 40,848

Table 49 (continued)

Calendar Year	Project Year	Combined Sewer Overflow Abatement Plan Element				Subtotal Combined Sewer Overflow Plan Element		Total	
		Racine Combined Sewer Overflow		Kenosha Combined Sewer Overflow					
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ 4,100,000	$ 3,900,000
1977	2	--	--	--	--	--	--	4,100,000	3,900,000
1978	3	--	--	--	--	--	--	439,000	3,900,000
1979	4	300,000	--	1,300,000	--	1,600,000	--	4,635,000	3,900,000
1980	5	900,000	--	3,200,000	--	4,100,000	--	10,875,000	3,902,400
1981	6	900,000	--	3,200,000	--	4,100,000	--	9,252,000	3,917,600
1982	7	900,000	--	3,200,000	--	4,100,000	--	5,966,000	3,917,600
1983	8	900,000	--	3,200,000	--	4,100,000	--	8,047,000	3,932,200
1984	9	--	--	--	--	--	--	6,179,000	3,938,500
1985	10	--	--	--	--	--	--	4,905,000	3,938,500
1986	11	--	--	--	--	--	--	--	3,938,500
1987	12	--	--	--	--	--	--	--	3,938,500
1988	13	--	--	--	--	--	--	380,000	3,938,500
1989	14	--	--	--	--	--	--	1,712,000	3,938,500
1990	15	--	--	--	--	--	--	1,712,000	3,964,400
1991	16	--	--	--	--	--	--	--	3,964,400
1992	17	--	--	--	--	--	--	--	3,964,400
1993	18	--	--	--	--	--	--	85,000	3,964,400
1994	19	--	--	--	--	--	--	383,000	3,964,400
1995	20	--	--	--	--	--	--	383,000	3,966,400
1996	21	--	--	--	--	--	--	--	3,966,400
1997	22	--	--	--	--	--	--	--	3,966,400
1998	23	--	--	--	--	--	--	--	3,966,400
1999	24	--	--	--	--	--	--	--	3,966,400
2000	25	--	--	--	--	--	--	--	3,966,400
Total		$ 3,900,000	$ --	$ 14,100,000	$ --	$ 18,000,000	$ --	$ 63,153,000	$ 98,521,200
Annual Average		$ 156,000	$ --	$ 564,000	$ --	$ 720,000	$ --	$ 2,526,120	$ 3,940,848

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

In the Kenosha portion of the subregional area, the schedule recommends the construction of the Pleasant Prairie-Kenosha trunk sewer by 1984, thus permitting abandonment of the Pleasant Park sewage treatment plant; the construction of the initial portion of the Somers-Kenosha trunk sewer by 1980 and of the second portion by 1990, thus permitting abandonment of the Somers sewage treatment facility; and the completion of the remaining portion of the Somers-Kenosha trunk sewer by 1995.

With respect to the abatement of pollution from combined sewer overflows in both the Kenosha and Racine urbanized areas, the implementation schedule recommends that the sewerage facilities planning efforts now underway in each area be completed and the resultant plans adopted by all parties concerned during 1979. Implementation of the recommendations to be contained in these facilities plans, which probably will consist of recommendations for completion of partial sewer separation programs in both communities, should be completed by 1983.

Root River Canal Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Root River Canal subregional area is set forth in Table 50. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 51.

Table 50

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE ROOT RIVER CANAL SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
Village of Union Grove	New plant by 1979 and expansion as required by 1985	By 1979 and expansion as required by 1985	By 1979	By 1990	Not Applicable	By 1979 and expansion as required by 1985	By 1979 and expansion as required by 1985	Existing sewage treatment plant site to new sewage treatment plant site—by 1979
Wisconsin Department of Health and Social Services	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Center for Developmentally Disabled (CDD) to Union Grove sewage treatment plant—by 1985 (abandon CDD sewage treatment plant)
Town of Yorkville Sanitary District No. 1	New plant (expansion of existing Racine County Office Building plant) by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	By 1985	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

With respect to sewage treatment plants, the schedule recommends that the sewage treatment plant presently under construction by the Village of Union Grove be completed during 1979. The schedule further calls for the expansion of the Union Grove plant by 1985 to accommodate sewage from the Center for the Developmentally Disabled operated by the Wisconsin Department of Health and Social Services, and for additional treatment units to be completed by 1990 to achieve an effluent concentration of 0.1 mg/l of phosphorus. The schedule also calls for the construction and operation of a new sewage treatment plant by the Town of Yorkville Sanitary District No. 1 by 1985. This new plant could be an expansion of the existing private plant serving the Racine County Highway and Park Commission Building at Yorkville. The schedule calls for land application of sewage effluent for the plant beginning in 1985.

With respect to trunk sewers, the schedule recommends that the trunk sewer required to convey sewage from the old to the new treatment plant sites in the Village of Union Grove be completed by 1979. This trunk sewer should be designed with sufficient capacity to carry sewage to the new plant from the Center for the Developmentally Disabled. The schedule also calls for the construction of a new trunk sewer from the Center for the Developmentally Disabled to the old Union Grove sewage treatment site by 1985, thus permitting abandonment of the plant serving the Center for the Developmentally Disabled.

Des Plaines River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Des Plaines River subregional area is set forth in Table 52. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 53.

With respect to sewage treatment plants, the schedule recommends that the Town of Pleasant Prairie Sewer Utility District D complete a plant expansion program by 1985, including the provision of capacity to serve the Bristol-IH 94 sewer service area and arrangements for land application of sewage effluent. The schedule also recommends that the Town of Pleasant Prairie Sanitary District No. 73-1 complete by 1985 arrangements to dispose of sewage effluent on land. The schedule calls for the Town of Bristol Utility District No. 1 to complete a plant expansion by 1985, including arrangements to dispose of sewage effluent on land. The schedule recommends that the Town of Salem Sewer Utility District

Table 51

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE ROOT RIVER CANAL SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element				Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element	
		Union Grove		Yorkville Sanitary District No. 1				Union Grove	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 96,000	$ --	$ 2,500	$ --	$ 98,500	$ --	$ --
1977	2	198,000	96,000	--	2,500	198,000	98,500	20,000	--
1978	3	893,000	96,000	--	2,500	893,000	98,500	83,000	--
1979	4	893,000	131,000	--	2,500	893,000	133,500	83,000	400
1980	5	--	131,000	--	2,500	--	133,500	--	400
1981	6	--	131,000	--	2,500	--	133,500	--	400
1982	7	--	131,000	--	2,500	--	133,500	--	400
1983	8	124,000	131,000	73,000	2,500	197,000	133,500	--	400
1984	9	557,000	131,000	331,000	2,500	888,000	133,500	--	400
1985	10	557,000	199,000	331,000	21,500	888,000	220,500	--	400
1986	11	--	199,000	--	21,500	--	220,500	--	400
1987	12	--	199,000	--	21,500	--	220,500	--	400
1988	13	94,000	199,000	--	21,500	94,000	220,500	--	400
1989	14	422,000	199,000	--	21,500	422,000	220,500	--	400
1990	15	422,000	321,000	--	21,500	422,000	342,500	--	400
1991	16	--	321,000	--	21,500	--	342,500	--	400
1992	17	--	321,000	--	21,500	--	342,500	--	400
1993	18	--	321,000	--	21,500	--	342,500	--	400
1994	19	--	321,000	--	21,500	--	342,500	--	400
1995	20	--	321,000	--	21,500	--	342,500	--	400
1996	21	--	321,000	--	21,500	--	342,500	--	400
1997	22	--	321,000	--	21,500	--	342,500	--	400
1998	23	--	321,000	--	21,500	--	342,500	--	400
1999	24	--	321,000	--	21,500	--	342,500	--	400
2000	25	--	321,000	--	21,500	--	342,500	--	400
Total		$ 4,160,000	$ 5,600,000	$ 735,000	$ 366,500	$ 4,895,000	$ 5,966,500	$ 186,000	$ 8,800
Annual Average		$ 166,400	$ 224,000	$ 29,400	$ 14,660	$ 195,800	$ 238,660	$ 7,440	$ 352

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element		Subtotal Intercommunity Trunk Sewer Plan Element		Total	
		Center for the Developmentally Disabled					
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ 98,500
1977	2	--	--	20,000	--	218,000	98,500
1978	3	--	--	83,000	--	976,000	98,500
1979	4	--	--	83,000	400	976,000	133,900
1980	5	--	--	--	400	--	133,900
1981	6	--	--	--	400	--	133,900
1982	7	--	--	--	400	--	133,900
1983	8	22,000	--	22,000	400	219,000	133,900
1984	9	94,000	--	94,000	400	982,000	133,900
1985	10	94,000	600	94,000	1,000	982,000	221,500
1986	11	--	600	--	1,000	--	221,500
1987	12	--	600	--	1,000	--	221,500
1988	13	--	600	--	1,000	94,000	221,500
1989	14	--	600	--	1,000	442,000	221,500
1990	15	--	600	--	1,000	442,000	343,500
1991	16	--	600	--	1,000	--	343,500
1992	17	--	600	--	1,000	--	343,500
1993	18	--	600	--	1,000	--	343,500
1994	19	--	600	--	1,000	--	343,500
1995	20	--	600	--	1,000	--	343,500
1996	21	--	600	--	1,000	--	343,500
1997	22	--	600	--	1,000	--	343,500
1998	23	--	600	--	1,000	--	343,500
1999	24	--	600	--	1,000	--	343,500
2000	25	--	600	--	1,000	--	343,500
Total		$ 210,000	$ 9,600	$ 396,000	$ 18,400	$ 5,291,000	$ 5,984,900
Annual Average		$ 8,400	$ 384	$ 15,840	$ 736	$ 211,640	$ 239,396

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

Table 52

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE DES PLAINES RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
Town of Pleasant Prairie Sewer Utility District D	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Cooperate with Town of Bristol in provision of Bristol-Pleasant Prairie trunk sewer
Town of Bristol New District—IH 94	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Bristol IH 94 to Pleasant Prairie D sewage treatment plant—by 1985
Village of Paddock Lake	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Paddock Lake to Salem No. 1 sewage treatment plant—by 1984 (abandon Paddock Lake sewage treatment plant)
Town of Bristol Utility District No. 1	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Not Applicable
Town of Pleasant Prairie Sanitary District No. 73-1	Already Provided	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Already Provided	Not Applicable
Town of Salem Sewer Utility District No. 1	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	Expansion as required by 1984	Cooperate with Village of Paddock Lake in provision of Paddock Lake-Salem trunk sewer

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 53

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE DES PLAINES RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Pleasant Prairie Sewer Utility District D		Pleasant Prairie Sanitary District No. 73-1		Salem Sewer Utility District No. 1		Bristol Sewer Utility District No. 1	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 34,000	$ --	$ 28,000	$ --	$ 31,000	$ --	$ 31,000
1977	2	--	34,000	--	28,000	--	31,000	--	31,000
1978	3	--	34,000	--	28,000	--	31,000	--	31,000
1979	4	--	34,000	--	28,000	--	31,000	--	31,000
1980	5	--	34,000	--	28,000	--	31,000	--	31,000
1981	6	--	34,000	--	28,000	--	31,000	--	31,000
1982	7	--	34,000	--	28,000	240,000	31,000	--	31,000
1983	8	317,000	34,000	100,000	28,000	1,080,000	31,000	169,000	31,000
1984	9	1,427,000	34,000	452,000	28,000	1,080,000	127,000	760,000	31,000
1985	10	1,427,000	136,000	452,000	77,000	--	127,000	760,000	83,000
1986	11	--	136,000	--	77,000	--	127,000	--	83,000
1987	12	--	136,000	--	77,000	--	127,000	--	83,000
1988	13	--	136,000	--	77,000	--	127,000	--	83,000
1989	14	--	136,000	--	77,000	--	127,000	--	83,000
1990	15	--	136,000	--	77,000	--	127,000	--	83,000
1991	16	--	136,000	--	77,000	--	127,000	--	83,000
1992	17	--	136,000	--	77,000	--	127,000	--	83,000
1993	18	--	136,000	--	77,000	--	127,000	--	83,000
1994	19	--	136,000	--	77,000	--	127,000	--	83,000
1995	20	--	136,000	--	77,000	--	127,000	--	83,000
1996	21	--	136,000	--	77,000	--	127,000	--	83,000
1997	22	--	136,000	--	77,000	--	127,000	--	83,000
1998	23	--	136,000	--	77,000	--	127,000	--	83,000
1999	24	--	136,000	--	77,000	--	127,000	--	83,000
2000	25	--	136,000	--	77,000	--	127,000	--	83,000
Total		$ 3,171,000	$ 2,482,000	$ 1,004,000	$ 1,484,000	$ 2,400,000	$ 2,407,000	$ 1,689,000	$ 1,607,000
Annual Average		$ 126,840	99,280	$ 40,160	$ 59,360	$ 96,000	$ 96,280	$ 67,560	$ 64,280

Calendar Year	Project Year	Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element				Subtotal Intercommunity Trunk Sewer Plan Element	
				Bristol - Pleasant Prairie		Paddock Lake-Salem			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 124,000	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	124,000	--	--	--	--	--	--
1978	3	--	124,000	--	--	--	--	--	--
1979	4	--	124,000	--	--	--	--	--	--
1980	5	--	124,000	--	--	--	--	--	--
1981	6	--	124,000	--	--	--	--	--	--
1982	7	240,000	124,000	--	--	62,000	--	62,000	--
1983	8	1,666,000	124,000	72,000	--	272,000	--	344,000	--
1984	9	3,719,000	220,000	325,000	--	272,000	12,000	597,000	12,000
1985	10	2,639,000	423,000	325,000	8,000	--	12,000	325,000	20,000
1986	11	--	423,000	--	8,000	--	12,000	--	20,000
1987	12	--	423,000	--	8,000	--	12,000	--	20,000
1988	13	--	423,000	--	8,000	--	12,000	--	20,000
1989	14	--	423,000	--	8,000	--	12,000	--	20,000
1990	15	--	423,000	--	8,000	--	12,000	--	20,000
1991	16	--	423,000	--	8,000	--	12,000	--	20,000
1992	17	--	423,000	--	8,000	--	12,000	--	20,000
1993	18	--	423,000	--	8,000	--	12,000	--	20,000
1994	19	--	423,000	--	8,000	--	12,000	--	20,000
1995	20	--	423,000	--	8,000	--	12,000	--	20,000
1996	21	--	423,000	--	8,000	--	12,000	--	20,000
1997	22	--	423,000	--	8,000	--	12,000	--	20,000
1998	23	--	423,000	--	8,000	--	12,000	--	20,000
1999	24	--	423,000	--	8,000	--	12,000	--	20,000
2000	25	--	423,000	--	8,000	--	12,000	--	20,000
Total		$ 8,264,000	$ 7,980,000	$ 722,000	$ 128,000	$ 606,000	$ 204,000	$ 1,328,000	$ 332,000
Annual Average		$ 330,560	$ 319,200	$ 28,880	$ 5,120	$ 24,240	$ 8,160	$ 53,120	$ 13,280

Table 53 (continued)

Calendar Year	Project Year	Total	
		Facility Construction	Operation and Maintenance
1976	1	$ --	$ 124,000
1977	2	--	124,000
1978	3	--	124,000
1979	4	--	124,000
1980	5	--	124,000
1981	6	--	124,000
1982	7	302,000	124,000
1983	8	2,010,000	124,000
1984	9	4,316,000	232,000
1985	10	2,964,000	443,000
1986	11	--	443,000
1987	12	--	443,000
1988	13	--	443,000
1989	14	--	443,000
1990	15	--	443,000
1991	16	--	443,000
1992	17	--	443,000
1993	18	--	443,000
1994	19	--	443,000
1995	20	--	443,000
1996	21	--	443,000
1997	22	--	443,000
1998	23	--	443,000
1999	24	--	443,000
2000	25	--	443,000
Total		$ 9,592,000	$ 8,312,000
Annual Average		$ 383,680	$ 332,480

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

No. 1 complete a plant expansion program by 1984, such expansion being required to serve the Village of Paddock Lake. In addition, the schedule calls for the Town of Salem Sewer Utility District No. 1 to make arrangements to dispose of sewage effluent on land by 1984.

With respect to trunk sewers, the schedule recommends that the Bristol-IH 94-Pleasant Prairie trunk sewer connection be completed by 1985 in conjunction with the expansion of the Town of Pleasant Prairie Sewer Utility District D treatment facility. In addition, the schedule recommends that the necessary trunk sewer to convey sewage from the Village of Paddock Lake to the Town of Salem Sewer Utility District No. 1 treatment facility be completed by 1984, thus permitting abandonment of the Paddock Lake sewage treatment facility.

Upper Fox River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Upper Fox River subregional area is set forth in Table 54. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 55.

With respect to sewage treatment plants, the schedule recommends completing an expansion program by 1981 at the City of Waukesha facility. The schedule further recommends the provision of additional treatment facilities by 1990 at the City of Waukesha plant to achieve an effluent concentration of 0.1 mg/l of phosphorus. In addition, the schedule recommends an expansion of the City of Brookfield sewage treatment facility by 1985, with the further provision of additional treatment facilities to achieve an effluent concentration of 0.1 mg/l of phosphorus by 1990.

With respect to trunk sewers, the schedule recommends the completion of the initial portion of the Poplar Creek trunk sewer during 1979; the completion of the Pewaukee Lake Sanitary District trunk sewer during 1979; the completion of the Lannon-Menomonee Falls-Brookfield trunk sewer from the old Brookfield sewage treatment plant site to STH 190 by 1980; the completion of the Pewaukee to Brookfield trunk sewer by 1981; the completion of the remaining portions of the Poplar Creek and Springdale trunk sewers by 1981; the completion of the Duplainville trunk sewer by 1986; the completion of the Lannon-Menomonee Falls-Brookfield trunk sewer from the old Brookfield sewage treatment plant site to the new Brookfield sewage treatment plant and from STH 190 north in 1991; and the completion of the Sussex trunk sewer in 1995, thus permitting abandonment of the Sussex sewage treatment plant.

Lower Fox River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Lower Fox River subregional area is set forth in Table 56. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 57.

With respect to sewage treatment plants, the schedule recommends that the Western Racine County Sewerage District complete a treatment plant expansion program by 1985 to provide adequate capacity to serve the Town of Waterford Sanitary District No. 1 and make arrangements by 1985 for land disposal of sewage effluent; that the City of Burlington complete a treatment plant expansion program by 1985, including additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus by 1990; that the City of Lake Geneva complete a treatment plant expansion program by 1984, including provision of adequate capacity to serve the Town of Linn Sanitary District No. 1 and a proposed new district in the Lake Como area of the Town of Geneva, and arrangements for land disposal of sewage effluent; that the Village of East Troy complete a treatment plant expansion program by 1984, including the provision of adequate capacity to serve the East Troy Sanitary District No. 2 and arrangements for land disposal of sewage effluent; that the Village of Genoa

Table 54

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER FOX RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
City of Brookfield	Expansion as required by 1985	By 1985	Expansion as required by 1985	By 1990	Not Applicable	Not Applicable	Expansion as required by 1985	Lannon-Menomonee Falls-Brookfield from old Brookfield sewage treatment plant to STH 190—1980 Lannon-Menomonee Falls-Brookfield from old Brookfield sewage treatment plant to new Brookfield sewage treatment plant—1991 Cooperate with other agencies in provision of all other trunk sewers in Upper Fox River watershed
Poplar Creek Sewerage Commission	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Initial portion of Poplar Creek to Brookfield sewage treatment plant—1978 Remaining portion of Poplar Creek to Brookfield sewage treatment plant—1981
Springdale Sewerage Commission	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Initial portion of Springdale to Brookfield sewage treatment plant—1976 Remaining portion of Springdale to Brookfield sewage treatment plant—1981
Village of Lannon, Village of Menomonee Falls, and Town of Lisbon	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Lannon-Menomonee Falls-Brookfield from STH 190 north—1991
Village of Pewaukee	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Pewaukee to Brookfield sewage treatment plant—1981 (abandon Pewaukee sewage treatment plant)
Village of Sussex	Interim expansion by 1978	Not Applicable	Interim expansion by 1978	Not Applicable	Not Applicable	Not Applicable	Interim expansion by 1978	Sussex to Lannon—1995 (abandon Sussex sewage treatment plant)
Town of Pewaukee Pewaukee Lake Sanitary District	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Pewaukee Lake to Pewaukee-Brookfield—1979
Town of Pewaukee Sanitary District No. 3	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Duplainville to Lannon-Menomonee Falls-Brookfield—1986
City of Waukesha	Expansion as required by 1981	By 1981	Expansion as required by 1981	By 1990	Not Applicable	Not Applicable	Expansion as required by 1981	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 55

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER FOX RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element				Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element	
		Brookfield		Waukesha				Duplainville	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 362,000	$ --	$ 974,000	$ --	$ 1,336,000	$ --	$ --
1977	2	--	362,000	--	974,000	--	1,336,000	--	--
1978	3	--	362,000	--	974,000	--	1,336,000	--	--
1979	4	--	362,000	1,190,000	974,000	1,190,000	1,336,000	--	--
1980	5	--	362,000	5,367,000	1,266,000	5,367,000	1,628,000	--	--
1981	6	--	362,000	5,367,000	1,266,000	5,367,000	1,628,000	--	--
1982	7	--	362,000	--	1,266,000	--	1,628,000	--	--
1983	8	896,000	362,000	--	1,266,000	896,000	1,628,000	--	--
1984	9	4,031,000	362,000	--	1,266,000	4,031,000	1,628,000	23,000	--
1985	10	4,031,000	983,000	--	1,266,000	4,031,000	2,249,000	103,000	--
1986	11	--	983,000	--	1,266,000	--	2,249,000	103,000	700
1987	12	--	983,000	--	1,266,000	--	2,249,000	--	700
1988	13	403,000	983,000	230,000	1,266,000	633,000	2,249,000	--	700
1989	14	1,814,000	983,000	1,042,000	1,266,000	2,856,000	2,249,000	--	700
1990	15	1,814,000	1,585,000	1,042,000	1,838,000	2,856,000	3,423,000	--	700
1991	16	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1992	17	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1993	18	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1994	19	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1995	20	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1996	21	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1997	22	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1998	23	--	1,585,000	--	1,838,000	--	3,423,000	--	700
1999	24	--	1,585,000	--	1,838,000	--	3,423,000	--	700
2000	25	--	1,585,000	--	1,838,000	--	3,423,000	--	700
Total		$ 12,989,000	$ 25,608,000	$ 14,238,000	$ 36,774,000	$ 27,227,000	$ 62,382,000	$ 229,000	$ 10,500
Annual Average		$ 519,560	$ 1,024,320	$ 569,520	$ 1,470,960	$ 1,089,080	$ 2,495,280	$ 9,160	$ 420

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Sussex-Lannon		Lannon-Menomonee Falls		Springdale		Pewaukee-Brookfield	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ 178,000	$ 400	$ --	$ --
1977	2	--	--	--	--	--	400	--	--
1978	3	--	--	62,000	--	--	400	--	--
1979	4	--	--	280,000	--	--	400	347,000	--
1980	5	--	--	280,000	300	15,000	400	1,557,000	--
1981	6	--	--	--	300	134,000	700	1,557,000	18,100
1982	7	--	--	--	300	--	700	--	18,100
1983	8	--	--	--	300	--	700	--	18,100
1984	9	--	--	--	300	--	700	--	18,100
1985	10	--	--	--	300	--	700	--	18,100
1986	11	--	--	--	300	--	700	--	18,100
1987	12	--	--	--	300	--	700	--	18,100
1988	13	--	--	--	300	--	700	--	18,100
1989	14	--	--	354,000	300	--	700	--	18,100
1990	15	--	--	1,594,000	300	--	700	--	18,100
1991	16	--	--	1,594,000	3,600	--	700	--	18,100
1992	17	--	--	--	3,600	--	700	--	18,100
1993	18	97,000	--	--	3,600	--	700	--	18,100
1994	19	434,000	--	--	3,600	--	700	--	18,100
1995	20	434,000	1,100	--	3,600	--	700	--	18,100
1996	21	--	1,100	--	3,600	--	700	--	18,100
1997	22	--	1,100	--	3,600	--	700	--	18,100
1998	23	--	1,100	--	3,600	--	700	--	18,100
1999	24	--	1,100	--	3,600	--	700	--	18,100
2000	25	--	1,100	--	3,600	--	700	--	18,100
Total		$ 965,000	$ 6,600	$ 4,164,000	$ 39,300	$ 327,000	$ 16,000	$ 3,461,000	$ 362,000
Annual Average		$ 38,600	$ 264	$ 166,560	$ 1,572	$ 13,080	$ 640	$ 138,440	$ 14,480

Table 55 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element: Poplar Creek Facility Construction	Poplar Creek Operation and Maintenance	Pewaukee Lake-Pewaukee Facility Construction	Pewaukee Lake-Pewaukee Operation and Maintenance	Subtotal Intercommunity Trunk Sewer Plan Element: Facility Construction	Subtotal Operation and Maintenance	Total: Facility Construction	Total: Operation and Maintenance
1976	1	$ 148,000	$ 1,000	$ --	$ --	$ 326,000	$ 1,400	$ 326,000	$ 1,337,400
1977	2	666,000	1,000	121,000	--	787,000	1,400	787,000	1,337,400
1978	3	666,000	1,000	544,000	--	1,272,000	1,400	1,272,000	1,337,400
1979	4	121,000	1,000	544,000	7,000	1,292,000	8,400	2,482,000	1,344,400
1980	5	545,000	1,000	--	7,000	2,397,000	8,700	7,764,000	1,636,700
1981	6	545,000	1,900	--	7,000	2,236,000	28,000	7,603,000	1,656,000
1982	7	--	1,900	--	7,000	--	28,000	--	1,656,000
1983	8	--	1,900	--	7,000	--	28,000	896,000	1,656,000
1984	9	--	1,900	--	7,000	23,000	28,000	4,054,000	1,656,000
1985	10	--	1,900	--	7,000	103,000	28,000	4,134,000	2,277,000
1986	11	--	1,900	--	7,000	103,000	28,700	103,000	2,277,700
1987	12	--	1,900	--	7,000	--	28,700	--	2,277,700
1988	13	--	1,900	--	7,000	--	28,700	633,000	2,277,700
1989	14	--	1,900	--	7,000	354,000	28,700	3,210,000	2,277,700
1990	15	--	1,900	--	7,000	1,594,000	28,700	4,450,000	3,451,700
1991	16	--	1,900	--	7,000	1,594,000	32,000	1,594,000	3,455,000
1992	17	--	1,900	--	7,000	--	32,000	--	3,455,000
1993	18	--	1,900	--	7,000	97,000	32,000	97,000	3,455,000
1994	19	--	1,900	--	7,000	434,000	32,000	434,000	3,455,000
1995	20	--	1,900	--	7,000	434,000	33,100	434,000	3,456,100
1996	21	--	1,900	--	7,000	--	33,100	--	3,456,100
1997	22	--	1,900	--	7,000	--	33,100	--	3,456,100
1998	23	--	1,900	--	7,000	--	33,100	--	3,456,100
1999	24	--	1,900	--	7,000	--	33,100	--	3,456,100
2000	25	--	1,900	--	7,000	--	33,100	--	3,456,100
Total		$ 2,691,000	$ 43,000	$ 1,209,000	$ 154,000	$ 13,046,000	$ 631,400	$ 40,273,000	$ 63,013,400
Annual Average		$ 107,640	$ 1,720	$ 48,360	$ 6,160	$ 521,840	$ 25,256	$ 1,610,920	$ 2,520,536

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

City complete a plant expansion program by 1985, including arrangements for land disposal of sewage effluent also by 1985; that the Village of Mukwonago complete construction of a new sewage treatment plant by 1983, and that by 1990 additional treatment units be added to achieve an effluent concentration of 0.1 mg/l phosphorus; that the Village of North Prairie complete construction of a new sewage treatment facility by 1986, including arrangements for land disposal of sewage effluent; that the Village of Silver Lake complete a treatment plant expansion program by 1985, including arrangements for land disposal of sewage effluent; that the Village of Twin Lakes complete a treatment plant expansion program by 1984, including arrangements for land disposal of sewage effluent; that the Town of Dover-Eagle Lake Sewer Utility District complete construction of a new sewage treatment plant by 1980, that treatment units be added by 1985 to provide for an effluent concentration of 1.0 mg/l of phosphorus, and that additional treatments be added by 1990 to provide for an effluent concentration of 0.1 mg/l of phosphorus; that the Town of Lyons Sanitary District No. 2 complete construction of a new plant by 1983, including arrangements for land disposal of sewage effluent; that the Town of Norway Sanitary District No. 1 complete a treatment plant expansion program by 1990, including provision of treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus; and that the Town of Salem Sanitary District No. 2 complete construction of a new plant by 1984 and provide additional treatment units by 1990 to achieve an effluent concentration of 0.1 mg/l of phosphorus.

Table 56

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE LOWER FOX RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
Western Racine County Sewerage District	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Cooperate with Town of Waterford Sanitary District No. 1 in provision of Tichigan Lake-Rochester trunk sewer
Town of Waterford Sanitary District No. 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Tichigan Lake-Rochester by 1985
City of Burlington	Expansion as required by 1985	Not Applicable	Expansion as required by 1985	By 1990	Not Applicable	Not Applicable	Expansion as required by 1985	Not Applicable
City of Lake Geneva	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	Expansion as required by 1984	Cooperate with Town of Linn Sanitary District No. 1 and Town of Geneva in provision of Geneva Lake-North, Geneva Lake-South, Como Lake-North, and Como Lake-South trunk sewer
Town of Geneva New District—Lake Como	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Como Lake-North—by 1984 Como Lake-South—by 1984
Town of Linn Sanitary District No. 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Geneva Lake-North—by 1986 Geneva Lake-South—by 1986
Village of East Troy	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	Expansion as required by 1984	Cooperate with Town of East Troy Sanitary District No. 2 and provision of Potter Lake trunk sewer
Town of East Troy Sanitary District No. 2 Village of Genoa City	Not Applicable Expansion as required by 1985	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Applicable By 1985	Not Applicable Not Applicable	Not Applicable Expansion as required by 1985	Potter Lake to East Troy sewage treatment plant—by 1984 Not Applicable
Village of Mukwonago	New plant by 1983	Not Applicable	Replacement as required by 1983	By 1990	Not Applicable	Not Applicable	Replacement as required by 1983	Existing sewage treatment plant site to new sewage treatment plant site—by 1983
Village of North Prairie	By 1986	Not Applicable	Not Applicable	Not Applicable	By 1986	Not Applicable	By 1986	Not Applicable
Village of Silver Lake	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Not Applicable
Village of Twin Lakes	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	Expansion as required by 1984	Not Applicable
Town of Dover Eagle Lake Sewer Utility District	By 1980	By 1980	By 1985	By 1990	Not Applicable	By 1980	By 1980	Not Applicable
Town of Lyons Sanitary District No. 2	New plant by 1983	Not Applicable	Not Applicable	Not Applicable	By 1983	Not Applicable	By 1983	Not Applicable
Town of Norway Sanitary District No. 1	By 1978 and expansion as required by 1990	By 1978 and expansion as required by 1990	By 1978	By 1990	Not Applicable	By 1978 and expansion as required by 1990	By 1978 and expansion as required by 1990	Muskego-Norway—by 1978
Town of Salem Sanitary District No. 2	By 1984	Not Applicable	By 1984	By 1990	Not Applicable	Not Applicable	By 1984	Silver Lake-Camp Lake—by 1984 Wilmot—by 1984 Cross-Rock Lakes—by 1984

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 57

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE LOWER FOX RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Mukwonago		East Troy		Lake Geneva		Lyons Sanitary District No. 1	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 136,000	$ --	$ 102,000	$ --	$ 205,000	$ --	$ --
1977	2	--	136,000	--	102,000	--	205,000	--	--
1978	3	--	136,000	--	102,000	--	205,000	--	--
1979	4	--	136,000	--	102,000	--	205,000	--	--
1980	5	--	136,000	--	102,000	--	205,000	--	--
1981	6	293,000	136,000	--	102,000	--	205,000	148,000	--
1982	7	1,318,000	136,000	437,000	102,000	992,000	205,000	660,000	--
1983	8	1,318,000	190,000	1,961,000	102,000	4,459,000	205,000	660,000	71,000
1984	9	--	190,000	1,961,000	102,000	4,459,000	304,000	--	71,000
1985	10	--	190,000	--	167,000	--	304,000	--	71,000
1986	11	--	190,000	--	167,000	--	304,000	--	71,000
1987	12	--	190,000	--	167,000	--	304,000	--	71,000
1988	13	105,000	190,000	--	167,,000	--	304,000	--	71,000
1989	14	474,000	190,000	--	167,000	--	304,000	--	71,000
1990	15	474,000	340,000	--	167,000	--	304,000	--	71,000
1991	16	--	340,000	--	167,000	--	304,000	--	71,000
1992	17	--	340,000	--	167,000	--	304,000	--	71,000
1993	18	--	340,000	--	167,000	--	304,000	--	71,000
1994	19	--	340,000	--	167,000	--	304,000	--	71,000
1995	20	--	340,000	--	167,000	--	304,000	--	71,000
1996	21	--	340,000	--	167,000	--	304,000	--	71,000
1997	22	--	340,000	--	167,000	--	304,000	--	71,000
1998	23	--	340,000	--	167,000	--	304,000	--	71,000
1999	24	--	340,000	--	167,000	--	304,000	--	71,000
2000	25	--	340,000	--	167,000	--	304,000	--	71,000
Total		$ 3,982,000	$ 6,022,000	$ 4,359,000	$ 3,590,000	$ 9,910,000	$ 6,808,000	$ 1,468,000	$ 1,278,000
Annual Average		$ 159,280	240,880	$ 174,360	$ 143,600	$ 396,400	$ 272,320	$ 58,720	$ 51,120

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Genoa City		Norway Sanitary District No. 1		Dover-Eagle Lake Sewer Utility District		Western Racine County Sewerage District	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 30,000	$ 126,000	$ --	$ --	$ --	$ --	$ 113,000
1977	2	--	30,000	569,000	--	--	--	--	113,000
1978	3	--	30,000	569,000	182,000	123,000	--	--	113,000
1979	4	--	30,000	--	182,000	550,000	--	--	113,000
1980	5	--	30,000	--	182,000	550,000	98,000	--	113,000
1981	6	--	30,000	--	182,000	--	98,000	--	113,000
1982	7	--	30,000	--	182,000	--	98,000	--	113,000
1983	8	167,000	30,000	--	182,000	14,000	98,000	505,000	113,000
1984	9	753,000	30,000	--	182,000	60,000	98,000	2,272,000	113,000
1985	10	753,000	72,000	--	182,000	60,000	123,000	2,272,000	212,000
1986	11	--	72,000	--	182,000	--	123,000	--	212,000
1987	12	--	72,000	--	182,000	--	123,000	--	212,000
1988	13	--	72,000	296,000	182,000	48,000	123,000	--	212,000
1989	14	--	72,000	1,333,000	182,000	210,000	123,000	--	212,000
1990	15	--	72,000	1,333,000	342,000	210,000	164,000	--	212,000
1991	16	--	72,000	--	342,000	--	164,000	--	212,000
1992	17	--	72 000	--	342,000	--	164,000	--	212,000
1993	18	--	72,000	--	342,000	--	164,000	--	212,000
1994	19	--	72,000	--	342,000	--	164,000	--	212,000
1995	20	--	72,000	--	342,000	--	164,000	--	212,000
1996	21	--	72,000	--	342,000	--	164,000	--	212,000
1997	22	--	72,000	--	342,000	--	164,000	--	212,000
1998	23	--	72,000	--	342,000	--	164,000	--	212,000
1999	24	--	72,000	--	342,000	--	164,000	--	212,000
2000	25	--	72,000	--	342,000	--	164,000	--	212,000
Total		$ 1,673,000	$ 1,422,000	$ 4,226,000	$ 5,946,000	$ 1,825,000	$ 2,909,000	$ 5,049,000	$ 4,409,000
Annual Average		$ 66,920	$ 56,880	$ 169,040	$ 237,840	$ 73,000	$ 116,360	$ 201,960	$ 176,360

Table 57 (continued)

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Burlington		Silver Lake		Twin Lakes		Salem Sewer Utility District No. 2	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 291,000	$ --	$ 72,000	$ --	$ 129,000	$ --	$ --
1977	2	--	291,000	--	72,000	--	129,000	--	--
1978	3	--	291,000	--	72,000	--	129,000	--	--
1979	4	--	291,000	--	72,000	--	129,000	--	--
1980	5	--	291,000	--	72,000	--	129,000	--	--
1981	6	--	291,000	--	72,000	--	129,000	--	--
1982	7	--	291,000	--	72,000	336,000	129,000	284,000	--
1983	8	166,000	291,000	215,000	72,000	1,513,000	129,000	1,277,000	--
1984	9	748,000	291,000	968,000	72,000	1,513,000	170,000	1,277,000	208,000
1985	10	748,000	340,000	968,000	100,000	--	170,000	--	208,000
1986	11	--	340,000	--	100,000	--	170,000	--	208,000
1987	12	--	340,000	--	100,000	--	170,000	--	208,000
1988	13	149,000	340,000	--	100,000	--	170,000	108,000	208,000
1989	14	668,000	340,000	--	100,000	--	170,000	486,000	208,000
1990	15	668,000	544,000	--	100,000	--	170,000	486,000	328,000
1991	16	--	544,000	--	100,000	--	170,000	--	328,000
1992	17	--	544,000	--	100,000	--	170,000	--	328,000
1993	18	--	544,000	--	100,000	--	170,000	--	328,000
1994	19	--	544,000	--	100,000	--	170,000	--	328,000
1995	20	--	544,000	--	100,000	--	170,000	--	328,000
1996	21	--	544,000	--	100,000	--	170,000	--	328,000
1997	22	--	544,000	--	100,000	--	170,000	--	328,000
1998	23	--	544,000	--	100,000	--	170,000	--	328,000
1999	24	--	544,000	--	100,000	--	170,000	--	328,000
2000	25	--	544,000	--	100,000	--	170,000	--	328,000
Total		$ 3,147,000	$ 10,303,000	$ 2,151,000	$ 2,248,000	$ 3,362,000	$ 3,922,000	$ 3,918,000	$ 4,856,000
Annual Average		$ 125,880	$ 412,120	$ 86,040	$ 89,920	$ 134,480	$ 156,880	$ 156,720	$ 194,240

Calendar Year	Project Year	Sewage Treatment Plant Plan Element		Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element			
		North Prairie				Lake Como-North		Lake Como-South	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ 126,000	$ 1,078,000	$ --	$ --	$ --	$ --
1977	2	--	--	569,000	1,078,000	--	--	--	--
1978	3	--	--	692,000	1,260,000	--	--	--	--
1979	4	--	--	550,000	1,260,000	--	--	--	--
1980	5	--	--	550,000	1,358,000	--	--	--	--
1981	6	--	--	441,000	1,358,000	--	--	--	--
1982	7	--	--	4,027,000	1,358,000	105,000	--	129,000	--
1983	8	--	--	12,255,000	1,483,000	466,000	--	583,000	--
1984	9	215,000	--	14,226,000	1,831,000	466,000	11,000	583,000	12,000
1985	10	964,000	--	5,765,000	2,139,000	--	11,000	--	12,000
1986	11	964,000	86,000	964,000	2,225,000	--	11,000	--	12,000
1987	12	--	86,000	--	2,225,000	--	11,000	--	12,000
1988	13	--	86,000	706,000	2,225,000	--	11,000	--	12,000
1989	14	--	86,000	3,171,000	2,225,000	--	11,000	--	12,000
1990	15	--	86,000	3,171,000	2,900,000	--	11,000	--	12,000
1991	16	--	86,000	--	2,900,000	--	11,000	--	12,000
1992	17	--	86,000	--	2,900,000	--	11,000	--	12,000
1993	18	--	86,000	--	2,900,000	--	11,000	--	12,000
1994	19	--	86,000	--	2,900,000	--	11,000	--	12,000
1995	20	--	86,000	--	2,900,000	--	11,000	--	12,000
1996	21	--	86,000	--	2,900,000	--	11,000	--	12,000
1997	22	--	86,000	--	2,900,000	--	11,000	--	12,000
1998	23	--	86,000	--	2,900,000	--	11,000	--	12,000
1999	24	--	86,000	--	2,900,000	--	11,000	--	12,000
2000	25	--	86,000	--	2,900,000	--	11,000	--	12,000
Total		$ 2,143,000	$ 1,290,000	$ 47,213,000	$ 55,003,000	$ 1,037,000	$ 187,000	$ 1,295,000	$ 204,000
Annual Average		$ 85,720	$ 51,600	$ 1,888,520	$ 2,200,120	$ 41,480	$ 7,480	$ 51,800	$ 8,160

Table 57 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Lake Geneva-North		Lake Geneva-South		Muskego-Norway		Mukwonago	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ 79,000	$ --	$ --	$ --
1977	2	--	--	--	--	349,000	--	--	--
1978	3	--	--	--	--	349,000	7,000	--	--
1979	4	--	--	--	--	--	7,000	--	--
1980	5	--	--	--	--	--	7,000	--	--
1981	6	--	--	--	--	--	7,000	13,000	--
1982	7	--	--	--	--	--	7,000	61,000	--
1983	8	--	--	--	--	--	7,000	61,000	300
1984	9	34,000	--	250,000	--	--	7,000	--	300
1985	10	151,000	--	1,118,000	--	--	7,000	--	300
1986	11	151,000	600	1,118,000	22,000	--	7,000	--	300
1987	12	--	600	--	22,000	--	7,000	--	300
1988	13	--	600	--	22,000	--	7,000	--	300
1989	14	--	600	--	22,000	--	7,000	--	300
1990	15	--	600	--	22,000	--	7,000	--	300
1991	16	--	600	--	22,000	--	7,000	--	300
1992	17	--	600	--	22,000	--	7,000	--	300
1993	18	--	600	--	22,000	--	7,000	--	300
1994	19	--	600	--	22,000	--	7,000	--	300
1995	20	--	600	--	22,000	--	7,000	--	300
1996	21	--	600	--	22,000	--	7,000	--	300
1997	22	--	600	--	22,000	--	7,000	--	300
1998	23	--	600	--	22,000	--	7,000	--	300
1999	24	--	600	--	22,000	--	7,000	--	300
2000	25	--	600	--	22,000	--	7,000	--	300
Total		$ 336,000	$ 9,000	$ 2,486,000	$ 330,000	$ 777,000	$ 161,000	$ 135,000	$ 5,400
Annual Average		$ 13,440	$ 360	$ 99,440	$ 13,200	$ 31,080	$ 6,440	$ 5,400	$ 216

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Potter Lake-East Troy		Tichigan Lake-Rochester		Cross-Rock Lakes		Silver Lake-Camp Lake	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--
1980	5	--	--	--	--	--	--	--	--
1981	6	--	--	--	--	--	--	--	--
1982	7	69,000	--	--	--	194,000	--	111,000	--
1983	8	311,000	--	303,000	--	867,000	--	501,000	--
1984	9	311,000	8,000	1,364,000	--	867,000	14,800	501,000	21,200
1985	10	--	8,000	1,364,000	54,000	--	14,800	--	21,200
1986	11	--	8,000	--	54,000	--	14,800	--	21,200
1987	12	--	8,000	--	54,000	--	14,800	--	21,200
1988	13	--	8,000	--	54,000	--	14,800	--	21,200
1989	14	--	8,000	--	54,000	--	14,800	--	21,200
1990	15	--	8,000	--	54,000	--	14,800	--	21,200
1991	16	--	8,000	--	54,000	--	14,800	--	21,200
1992	17	--	8,000	--	54,000	--	14,800	--	21,200
1993	18	--	8,000	--	54,000	--	14,800	--	21,200
1994	19	--	8,000	--	54,000	--	14,800	--	21,200
1995	20	--	8,000	--	54,000	--	14,800	--	21,200
1996	21	--	8,000	--	54,000	--	14,800	--	21,200
1997	22	--	8,000	--	54,000	--	14,800	--	21,200
1998	23	--	8,000	--	54,000	--	14,800	--	21,200
1999	24	--	8,000	--	54,000	--	14,800	--	21,200
2000	25	--	8,000	--	54,000	--	14,800	--	21,200
Total		$ 691,000	$ 136,000	$ 3,031,000	$ 864,000	$ 1,928,000	$ 251,600	$ 1,113,000	$ 360,400
Annual Average		$ 27,640	$ 5,440	$ 121,240	$ 34,560	$ 77,120	$ 10,064	$ 44,520	$ 14,416

Table 57 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element – Wilmot: Facility Construction	Intercommunity Trunk Sewer Plan Element – Wilmot: Operation and Maintenance	Subtotal Intercommunity Trunk Sewer Plan Element: Facility Construction	Subtotal Intercommunity Trunk Sewer Plan Element: Operation and Maintenance	Total: Facility Construction	Total: Operation and Maintenance
1976	1	$ --	$ --	$ 79,000	$ --	$ 205,000	$ 1,078,000
1977	2	--	--	349,000	--	918,000	1,078,000
1978	3	--	--	349,000	7,000	1,041,000	1,267,000
1979	4	--	--	--	7,000	550,000	1,267,000
1980	5	--	--	--	7,000	550,000	1,365,000
1981	6	--	--	13,000	7,000	454,000	1,365,000
1982	7	40,000	--	709,000	7,000	4,736,000	1,365,000
1983	8	180,000	--	3,272,000	7,300	15,527,000	1,490,300
1984	9	180,000	5,400	4,556,000	79,700	18,782,000	1,910,700
1985	10	--	5,400	2,633,000	133,700	8,398,000	2,272,700
1986	11	--	5,400	1,269,000	156,300	2,233,000	2,381,300
1987	12	--	5,400	--	156,300	--	2,381,300
1988	13	--	5,400	--	156,300	706,000	2,381,300
1989	14	--	5,400	--	156,300	3,171,000	2,381,300
1990	15	--	5,400	--	156,300	3,171,000	3,056,300
1991	16	--	5,400	--	156,300	--	3,056,300
1992	17	--	5,400	--	156,300	--	3,056,300
1993	18	--	5,400	--	156,300	--	3,056,300
1994	19	--	5,400	--	156,300	--	3,056,300
1995	20	--	5,400	--	156,300	--	3,056,300
1996	21	--	5,400	--	156,300	--	3,056,300
1997	22	--	5,400	--	156,300	--	3,056,300
1998	23	--	5,400	--	156,300	--	3,056,300
1999	24	--	5,400	--	156,300	--	3,056,300
2000	25	--	5,400	--	156,300	--	3,056,300
Total		$ 400,000	$ 91,800	$ 13,229,000	$ 2,600,200	$ 60,442,000	$ 57,603,200
Annual Average		$ 16,000	$ 3,672	$ 529,160	$ 104,008	$ 2,417,680	$ 2,304,128

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

With respect to trunk sewers, the schedule recommends that the Village of Mukwonago complete construction of a trunk sewer from the existing sewage treatment plant site to the new sewage treatment plant site by 1983; that the Town of East Troy Sanitary District No. 2 complete construction of the Potter Lake to East Troy trunk sewer by 1984; that the Town of Linn Sanitary District No. 1 complete construction of the Geneva Lake-North and Geneva Lake-South trunk sewers by 1986; that the new district to serve Lake Como in the Town of Geneva complete construction of the Como Lake-North and Como Lake-South trunk sewers by 1984; that the Town of Waterford Sanitary District No. 1 complete construction of the Tichigan Lake to Rochester trunk sewer by 1985; and that the Town of Salem Sanitary District No. 2 complete construction of the Silver Lake-Camp Lake, Wilmot, and Cross-Rock Lake trunk sewers by 1984.

Upper Rock River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Upper Rock River subregional area is set forth in Table 58. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 59.

With respect to sewage treatment plants, the schedule recommends that the City of Hartford complete construction of additional treatment units that would provide for nitrification by 1985, for an effluent concentration of 1.0 mg/l of phosphorus by 1985, and for an effluent concentration of 0.1 mg/l of phosphorus by 1990; that the Village of Slinger complete construction of a new sewage treatment plant by 1983, and by 1990 provide additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus; and that the Allenton Sanitary District in the Town of Addison complete a treatment plant expansion program by 1985, including arrangements for land disposal of sewage effluent.

With respect to trunk sewers, the schedule recommends that the Village of Slinger complete construction of the trunk sewer from the existing sewage treatment plant site to the new sewage treatment plant site by 1983.

Table 58

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER ROCK RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
City of Hartford	Expansion as required by 1990	By 1985	Expansion as required by 1985	By 1990	Not Applicable	Expansion as required by 1990	Expansion as required by 1990	Not Applicable
Village of Slinger	New plant by 1983	By 1983	By 1983	By 1990	Not Applicable	By 1983	By 1983	Existing sewage treatment plant site to new sewage treatment plant site—by 1983
Town of Addison Allenton Sanitary District	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 59

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE UPPER ROCK RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Allenton Sanitary District No. 1		Slinger		Hartford		Subtotal Sewage Treatment Plant Plan Element	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 66,000	$ --	$ 66,000	$ --	$ 269,000	$ --	$ 401,000
1977	2	--	66,000	--	66,000	--	269,000	--	401,000
1978	3	--	66,000	--	66,000	--	269,000	--	401,000
1979	4	--	66,000	--	66,000	--	269,000	--	401,000
1980	5	--	66,000	--	66,000	--	269,000	--	401,000
1981	6	--	66,000	187,000	66,000	--	269,000	187,000	401,000
1982	7	--	66,000	844,000	66,000	--	269,000	844,000	401,000
1983	8	210,000	66,000	844,000	129,000	249,000	269,000	1,303,000	464,000
1984	9	941,000	66,000	--	129,000	1,116,000	269,000	2,057,000	464,000
1985	10	941,000	89,000	--	129,000	1,116,000	343,000	2,057,000	561,000
1986	11	--	89,000	--	129,000	--	343,000	--	561,000
1987	12	--	89,000	--	129,000	--	343,000	--	561,000
1988	13	--	89,000	73,000	129,000	149,000	343,000	222,000	561,000
1989	14	--	89,000	330,000	129,000	668,000	343,000	998,000	561,000
1990	15	--	89,000	330,000	235,000	668,000	564,000	998,000	888,000
1991	16	--	89,000	--	235,000	--	564,000	--	888,000
1992	17	--	89,000	--	235,000	--	564,000	--	888,000
1993	18	--	89,000	--	235,000	--	564,000	--	888,000
1994	19	--	89,000	--	235,000	--	564,000	--	888,000
1995	20	--	89,000	--	235,000	--	564,000	--	888,000
1996	21	--	89,000	--	235,000	--	564,000	--	888,000
1997	22	--	89,000	--	235,000	--	564,000	--	888,000
1998	23	--	89,000	--	235,000	--	564,000	--	888,000
1999	24	--	89,000	--	235,000	--	564,000	--	888,000
2000	25	--	89,000	--	235,000	--	564,000	--	888,000
Total		$ 2,092,000	$ 2,018,000	$ 2,608,000	$ 3,950,000	$ 3,966,000	$ 10,340,000	$ 8,666,000	$ 16,308,000
Annual Average		$ 83,680	$ 80,720	$ 104,320	$ 158,000	$ 158,640	$ 413,600	$ 346,640	$ 652,320

Middle Rock River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan in the Middle Rock River subregional area is set forth in Table 60. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 61.

With respect to sewage treatment plants, the schedule recommends that the Delafield-Hartland Water Pollution Control Commission complete construction of a new sewage treatment plant by 1981, and further provide additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus by 1990; that the Village of Dousman complete a treatment plant expansion program by 1983, with the provision of additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus by 1990; that the City of Oconomowoc complete construction of additional treatment units that would provide for nitrification by 1985, for an effluent concentration of 1.0 mg/l of phosphorus by 1985, and for an effluent concentration of 0.1 mg/l of phosphorus by 1990; and that the Village of Wales construct a new sewage treatment plant by 1987, including arrangements for land disposal of sewage effluent.

With respect to trunk sewers, the schedule recommends that the Delafield-Hartland Water Pollution Control Commission complete construction of the Hartland-Delafield trunk sewer by 1981, thus permitting abandonment of both the Hartland sewage treatment plant and the Nashotah-Delafield trunk sewer by 1981; that the Town of Summit complete construction of the Summit-Delafield trunk sewer by 1983; that the Village of Lac La Belle and Town of Oconomowoc complete construction of the Lac La Belle-Oconomowoc-East and the Lac La Belle-Oconomowoc-West trunk sewers by 1984; that the Town of Summit complete construction of the Silver Lake trunk sewer by 1987; and that the Village of Oconomowoc Lake, the Village of Chenequa, the Town of Oconomowoc, and the Town of Merton complete construction of the North Lake trunk sewer by 1990.

Table 59 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element – Slinger: Facility Construction	Intercommunity Trunk Sewer Plan Element – Slinger: Operation and Maintenance	Subtotal Intercommunity Trunk Sewer Plan Element: Facility Construction	Subtotal Intercommunity Trunk Sewer Plan Element: Operation and Maintenance	Total: Facility Construction	Total: Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ 401,000
1977	2	--	--	--	--	--	401,000
1978	3	--	--	--	--	--	401,000
1979	4	--	--	--	--	--	401,000
1980	5	--	--	--	--	--	401,000
1981	6	--	--	--	--	187,000	401,000
1982	7	7,000	--	7,000	--	851,000	401,000
1983	8	61,000	200	61,000	200	1,364,000	464,200
1984	9	--	200	--	200	2,057,000	464,200
1985	10	--	200	--	200	2,057,000	561,200
1986	11	--	200	--	200	--	561,200
1987	12	--	200	--	200	--	561,200
1988	13	--	200	--	200	222,000	561,200
1989	14	--	200	--	200	998,000	561,200
1990	15	--	200	--	200	998,000	888,200
1991	16	--	200	--	200	--	888,200
1992	17	--	200	--	200	--	888,200
1993	18	--	200	--	200	--	888,200
1994	19	--	200	--	200	--	888,200
1995	20	--	200	--	200	--	888,200
1996	21	--	200	--	200	--	888,200
1997	22	--	200	--	200	--	888,200
1998	23	--	200	--	200	--	888,200
1999	24	--	200	--	200	--	888,200
2000	25	--	200	--	200	--	888,200
Total		$ 68,000	$ 3,600	$ 68,000	$ 3,600	$ 8,734,000	$ 16,311,600
Annual Average		$ 2,720	$ 144	$ 2,720	$ 144	$ 349,360	$ 652,464

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

Table 60

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE MIDDLE ROCK RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
Delafield-Hartland Water Pollution Control Commission	New plant by 1981 and expansion as required by 1990	By 1981 and expansion as required by 1990	By 1985 and expansion as required by 1990	By 1990	Not Applicable	By 1981 and expansion as required by 1990	By 1981 and expansion as required by 1990	Hartland-Delafield—by 1981 (abandon Hartland sewage treatment plant) Nashotah-Delafield—by 1981
Town of Summit	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Summit-Delafield—by 1983
City of Oconomowoc	New plant by 1978 and expansion as required by 1990	By 1985	By 1985	By 1990	Not Applicable	Not Applicable	By 1978 and expansion as required by 1990	Cooperate with other agencies in provision of trunk sewers in Oconomowoc River watershed
Village of Lac La Belle and Town of Oconomowoc	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Lac La Belle-Oconomowoc-East—by 1984 Lac La Belle-Oconomowoc-West—by 1984
Village of Oconomowoc Lake, Village of Chenequa, Town of Oconomowoc, and Town of Merton	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	North Lake—by 1990
Town of Summit	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Silver Lake—by 1987
Village of Dousman	Expansion as required by 1983	By 1983	By 1983	By 1990	Not Applicable	By 1983	Expansion as required by 1983	Not Applicable
Village of Wales	New plant by 1987	Not Applicable	Not Applicable	Not Applicable	By 1987	Not Applicable	By 1987	Not Applicable

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 61

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE MIDDLE ROCK RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Oconomowoc		Delafield-Hartland		Dousman		Wales	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ 304,000	$ 134,000	$ --	$ 110,000	$ --	$ 46,000	$ --	$ --
1977	2	1,371,000	134,000	--	110,000	--	46,000	--	--
1978	3	1,371,000	180,000	--	110,000	--	46,000	--	--
1979	4	--	180,000	495,000	110,000	--	46,000	--	--
1980	5	--	180,000	2,224,000	110,000	--	46,000	--	--
1981	6	--	180,000	2,224,000	170,000	125,000	46,000	--	--
1982	7	--	180,000	--	170,000	565,000	46,000	--	--
1983	8	160,000	180,000	--	170,000	565,000	102,000	--	--
1984	9	722,000	180,000	45,000	170,000	--	102,000	--	--
1985	10	722,000	581,000	405,000	338,000	--	102,000	292,000	--
1986	11	--	581,000	--	338,000	--	102,000	1,316,000	--
1987	12	--	581,000	--	338,000	--	102,000	1,316,000	131,000
1988	13	457,000	581,000	389,000	338,000	49,000	102,000	--	131,000
1989	14	2,057,000	581,000	1,746,000	338,000	221,000	102,000	--	131,000
1990	15	2,057,000	1,101,000	1,746,000	577,000	221,000	161,000	--	131,000
1991	16	--	1,101,000	--	577,000	--	161,000	--	131,000
1992	17	--	1,101,000	--	577,000	--	161,000	--	131,000
1993	18	--	1,101,000	--	577,000	--	161,000	--	131,000
1994	19	--	1,101,000	--	577,000	--	161,000	--	131,000
1995	20	--	1,101,000	--	577,000	--	161,000	--	131,000
1996	21	--	1,101,000	--	577,000	--	161,000	--	131,000
1997	22	--	1,101,000	--	577,000	--	161,000	--	131,000
1998	23	--	1,101,000	--	577,000	--	161,000	--	131,000
1999	24	--	1,101,000	--	577,000	--	161,000	--	131,000
2000	25	--	1,101,000	--	577,000	--	161,000	--	131,000
Total		$ 9,221,000	$ 16,544,000	$ 9,274,000	$ 9,267,000	$ 1,746,000	$ 2,807,000	$ 2,924,000	$ 1,834,000
Annual Average		$ 368,840	$ 661,760	$ 370,960	$ 370,680	$ 69,840	$ 112,280	$ 116,960	$ 73,360

Calendar Year	Project Year	Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element					
				Hartland-Delafield		Nashotah-Delafield		Summit-Delafield	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ 304,000	$ 290,000	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	1,371,000	290,000	--	--	--	--	--	--
1978	3	1,371,000	336,000	--	--	--	--	--	--
1979	4	495,000	336,000	391,000	--	48,000	--	--	--
1980	5	2,224,000	336,000	1,758,000	--	215,000	--	--	--
1981	6	2,349,000	396,000	1,758,000	45,000	215,000	1,100	60,000	--
1982	7	565,000	396,000	--	45,000	--	1,100	267,000	--
1983	8	725,000	452,000	--	45,000	--	1,100	267,000	11,000
1984	9	767,000	452,000	--	45,000	--	1,100	--	11,000
1985	10	1,419,000	1,021,000	--	45,000	--	1,100	--	11,000
1986	11	1,316,000	1,021,000	--	45,000	--	1,100	--	11,000
1987	12	1,316,000	1,152,000	--	45,000	--	1,100	--	11,000
1988	13	895,000	1,152,000	--	45,000	--	1,100	--	11,000
1989	14	4,024,000	1,152,000	--	45,000	--	1,100	--	11,000
1990	15	4,024,000	1,970,000	--	45,000	--	1,100	--	11,000
1991	16	--	1,970,000	--	45,000	--	1,100	--	11,000
1992	17	--	1,970,000	--	45,000	--	1,100	--	11,000
1993	18	--	1,970,000	--	45,000	--	1,100	--	11,000
1994	19	--	1,970,000	--	45,000	--	1,100	--	11,000
1995	20	--	1,970,000	--	45,000	--	1,100	--	11,000
1996	21	--	1,970,000	--	45,000	--	1,100	--	11,000
1997	22	--	1,970,000	--	45,000	--	1,110	--	11,000
1998	23	--	1,970,000	--	45,000	--	1,100	--	11,000
1999	24	--	1,970,000	--	45,000	--	1,100	--	11,000
2000	25	--	1,970,000	--	45,000	--	1,110	--	11,000
Total		$ 23,165,000	$ 30,452,000	$ 3,907,000	$ 900,000	$ 478,000	$ 22,000	$ 594,000	$ 198,000
Annual Average		$ 926,600	$ 1,218,080	$ 156,280	$ 36,000	$ 19,120	$ 880	$ 23,760	$ 7,920

Table 61 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Lac La Belle Oconomowoc-East		Lac La Belle Oconomowoc-West		North Lake-Oconomowoc		Silver Lake-Oconomowoc	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--
1980	5	--	--	--	--	--	--	--	--
1981	6	--	--	--	--	--	--	--	--
1982	7	52,000	--	60,000	--	--	--	--	--
1983	8	231,000	--	265,000	--	--	--	--	--
1984	9	231,000	6,000	265,000	1,500	--	--	--	--
1985	10	--	6,000	--	1,500	--	--	32,000	--
1986	11	--	6,000	--	1,500	--	--	140,000	--
1987	12	--	6,000	--	1,500	--	--	140,000	5,100
1988	13	--	6,000	--	1,500	442,000	--	--	5,100
1989	14	--	6,000	--	1,500	1,985,000	--	--	5,100
1990	15	--	6,000	--	1,500	1,985,000	46,100	--	5,100
1991	16	--	6,000	--	1,500	--	46,100	--	5,100
1992	17	--	6,000	--	1,500	--	46,100	--	5,100
1993	18	--	6,000	--	1,500	--	46,100	--	5,100
1994	19	--	6,000	--	1,500	--	46,100	--	5,100
1995	20	--	6,000	--	1,500	--	46,100	--	5,100
1996	21	--	6,000	--	1,500	--	46,100	--	5,100
1997	22	--	6,000	--	1,500	--	46,100	--	5,100
1998	23	--	6,000	--	1,500	--	46,100	--	5,100
1999	24	--	6,000	--	1,500	--	46,100	--	5,100
2000	25	--	6,000	--	1,500	--	46,100	--	5,100
Total		$ 514,000	$ 102,000	$ 590,000	$ 25,500	$ 4,412,000	$ 507,100	$ 312,000	$ 71,400
Annual Average		$ 20,560	$ 4,080	$ 23,600	$ 1,020	$ 176,480	$ 20,284	$ 12,480	$ 2,856

Calendar Year	Project Year	Subtotal Intercommunity Trunk Sewer Plan Element		Total	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ 304,000	$ 290,000
1977	2	--	--	1,371,000	290,000
1978	3	--	--	1,371,000	336,000
1979	4	439,000	--	934,000	336,000
1980	5	1,973,000	--	4,197,000	336,000
1981	6	2,033,000	46,100	4,382,000	442,100
1982	7	379,000	46,100	944,000	442,100
1983	8	763,000	57,100	1,488,000	509,100
1984	9	496,000	64,600	1,263,000	516,600
1985	10	32,000	64,600	1,451,000	1,085,600
1986	11	140,000	64,600	1,456,000	1,085,600
1987	12	140,000	69,700	1,456,000	1,221,700
1988	13	442,000	69,700	1,337,000	1,221,700
1989	14	1,985,000	69,700	6,009,000	1,221,700
1990	15	1,985,000	115,800	6,009,000	2,085,800
1991	16	--	115,800	--	2,085,800
1992	17	--	115,800	--	2,085,800
1993	18	--	115,800	--	2,085,800
1994	19	--	115,800	--	2,085,800
1995	20	--	115,800	--	2,085,800
1996	21	--	115,800	--	2,085,800
1997	22	--	115,800	--	2,085,800
1998	23	--	115,800	--	2,085,800
1999	24	--	115,800	--	2,085,800
2000	25	--	115,800	--	2,085,800
Total		$ 10,807,000	$ 1,826,000	$ 33,972,000	$ 32,278,000
Annual Average		$ 432,280	$ 73,040	$ 1,358,880	$ 1,291,120

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

Lower Rock River Subregional Area: The proposed implementation schedule for the point source pollution abatement element of the recommended plan for the Lower Rock River subregional area is set forth in Table 62. A companion schedule of construction and operation and maintenance costs for implementation of the plan in this subregional area is set forth in Table 63.

With respect to sewage treatment plants, the schedule recommends that the City of Whitewater complete construction of a new sewage treatment plant by 1982, that additional treatment units to achieve an effluent concentration of 1.0 mg/l of phosphorus be provided by 1985, and that additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus be provided by 1990; that the Walworth County Metro-

Table 62

PROPOSED IMPLEMENTATION SCHEDULE FOR THE POINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE LOWER ROCK RIVER SUBREGIONAL AREA

Management Agency	Sewage Treatment Plant Element[a]							Trunk Sewer Plan Element[b]
	Secondary Waste Treatment	Advanced Waste Treatment				Auxiliary Waste Treatment		
		Nitrification	Phosphorus Removal		Land Application	Effluent Aeration	Effluent Disinfection	
			1.0 mg/l	0.1 mg/l				
Walworth County Metropolitan Sewerage District	By 1983	By 1983	By 1983	By 1990	Not Applicable	By 1983	By 1983	Elkhorn-Delavan—by 1983 (abandon Elkhorn sewage treatment plant) Delavan Lake—by 1983 Walworth County Institutions by 1983
City of Whitewater	New plant by 1982	By 1982	By 1985	By 1990	Not Applicable	By 1982	By 1982	Existing sewage treatment plant site to new sewage treatment plant site—by 1982
Village of Darien	Expansion as required by 1985	Not Applicable	Not Applicable	Not Applicable	By 1985	Not Applicable	Expansion as required by 1985	Not Applicable
Village of Sharon	Expansion as required by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	Expansion as required by 1984	Not Applicable
Village of Walworth	New plant by 1984	Not Applicable	Not Applicable	Not Applicable	By 1984	Not Applicable	By 1984	Existing sewage treatment plant site to new sewage treatment plant site—by 1984
Village of Fontana	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Fontana-Walworth—by 1984 (abandon Fontana sewage treatment plant)
Village of Williams Bay	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Williams Bay-Fontana—by 1984 (abandon Williams Bay sewage treatment plant)
Town of Linn Sanitary District No. 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Williams Bay-Geneva Lake—by 1985 Fontana-Geneva Lake—by 1984

NOTE: This proposed implementation schedule represents a point of departure for intergovernmental negotiations and tentative federal and state agency programming, including the issuance of pollution abatement orders and waste discharge permits and the disposition of grants-in-aid.

[a] *Specific recommended performance standards for each sewage treatment plant are set forth in Table 2, Chapter II of this volume.*

[b] *See Map 5, Chapter II of this volume.*

Source: SEWRPC.

Table 63

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE POINT SOURCE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE LOWER ROCK RIVER SUBREGIONAL AREA: 1976-2000[a]

Calendar Year	Project Year	Sewage Treatment Plant Plan Element							
		Whitewater		Walworth County Metropolitan Sewerage District		Darien		Walworth	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 120,000	$ --	$ 185,000	$ --	$ 67,000	$ --	$ 118,000
1977	2	--	120,000	--	185,000	--	67,000	--	118,000
1978	3	--	120,000	--	185,000	--	67,000	--	118,000
1979	4	--	120,000	--	185,000	--	67,000	--	118,000
1980	5	331,000	120,000	--	185,000	--	67,000	--	118,000
1981	6	1,490,000	120,000	473,000	185,000	--	67,000	--	118,000
1982	7	1,490,000	195,000	2,129,000	185,000	--	67,000	807,000	118,000
1983	8	--	195,000	2,129,000	498,000	207,000	67,000	3,627,000	118,000
1984	9	42,000	195,000	--	498,000	932,000	67,000	3,627,000	292,000
1985	10	383,000	357,000	--	498,000	932,000	85,000	--	292,000
1986	11	--	357,000	--	498,000	--	85,000	--	292,000
1987	12	--	357,000	--	498,000	--	85,000	--	292,000
1988	13	148,000	357,000	189,000	498,000	--	85,000	--	292,000
1989	14	666,000	357,000	847,000	498,000	--	85,000	--	292,000
1990	15	666,000	569,000	847,000	767,000	--	85,000	--	292,000
1991	16	--	569,000	--	767,000	--	85,000	--	292,000
1992	17	--	569,000	--	767,000	--	85,000	--	292,000
1993	18	--	569,000	--	767,000	--	85,000	--	292,000
1994	19	--	569,000	--	767,000	--	85,000	--	292,000
1995	20	--	569,000	--	767,000	--	85,000	--	292,000
1996	21	--	569,000	--	767,000	--	85,000	--	292,000
1997	22	--	569,000	--	767,000	--	85,000	--	292,000
1998	23	--	569,000	--	767,000	--	85,000	--	292,000
1999	24	--	569,000	--	767,000	--	85,000	--	292,000
2000	25	--	569,000	--	767,000	--	85,000	--	292,000
Total		$ 5,216,000	$ 9,349,000	$ 6,614,000	$ 13,218,000	$ 2,071,000	$ 1,963,000	$ 8,061,000	$ 5,908,000
Annual Average		$ 208,640	$ 373,960	$ 264,560	$ 528,720	$ 82,840	$ 78,520	$ 322,440	$ 236,320

Calendar Year	Project Year	Sewage Treatment Plant Plan Element		Subtotal Sewage Treatment Plant Plan Element		Intercommunity Trunk Sewer Plan Element			
		Sharon				Whitewater		Walworth County Institutions	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 64,000	$ --	$ 554,000	$ --	$ --	$ --	$ --
1977	2	--	64,000	--	554,000	--	--	--	--
1978	3	--	64,000	--	554,000	--	--	--	--
1979	4	--	64,000	--	554,000	--	--	--	--
1980	5	--	64,000	331,000	554,000	65,000	--	--	--
1981	6	--	64,000	1,963,000	554,000	289,000	--	93,000	--
1982	7	197,000	64,000	4,623,000	629,000	289,000	500	421,000	--
1983	8	880,000	64,000	6,843,000	942,000	--	500	421,000	6,900
1984	9	880,000	81,000	5,481,000	1,133,000	--	500	--	6,900
1985	10	--	81,000	1,315,000	1,313,000	--	500	--	6,900
1986	11	--	81,000	--	1,313,000	--	500	--	6,900
1987	12	--	81,000	--	1,313,000	--	500	--	6,900
1988	13	--	81,000	337,000	1,313,000	--	500	--	6,900
1989	14	--	81,000	1,513,000	1,313,000	--	500	--	6,900
1990	15	--	81,000	1,513,000	1,794,000	--	500	--	6,900
1991	16	--	81,000	--	1,794,000	--	500	--	6,900
1992	17	--	81,000	--	1,794,000	--	500	--	6,900
1993	18	--	81,000	--	1,794,000	--	500	--	6,900
1994	19	--	81,000	--	1,794,000	--	500	--	6,900
1995	20	--	81,000	--	1,794,000	--	500	--	6,900
1996	21	--	81,000	--	1,794,000	--	500	--	6,900
1997	22	--	81,000	--	1,794,000	--	500	--	6,900
1998	23	--	81,000	--	1,794,000	--	500	--	6,900
1999	24	--	81,000	--	1,794,000	--	500	--	6,900
2000	25	--	81,000	--	1,794,000	--	500	--	6,900
Total		$ 1,957,000	$ 1,889,000	$ 23,919,000	$ 32,327,000	$ 643,000	$ 9,500	$ 935,000	$ 124,200
Annual Average		$ 78,280	$ 75,560	$ 956,760	$ 1,293,080	$ 25,720	$ 380	$ 37,400	$ 4,968

Table 63 (continued)

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element							
		Delavan Lake Sanitary District		Delavan Lake		Williams Bay-Lake Geneva		Williams Bay-Fontana	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--
1980	5	144,000	--	--	--	--	--	--	--
1981	6	646,000	--	353,000	--	--	--	--	--
1982	7	646,000	21,800	1,586,000	--	--	--	147,000	--
1983	8	--	21,800	1,586,000	24,000	34,000	--	661,000	--
1984	9	--	21,800	--	24,000	146,000	--	661,000	20,400
1985	10	--	21,800	--	24,000	146,000	14,600	--	20,400
1986	11	--	21,800	--	24,000	--	14,600	--	20,400
1987	12	--	21,800	--	24,000	--	14,600	--	20,400
1988	13	--	21,800	--	24,000	--	14,600	--	20,400
1989	14	--	21,800	--	24,000	--	14,600	--	20,400
1990	15	--	21,800	--	24,000	--	14,600	--	20,400
1991	16	--	21,800	--	24,000	--	14,600	--	20,400
1992	17	--	21,800	--	24,000	--	14,600	--	20,400
1993	18	--	21,800	--	24,000	--	14,600	--	20,400
1994	19	--	21,800	--	24,000	--	14,600	--	20,400
1995	20	--	21,800	--	24,000	--	14,600	--	20,400
1996	21	--	21,800	--	24,000	--	14,600	--	20,400
1997	22	--	21,800	--	24,000	--	14,600	--	20,400
1998	23	--	21,800	--	24,000	--	14,600	--	20,400
1999	24	--	21,800	--	24,000	--	14,600	--	20,400
2000	25	--	21,800	--	24,000	--	14,600	--	20,400
Total		$ 1,436,000	$ 414,200	$ 3,525,000	$ 432,000	$ 326,000	$ 233,600	$ 1,469,000	$ 346,800
Annual Average		$ 57,440	$ 16,568	$ 141,000	$ 17,280	$ 13,040	$ 9,344	$ 58,760	$ 13,872

Calendar Year	Project Year	Intercommunity Trunk Sewer Plan Element						Subtotal Intercommunity Trunk Sewer Plan Element	
		Fontana-Lake Geneva		Fontana-Walworth		Walworth			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ --	$ --	$ --	$ --	$ --	$ --	$ --
1977	2	--	--	--	--	--	--	--	--
1978	3	--	--	--	--	--	--	--	--
1979	4	--	--	--	--	--	--	--	--
1980	5	--	--	--	--	--	--	209,000	--
1981	6	--	--	--	--	--	--	1,381,000	--
1982	7	20,000	--	113,000	--	75,000	--	3,297,000	22,300
1983	8	661,000	--	511,000	--	338,000	--	4,212,000	53,200
1984	9	661,000	14,200	511,000	11,700	338,000	1,400	2,317,000	100,900
1985	10	--	14,200	--	11,700	--	1,400	146,000	115,500
1986	11	--	14,200	--	11,700	--	1,400	--	115,500
1987	12	--	14,200	--	11,700	--	1,400	--	115,500
1988	13	--	14,200	--	11,700	--	1,400	--	115,500
1989	14	--	14,200	--	11,700	--	1,400	--	115,500
1990	15	--	14,200	--	11,700	--	1,400	--	115,500
1991	16	--	14,200	--	11,700	--	1,400	--	115,500
1992	17	--	14,200	--	11,700	--	1,400	--	115,500
1993	18	--	14,200	--	11,700	--	1,400	--	115,500
1994	19	--	14,200	--	11,700	--	1,400	--	115,500
1995	20	--	14,200	--	11,700	--	1,400	--	115,500
1996	21	--	14,200	--	11,700	--	1,400	--	115,500
1997	22	--	14,200	--	11,700	--	1,400	--	115,500
1998	23	--	14,200	--	11,700	--	1,400	--	115,500
1999	24	--	14,200	--	11,700	--	1,400	--	115,500
2000	25	--	14,200	--	11,700	--	1,400	--	115,500
Total		$ 1,342,000	$ 241,400	$ 1,135,000	$ 198,900	$ 751,000	$ 23,800	$ 11,562,000	$ 2,024,400
Annual Average		$ 53,680	$ 9,656	$ 45,400	$ 7,956	$ 30,040	$ 952	$ 462,480	$ 80,976

Table 63 (continued)

Calendar Year	Project Year	Total Facility Construction	Total Operation and Maintenance
1976	1	$ --	$ 554,000
1977	2	--	554,000
1978	3	--	554,000
1979	4	--	554,000
1980	5	540,000	554,000
1981	6	3,344,000	554,000
1982	7	7,920,000	651,300
1983	8	11,055,000	995,200
1984	9	7,798,000	1,233,900
1985	10	1,461,000	1,428,500
1986	11	--	1,428,500
1987	12	--	1,428,500
1988	13	337,000	1,428,000
1989	14	1,513,000	1,428,500
1990	15	1,513,000	1,909,500
1991	16	--	1,909,500
1992	17	--	1,909,500
1993	18	--	1,909,500
1994	19	--	1,909,500
1995	20	--	1,909,500
1996	21	--	1,909,500
1997	22	--	1,909,500
1998	23	--	1,909,500
1999	24	--	1,909,500
2000	25	--	1,909,500
Total		$ 35,481,000	$ 34,351,400
Annual Average		$ 1,419,240	$ 1,374,056

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction. The costs do not include those associated with sludge management, which are discussed in a later section.*

Source: SEWRPC.

politan Sewerage District construct a new treatment plant by 1983, and that by 1990 the District provide additional treatment units to achieve an effluent concentration of 0.1 mg/l of phosphorus; that the Village of Sharon complete a treatment plant expansion program by 1984, including arrangements for land disposal of sewage effluent; that the Village of Darien complete a treatment plant expansion program by 1985, including arrangements for land disposal of sewage effluent; and that the Village of Walworth complete construction of a new sewage treatment plant by 1984, including arrangements for land disposal of sewage effluent.

With respect to trunk sewers, the schedule recommends that the City of Whitewater complete construction of a trunk sewer from the existing treatment plant site to the new treatment plant site by 1982; that the Walworth County Metropolitan Sewerage District complete construction of the Elkhorn-Delavan trunk sewer by 1983, thus permitting abandonment of the Elkhorn sewage treatment plant, the Delavan Lake trunk sewer by 1983, and the Walworth County Institutions trunk sewer by 1983; that the Village of Walworth complete construction of a trunk sewer from the existing sewage treatment plant site to the new sewage treatment plant site by 1984; that the Town of Linn Sanitary District No.1 complete construction of the Fontana-Geneva Lake trunk sewer by 1984 and the Williams Bay-Geneva Lake Trunk sewer by 1985; that the Village of Williams Bay complete construction of the Williams Bay-Fontana trunk sewer by 1984, thus permitting abandonment of the Williams Bay sewage treatment plant; and that the Village of Fontana complete construction of the Fontana-Walworth trunk sewer by 1984, thus permitting abandonment of the Fontana sewage treatment plant.

Implementation Schedules—Concluding Remarks: The schedules set forth above for the point source pollution abatement element of the plan reflect to the extent possible committed decisions that have been made since completion of the regional sanitary sewerage system plan, the goal set by the U. S. Congress to achieve "fishable and swimmable" waters by 1983, and existing schedules for construction of sewerage facilities negotiated between the local unit of governments involved and the Wisconsin Department of Natural Resources. In some cases, however, the schedules set forth herein do not precisely reflect previously negotiated schedules because, as a practical matter, the previous schedules cannot be met. As necessary the schedules reflect the staging of major construction projects where multiple year construction is anticipated. The schedules also reflect the phased implementation of advanced waste treatment requirements for phosphorus removal in light of the need to adopt in Wisconsin an instream phosphorus standard, to prepare and promulgate rules that relate to such a standard, and to reflect such rules in an orderly way in the five-year cycle of issuance of waste discharge permits.

As noted throughout the discussion of the implementation schedules, the plan proposes in 21 instances the disposal of sewage effluent on land. The costs set forth in the plan implementation schedules reflect an assumption that the operator of the sewage treatment facility will act to acquire the land needed for sewage effluent disposal purposes. It is possible that sewage treatment plant operators could choose to contract with existing private landowners for land disposal of sewage effluent. As discussed in Volume Two, Chapter IV of this report, however, such a course of action would probably require more land for effluent disposal than contemplated in the plan since private landowners are likely to seek to optimize crop production rather than to dispose of sewage effluent. The question of whether or not to purchase land for sewage effluent disposal must be addressed by the designated management agencies in the facilities planning process.

Private Sewage Treatment Plants

Under the recommended water quality management plan for the Region, 35 of the 68 existing private sewage treatment facilities are proposed to be abandoned over the plan design period. These 35 facilities are identified in Table 10 of this volume. It is recommended that the Wisconsin Department of Natural Resources, in administering the Wisconsin Pollutant Discharge Elimination System, schedule the abandonment of these 35 identified private sewage treatment facilities, with the precise scheduling to be determined by the Department as public centralized sanitary sewerage systems are constructed and extended. It is further recommended that the Department formulate on a case-by-case basis definitive recommendations concerning the type and level of

treatment to be provided at the remaining existing private sewage treatment facilities in the Region. In formulating such recommendations, it is recommended that the Department give careful consideration to the disposal of treated effluent on land and thus avoid discharge of sewage effluent to surface waters wherever possible. Should detailed studies called for by the Department during the plan implementation period indicate that land application of sewage effluent is not practical for a given sewage treatment facility, then it is recommended that the Department require the facility to be designed so as to provide the level of treatment needed to meet the recommended water use objectives and supporting water quality standards.

It is recognized that the Department may receive during the plan implementation period requests to approve additional private sewage treatment facilities to serve new enclaves of isolated land use development. It is recommended that the Department of Natural Resources, with the assistance of the Southeastern Wisconsin Regional Planning Commission, evaluate each such proposal as it arises. Such evaluation should be made in light of the objectives sought to be achieved in both the adopted regional land use plan and the recommended areawide water quality management plan.

Miscellaneous Point Source Discharges

It is recommended that the Wisconsin Department of Natural Resources, through the Wisconsin Pollutant Discharge Elimination System, establish appropriate effluent quality limits for all miscellaneous point source discharges as identified in Volume Two, Chapter IV of this report. In so doing, it is recommended that the Department require the reduction of the concentration of pollutants in the discharges attendant to such point sources to levels that are at a minimum consistent with the effluent characteristics recommended for public and private sewage treatment facilities discharging to the same or similar surface watercourses. It is also recommended that the Department require that these point sources reduce discharges of such pollutants as sediment, grease, heavy metals, organics, and heat to levels attainable by the application of the "Best Available Technology" and "Best Conventional Control Technology."

Clear Water Reduction

It is recommended that all of the designated point source management agencies identified in Table 41 that currently are responsible for the construction, operation, and maintenance of a sanitary sewerage system evaluate the need to reduce clear water infiltration and inflow into the local system. Where such infiltration and inflow anayses indicate excessive clear water in the system, it is further recommended that sewer system evaluation surveys be undertaken. Following such surveys, it is recommended that sewer system rehabilitation measures and preventative measures be instituted so that all infiltration and inflow that can be cost-effectively eliminated is eliminated.

Two of the major sources of clear water inflow into sanitary sewerage systems are roof downspout and building foundation drain connections to the separate sanitary sewerage system. These connections may be classified as either "legal"—that is, connections made prior to the enactment of local ordinances prohibiting such connections—or "illegal"—that is, connections made after the enactment of such ordinances. Local units of government in the Region must generally eliminate these sources of clear water—whether in the form of "legal" or "illegal" connections—as a first step in the reduction of clear water flows in separate sanitary sewerage systems.

One community's approach to the problem of eliminating clear water inflows from roof downspouts and building foundation drains is illustrated in Figure 5. By ordinance, the City of Oak Creek has prohibited the discharge of clear water into the sanitary sewerage system and further declares it be the public policy to eliminate all discharge of clear water now occurring in the sanitary sewerage system. The ordinance relating to this matter, as well as a diagram illustrating a recommended arrangement for eliminating clear water discharge from foundation drains to the sanitary sewerage system, is shown in Figure 5. Under the ordinance, and in accordance with Section 66.22 of the Wisconsin Statutes, the City has the authority to impose special assessments against real property for all or part of the cost of abating, correcting, or eliminating clear water connections to the sewer system. In this connection, it should be recognized that, with respect to those problem situations created before local ordinances were enacted to prohibit the discharge of clear water to sanitary sewerage systems, there may well be a public responsibility to assist financially in correcting such problems. Clearly, no such public responsibility exists for correcting such problems created by illegal connections.

Waste Load Reduction

It is recommended that all of the designated point source management agencies identified in Table 41 undertake public education efforts to encourage voluntary reduction in water use and, accordingly, a corresponding reduction in waste loading. It is further recommended that these management agencies encourage local industries to examine opportunities for reduction and reuse of wastewaters so as to minimize discharges to public sanitary sewerage systems.

Flow Metering

It is recommended that each local government management agency so designated in Table 41 take steps to achieve complete metering of sewage flows in accordance with the metering recommendations set forth in Chapter II of this volume. Metering equipment providing continuous data on rates and volumes of sewage flow should be provided at all sewage treatment facilities and pumping stations, as well as at all points of sewage flow relief, until such points have been eliminated.

Elimination of Flow Relief Devices

It is recommended that each local government management agency so identified in Table 41 conduct a detailed study of the local sanitary sewerage system, if it has not already done so, to identify all existing points of sewage

Figure 5

CLEAR WATER PROHIBITION AND ELIMINATION ORDINANCE AND RECOMMENDED ARRANGEMENT FOR CORRECTING EXISTING SITUATIONS WHERE FOUNDATION DRAINS DISCHARGE TO THE SANITARY SEWER SYSTEMS: CITY OF OAK CREEK

CITY OF OAK CREEK

Official Notice

ORDINANCE NO. 493
By Ald. Martens

An Ordinance to Prohibit the Discharge of Clear Water into the Sanitary Sewer System and to Authorize Inspection of Connections, Providing for Notice, Hearing, Appeal, Assessment and Penalty.

WHEREAS, the Department of Natural Resources of the state of Wisconsin has issued an order, 4B-70-5-4, directing the city of Oak Creek to eliminate clear water that reaches sanitary, main and intercepting sewers; this, to improve the capacity and efficiency of overtaxed sewerage treatment facilities, and reduce pollution, and

WHEREAS, all sewers installed in Oak Creek since 1959 have been designed as separate sanitary sewers and no sources of clear water have been allowed to be connected to the sanitary sewer system; however, clear water sources do exist in areas where sewers and buildings were constructed prior to the enactment of Ordinance No. 99 in 1959; also, some structures have a valving system to be manually operated by the homeowner to direct the flow of waste water into the sanitary sewers, and clear water into the sump system; however, said systems are not properly used by the owners, and clear water is pumped into the sanitary system; further, some property owners have physically altered sanitary sewer systems originally properly installed, to direct sump pump clear water discharge into the sanitary sewer system, and

WHEREAS, the public health, safety, and welfare requires all such clear water discharges into the sanitary sewer system to be eliminated.

NOW, THEREFORE, the common council of the city of Oak Creek do hereby ordain as follows:

Section 1. The discharge of clear water into the sanitary sewer system is prohibited.

Section 2. The discharge of clear water into the sanitary sewer system is to be eliminated.

Section 3. The inspection officers of the city of Oak Creek are hereby authorized and directed to make such inspections as are necessary to determine where clear water connections, or clear water infiltration, exists. In making such inspections, they are authorized and directed to obtain special inspection warrants under the provisions of Sections 66.122 and 66.123 of the Wisconsin statutes.

Section 4. Upon determining that a clear water connection, or clear water infiltration exists, city inspection officers are authorized and directed to issue appropriate orders to abate, correct, or eliminate such connection of infiltration within a reasonable time, not to exceed 90 days. This order shall be sent to the owner by certified mail, at the address shown on the tax roll. The owner shall have the right to appeal the said order to the common council within 10 days from the date of mailing. The council shall hold a public hearing on the said appeal, within 10 days from receipt of the appeal. The owner shall have the right to appear in person, or by an attorney. The council shall have the authority to affirm, modify, or reverse the order appealed from. The owner shall have the right to appeal the council's decision by certiorari commenced within 10 days of the council order. If no such appeal is taken, the council's order shall be final, and may be implemented by mandatory injunction or other appropriate legal means.

Section 5. In accordance with the provisions of Section 66.62 Wisconsin statutes, the council shall have the authority to impose special assessments against the property for all or part of the cost of abating, correcting, or eliminating clear water connections or infiltration, including the manual valving system described in the preamble hereof. Prior to the imposition of such assessment, the council shall conduct a public hearing, preceded by a Class 1 notice published in the official city newspaper, and a mailed notice to each owner at the address shown on the last tax roll. Any special assessment imposed shall be by a final resolution as provided in Section 66.60 of the Wisconsin statutes, and shall constitute a lien on the property. Payment shall be made as the council provides in said resolution. The council may provide for installment payments not to exceed five (5) years, with 6 percent interest on the unpaid balance. The owner shall have the right to appeal the said special assessment in the manner provided in Section 66.60 (12) within 40 days of the publication of the final resolution.

Section 6. City officers and contractors retained by the city are authorized to enter upon property for the purpose of performing the work necessary to abate, correct, or eliminate such clear water connections or infiltration. No person shall refuse such entry, or interfere with such city officer or contractor in the performance of such work. In addition to the penalties herein provided, any person who so refuses or interferes, shall be subject to injunction or restraining order of a court or competent jurisdiction.

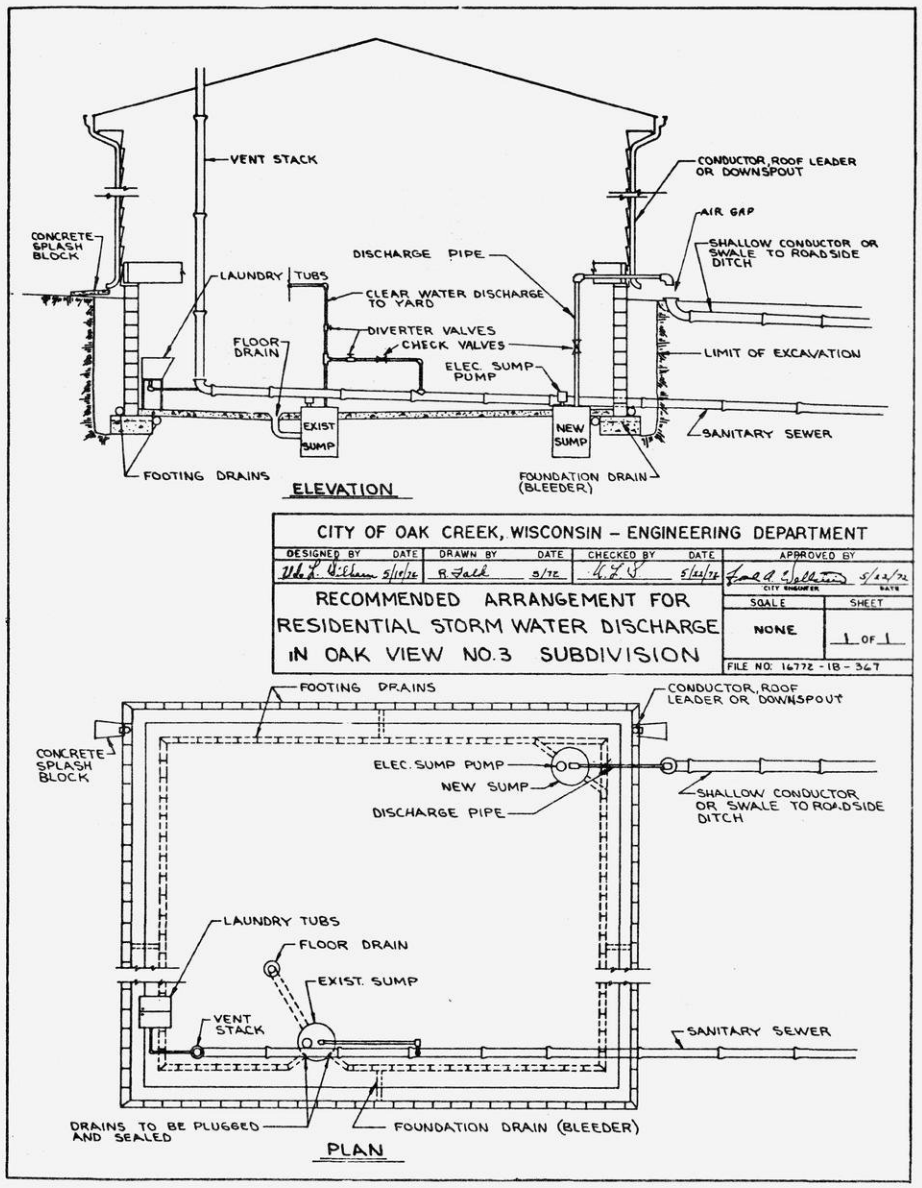
Section 7. Any person, firm, or corporation violating any of the provisions of this ordinance, shall forfeit not less than $10 nor more than $200 or in default of payment thereof, be imprisoned in the county jail for a period not to exceed 60 days. Each day of violation shall constitute a separate offense.

Section 8. All ordinances or parts of ordinances contravening the provisions of this ordinance are hereby repealed.

Section 9. This ordinance shall take effect and be in force from and after its passage and publication.

Passed and adopted this 21st day of November, 1972.
/s/Allen H. Windschanz,
President, Common Council

Approved this 22nd day of November, 1972.
/s/Elroy C. Honadel, Mayor
Attest:
/s/La Verne C. Gutknecht
City Clerk
Vote: Ayes 5 Noes 0



flow relief and to determine the steps necessary to ensure the ultimate elimination of those flow relief points not eliminated through the construction of the sewerage facilities contained in the recommended point source pollution abatement element of the water quality management plan for the Region. Each individual point of sewage flow relief must be identified and physically eliminated so as to preclude the possibility of the discharge of raw sewage ahead of the sewage treatment plant. It is recognized that in some cases this will require the construction of local relief sewers.

Industrial Pretreatment

It is recommended that those local government management agencies so identified in Table 41 cooperate with local industries in the establishment of pretreatment programs. Industries in the Region should review their wastewater discharges and take such steps as may be necessary to ensure that adequate treatment is provided before discharge to a receiving public sanitary sewerage system. Pretreatment of industrial wastewater is at times essential to the control of heavy metals in sewage sludges, and thereby ensures the long-term safety of such sludges on agricultural lands.

Sewage Treatment Plant Operation and Maintenance

It is recommended that the Wisconsin Department of Natural Resources review its sewage treatment plant operators certification program and make such changes as may be deemed necessary in order to improve the operation and maintenance of sewage treatment plants so as to achieve the operating standards needed to carry out the plan recommendations. It is further recommended that each designated point source management agency in Table 41 responsible for the construction, operation, and maintenance of a sewage treatment facility consider staffing and operation in accordance with the minimum standards set forth in Table 17 in Chapter II of this volume. Generally, municipal sewage treatment plants should be monitored on a 24-hour, seven-day-per-week basis in order to provide continuous surveillance of the operation. It is further recommended that each such management agency provide proper laboratory and related facilities needed to adequately assess the treatment plant operation, and determine whether or not the specific recommended performance standards set forth in the plan and effluent limits required under the Wisconsin Pollutant Discharge Elimination System permits are being met. Finally, it is recommended that the Department of Natural Resources review its requirements for sewage treatment plant operational reporting to ensure that all the data described in Table 17 and those additional data that may be necessary to determine whether or not the treatment level performance standards are being met are included in the reports submitted to the Wisconsin Department of Natural Resources by individual treatment plant operators.

NONPOINT SOURCE POLLUTION ABATEMENT PLAN ELEMENT IMPLEMENTATION

Designation of Urban Nonpoint Source Management Agencies

The local governmental management agencies designated to implement the urban nonpoint source pollution abatement subelement of the recommended areawide water quality management plan are identified in Table 64. These designations are comprised of all of the incorporated units of government in the Region, together with selected unincorporated towns that have large urban populations and selected utility, sanitary, and/or lake protection and rehabilitation districts within unincorporated towns. New agencies are proposed in some instances, particularly for lake areas where the creation of such agencies is deemed necessary to carry out the plan recommendations.

In Kenosha County, a total of 14 urban nonpoint source management agencies have been designated. Of this total, 13 are existing agencies and one would be a new agency. The one new agency would be a sanitary, utility, or lake protection and rehabilitation district that would be created in the Town of Randall to encompass urban and rural development tributary to Benedict and Powers Lakes.[2] The existing agencies designated in Kenosha County include Kenosha County; the Kenosha County Soil and Water Conservation District; the City of Kenosha; the Villages of Paddock Lake, Silver Lake, and Twin Lakes; the Towns of Pleasant Prairie and Somers, which are deemed to be urban in character for this purpose; the Town of Bristol Sewer Utility District No. 1 and the George Lake Protection and Rehabilitation District in the Town of Bristol; the Town of Salem Sewer Utility District Nos. 1 and 2; and the Lilly Lake Protection and Rehabilitation District in the Town of Wheatland. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

In Milwaukee County, a total of 21 urban nonpoint source management agencies have been designated, all of which currently exist. These agencies include Milwaukee County; the Milwaukee County Soil and Water Conservation District; the Cities of Cudahy, Franklin, Glendale, Greenfield, Milwaukee, Oak Creek, St. Francis, South Milwaukee, Wauwatosa, and West Allis; and the Villages of Bayside, Brown Deer, Fox Point, Greendale, Hales Corners, River Hills, Shorewood, West Milwaukee, and Whitefish Bay. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

In Ozaukee County, a total of 10 urban nonpoint source management agencies have been designated, all of which currently exist. These agencies include Ozaukee County; the Ozaukee County Soil and Water Conservation District; the Cities of Cedarburg, Mequon, and Port Washington; and the Villages of Belgium, Fredonia, Grafton, Saukville, and Thiensville. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

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[2] *This new district would also encompass a portion of the Town of Bloomfield in Walworth County.*

Table 64

LOCAL GOVERNMENTAL MANAGEMENT AGENCY DESIGNATIONS AND SELECTED RESPONSIBILITIES FOR THE URBAN-ORIENTED NONPOINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Urban Nonpoint Source Management Agency	Undertake Septic Tank System Management Program	Undertake Construction Erosion Control Program	Develop and Implement Detailed Plan for Application of Urban Land Practices			Abate Creosote Pollution of Bottom Deposits in Little Menomonee River	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
			25 Percent Reduction in Pollutant Runoff	50 Percent Reduction in Pollutant Runoff	75 Percent Reduction in Pollutant Runoff				
KENOSHA COUNTY									
Kenosha County	X	X	--	--	--	--	X	--	X
Kenosha County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Kenosha	--	X	X	--	--	--	X	--	--
Village of Paddock Lake	--	X	X	X	--	--	X	--	--
Village of Silver Lake	--	X	X	--	--	--	X	--	--
Village of Twin Lakes	--	X	X	--	--	--	X	--	--
Town of Bristol									
Utility District No. 1	--	--	X	--	--	--	X	--	--
George Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
Town of Pleasant Prairie	--	--	X	X	--	--	X	--	--
Town of Randall									
New District—Benedict and Powers Lakes[a]	--	--	X	--	--	--	X	--	--
Town of Salem									
Sewer Utility District No. 1	--	--	X	X	--	--	X	--	--
Sewer Utility District No. 2	--	--	X	--	--	--	X	--	--
Town of Somers	--	--	X	--	--	--	X	--	--
Town of Wheatland									
Lilly Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
MILWAUKEE COUNTY									
Milwaukee County	--	X	--	--	--	X	X	--	X
Milwaukee County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Cudahy	--	X	X	--	--	--	X	--	--
City of Franklin	X	X	X	X	--	--	X	--	--
City of Glendale	--	X	X	--	--	--	X	--	--
City of Greenfield	--	X	X	X	--	--	X	--	--
City of Milwaukee	--	X	X	X	--	--	X	--	--
City of Oak Creek	X	X	X	X	--	--	X	--	--
City of St. Francis	--	X	X	--	--	--	X	--	--
City of South Milwaukee	--	X	X	X	--	--	X	--	--
City of Wauwatosa	--	X	X	--	--	--	X	--	--
City of West Allis	--	X	X	X	--	--	X	--	--
Village of Bayside	--	X	X	--	--	--	X	--	--
Village of Brown Deer	--	X	X	--	--	--	X	--	--
Village of Fox Point	--	X	X	--	--	--	X	--	--
Village of Greendale	--	X	X	X	--	--	X	--	--
Village of Hales Corners	--	X	X	X	--	--	X	--	--
Village of River Hills	--	X	X	--	--	--	X	--	--
Village of Shorewood	--	X	X	--	--	--	X	--	--
Village of West Milwaukee	--	X	X	--	--	--	X	--	--
Village of Whitefish Bay	--	X	X	--	--	--	X	--	--
OZAUKEE COUNTY									
Ozaukee County	X	X	--	--	--	--	X	--	X
Ozaukee County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Cedarburg	--	X	X	--	--	--	X	--	--
City of Mequon	X	X	X	--	--	--	X	--	--
City of Port Washington	--	X	X	--	--	--	X	--	--
Village of Belgium	--	X	X	--	--	--	X	--	--
Village of Fredonia	--	X	X	--	--	--	X	--	--
Village of Grafton	--	X	X	--	--	--	X	--	--
Village of Saukville	--	X	X	--	--	--	X	--	--
Village of Thiensville	--	X	X	--	--	--	X	--	--
RACINE COUNTY									
Racine County	X	X	--	--	--	--	X	--	X
Racine County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Burlington	--	X	X	--	--	--	X	--	--
City of Racine	--	X	X	X	--	--	X	--	--
Village of Elmwood Park	--	X	X	--	--	--	X	--	--
Village of North Bay	--	X	X	--	--	--	X	--	--
Village of Rochester	--	X	X	--	--	--	X	--	--
Village of Sturtevant	--	X	X	--	--	--	X	--	--

Table 64 (continued)

Urban Nonpoint Source Management Agency	Undertake Septic Tank System Management Program	Undertake Construction Erosion Control Program	Develop and Implement Detailed Plan for Application of Urban Land Practices			Abate Creosote Pollution of Bottom Deposits in Little Menomonee River	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
			25 Percent Reduction in Pollutant Runoff	50 Percent Reduction in Pollutant Runoff	75 Percent Reduction in Pollutant Runoff				
RACINE COUNTY (continued)									
Village of Union Grove	--	X	X	X	--	--	X	--	X
Village of Waterford	--	X	X	--	--	--	X	--	--
Village of Wind Point	--	X	X	--	--	--	X	--	--
Town of Burlington									
Browns Lake Sanitary District	--	--	X	--	--	--	X	--	--
New District—Bohner Lake	--	--	X	--	--	--	X	--	--
New District—Long Lake[b]	--	--	X	X	--	--	X	--	--
Town of Caledonia	--	--	X	X	--	--	X	--	--
Town of Dover									
Eagle Lake Sewer Utility District	--	--	X	--	--	--	X	--	--
Town of Mt. Pleasant	--	--	X	X	--	--	X	--	--
Town of Norway									
Sanitary District No. 1	--	--	X	X	--	--	X	--	--
Town of Rochester									
Sewer Utility District No. 1	--	--	X	--	--	--	X	--	--
Town of Waterford									
Sanitary District No. 1	--	--	X	--	--	--	X	--	--
Town of Yorkville									
Sanitary District No. 1	--	--	X	X	--	--	X	--	--
WALWORTH COUNTY									
Walworth County	X	X	--	--	--	--	X	--	X
Walworth County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
Geneva Lake Environmental Watershed Agency	--	--	--	--	--	--	X	X	--
City of Delavan	--	X	X	--	--	--	X	--	--
City of Elkhorn	--	X	X	--	--	--	X	--	--
City of Lake Geneva	--	X	X	--	--	--	X	--	--
City of Whitewater	--	X	X	--	--	--	X	--	--
Village of Darien	--	X	X	--	--	--	X	--	--
Village of East Troy	--	X	X	--	--	--	X	--	--
Village of Fontana	--	X	X	--	--	--	X	--	--
Village of Genoa City	--	X	X	--	--	--	X	--	--
Village of Sharon	--	X	X	--	--	--	X	--	--
Village of Walworth	--	X	X	--	--	--	X	--	--
Village of Williams Bay	--	X	X	--	--	--	X	--	--
Town of Bloomfield									
New District—Pell Lake	--	--	X	--	--	--	X	--	--
Town of Delavan									
Delavan Lake Sanitary District[c]	--	--	X	--	--	--	X	--	--
Town of East Troy									
Sanitary District No. 1	--	--	X	--	--	--	X	--	--
Sanitary District No. 2	--	--	X	--	--	--	X	--	--
Town of Geneva									
New District—Lake Como	--	--	X	--	--	--	X	--	--
Town of La Grange									
New District—Pleasant, Green, Middle, and Mill Lakes	--	--	X	--	--	--	X	--	--
Town of Linn									
Sanitary District No. 1	--	--	X	--	--	--	X	--	--
Town of Richmond									
New District—Lake Loraine	--	--	X	--	--	--	X	--	--
New District—Turtle Lake	--	--	X	--	--	--	X	--	--
Town of Spring Prairie									
Honey Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
Town of Sugar Creek									
New District—North Lake	--	--	X	--	--	--	X	--	--
New District—Silver Lake	--	--	X	--	--	--	X	--	--
New District—Wandawega Lake	--	--	X	--	--	--	X	--	--
Town of Troy									
New District—Booth Lake	--	--	X	--	--	--	X	--	--
Town of Whitewater									
New District—Rice and Whitewater Lakes	--	--	X	--	--	--	X	--	--
WASHINGTON COUNTY									
Washington County	X	X	--	--	--	--	X	--	X
Washington County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Hartford	--	X	X	--	--	--	X	--	--
City of West Bend	--	X	X	--	--	--	X	--	--
Village of Germantown	X	X	X	--	--	--	X	--	--
Village of Jackson	--	X	X	--	--	--	X	--	--
Village of Kewaskum	--	X	X	--	--	--	X	--	--
Village of Newburg	--	X	X	--	--	--	X	--	--
Village of Slinger	--	X	X	--	--	--	X	--	--
Town of Addison									
Allenton Sanitary District	--	--	X	--	--	--	X	--	--
Town of Erin									
New District—Druid Lake	--	--	X	--	--	--	X	--	--

Table 64 (continued)

Urban Nonpoint Source Management Agency	Undertake Septic Tank System Management Program	Undertake Construction Erosion Control Program	Develop and Implement Detailed Plan for Application of Urban Land Practices: 25 Percent Reduction in Pollutant Runoff	50 Percent Reduction in Pollutant Runoff	75 Percent Reduction in Pollutant Runoff	Abate Creosote Pollution of Bottom Deposits in Little Menomonee River	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
WASHINGTON COUNTY (continued)									
Town of Farmington									
New District—Green Lake	--	--	X	--	--	--	X	--	X
New District—Lake Twelve	--	--	X	--	--	--	X	--	--
Town of Hartford									
New District—Pike Lake	--	--	X	--	--	--	X	--	--
Town of Richfield									
New District—Bark Lake	--	--	X	--	--	--	X	--	--
New District—Freiss Lake	--	--	X	--	--	--	X	--	--
New District—Lake Five	--	--	X	--	--	--	X	--	--
Town of Trenton									
Wallace Lake Sanitary District	--	--	X	--	--	--	X	--	--
Town of West Bend									
Big Cedar Lake Sanitary District	--	--	X	--	--	--	X	--	--
Little Cedar Lake Sanitary District	--	--	X	--	--	--	X	--	--
Silver Lake Sanitary District	--	--	X	--	--	--	X	--	--
WAUKESHA COUNTY									
Waukesha County	--	X	--	--	--	--	X	--	X
Waukesha County Board of Health	X	--	--	--	--	--	X	--	--
Waukesha County Soil and Water Conservation District	--	--	--	--	--	--	--	X	--
City of Brookfield	--	X	X	--	--	--	X	--	--
City of Delafield	--	X	X	--	--	--	X	--	--
City of Muskego	--	X	X	X	--	--	X	--	--
City of New Berlin	--	X	X	X	--	--	X	--	--
City of Oconomowoc	--	X	X	--	--	--	X	--	--
City of Waukesha	--	X	X	X	--	--	X	--	--
Village of Big Bend	--	X	X	--	--	--	X	--	--
Village of Butler	--	X	X	--	--	--	X	--	--
Village of Chenequa	--	X	X	--	--	--	X	--	--
Village of Dousman	--	X	X	--	--	--	X	--	--
Village of Eagle	--	X	X	--	--	--	X	--	--
Village of Elm Grove	--	X	X	--	--	--	X	--	--
Village of Hartland	--	X	X	X	--	--	X	--	--
Village of Lac La Belle	--	X	X	--	--	--	X	--	--
Village of Lannon	--	X	X	--	--	--	X	--	--
Village of Menomonee Falls	--	X	X	--	--	--	X	--	--
Village of Merton	--	X	X	--	--	--	X	--	--
Village of Mukwonago	--	X	X	--	--	--	X	--	--
Village of Nashotah	--	X	X	--	--	--	X	--	--
Village of North Prairie	--	X	X	--	--	--	X	--	--
Village of Oconomowoc Lake	--	X	X	--	--	--	X	--	--
Village of Pewaukee	--	X	X	X	--	--	X	--	--
Village of Sussex	--	X	X	--	--	--	X	--	--
Village of Wales	--	X	X	--	--	--	X	--	--
Town of Brookfield	--	--	X	--	--	--	X	--	--
Town of Delafield	--	--	X	--	--	--	X	--	--
Town of Eagle									
Eagle Spring Lake Sanitary District	--	--	X	--	--	--	X	-	--
Town of Genesee	--	--	X	--	--	--	X	--	--
Town of Lisbon	--	--	X	X	--	--	X	--	--
Town of Merton									
New District—North Lake	--	--	X	--	--	--	X	--	--
New District—Beaver Lake	--	--	X	--	--	--	X	--	--
New District—Lake Keesus	--	--	X	--	--	--	X	--	--
Town of Mukwonago									
Phantom Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
New District—Spring Lake	--	--	X	--	--	--	X	--	--
Town of Oconomowoc									
New District—Lac La Belle	--	--	X	--	--	--	X	--	--
New District—Moose Lake	--	--	X	--	--	--	X	--	--
Okauchee Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
Ashippun Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
Town of Ottawa									
Pretty Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
School Section Lake Protection and Rehabilitation District	--	--	X	--	--	--	X	--	--
Town of Pewaukee	--	--	X	X	--	--	X	--	--
Town of Summit	--	--	X	--	--	--	X	--	--
Town of Vernon	--	--	X	X	--	--	X	--	--
Town of Waukesha	--	--	X	X	--	--	X	--	--

[a] *This new District would also serve a portion of Walworth County.*

[b] *This new District would also serve a portion of the Town of Rochester.*

[c] *The Delavan Lake Sanitary District also serves part of the Town of Walworth.*

Source: SEWRPC.

In Racine County, a total of 21 urban nonpoint source management agencies have been designated. Of this total, 19 are existing agencies and two would be new agencies. The two new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created to encompass urban and rural development tributary to Bohners Lake and Long Lake, both in the Town of Burlington. The existing agencies designated in Racine County include Racine County; the Racine County Soil and Water Conservation District; the Cities of Burlington and Racine; the Villages of Elmwood Park, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point; the Towns of Caledonia and Mt. Pleasant, which are deemed to be urban in character for this purpose; the Browns Lake Sanitary District in the Town of Burlington; the Eagle Lake Sewer Utility District in the Town of Dover; the Town of Norway Sanitary District No. 1; the Town of Rochester Sewer Utility District No. 1; the Town of Waterford Sanitary District No. 1; and the Town of Yorkville Sanitary District No. 1. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

In Walworth County, a total of 29 urban nonpoint source management agencies have been designated. Of this total, 19 are existing agencies and 10 would be new agencies. The 10 new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Bloomfield to encompass urban and rural development tributary to Pell Lake; in the Town of Geneva to encompass urban and rural development tributary to Lake Como; in the Town of La Grange to encompass urban and rural development tributary to Pleasant, Green, Middle, and Mill Lakes; in the Town of Richmond to encompass urban and rural development tributary to Lake Loraine and to Turtle Lake; in the Town of Sugar Creek to encompass urban and rural development tributary to North Lake, to Silver Lake, and to Wandewega Lake; in the Town of Troy to encompass urban and rural development tributary to Booth Lake; and in the Town of Whitewater to encompass urban and rural development tributary to Whitewater and Rice Lakes. The existing agencies designated in Walworth County include Walworth County; the Walworth County Soil and Water Conservation District; the Geneva Lake Environmental Watershed Agency; the Cities of Delavan, Elkhorn, Lake Geneva, and Whitewater; the Villages of Darien, East Troy, Fontana, Genoa City, Sharon, Walworth, and Williams Bay; the Delavan Lake Sanitary District in the Towns of Delavan and Walworth; the Town of East Troy Sanitary Districts Nos. 1 and 2; the Town of Linn Sanitary District No. 1; and the Honey Lake Protection and Rehabilitation District in the Town of Spring Prairie. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

In Washington County, a total of 21 urban nonpoint source management agencies have been designated. Of this total, 14 are existing agencies and seven would be new agencies. The seven new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Erin to encompass urban and rural development tributary to Druid Lake; in the Town of Farmington to encompass urban and rural development tributary to Green Lake and to Lake Twelve; in the Town of Hartford to encompass urban and rural development tributary to Pike Lake; and in the Town of Richfield to encompass urban and rural development tributary to Bark Lake, to Freiss Lake, and to Lake Five. The existing agencies designated in Washington County include Washington County; the Washington County Soil and Water Conservation District; the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; the Allenton Sanitary District in the Town of Addison; the Wallace Lake Sanitary District in the Town of Trenton; and the Big Cedar Lake, Little Cedar Lake, and Silver Lake Sanitary Districts in the Town of West Bend. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

In Waukesha County, a total of 47 urban nonpoint source management agencies have been designated. Of this total, 41 are existing agencies and six would be new agencies. The six new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Merton to encompass urban and rural development tributary to North Lake, to Beaver Lake, and to Lake Keesus; in the Town of Mukwonago to encompass urban and rural development tributary to Spring Lake; and in the Town of Oconomowoc to encompass urban and rural development tributary to Lac La Belle and to Moose Lake. The existing agencies designated in Waukesha County include Waukesha County; the Waukesha County Board of Health; the Waukesha County Soil and Water Conservation District; the Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, and Waukesha; the Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lac La Belle, Lannon, Menomonee Falls, Merton, Mukwonago, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex, and Wales; the Towns of Brookfield, Delafield, Genesee, Lisbon, Pewaukee, Summit, Vernon, and Waukesha, which are deemed to be urban in character for this purpose; the Eagle Spring Lake Sanitary District in the Town of Eagle; the Phantom Lake Protection and Rehabilitation District in the Town of Mukwonago; the Okauchee Lake Protection and Rehabilitation District and the Ashippun Lake Protection and Rehabilitation District in the Town of Oconomowoc; and the Pretty Lake Protection and Rehabilitation District and the School Section Lake Protection and Rehabilitation District in the Town of Ottawa. The various responsibilities assigned to each of these management agencies are summarized in Table 64 and are discussed in more detail below.

For the Region as a whole, then, a total of 163 management agencies have been designated for urban nonpoint source pollution abatement purposes. Of this total, all but 26 agencies currently exist. The 26 new agencies would be sanitary, utility, and/or lake protection and

rehabilitation districts created to provide an institutional framework for the development and implementation of detailed local plans for the application of urban nonpoint source pollution abatement practices. Of the 163 designated urban nonpoint source pollution abatement management agencies, a total of 98 have been previously designated for point source pollution abatement purposes.

Septic Tank System Management Program

The urban nonpoint source pollution abatement element of the recommended plan proposes the establishment within each county in the Region of a septic tank system management program. The basic objective of such a program would be to ensure the proper installation, operation, and maintenance of existing septic tank and other onsite waste disposal systems, and of any new such systems that may be required to serve existing urban development in those portions of the Region where centralized sanitary sewer service is not recommended to be provided, as well as in such new rural development as is recommended to be developed in the regional land use plan.

A total of 10 urban nonpoint source pollution abatement management agencies would have responsibility for undertaking septic tank system management programs. These 10 agencies consist of Kenosha County, the Cities of Franklin and Oak Creek in Milwaukee County, Ozaukee County, the City of Mequon in Ozaukee County, Racine County, Walworth County, Washington County, the Village of Germantown in Washington County, and the Waukesha County Board of Health.

A septic tank system management program should consist of at least the following actions:

1. The adoption of an ordinance governing the installation, operation, and maintenance of onsite sewage disposal systems, including septic tanks, holding tanks, and "mound" systems or other systems approved by the Wisconsin Department of Health and Social Services.

2. The establishment of a regular program of inspection of onsite sewage disposal systems. Such a program would include the visual inspection by trained individuals in the field of each onsite sewage disposal system. The purpose of the inspection would be to identify any malfunctioning sewage disposal systems. Such an inspection program could extend to the testing of individual systems through the injection of dye, particularly in those cases where onsite systems are suspected of discharging directly to inlake lakes. It is envisioned that each system would be inspected once every five years, and that each management agency would thereby inspect one-fifth of all such systems annually. The inspection program would result, as necessary, in the issuance of orders to abate improper practices and take appropriate corrective measures.

3. The conduct of an educational program whereby homeowners would be advised of the rules and regulations governing onsite sewage disposal systems and be encouraged to undertake preventive maintenance measures.

4. The conduct where necessary of detailed facilities planning studies where it has been determined that conventional septic tank systems cannot properly serve isolated enclaves of urban development. Such detailed studies should explore alternatives to the use of the existing septic tank systems, including mound systems, holding tanks, and community systems involving low-pressure sewers and common drain fields, and should consider the installation of conventional sanitary sewerage systems to resolve the problems.

It is recommended that Kenosha County undertake such a septic tank system management program. At the present time, Kenosha County regulates the installation of septic tanks only in floodland and shoreland areas. The Floodland and Shoreland Sanitary Ordinance should be replaced by a new ordinance that would apply throughout the unincorporated areas of the County and that would fully regulate the installation, operation, and maintenance of onsite sewage disposal systems. This would require the appointment of a full-time county sanitarian and such additional staff as may be required.

In Milwaukee County, only the Cities of Franklin and Oak Creek would, under the plan recommendations, have any significant number of onsite sewage disposal systems. It is accordingly recommended that these two cities review their current plumbing and sanitary regulations and amend such regulations as may be necessary to effectively carry out a septic tank system management program.

In Ozaukee, Walworth, and Washington Counties, there are currently in effect county sanitary ordinances that apply to all of the unincorporated areas of each county. It is recommended that these three counties review the existing ordinances and update and modify such ordinances as may be necessary to carry out the recommended septic tank system management program. Additional steps should be taken as necessary to ensure that all aspects of the management program outlined above are undertaken. It is further recommended with respect to Washington County that the Village of Germantown continue its cooperative effort with the County to administer the Washington County Sanitary Ordinance within the Village.

It is recommended that Racine County prepare and adopt a sanitary ordinance regulating onsite sewage disposal systems throughout the unincorporated areas of that County. It is further recommended that the County establish the position of county sanitarian and direct the sanitarian to establish a new program of septic tank system management in the manner described above.

In Waukesha County, the County Board of Health currently regulates onsite sewage disposal systems through a countywide ordinance that is applicable within the incorporated, as well as the unincorporated, areas of the County. It is recommended that this ordinance be reviewed and revised as necessary to effectively carry out a management program as defined above.

Construction Erosion Control Program

The urban nonpoint source pollution abatement element of the recommended plan calls for undertaking at all levels of government steps to ensure the reduction of water pollution from erosion from land under construction, particularly including land being converted from rural to urban use and land lain bare for transportation facility construction.

It is recommended that those local government management agencies so designated in Table 64 establish a formal construction erosion control program. These agencies include all seven of the counties in the Region plus all of the incorporated municipalities. Each county should review its transportation facility construction program to ensure that the standard set of contracts and specifications for transportation facility construction includes appropriate requirements to ensure minimization of erosion during the period of construction. It is further recommended that the Wisconsin Department of Transportation and the U. S. Department of Transportation, Federal Highway Administration and Federal Urban Mass Transportation Administration, review any rules and guidelines established with respect to state and federally aided transportation facility construction to ensure that any contracts let in connection with aided projects contain appropriate provisions for erosion control.

It is further recommended that all counties in cooperation with the towns in the Region, except Milwaukee County, and all cities and villages review their subdivision regulations, zoning ordinances, and building codes, and revise such regulations, ordinances, and codes as appropriate to incorporate construction erosion control provisions. Model provisions relating to erosion control and designed to be incorporated into land subdivision regulations, zoning ordinances, and building codes are set forth in a series of appendices to SEWRPC Planning Guide No. 6, Soils Development Guide. In this respect, Ozaukee and Waukesha Counties should act to expand the jurisdiction of their respective subdivision control ordinances to the unincorporated areas of the Counties, rather than to the shoreland and floodland areas alone.

Develop and Implement Detailed Plan for Application of Urban Land Practices

The urban nonpoint source pollution abatement element of the recommended plan was prepared at the systems level of planning and, as noted in Chapter II of this volume, is specifically intended to serve as a point of departure for more detailed local planning. The design of urban nonpoint source pollution abatement practices should be a highly localized, detailed, and individualized effort requiring, as it does, highly specific knowledge of the physical, managerial, social, and fiscal considerations that affect the local public officials and landowners concerned. Accordingly, it is recommended that each city and village and each sanitary, utility, or lake protection and rehabilitation district identified in Table 64 undertake the preparation of a detailed plan for the application of urban land practices. Table 64 identifies those instances where such detailed planning should result in the application of minimum urban land practices designed to achieve up to a 25 percent reduction in pollutant runoff, and of additional urban land practices designed to achieve an approximate 50 percent reduction in pollutant runoff.

Following the preparation of such detailed local facilities plans for the abatement of nonpoint source pollution in urban areas, it is recommended that the management agencies concerned take appropriate steps to implement the detailed plan. This could include the establishment of public educational programs, enactment of ordinances for litter and pet waste control, and modification of municipal housekeeping practices dealing with street sweeping, leaf collection, and catch basin cleaning. It is further recommended that the cities, villages, and special districts concerned seek technical assistance in the preparation and implementation of the detailed plans from the appropriate county soil and water conservation district, and further seek assistance in the form of public educational and information programs from the appropriate county office of the University of Wisconsin-Extension Service.

In order to provide a framework for undertaking the detailed planning and implementation activities necessary to abate nonpoint source pollution in urban areas, it is recommended that the Wisconsin Department of Natural Resources seek statutory authority as may be required to expand the Wisconsin Pollutant Discharge Elimination System to include the elimination of pollutants from nonpoint, or diffuse, sources of pollution. It is envisioned in this respect that the legislation would authorize the Department to establish a general permit program for the discharge of diffuse surface water from storm sewers, conduits, and open drainage channels. Under such a proposed system, each of the designated management agencies would be required to obtain a general discharge permit from the Department for discharge of diffuse surface waters. The permit would require the management agency to undertake the detailed local facilities planning necessary to identify the practices that would result in the required level of pollutant runoff control. Upon preparation and approval of the detailed facilities plan by the Commission as the areawide water quality management planning agency and the Department as the state water regulatory agency, the permit would specify the practices to be undertaken by the management agency. The establishment of such a general discharge permit program would have to be accompanied by penalties for failure to apply for a permit and to comply with the terms of the permit. The recently enacted state nonpoint source water pollution abatement grant program should be useful in aiding local designated management agencies in the planning and implementation of detailed urban nonpoint source pollution abatement measures.

Abatement of Creosote Pollution of Bottom Deposits in the Little Menomonee River

It is recommended that Milwaukee County through the Milwaukee County Park Commission assume responsibility for the abatement of pollution from the creosote contamination of bottom deposits in the Little Menomonee River. As set forth in more detail in the adopted Menomonee River watershed plan, this will involve constructing nearly 3.5 miles of new stream channel adjacent and parallel to the existing channel of the Little Menomonee River in the City of Milwaukee, and covering the existing channel bottom with up to four feet of clean fill materials.

Designation of Rural Nonpoint Source Management Agencies

The local governmental management agencies designated to implement the rural nonpoint source pollution abatement element of the recommended areawide water quality management plan are identified in Table 65.

These designations are comprised of each of the seven counties in the Region, each of the seven county soil and water conservation districts in the Region, and selected utility, sanitary, and/or lake protection and rehabilitation districts within unincorporated towns. The only new agencies proposed are those which have previously been proposed for urban nonpoint source pollution abatement purposes in lake drainage areas.

In Kenosha County, a total of seven rural nonpoint source management agencies have been designated. Of this total, six are existing agencies and one would be a new agency. The one new agency would be a sanitary, utility, or lake protection and rehabilitation district that would be created in the Town of Randall to encompass urban and rural development tributary to Benedict and Powers Lakes. The existing agencies designated in Kenosha County include Kenosha County; the Kenosha County Soil and Water Conservation District; the George Lake Protection and Rehabilitation District in the Town of Bristol; the Town of Salem Sewer Utility District Nos. 1 and 2; and the Lilly Lake Protection and Rehabilitation District in the Town of Wheatland. The various responsibilities assigned to each of these management agencies are summarized in Table 65 and are discussed in more detail below.

In Milwaukee County, a total of two rural nonpoint source management agencies have been designated, both of which currently exist. These agencies are Milwaukee County and the Milwaukee County Soil and Water Conservation District. The various responsibilities assigned to these two management agencies are summarized in Table 65 and are discussed in more detail below.

In Ozaukee County, a total of two rural nonpoint source management agencies have been designated, both of which currently exist. These agencies are Ozaukee County and the Ozaukee County Soil and Water Conservation District. The various responsibilities assigned to these two management agencies are summarized in Table 65 and are discussed in more detail below.

In Racine County, a total of eight rural nonpoint source management agencies have been designated. Of this total, six are existing agencies and two would be new agencies. The two new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created to encompass urban and rural development tributary to Bohners Lake and Long Lake, both in the Town of Burlington. The existing agencies designated in Racine County include Racine County; the Racine County Soil and Water Conservation District; the Browns Lake Sanitary District in the Town of Burlington; the Eagle Lake Sewer Utility District in the Town of Dover; the Town of Norway Sanitary District No. 1; and the Town of Waterford Sanitary District No. 1.

In Walworth County, a total of 18 rural nonpoint source management agencies have been designated. Of this total, eight are existing agencies and 10 would be new agencies. The 10 new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Bloomfield to encompass urban and rural development tributary to Pell Lake; in the Town of Geneva to encompass urban and rural development tributary to Lake Como; in the Town of La Grange to encompass urban and rural development tributary to Pleasant, Green, Middle, and Mill Lakes; in the Town of Richmond to encompass urban and rural development tributary to Lake Loraine and to Turtle Lake; in the Town of Sugar Creek to encompass urban and rural development tributary to North Lake, to Silver Lake, and to Wandawega Lake; in the Town of Troy to encompass urban and rural development tributary to Booth Lake; and in the Town of Whitewater to encompass urban and rural development tributary to Rice and Whitewater Lakes. The existing agencies designated in Walworth County include Walworth County; the Walworth County Soil and Water Conservation District; the Geneva Lake Environmental Watershed Agency; the Delavan Lake Sanitary District in the Town of Delavan; the Town of East Troy Sanitary Districts Nos. 1 and 2; the Town of Linn Sanitary District No. 1; and the Honey Lake Protection and Rehabilitation District in the Town of Spring Prairie. The various responsibilities assigned to each of these management agencies are summarized in Table 65 and are discussed in more detail below.

In Washington County, a total of 13 rural nonpoint source management agencies have been designated. Of this total, six are existing agencies and seven would be new agencies. These seven new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Erin to encompass urban and rural development tributary to Druid Lake; in the Town of Farmington to encompass urban and rural development tributary to Green Lake and to Lake Twelve; in the Town of Hartford to encompass urban and rural development tributary to Pike Lake; and in the Town of Richfield to encompass urban and rural development tributary to Bark Lake, to Freiss Lake, and to Lake Five. The existing agencies designated in Washington County include Washington County; the Washington County Soil and Water Conservation District; the Wallace Lake Sanitary District in the Town of

Table 65

LOCAL GOVERNMENT MANAGEMENT AGENCY DESIGNATIONS AND SELECTED RESPONSIBILITIES FOR THE RURAL-ORIENTED NONPOINT SOURCE POLLUTION ABATEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Rural Nonpoint Source Management Agency	Undertake Livestock Waste Control Program	Develop and Implement Detailed Plan for Application of Rural Land Conservation Practices			Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
		25 Percent Reduction in Pollutant Runoff	50 Percent Reduction in Pollutant Runoff	75 Percent Reduction in Pollutant Runoff			
KENOSHA COUNTY							
Kenosha County	X	--	--	--	X	--	X
Kenosha County Soil and Water Conservation District	X	X	X	X	--	X	--
Town of Bristol							
George Lake Protection and Rehabilitation District	--	X	X	--	X	--	--
Town of Randall							
New District—Benedict and Powers Lakes[a]	--	X	X	--	X	--	--
Town of Salem							
Sewer Utility District No. 1	--	X	X	X	X	--	--
Sewer Utility District No. 2	--	X	X	X	X	--	--
Town of Wheatland							
Lilly Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
MILWAUKEE COUNTY							
Milwaukee County	--	--	--	--	X	--	X
Milwaukee County Soil and Water Conservation District	--	X	X	--	--	X	--
OZAUKEE COUNTY							
Ozaukee County	X	--	--	--	X	--	X
Ozaukee County Soil and Water Conservation District	X	X	--	--	--	X	--
RACINE COUNTY							
Racine County	X	--	--	--	X	--	X
Racine County Soil and Water Conservation District	X	X	X	X	--	X	--
Town of Burlington							
Browns Lake Sanitary District	--	X	--	--	X	--	--
New District—Bohner Lake	--	X	--	--	X	--	--
New District—Long Lake[b]	--	X	--	--	X	--	--
Town of Dover							
Eagle Lake Sewer Utility District	--	X	--	--	X	--	--
Town of Norway							
Sanitary District No. 1	--	X	--	--	X	--	--
Town of Waterford							
Sanitary District No. 1	--	X	--	--	X	--	--
WALWORTH COUNTY							
Walworth County	X	--	--	--	X	--	X
Walworth County Soil and Water Conservation District	X	X	X	X	--	X	--
Geneva Lake Environmental Watershed Agency	--	--	--	--	X	--	--
Town of Bloomfield							
New District—Pell Lake	--	X	X	--	X	--	--
Town of Delavan							
Delavan Lake Sanitary District[c]	--	X	--	--	X	--	--
Town of East Troy							
Sanitary District No. 1	--	X	--	--	X	--	--
Sanitary District No. 2	--	X	--	--	X	--	--
Town of Geneva							
New District—Lake Como	--	X	--	--	X	--	--
Town of La Grange							
New District—Pleasant, Green, Middle, and Mill Lakes	--	X	--	--	X	--	--
Town of Linn							
Sanitary District No. 1	--	X	--	--	X	--	--
Town of Richmond							
New District—Lake Loraine	--	X	--	--	X	--	--
New District—Turtle Lake	--	X	--	--	X	--	--

Table 65 (continued)

Rural Nonpoint Source Management Agency	Undertake Livestock Waste Control Program	Develop and Implement Detailed Plan for Application of Rural Land Conservation Practices: 25 Percent Reduction in Pollutant Runoff	50 Percent Reduction in Pollutant Runoff	75 Percent Reduction in Pollutant Runoff	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
WALWORTH COUNTY (continued)							
Town of Spring Prairie							
Honey Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
Town of Sugar Creek							
New District—North Lake	--	X	X	--	X	--	--
New District—Silver Lake	--	X	--	--	X	--	--
New District—Wandawega Lake	--	X	--	--	X	--	--
Town of Troy							
New District—Booth Lake	--	X	--	--	X	--	--
Town of Whitewater							
New District—Rice and Whitewater Lakes	--	X	--	--	X	--	--
WASHINGTON COUNTY							
Washington County	X	--	--	--	X	--	X
Washington County Soil and Water Conservation District	X	X	X	X	--	X	--
Town of Erin							
New District—Druid Lake	--	X	--	--	X	--	--
Town of Farmington							
New District—Green Lake	--	X	--	--	X	--	--
New District—Lake Twelve	--	X	X	X	X	--	--
Town of Hartford							
New District—Pike Lake	--	X	--	--	X	--	--
Town of Richfield							
New District—Bark Lake	--	X	X	X	X	--	--
New District—Freiss Lake	--	X	--	--	X	--	--
New District—Lake Five	--	X	--	--	X	--	--
Town of Trenton							
Wallace Lake Sanitary District	--	X	--	--	X	--	--
Town of West Bend							
Big Cedar Lake Sanitary District	--	X	--	--	X	--	--
Little Cedar Lake Sanitary District	--	X	--	--	X	--	--
Silver Lake Sanitary District	--	X	--	--	X	--	--
WAUKESHA COUNTY							
Waukesha County	X	--	--	--	X	--	X
Waukesha County Soil and Water Conservation District	X	X	X	X	--	X	--
Town of Eagle							
Eagle Spring Lake Sanitary District	--	X	X	X	X	--	--
Town of Merton							
New District—North Lake	--	X	--	--	X	--	--
New District—Beaver Lake	--	X	--	--	X	--	--
New District—Lake Keesus	--	X	--	--	X	--	--
Town of Mukwonago							
Phantom Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
New District—Spring Lake	--	X	--	--	X	--	--
Town of Oconomowoc							
New District—Lac La Belle	--	X	--	--	X	--	--
New District—Moose Lake	--	X	--	--	X	--	--
Okauchee Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
Ashippun Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
Town of Ottawa							
Pretty Lake Protection and Rehabilitation District	--	X	--	--	X	--	--
School Section Lake Protection and Rehabilitation District	--	X	--	--	X	--	--

[a] *This new District would also serve a portion of Walworth County.*

[b] *This new District would also serve a portion of the Town of Rochester.*

[c] *The Delavan Lake Sanitary District also serves part of the Town of Walworth.*

Source: SEWRPC.

Trenton; and the Big Cedar Lake, Little Cedar Lake, and Silver Lake Sanitary Districts in the Town of West Bend. The various responsibilities assigned to each of these management agencies are summarized in Table 65 and are discussed in more detail below.

In Waukesha County, a total of 14 rural nonpoint source management agencies have been designated. Of this total, eight are existing agencies and six would be new agencies. The six new agencies would be sanitary, utility, or lake protection and rehabilitation districts that would be created in the Town of Merton to encompass urban and rural development tributary to North Lake, to Beaver Lake, and to Lake Keesus; in the Town of Mukwonago to encompass urban and rural development tributary to Spring Lake; and in the Town of Oconomowoc to encompass urban and rural development tributary to Lac La Belle and to Moose Lake. The existing agencies designated in Waukesha County include Waukesha County; the Waukesha County Soil and Water Conservation District; the Eagle Spring Lake Sanitary District in the Town of Eagle; the Phantom Lake Protection and Rehabilitation District in the Town of Mukwonago; the Okauchee Lake Protection and Rehabilitation District and the Ashippun Lake Protection and Rehabilitation District in the Town of Oconomowoc; and the Pretty Lake Protection and Rehabilitation District and the School Section Lake Protection and Rehabilitation District in the Town of Ottawa. The various responsibilities assigned to each of these management agencies are summarized in Table 65 and are discussed in more detail below.

For the Region as a whole, then, a total of 64 management agencies have been designated for rural nonpoint source pollution abatement purposes. Of this total, all but 26 agencies currently exist. The 26 new agencies would be sanitary, utility, and/or lake protection and rehabilitation districts created to provide an institutional framework for the development and implementation of detailed local plans for the application of rural nonpoint source pollution abatement practices. All of the 64 designated rural nonpoint source pollution abatement management agencies have been previously designated either for point source pollution abatement purposes or for urban nonpoint source pollution abatement purposes.

Livestock Waste Control Program

The nonpoint source pollution abatement element of the recommended plan proposes that there be undertaken within each county in the Region a livestock waste control program. The basic objective of such a program would be to achieve the abatement of water pollution from livestock wastes. The essential elements of such a program include:

1. The adoption of an ordinance governing livestock grazing and waste control. Such an ordinance, which could either be included within a county sanitary ordinance, a county zoning ordinance, or a county health ordinance, would seek to ensure that livestock grazing is prohibited from occurring in stream channels and drainageways, and that proper measures are undertaken to confine animal wastes to areas where storm water runoff is diverted and remains unpolluted from such wastes. Stored wastes could be disposed of on land in accordance with sound rural land management practices.

2. The conduct of an educational program whereby farmers and other operators of livestock facilities would be advised of the rules and regulations governing livestock control and encouraged to practice and maintain preventive measures.

3. The provision of technical guidance and advice, as well as financial assistance, by the county soil and water conservation district to individual farmers and other operators of livestock facilities for the purpose of implementing detailed plans for the installation of livestock waste control facilities.

It is recommended that each management agency designated to implement livestock waste control programs, as set forth in Table 65, review the local and county sanitary, zoning, and health ordinances and make such changes as may be necessary to effectively regulate livestock grazing and livestock waste disposal practices. It is also recommended that the county soil and water conservation districts provide whatever technical assistance may be required to undertake the individual livestock waste control programs throughout the Region, including assistance in obtaining any state and federal grants-in-aid available for the construction of livestock waste control facilities.

Develop and Implement Detailed Plan for Application of Rural Land Practices

The rural nonpoint source pollution abatement element of the recommended plan was, like the urban nonpoint source pollution abatement element, prepared at the systems level of planning and is specifically intended to serve as a point of departure for more detailed local planning. The design of such rural nonpoint source pollution abatement practices should be a highly localized, detailed, and individualized effort requiring, as it does, highly specific knowledge of the physical, managerial, social, and fiscal considerations that particularly affect the farmers and rural landowners concerned.

Accordingly, it is recommended that each county soil and water conservation district and each sanitary, utility, or lake protection and rehabilitation district identified in Table 65 for this purpose undertake the preparation of a detailed plan for the application of rural land conservation practices. Because of overlapping jurisdictions, it is recommended that the county soil and water conservation district in each county be the lead agency in the preparation of such detailed plans. The county soil and water conservation district has authority to plan for rural and urban nonpoint source pollution abatement practices throughout the entire county. It is envisioned that the individual sanitary, utility, or lake protection and rehabilitation districts identified in Table 65 would cooperate with the county soil and water conservation

district in undertaking the necessary detailed planning. Once that detailed planning is completed, it is envisioned that the individual lake protection and rehabilitation districts would bear primary responsibility for plan implementation within their jurisdictional area, with the county soil and water conservation district bearing primary responsibility for the plan implementation throughout the remaining portion of the county. Table 65 identifies those instances where such detailed planning should result in the application of minimum rural land practices designed to achieve up to a 25 percent reduction in pollutant runoff, additional practices designed to achieve up to a 50 percent reduction in pollutant runoff, and additional practices designed to achieve an approximate 75 percent reduction in pollutant runoff.

In undertaking the lead in preparing and implementing detailed plans for the application of rural land conservation practices, is is recommended that each county soil and water conservation district review its membership so as to determine whether or not farmers are adequately represented. In some instances, the county board should act under the authority granted to it in Chapter 92 of the Wisconsin Statutes to appoint to the soil and water conservation district board one or two additional members who are not county board supervisors. In those cases where the county board determines that adequate farmer representation on the soil and water conservation district board is lacking, the one or two additional persons added to the board could be individuals actively engaged in farming who hold the respect of the farming community.

Following the preparation of such detailed local facilities plans for the abatement of nonpoint source pollution in rural areas, it is recommended that the management agencies concerned take appropriate steps to implement the detailed plan. This could include the establishment of public educational programs, the installation of farm conservation practices, and the undertaking of improvements to protect critical areas from erosion. It is further recommended that the county soil and water conservation districts concerned provide all necessary technical assistance in carrying out the detailed plans. Finally, it is recommended that the county offices of the University of Wisconsin-Extension Service establish appropriate education and information programs in support of the plan implementation efforts.

The foregoing structure for implementation of the rural nonpoint source pollution abatement program envisions a voluntary effort on the part of the agencies and units of government concerned, as well as on the part of individual farmers and rural landowners. It is recommended that the Wisconsin Department of Natural Resources monitor this effort carefully over the initial five-year plan implementation period, particularly through implementation efforts that may be mounted as a part of the Wisconsin nonpoint source pollution abatement program. Should the initial experience in this effort indicate that a voluntary effort will not result in the desired level of pollutant runoff control from rural lands, then it is recommended that the Wisconsin Department of Natural Resources seek legislation to establish a regulatory program for rural nonpoint source pollution control. Should such a regulatory program become necessary, it is recommended that the county soil and water conservation districts be the local regulatory authorities and be given the responsibility to adopt and enforce any necessary regulations.

Nonpoint Source Pollution Abatement Implementation Plans and Schedules

Because of the need to undertake an entirely new kind of local planning effort for nonpoint source pollution abatement purposes, detailed schedules for implementation of this planning were not prepared. For the most part the nonpoint source pollution abatement recommendations in the recommended plan are general in nature, and the costs associated with such measures are necessarily averages developed for systems planning purposes. A summary of the unit costs assumed for application of the nonpoint source pollution abatement measures in the making of the plan is set forth in Table 66. Each designated management agency can use these unit costs as a general guide toward determining the total cost of carrying out a nonpoint source pollution abatement program. The development of detailed cost estimates, however, will have to be a part of the detailed facilities planning work described above.

With respect to scheduling of the detailed facilities planning work, it is recommended that each county soil and water conservation district establish within its county a priority list for nonpoint source pollution abatement planning. It is further recommended that the district undertake in cooperation with a selected designated urban management agency a pilot urban and pilot rural nonpoint source planning effort. After completion of these pilot planning efforts, and based upon the experience gained in conducting such planning, it is recommended that they be accelerated so that all detailed local facilities planning is completed by 1985.

The foregoing recommendations for undertaking detailed local nonpoint source pollution abatement planning should culminate in the preparation of the following three types of detailed plans:

1. A detailed plan for urban nonpoint source pollution abatement prepared by each designated urban agency—all cities and villages and selected towns. It is envisioned that each agency would prepare only one such plan covering its entire area of jurisdiction and relating directly to the area over which it performs a variety of public works functions. Thus, for example, one such detailed plan would be prepared for the entire City of New Berlin even though portions of that City lie in three major watersheds.

2. A detailed plan for both urban and rural nonpoint source pollution abatement for geographic area directly tributary to each major lake in the Region. Both the appropriate county soil and water conservation district and the lake sani-

Table 66

ESTIMATED UNIT COSTS FOR APPLICATION OF NONPOINT SOURCE POLLUTION ABATEMENT MEASURES USED IN PREPARATION OF THE AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Nonpoint Source Pollution Abatement Measure	Unit Cost		
	Public Sector	Private Sector	Total
Construction Erosion Control	$2,600 per acre of public land under construction	$2,600 per acre of private land under construction	$2,600 per acre of land under construction
Urban Land Management Practices			
Minimum—Up to 25 percent reduction in pollutant runoff	$8 annually per acre of urban land	$52 annually per acre of industrial land	$8 annually per acre of urban land; $52 annually per acre of industrial land
Additional—Up to 50 percent reduction in pollutant runoff	$100 annually per acre of of industrial land $164 annually per acre of commercial land $105 annually per acre of residential land	--	$100 annually per acre of industrial land $164 annually per acre of commercial land $105 annually per acre of residential land
Livestock Waste Control			
Runoff Control Measures	$2 annually per animal unit	$10 annually per animal unit	$12 annually per animal unit
Liquid and Slurry Waste Storage Facilities	$10 annually per animal unit	$40 annually per animal unit	$50 annually per animal unit
Rural Land Conservation Practices			
Minimum—Up to 25 percent reduction in pollutant runoff	--	$2 annually per acre of rural land	$2 annually per acre of rural land
Additional—Up to 50 percent reduction in pollutant runoff	$1 annually per acre of rural land	$4 annually per acre of rural land	$5 annually per acre of rural land
Additional—Up to 75 percent reduction in pollutant runoff	$6 annually per acre of rural land	$18 annually per acre of rural land	$24 annually per acre of rural land

NOTE: An animal unit is the weight equivalent of a 1,000-pound cow.

Source: SEWRPC.

tary, utility, or protection and rehabilitation district would have responsibility to prepare such a plan. In such cases it is recommended that the county district assume lead responsibility for plan preparation.

3. A detailed plan for rural nonpoint source pollution abatement in the remaining portions of the Region. It is envisioned that the appropriate county soil and water conservation district would prepare such a plan on a drainage area-by-drainage area basis, coordinating such planning with the urban-oriented planning being conducted by cities, villages, and urban towns within a given drainage area, and the rural planning being conducted for the same drainage area that may lie in an adjacent county.

From the foregoing, it may be concluded that a large number of detailed facilities plans for nonpoint source pollution abatement will be required. Such a large amount of planning will of necessity require extensive coordination. It is, accordingly, recommended that each of the seven county soil and water conservation districts assume the responsibility for providing such coordination and overall monitoring of detailed planning activities. Such responsibility is fully consistent with the role of the district as envisioned in the Wisconsin Statutes. The Regional Planning Commission and the Department of Natural Resources should assist in the detailed planning coordination efforts. In addition, all plans should be submitted to the Commission and the Department for a determination as to the conformance of the plan with the areawide water quality management plan and for incorporation into the continuing areawide water quality management planning and plan implementation effort.

SLUDGE MANAGEMENT PLAN ELEMENT IMPLEMENTATION

Designation of Sludge Management Agencies

The local governmental management agencies designated to implement the sludge management element of the recommended areawide water quality management plan are identified in Table 67. These designations are

comprised of all of the units and agencies of government that under the plan would operate a sewage treatment facility, together with all counties, towns, and selected cities and villages that have significant rural lands that could be made available for sludge application. All of the local governmental management agencies designated are currently in existence.

In Kenosha County, a total of 18 sludge management agencies have been designated. These agencies include Kenosha County; the Kenosha County Soil and Water Conservation District; the City of Kenosha; the Villages of Silver Lake and Twin Lakes; the Towns of Brighton, Bristol, Paris, Pleasant Prairie, Randall, Salem, Somers, and Wheatland; the Town of Bristol Sewer Utility District No. 1; the Town of Pleasant Prairie Sewer Utility District D and Sanitary District No. 73-1; and the Town of Salem Sewer Utility Districts Nos. 1 and 2. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Milwaukee County, a total of five sludge management agencies have been designated. These agencies include Milwaukee County; the Milwaukee County Soil and Water Conservation District; the Milwaukee Metropolitan Sewerage District; and the Cities of Franklin and South Milwaukee. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Ozaukee County, a total of 15 sludge management agencies have been designated. These agencies include Ozaukee County; the Ozaukee County Soil and Water Conservation District; the Cities of Cedarburg, Mequon, and Port Washington; the Villages of Belgium, Fredonia, Grafton, and Saukville; and the Towns of Belgium, Cedarburg, Fredonia, Grafton, Port Washington, and Saukville. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Racine County, a total of 18 sludge management agencies have been designated. These 18 agencies include Racine County; the Racine County Soil and Water Conservation District; the Western Racine County Sewerage District; the Cities of Burlington and Racine; the Village of Union Grove; the Towns of Burlington, Caledonia, Dover, Mt. Pleasant, Norway, Raymond, Rochester, Waterford, and Yorkville; the Town of Dover-Eagle Lake Sewer Utility District No. 1; the Town of Norway Sanitary District No. 1; and the Town of Yorkville Sanitary District No. 1. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Walworth County, a total of 27 sludge management agencies have been designated. These agencies include Walworth County; the Walworth County Soil and Water Conservation District; the Walworth County Metropolitan Sewerage District; the Cities of Lake Geneva and Whitewater; the Villages of Darien, East Troy, Genoa City, Sharon, and Walworth; the Towns of Bloomfield, Darien, Delavan, East Troy, Geneva, LaFayette, La Grange, Linn, Lyons, Richmond, Sharon, Spring Prairie, Sugar Creek, Troy, Walworth, and Whitewater; and the Town of Lyons Sanitary District No. 2. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Washington County, a total of 23 sludge management agencies have been designated. These agencies include Washington County; the Washington County Soil and Water Conservation District; the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; the Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Richfield, Trenton, Wayne, and West Bend; and the Town of Addison Allenton Sanitary District No. 1. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

In Waukesha County, a total of 25 sludge management agencies have been designated. These agencies include Waukesha County; the Waukesha County Soil and Water Conservation District; the Delafield-Hartland Water Pollution Control Commission; the Cities of Brookfield, Muskego, New Berlin, Oconomowoc, and Waukesha; the Villages of Dousman, Menomonee Falls, Mukwonago, North Prairie, and Wales; and the Towns of Delafield, Eagle, Genesee, Lisbon, Merton, Mukwonago, Oconomowoc, Ottawa, Pewaukee, Summit, Vernon, and Waukesha. The various responsibilities assigned to each of these management agencies are summarized in Table 67 and are discussed in more detail below.

For the Region as a whole, then, a total of 131 management agencies have been designated for sludge management purposes. All of these agencies currently exist. Of the 131 designated sludge management agencies, a total of 109 have been previously designated for either point source or nonpoint source pollution abatement purposes.

Sludge Management Implementation Recommendations Applicable to Operators of Sewage Treatment Facilities

It is recommended that each of the operators of sewage treatment facilities recommended in the plan undertake as appropriate and as indicated in Table 67 the following plan implementation activities with respect to sludge management:

1. The preparation of a sludge management facilities plan. This facilities plan is currently required by the Wisconsin Department of Natural Resources as part of the condition for issuing a waste discharge permit.

2. The construction, maintenance, and operation of sludge handling, utilization, and disposal facilities as outlined in general in the systems level sludge management plan and as detailed in the local sludge facilities management plan. Detailed

Table 67

LOCAL GOVERNMENTAL MANAGEMENT AGENCY DESIGNATIONS AND SELECTED RESPONSIBILITIES FOR THE SLUDGE MANAGEMENT ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Sludge Management Agency	Prepare Detailed and Refined Sludge Management Plan	Construct, Maintain, and Operate Sludge-Handling, -Utilization and -Disposal Facilities	Cooperate With Industries in Development of Contaminant Control Program	Develop Backup Alternative Sludge Disposal Capability	Develop Septage Receiving Capability	Develop and Implement Regulatory Program for Land Application of Sludge	Develop and Implement System for Recording Sludge Applications to Land	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
KENOSHA COUNTY										
Kenosha County	--	--	--	--	--	X	X	X	--	X
Kenosha County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
City of Kenosha	X	X	X	X	X	--	X	--	--	--
Village of Silver Lake	X	X	--	X	--	--	X	--	--	--
Village of Twin Lakes	X	X	--	X	X	--	X	--	--	--
Town of Brighton	--	--	--	--	--	X	--	--	--	--
Town of Bristol	--	--	--	--	--	X	--	--	--	--
Town of Bristol Utility District No. 1	X	X	X	X	X	--	X	--	--	--
Town of Paris	--	--	--	--	--	X	--	--	--	--
Town of Pleasant Prairie	--	--	--	--	--	X	--	--	--	--
Town of Pleasant Prairie Sewer Utility District D	X	X	--	X	X	--	X	--	--	--
Sanitary District No. 73-1	X	X	X	X	X	--	X	--	--	--
Town of Randall	--	--	--	--	--	X	--	--	--	--
Town of Salem	--	--	--	--	--	X	--	--	--	--
Town of Salem Sewer Utility District No. 1	X	X	--	X	X	--	X	--	--	--
Sewer Utility District No. 2	X	X	--	X	X	--	X	--	--	--
Town of Somers	--	--	--	--	--	X	--	--	--	--
Town of Wheatland	--	--	--	--	--	X	--	--	--	--
MILWAUKEE COUNTY										
Milwaukee County	--	--	--	--	--	--	--	X	--	X
Milwaukee County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
Milwaukee Metropolitan Sewerage District	X	X	X	X	X	--	X	--	--	--
City of Franklin	--	--	--	--	--	X	X	--	--	--
City of South Milwaukee	X	X	X	X	--	--	X	--	--	--
OZAUKEE COUNTY										
Ozaukee County	--	--	--	--	--	X	X	X	--	X
Ozaukee County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
City of Cedarburg	X	X	X	X	X	--	X	--	--	--
City of Mequon	--	--	--	--	--	X	--	--	--	--
City of Port Washington	X	X	X	X	X	--	X	--	--	--
Village of Belgium	X	X	--	X	X	--	X	--	--	--
Village of Fredonia	X	X	X	X	X	--	X	--	--	--
Village of Grafton	X	X	X	X	X	--	X	--	--	--
Village of Saukville	X	X	X	X	X	--	X	--	--	--
Town of Belgium	--	--	--	--	--	X	--	--	--	--
Town of Cedarburg	--	--	--	--	--	X	--	--	--	--
Town of Fredonia	--	--	--	--	--	X	--	--	--	--
Town of Grafton	--	--	--	--	--	X	--	--	--	--
Town of Port Washington	--	--	--	--	--	X	--	--	--	--
Town of Saukville	--	--	--	--	--	X	--	--	--	--
RACINE COUNTY										
Racine County	--	--	--	--	--	X	X	X	--	X
Racine County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
Western Racine County Sewerage District	X	X	X	X	X	--	X	--	--	--
City of Burlington	X	X	X	X	X	--	X	--	--	--
City of Racine	X	X	X	X	X	--	X	--	--	--
Village of Union Grove	X	X	X	X	X	--	X	--	--	--
Town of Burlington	--	--	--	--	--	X	--	--	--	--
Town of Caledonia	--	--	--	--	--	X	--	--	--	--
Town of Dover	--	--	--	--	--	X	--	--	--	--
Town of Dover Eagle Lake Sewer Utility District No. 1	X	X	--	X	X	--	X	--	--	--
Town of Mt. Pleasant	--	--	--	--	--	X	--	--	--	--
Town of Norway	--	--	--	--	--	X	--	--	--	--
Town of Norway Sanitary District No. 1	X	X	--	X	X	--	X	--	--	--
Town of Raymond	--	--	--	--	--	X	--	--	--	--
Town of Rochester	--	--	--	--	--	X	--	--	--	--
Town of Waterford	--	--	--	--	--	X	--	--	--	--
Town of Yorkville	--	--	--	--	--	X	--	--	--	--
Town of Yorkville Sanitary District No. 1	X	X	X	X	X	--	X	--	--	--

Table 67 (continued)

Sludge Management Agency	Prepare Detailed and Refined Sludge Management Plan	Construct, Maintain, and Operate Sludge-Handling, -Utilization and -Disposal Facilities	Cooperate With Industries in Development of Contaminant Control Program	Develop Backup Alternative Sludge Disposal Capability	Develop Septage Receiving Capability	Develop and Implement Regulatory Program for Land Application of Sludge	Develop and Implement System for Recording Sludge Applications to Land	Conduct Educational and Informational Programs	Provide Technical Assistance	Provide Fiscal Support to Soil and Water Conservation District
WALWORTH COUNTY										
Walworth County	--	--	--	--	--	X	X	X	--	X
Walworth County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
Walworth County Metropolitan Sewerage District	X	X	X	X	X	--	X	--	--	--
City of Lake Geneva	X	X	X	X	X	--	X	--	--	--
City of Whitewater	X	X	X	X	X	--	X	--	--	--
Village of Darien	X	X	X	X	X	--	X	--	--	--
Village of East Troy	X	X	X	X	X	--	X	--	--	--
Village of Genoa City	X	X	X	X	X	--	X	--	--	--
Village of Sharon	X	X	X	X	X	--	X	--	--	--
Village of Walworth	X	X	X	X	X	--	X	--	--	--
Town of Bloomfield	--	--	--	--	--	X	--	--	--	--
Town of Darien	--	--	--	--	--	X	--	--	--	--
Town of Delavan	--	--	--	--	--	X	--	--	--	--
Town of East Troy	--	--	--	--	--	X	--	--	--	--
Town of Geneva	--	--	--	--	--	X	--	--	--	--
Town of LaFayette	--	--	--	--	--	X	--	--	--	--
Town of La Grange	--	--	--	--	--	X	--	--	--	--
Town of Linn	--	--	--	--	--	X	--	--	--	--
Town of Lyons	--	--	--	--	--	X	--	--	--	--
Town of Lyons Sanitary District No. 2	X	--	X	X	X	--	X	--	--	--
Town of Richmond	--	--	--	--	--	X	--	--	--	--
Town of Sharon	--	--	--	--	--	X	--	--	--	--
Town of Spring Prairie	--	--	--	--	--	X	--	--	--	--
Town of Sugar Creek	--	--	--	--	--	X	--	--	--	--
Town of Troy	--	--	--	--	--	X	--	--	--	--
Town of Walworth	--	--	--	--	--	X	--	--	--	--
Town of Whitewater	--	--	--	--	--	X	--	--	--	--
WASHINGTON COUNTY										
Washington County	--	--	--	--	--	X	X	X	--	X
Washington County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
City of Hartford	X	X	X	X	X	--	X	--	--	--
City of West Bend	X	X	X	X	X	--	X	--	--	--
Village of Germantown	--	--	--	--	--	X	--	--	--	--
Village of Jackson	X	X	X	X	X	--	X	--	--	--
Village of Kewaskum	X	X	X	X	X	--	X	--	--	--
Village of Newburg	X	X	--	X	X	--	X	--	--	--
Village of Slinger	X	X	X	X	X	--	X	--	--	--
Town of Addison	--	--	--	--	--	X	--	--	--	--
Town of Addison Allenton Sanitary District No. 1	X	X	X	X	X	--	X	--	--	--
Town of Barton	--	--	--	--	--	X	--	--	--	--
Town of Erin	--	--	--	--	--	X	--	--	--	--
Town of Farmington	--	--	--	--	--	X	--	--	--	--
Town of Germantown	--	--	--	--	--	X	--	--	--	--
Town of Hartford	--	--	--	--	--	X	--	--	--	--
Town of Jackson	--	--	--	--	--	X	--	--	--	--
Town of Kewaskum	--	--	--	--	--	X	--	--	--	--
Town of Polk	--	--	--	--	--	X	--	--	--	--
Town of Richfield	--	--	--	--	--	X	--	--	--	--
Town of Trenton	--	--	--	--	--	X	--	--	--	--
Town of Wayne	--	--	--	--	--	X	--	--	--	--
Town of West Bend	--	--	--	--	--	X	--	--	--	--
WAUKESHA COUNTY										
Waukesha County	--	--	--	--	--	X	X	X	--	X
Waukesha County Soil and Water Conservation District	--	--	--	--	--	--	--	--	X	--
Delafield-Hartland Water Pollution Control Commission	X	X	X	X	X	--	X	--	--	--
City of Brookfield	X	X	X	X	X	--	X	--	--	--
City of Muskego	--	--	--	--	--	X	--	--	--	--
City of New Berlin	--	--	--	--	--	X	--	--	--	--
City of Oconomowoc	X	X	X	X	X	--	X	--	--	--
City of Waukesha	X	X	X	X	X	--	X	--	--	--
Village of Dousman	X	X	--	X	X	--	X	--	--	--
Village of Menomonee Falls	--	--	--	--	--	X	--	--	--	--
Village of Mukwonago	X	X	X	X	X	--	X	--	--	--
Village of North Prairie	X	X	X	X	X	--	X	--	--	--
Village of Wales	X	X	--	X	X	--	X	--	--	--
Town of Delafield	--	--	--	--	--	X	--	--	--	--
Town of Eagle	--	--	--	--	--	X	--	--	--	--
Town of Genesee	--	--	--	--	--	X	--	--	--	--
Town of Lisbon	--	--	--	--	--	X	--	--	--	--
Town of Merton	--	--	--	--	--	X	--	--	--	--
Town of Mukwonago	--	--	--	--	--	X	--	--	--	--
Town of Oconomowoc	--	--	--	--	--	X	--	--	--	--
Town of Ottawa	--	--	--	--	--	X	--	--	--	--
Town of Pewaukee	--	--	--	--	--	X	--	--	--	--
Town of Summit	--	--	--	--	--	X	--	--	--	--
Town of Vernon	--	--	--	--	--	X	--	--	--	--
Town of Waukesha	--	--	--	--	--	X	--	--	--	--

Source: SEWRPC.

schedules of capital and operation and maintenance costs relating to the sludge management element of the recommended plan as that plan applies to sewage treatment plant operators within each county are set forth in Tables 68 through 74. These schedules directly relate to the schedules of capital and operation and maintenance costs for major sewage treatment plant and trunk sewer construction set forth previously in this chapter. It may be expected that these schedules will be revised as the detailed sludge management plans for each treatment plant are prepared and adopted.

3. The development of a contaminant control program in cooperation with local industries. It is important that the discharges from local industries be analyzed to determine if contaminants exist in such concentrations to result in long-term problems if sludge is ultimately applied to agricultural land.

4. The development of a backup alternative sludge disposal capability. It is expected that this will require contracting for assurance of landfill capacity if it is necessary to shift sludge disposal to landfilling because of weather or other unforeseen conditions.

5. The development of a septage receiving capability. Those public sewage treatment plants so identified in Table 67 should develop such a capability to receive septage from the geographic areas of the Region identified in the sludge management plan.

6. The development and implementation in cooperation with the respective counties of a system for recording sludge quality and the amount applied over time to specific receiving lands.

Sludge Management Plan Implementation Recommendations Applicable to Other Designated Agencies

It is recommended that Kenosha County and the towns in that County; the City of Franklin in Milwaukee County; Ozaukee County and the City of Mequon and the towns in that County; Racine County and the towns in that County; Walworth County and the towns in that County; Washington County and the Village of Germantown and the towns in that County; and Waukesha County and the Cities of Muskego and New Berlin and the Village of Menomonee Falls and the towns in that County develop and implement on a countywide basis a regulatory program for the land application of sludge. This program could be implemented through zoning, sanitary, and/or local health ordinances, and should seek to ensure the safe long-term application of sludge wastes on rural land. It is further recommended that each county soil and water conservation district provide technical assistance in the development of this regulatory program, which should extend to a requirement that a farm conservation plan, approved by the soil and water conservation district, be prepared for each farm prior to authorizing the application of sludge. It is also recommended that each county through the University of Wisconsin-Extension Service provide education and information assistance as necessary in carrying out the sludge management program. It is further recommended that each countywide regulatory program include the development and implementation of a system for recording sludge applications to the land. Primary responsibility for the development and implementation of such a system should rest with each county and, in Milwaukee County, with the City of Franklin. The proposed recordation system should ensure that any concerned public official or interested citizen who may wish to purchase land can go to a central place and quickly determine the type and extent of historical sludge applications on a given parcel of land.

All landfills accepting sludges should be designed to minimize the production of leachate and to protect the groundwater. Any leachate produced is recommended to be collected and treated before discharge to surface or groundwaters. Treatment is recommended to be provided at a municipal wastewater facility—or in certain cases, at a self-contained onsite facility. Detailed recommendations regarding the treatment and disposal of leachate should be developed in conjunction with solid waste management engineering studies.

WATER QUALITY MONITORING PLAN ELEMENT IMPLEMENTATION

Long-Term Water Quality Analyses

The recommended areawide water quality management plan calls for a comprehensive long-term water quality monitoring program within the Region that can serve both the needs of the Commission as an areawide water quality management planning agency and the needs of the Wisconsin Department of Natural Resources as a regulatory agency. It is, accordingly, recommended that the Commission in cooperation with the Department prepare a study design that would specify a detailed ongoing comprehensive water quality data collection program, including the number and location of monitoring sites; the water quality indicators and biological parameters for which samples are to be analyzed; and specification of the type, frequency, and duration of sampling. The study design should specify an organizational structure for conducting the program, should develop cost estimates for the program, and should recommend sources of funding.

Demonstration Water Quality Sampling Efforts

It is recommended that the Department of Natural Resources and the seven county soil and water conservation districts undertake special water quality sampling efforts to demonstrate the effects of special water pollution abatement practices that may be undertaken, particularly with respect to nonpoint source pollution abatement practices. Such water quality sampling efforts

Table 68

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR KENOSHA COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Kenosha		Village of Silver Lake		Village of Twin Lakes		Town of Bristol Sewer Utility District No. 1	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 200,000	$ --	$ 5,700	$ --	$ 9,000	$ --	$ 4,700
1977	2	--	200,000	--	5,700	--	9,000	--	4,700
1978	3	--	200,000	--	5,700	--	9,000	--	4,700
1979	4	--	200,000	--	5,700	--	9,000	--	4,700
1980	5	--	200,000	--	5,700	--	9,000	--	4,700
1981	6	--	200,000	--	5,700	--	9,000	--	4,700
1982	7	--	200,000	--	5,700	20,000	9,000	--	4,700
1983	8	320,000	200,000	30,000	5,700	70,000	9,000	30,000	4,700
1984	9	1,440,000	200,000	140,000	5,700	70,000	10,000	120,000	4,700
1985	10	1,440,000	230,000	140,000	7,800	--	10,000	120,000	6,800
1986	11	--	230,000	--	7,800	--	10,000	--	6,800
1987	12	--	230,000	--	7,800	--	10,000	--	6,800
1988	13	--	230,000	--	7,800	--	10,000	--	6,800
1989	14	--	230,000	--	7,800	--	10,000	--	6,800
1990	15	--	230,000	--	7,800	--	10,000	--	6,800
1991	16	--	230,000	--	7,800	--	10,000	--	6,800
1992	17	--	230,000	--	7,800	--	10,000	--	6,800
1993	18	--	230,000	--	7,800	--	10,000	--	6,800
1994	19	--	230,000	--	7,800	--	10,000	--	6,800
1995	20	--	230,000	--	7,800	--	10,000	--	6,800
1996	21	--	230,000	--	7,800	--	10,000	--	6,800
1997	22	--	230,000	--	7,800	--	10,000	--	6,800
1998	23	--	230,000	--	7,800	--	10,000	--	6,800
1999	24	--	230,000	--	7,800	--	10,000	--	6,800
2000	25	--	230,000	--	7,800	--	10,000	--	6,800
Total		$ 3,200,000	$ 5,480,000	$ 310,000	$ 176,100	$ 160,000	$ 242,000	$ 270,000	$ 151,100
Annual Average		$ 128,000	$ 219,200	$ 12,400	$ 7,044	$ 6,400	$ 9,680	$ 10,800	$ 6,044

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		Town of Pleasant Prairie Sewer Utility District D		Town of Pleasant Prairie Sanitary District No. 1		Town of Salem Sewer Utility District No. 1		Town of Salem Sanitary District No. 2	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 6,800	$ --	$ 3,600	$ --	$ 5,600	$ --	$ --
1977	2	--	6,800	--	3,600	--	5,600	--	--
1978	3	--	6,800	--	3,600	--	5,600	--	--
1979	4	--	6,800	--	3,600	--	5,600	--	--
1980	5	--	6,800	--	3,600	--	5,600	--	--
1981	6	--	6,800	--	3,600	--	5,600	--	--
1982	7	--	6,800	--	3,600	40,000	5,600	80,000	--
1983	8	50,000	6,800	20,000	3,600	180,000	5,600	350,000	--
1984	9	200,000	6,800	110,000	3,600	180,000	10,800	350,000	29,000
1985	10	200,000	12,000	110,000	5,100	--	10,800	--	29,000
1986	11	--	12,000	--	5,100	--	10,800	--	29,000
1987	12	--	12,000	--	5,100	--	10,800	--	29,000
1988	13	--	12,000	--	5,100	--	10,800	100,000	29,000
1989	14	--	12,000	--	5,100	--	10,800	440,000	29,000
1990	15	--	12,000	--	5,100	--	10,800	440,000	74,000
1991	16	--	12,000	--	5,100	--	10,800	--	74,000
1992	17	--	12,000	--	5,100	--	10,800	--	74,000
1993	18	--	12,000	--	5,100	--	10,800	--	74,000
1994	19	--	12,000	--	5,100	--	10,800	--	74,000
1995	20	--	12,000	--	5,100	--	10,800	--	74,000
1996	21	--	12,000	--	5,100	--	10,000	--	74,000
1997	22	--	12,000	--	5,100	--	10,800	--	74,000
1998	23	--	12,000	--	5,100	--	10,800	--	74,000
1999	24	--	12,000	--	5,100	--	10,800	--	74,000
2000	25	--	12,000	--	5,100	--	10,800	--	74,000
Total		$ 450,000	$ 253,200	$ 240,000	$ 114,000	$ 400,000	$ 228,400	$ 1,760,000	$ 988,000
Annual Average		$ 18,000	$ 10,128	$ 9,600	$ 4,560	$ 16,000	$ 9,136	$ 70,400	$ 39,520

Table 68 (continued)

Calendar Year	Project Year	Total Facility Construction	Total Operation and Maintenance
1976	1	$ --	$ 235,400
1977	2	--	235,400
1978	3	--	235,400
1979	4	--	235,400
1980	5	--	235,400
1981	6	--	235,400
1982	7	140,000	235,400
1983	8	1,050,000	235,400
1984	9	2,610,000	270,600
1985	10	2,010,000	311,500
1986	11	--	311,500
1987	12	--	311,500
1988	13	100,000	311,500
1989	14	440,000	311,500
1990	15	440,000	356,500
1991	16	--	356,500
1992	17	--	356,500
1993	18	--	356,500
1994	19	--	356,500
1995	20	--	356,500
1996	21	--	356,500
1997	22	--	356,500
1998	23	--	356,500
1999	24	--	356,500
2000	25	--	356,500
Total		$ 6,790,000	$ 7,632,800
Annual Average		$ 271,600	$ 305,312

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

should be designed to establish the quality of storm water runoff before a special pollution abatement practice is implemented, and after implementation of the practice. Such special sampling should be conducted in a carefully controlled manner so as to ensure that the differences in runoff quality, if any, can be attributed to the implementation of a particular pollution abatement practice. The results of any such special water quality sampling efforts should be documented in technical reports so as to contribute to the state-of-the-art of water quality planning and management.

Water Quality Standards Surveys

It is recommended that the Wisconsin Department of Natural Resources undertake special intensive water quality surveys in connection with the implementation of point source pollution abatement measures. Waste load allocation surveys should be undertaken to refine and detail the effluent requirements set forth in this plan for an individual public or private sewage treatment facility. In addition, the Department should conduct special surveys to evaluate the potential for raising the water use objectives and supporting water quality standards that have been assigned to specific stream reaches.

Lake Water Quality Monitoring

It is recommended that the Wisconsin Department of Natural Resources and each lake protection and rehabilitation and/or sanitary or utility district formed in the Region for each of the 100 major lakes conduct such lake water quality surveys as may be necessary to prepare detailed, local lake use plans. In addition, long-term water quality sampling efforts should be undertaken on lakes to monitor the effects of plan implementation actions and of continuing lake management efforts.

FINANCIAL AND TECHNICAL ASSISTANCE

Upon adoption of the areawide water quality management plan and attendant implementation schedules, the implementation agencies concerned should effectively utilize all sources of financial and technical assistance available for the timely implementation of the recommended plan. In addition to current revenue sources, such as property taxes, fees, fines, and public utility earnings, and other sources, such as shared taxes, the agencies and units of government concerned can make use of other revenue sources, such as borrowing, special assessments, sewer service charges, and state and federal grants-in-aid. Various types of technical assistance useful in plan implementation are also available from county, regional, state, and federal agencies. The type of assistance available extends from technical advice on land and water management practices provided by the U. S. Department of Agriculture, Soil Conservation Service, to educational, advisory, and review services offered by the University of Wisconsin-Extension Service and the Regional Planning Commission.

Financial Assistance

Financial assistance includes borrowing, special assessments, sewer service charges, and state and federal grant-in-aid programs. Each of these categories of financial assistance is briefly discussed below.

Borrowing: Areawide agencies and local units of government are normally authorized to borrow so as to discharge their duties and responsibilities. Chapter 67 of the Wisconsin Statutes generally empowers counties, cities, villages, and towns to borrow money and to issue municipal obligations not to exceed 5 percent of the equalized assessed valuation of its taxable property with certain exceptions, including school bonds and revenue bonds. Such borrowing powers are important to local units of government in the construction of sewerage facilities to implement the recommended plan. Section 60.307 of the Wisconsin Statutes specifically authorizes town sanitary districts to borrow money and to issue bonds for the construction or extension of sanitary sewerage systems. Sections 66.202 and 59.96(7) of the Wisconsin Statutes authorize metropolitan sewerage districts to borrow money and to issue bonds for the construction of sanitary sewerage facilities. In addition, the powers of cooperative contract commissions under Section 66.30 of the Wisconsin Statutes include borrowing by the contracting bodies of such commissions for acquiring, constructing, and equipping areawide sewerage projects.

Table 69

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR MILWAUKEE COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element						Total	
		Milwaukee Metropolitan Sewerage District Jones Island Plant		Milwaukee Metropolitan Sewerage District South Shore Plant		City of South Milwaukee			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 1,400,000	$ --	$ 800,000	$ --	$ 36,000	$ --	$ 2,236,000
1977	2	--	1,400,000	--	800,000	--	36,000	--	2,236,000
1978	3	--	1,400,000	--	800,000	--	36,000	--	2,236,000
1979	4	2,500,000	1,400,000	1,100,000	900,000	--	36,000	3,600,000	2,336,000
1980	5	5,000,000	1,400,000	1,100,000	1,100,000	--	36,000	6,100,000	2,536,000
1981	6	13,200,000	1,400,000	9,200,000	1,300,000	--	36,000	22,400,000	2,736,000
1982	7	13,200,000	1,400,000	9,200,000	1,500,000	40,000	36,000	22,440,000	2,936,000
1983	8	13,200,000	1,400,000	9,200,000	1,700,000	160,000	36,000	22,560,000	3,136,000
1984	9	13,300,000	1,400,000	9,200,000	1,900,000	160,000	36,000	22,660,000	3,336,000
1985	10	13,300,000	1,400,000	--	1,900,000	--	36,000	13,300,000	3,336,000
1986	11	13,300,000	1,500,000	--	1,900,000	--	36,000	13,300,000	3,436,000
1987	12	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1988	13	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1989	14	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1990	15	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1991	16	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1992	17	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1993	18	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1994	19	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1995	20	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1996	21	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1997	22	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1998	23	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
1999	24	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
2000	25	--	1,500,000	--	1,900,000	--	36,000	--	3,436,000
Total		$ 87,000,000	$ 36,500,000	$ 39,000,000	$ 41,200,000	$ 360,000	$ 900,000	$126,360,000	$ 78,600,000
Annual Average		$ 3,480,000	$ 1,460,000	$ 1,560,000	$ 1,648,000	$ 14,400	$ 36,000	$ 5,054,400	$ 3,144,000

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

Rural sewer development loans are available to rural units of government from the U. S. Farmers Home Administration for developing waste disposal systems. To qualify, such rural units of government must have less than 5,500 population, lie beyond the metropolitan area, and be unable to obtain financial assistance elsewhere. In an effort to ensure that inability to borrow necessary funds at reasonable terms does not prevent local public agencies from carrying out necessary sewerage facility construction programs, the U. S. Congress, as part of the Federal Water Pollution Control Act amendments of 1972, created an Environmental Financing Authority, which is empowered to make commitments to purchase, on terms and conditions to be determined by the Authority, any obligation that is issued by a state or local public body to finance the nonfederal share of any sewerage facility project. It is the intent of Congress that this authority should not provide financial assistance to a community that can borrow money on the open market at reasonable rates.

Section 8 of the Federal Water Pollution Control Act of 1972 amended Section 7 of the Small Business Act to authorize loans to assist small business concerns in adding to or altering their equipment, facilities, or methods of operation in order to meet water pollution control requirements. In addition, farmers who need to comply with requirements of the Federal Water Pollution Control Act are made eligible for small business loans. This latter program is administered jointly by the U. S. Environmental Protection Agency and the U. S. Department of Commerce, Small Business Administration. Loans are made by the Small Business Administration to applicants certified by the U. S. Environmental Protection Agency. Loan terms may extend up to 30 years with no ceiling on the amount to be borrowed; however, all loans over $500,000 are subject to review by the Small Business Administration.

Areawide agencies and local units of government are authorized to borrow money and issue bonds

Table 70

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR OZAUKEE COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Cedarburg		City of Port Washington		Village of Belgium		Village of Fredonia	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 25,000	$ --	$ 18,000	$ --	$ 5,600	$ --	$ 93,000
1977	2	--	25,000	--	18,000	--	5,600	--	93,000
1978	3	--	25,000	--	18,000	--	5,600	--	93,000
1979	4	--	25,000	--	18,000	--	5,600	--	93,000
1980	5	--	25,000	--	18,000	--	5,600	--	93,000
1981	6	--	25,000	--	18,000	--	5,600	50,000	93,000
1982	7	10,000	25,000	--	18,000	--	5,600	200,000	93,000
1983	8	100,000	25,000	30,000	18,000	40,000	5,600	200,000	13,900
1984	9	100,000	32,000	110,000	18,000	170,000	5,600	--	13,900
1985	10	--	32,000	110,000	23,000	170,000	10,300	--	13,900
1986	11	--	32,000	--	23,000	--	10,300	--	13,900
1987	12	--	32,000	--	23,000	--	10,300	--	13,900
1988	13	100,000	32,000	--	23,000	--	10,300	--	13,900
1989	14	450,000	32,000	--	23,000	--	10,300	--	13,900
1990	15	450,000	112,000	--	23,000	--	10,300	--	13,900
1991	16	--	112,000	--	23,000	--	10,300	--	13,900
1992	17	--	112,000	--	23,000	--	10,300	--	13,900
1993	18	--	112,000	--	23,000	--	10,300	--	13,900
1994	19	--	112,000	--	23,000	--	10,300	--	13,900
1995	20	--	112,000	--	23,000	--	10,300	--	13,900
1996	21	--	112,000	--	23,000	--	10,300	--	13,900
1997	22	--	112,000	--	23,000	--	10,300	--	13,900
1998	23	--	112,000	--	23,000	--	10,300	--	13,900
1999	24	--	112,000	--	23,000	--	10,300	--	13,900
2000	25	--	112,000	--	23,000	--	10,300	--	13,900
Total		$ 1,210,000	$ 1,624,000	$ 250,000	$ 530,000	$ 380,000	$ 215,200	$ 450,000	$ 901,200
Annual Average		$ 48,400	$ 64,960	$ 10,000	$ 21,200	$ 15,200	$ 8,608	$ 18,000	$ 36,048

Calendar Year	Project Year	Wastewater Sludge Plan Element				Total	
		Village of Grafton		Village of Saukville			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 27,000	$ --	$ 10,700	$ --	$ 179,300
1977	2	--	27,000	--	10,700	--	179,300
1978	3	--	27,000	--	10,700	--	179,300
1979	4	--	27,000	--	10,700	--	179,300
1980	5	--	27,000	--	10,700	--	179,300
1981	6	--	27,000	70,000	10,700	120,000	179,300
1982	7	50,000	27,000	300,000	10,700	560,000	179,300
1983	8	250,000	27,000	300,000	20,500	920,000	110,000
1984	9	250,000	30,000	--	20,500	630,000	120,000
1985	10	--	30,000	--	20,500	280,000	129,700
1986	11	--	30,000	--	20,500	--	129,700
1987	12	--	30,000	--	20,500	--	129,700
1988	13	--	30,000	--	20,500	100,000	129,700
1989	14	--	30,000	--	20,500	450,000	129,700
1990	15	--	30,000	--	20,500	450,000	209,700
1991	16	--	30,000	--	20,500	--	209,700
1992	17	--	30,000	--	20,500	--	209,700
1993	18	--	30,000	--	20,500	--	209,700
1994	19	--	30,000	--	20,500	--	209,700
1995	20	--	30,000	--	20,500	--	209,700
1996	21	--	30,000	--	20,500	--	209,700
1997	22	--	30,000	--	20,500	--	209,700
1998	23	--	30,000	--	20,500	--	209,700
1999	24	--	30,000	--	20,500	--	209,700
2000	25	--	30,000	--	20,500	--	209,700
Total		$ 550,000	$ 726,000	$ 670,000	$ 443,900	$ 3,510,000	$ 4,440,300
Annual Average		$ 22,000	$ 29,000	$ 26,800	$ 17,756	$ 140,400	$ 177,612

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

Table 71

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR RACINE COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Burlington		City of Racine		Village of Union Grove		Town of Dover-Eagle Lake Sewer Utility District No. 1	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 37,000	$ 2,260,000	$ 141,000	$ --	$ 14,000	$ --	$ --
1977	2	--	37,000	2,260,000	242,000	60,000	14,000	--	--
1978	3	--	37,000	--	242,000	280,000	14,000	30,000	--
1979	4	--	37,000	--	242,000	280,000	27,000	160,000	--
1980	5	--	37,000	--	242,000	--	27,000	160,000	12,300
1981	6	--	37,000	--	242,000	--	27,000	--	12,300
1982	7	--	37,000	--	242,000	--	27,000	--	12,300
1983	8	40,000	37,000	--	242,000	--	27,000	--	12,300
1984	9	150,000	37,000	--	242,000	--	27,000	--	12,300
1985	10	150,000	46,000	--	242,000	--	27,000	--	12,300
1986	11	--	46,000	--	242,000	--	27,000	--	12,300
1987	12	--	46,000	--	242,000	--	27,000	--	12,300
1988	13	90,000	46,000	--	242,000	80,000	27,000	50,000	12,300
1989	14	450,000	46,000	--	242,000	320,000	27,000	240,000	12,300
1990	15	450,000	126,000	--	242,000	320,000	65,000	240,000	34,500
1991	16	--	126,000	--	242,000	--	65,000	--	34,500
1992	17	--	126,000	--	242,000	--	65,000	--	34,500
1993	18	--	126,000	--	242,000	--	65,000	--	34,500
1994	19	--	126,000	--	242,000	--	65,000	--	34,500
1995	20	--	126,000	--	242,000	--	65,000	--	34,500
1996	21	--	126,000	--	242,000	--	65,000	--	34,500
1997	22	--	126,000	--	242,000	--	65,000	--	34,500
1998	23	--	126,000	--	242,000	--	65,000	--	34,500
1999	24	--	126,000	--	242,000	--	65,000	--	34,500
2000	25	--	126,000	--	242,000	--	65,000	--	34,500
Total		$ 1,330,000	$ 1,949,000	$ 4,520,000	$ 5,949,000	$ 1,340,000	$ 1,054,000	$ 880,000	$ 502,500
Annual Average		$ 53,200	$ 77,960	$ 180,800	$ 237,960	$ 53,600	$ 42,160	$ 35,200	$ 20,100

Calendar Year	Project Year	Wastewater Sludge Plan Element						Total	
		Town of Norway Sanitary District No. 1		Town of Yorkville Sanitary District No. 1		Western Racine County Sewerage District			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ 70,000	$ --	$ --	$ --	$ --	$ 13,000	$ 2,330,000	$ 205,000
1977	2	350,000	--	--	--	--	13,000	2,670,000	306,000
1978	3	350,000	23,000	--	--	--	13,000	660,000	329,000
1979	4	--	23,000	--	--	--	13,000	440,000	342,000
1980	5	--	23,000	--	--	--	13,000	160,000	354,300
1981	6	--	23,000	--	--	--	13,000	--	354,300
1982	7	--	23,000	--	--	--	13,000	--	354,300
1983	8	--	23,000	10,000	--	58,000	13,000	108,000	354,300
1984	9	--	23,000	70,000	--	256,000	13,000	476,000	354,300
1985	10	--	23,000	70,000	4,000	256,000	18,000	476,000	372,300
1986	11	--	23,000	--	4,000	--	18,000	--	372,300
1987	12	--	23,000	--	4,000	--	18,000	--	372,300
1988	13	100,000	23,000	--	4,000	--	18,000	320,000	372,300
1989	14	430,000	23,000	--	4,000	--	18,000	1,440,000	372,300
1990	15	430,000	69,000	--	4,000	--	18,000	1,440,000	558,500
1991	16	--	69,000	--	4,000	--	18,000	--	558,500
1992	17	--	69,000	--	4,000	--	18,000	--	558,500
1993	18	--	69,000	--	4,000	--	18,000	--	558,500
1994	19	--	69,000	--	4,000	--	18,000	--	558,500
1995	20	--	69,000	--	4,000	--	18,000	--	558,500
1996	21	--	69,000	--	4,000	--	18,000	--	558,500
1997	22	--	69,000	--	4,000	--	18,000	--	558,500
1998	23	--	69,000	--	4,000	--	18,000	--	558,500
1999	24	--	69,000	--	4,000	--	18,000	--	558,500
2000	25	--	69,000	--	4,000	--	18,000	--	558,500
Total		$ 1,730,000	$ 1,035,000	$ 150,000	$ 64,000	$ 570,000	$ 405,000	$ 10,520,000	$ 10,958,500
Annual Average		$ 69,200	$ 41,400	$ 6,000	$ 2,560	$ 22,800	$ 16,200	$ 420,800	$ 438,340

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

Table 72

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR WALWORTH COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Lake Geneva		City of Whitewater		Village of Darien		Village of East Troy	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 20,000	$ --	$ 33,000	$ --	$ 5,700	$ --	$ 12,000
1977	2	--	20,000	--	33,000	--	5,700	--	12,000
1978	3	--	20,000	--	33,000	--	5,700	--	12,000
1979	4	--	20,000	--	33,000	--	5,700	--	12,000
1980	5	--	20,000	--	33,000	--	5,700	--	12,000
1981	6	--	20,000	240,000	33,000	--	5,700	--	12,000
1982	7	70,000	20,000	1,100,000	33,000	--	5,700	50,000	12,000
1983	8	360,000	20,000	1,100,000	52,000	20,000	5,700	240,000	12,000
1984	9	360,000	32,000	--	52,000	130,000	5,700	240,000	17,000
1985	10	--	32,000	--	52,000	130,000	7,800	--	17,000
1986	11	--	32,000	--	52,000	--	7,800	--	17,000
1987	12	--	32,000	--	52,000	--	7,800	--	17,000
1988	13	--	32,000	80,000	52,000	--	7,800	--	17,000
1989	14	--	32,000	450,000	52,000	--	7,800	--	17,000
1990	15	--	32,000	450,000	134,000	--	7,800	--	17,000
1991	16	--	32,000	--	134,000	--	7,800	--	17,000
1992	17	--	32,000	--	134,000	--	7,800	--	17,000
1993	18	--	32,000	--	134,000	--	7,800	--	17,000
1994	19	--	32,000	--	134,000	--	7,800	--	17,000
1995	20	--	32,000	--	134,000	--	7,800	--	17,000
1996	21	--	32,000	--	134,000	--	7,800	--	17,000
1997	22	--	32,000	--	134,000	--	7,800	--	17,000
1998	23	--	32,000	--	134,000	--	7,800	--	17,000
1999	24	--	32,000	--	134,000	--	7,800	--	17,000
2000	25	--	32,000	--	134,000	--	7,800	--	17,000
Total		$ 790,000	$ 704,000	$ 3,420,000	$ 2,069,000	$ 280,000	$ 176,100	$ 530,000	$ 385,000
Annual Average		$ 31,600	$ 28,160	$ 136,800	$ 82,760	$ 11,200	$ 7,044	$ 21,200	$ 15,400

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		Village of Genoa City		Village of Sharon		Village of Walworth		Town of Lyons Sanitary District No. 2	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 4,400	$ --	$ 4,200	$ --	$ 21,000	$ --	$ --
1977	2	--	4,400	--	4,200	--	21,000	--	--
1978	3	--	4,400	--	4,200	--	21,000	--	--
1979	4	--	4,400	--	4,200	--	21,000	--	--
1980	5	--	4,400	--	4,200	--	21,000	--	--
1981	6	--	4,400	--	4,200	--	21,000	20,000	--
1982	7	--	4,400	20,000	4,200	80,000	21,000	90,000	--
1983	8	20,000	4,400	130,000	4,200	370,000	21,000	90,000	5,000
1984	9	100,000	4,400	130,000	6,100	370,000	28,000	--	5,000
1985	10	100,000	5,300	--	6,100	--	28,000	--	5,000
1986	11	--	5,300	--	6,100	--	28,000	--	5,000
1987	12	--	5,300	--	6,100	--	28,000	--	5,000
1988	13	--	5,300	--	6,100	--	28,000	--	5,000
1989	14	--	5,300	--	6,100	--	28,000	--	5,000
1990	15	--	5,300	--	6,100	--	28,000	--	5,000
1991	16	--	5,300	--	6,100	--	28,000	--	5,000
1992	17	--	5,300	--	6,100	--	28,000	--	5,000
1993	18	--	5,300	--	6,100	--	28,000	--	5,000
1994	19	--	5,300	--	6,100	--	28,000	--	5,000
1995	20	--	5,300	--	6,100	--	28,000	--	5,000
1996	21	--	5,300	--	6,100	--	28,000	--	5,000
1997	22	--	5,300	--	6,100	--	28,000	--	5,000
1998	23	--	5,300	--	6,100	--	28,000	--	5,000
1999	24	--	5,300	--	6,100	--	28,000	--	5,000
2000	25	--	5,300	--	6,100	--	28,000	--	5,000
Total		$ 220,000	$ 124,400	$ 280,000	$ 137,300	$ 820,000	$ 644,000	$ 200,000	$ 90,000
Annual Average		$ 8,800	$ 4,976	$ 11,200	$ 5,492	$ 32,800	$ 25,760	$ 8,000	$ 3,600

Table 72 (continued)

Calendar Year	Project Year	Wastewater Sludge Plan Element: Walworth County Metropolitan Sewerage District: Facility Construction	Wastewater Sludge Plan Element: Walworth County Metropolitan Sewerage District: Operation and Maintenance	Total: Facility Construction	Total: Operation and Maintenance
1976	1	$ --	$ 21,000	$ --	$ 121,300
1977	2	--	21,000	--	121,300
1978	3	--	21,000	--	121,300
1979	4	--	21,000	--	121,300
1980	5	--	21,000	--	121,300
1981	6	170,000	21,000	430,000	121,300
1982	7	760,000	21,000	2,170,000	121,300
1983	8	760,000	32,000	3,090,000	156,300
1984	9	--	32,000	1,330,000	182,200
1985	10	--	32,000	230,000	185,200
1986	11	--	32,000	--	185,200
1987	12	--	32,000	--	185,200
1988	13	110,000	32,000	190,000	185,200
1989	14	530,000	32,000	980,000	185,200
1990	15	530,000	132,000	980,000	367,200
1991	16	--	132,000	--	367,200
1992	17	--	132,000	--	367,200
1993	18	--	132,000	--	367,200
1994	19	--	132,000	--	367,200
1995	20	--	132,000	--	367,200
1996	21	--	132,000	--	367,200
1997	22	--	132,000	--	367,200
1998	23	--	132,000	--	367,200
1999	24	--	132,000	--	367,200
2000	25	--	132,000	--	367,200
Total		$ 2,860,000	$ 1,823,000	$ 9,400,000	$ 6,152,800
Annual Average		$ 114,400	$ 72,920	$ 376,000	$ 246,112

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

for nonpoint source pollution abatement measures. Towns may borrow in anticipation of special assessments for lake improvements, soil conservation work, and storm sewers. Counties may borrow and issue bonds to finance the costs of shore protection work and the construction of incinerators, composting plants, recycling plants, and sanitary landfills. Villages and cities are authorized to issue bonds for incineration and solid waste collection and disposal. Inland lake protection and rehabilitation districts may also borrow for the construction of any needed improvements and the acquisition of any needed equipment.

Special Assessments: Most governmental units that have authority to provide for sanitary sewerage facilities have special assessment powers under various provisions of the Wisconsin Statutes. Cities and villages have such special assessment powers under Sections 62.18(16) and 61.39 of the Statutes; metropolitan sewerage districts have special assessment powers under Sections 59.96(9) and 66.25 of the Statutes; and town sanitary and utility districts have such special assessment powers under Sections 60.309 and 66.072 of the Statutes. Such special assessment powers and revenues may be expected normally to be used primarily for local sewerage system improvements needed to extend sewer service to the areas recommended in the areawide water quality management plan, as opposed to the areawide facilities included in the plan.

Town boards are authorized by Sections 60.29(29) and 66.345 to levy special assessments for lake improvements and soil conservation work. Villages and cities are authorized to levy special assessments for any municipal work or improvement conferring special benefits on private property. Inland lake protection and rehabilitation districts may raise money through special assessments to finance projects that have been approved by the district and the Department of Natural Resources. Although soil and water conservation districts have no assessment powers, such districts may recover the

Table 73

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR WASHINGTON COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Hartford		City of West Bend		Village of Jackson		Village of Kewaskum	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 61,000	$ --	$ 74,000	$ --	$ 10,800	$ --	$ 9,400
1977	2	--	61,000	--	74,000	--	10,800	--	9,400
1978	3	--	61,000	250,000	74,000	--	10,800	--	9,400
1979	4	--	61,000	1,110,000	74,000	60,000	10,800	--	9,400
1980	5	--	61,000	1,110,000	108,000	310,000	10,800	--	9,400
1981	6	--	61,000	--	108,000	310,000	19,000	--	9,400
1982	7	--	61,000	--	108,000	--	19,000	--	9,400
1983	8	10,000	61,000	--	108,000	--	19,000	50,000	9,400
1984	9	50,000	61,000	--	108,000	--	19,000	210,000	9,400
1985	10	50,000	71,000	--	108,000	--	19,000	210,000	13,600
1986	11	--	71,000	--	108,000	--	19,000	--	13,600
1987	12	--	71,000	--	108,000	--	19,000	--	13,600
1988	13	90,000	71,000	170,000	108,000	70,000	19,000	--	13,600
1989	14	450,000	71,000	670,000	108,000	310,000	19,000	--	13,600
1990	15	450,000	141,000	670,000	255,000	310,000	56,000	--	13,600
1991	16	--	141,000	--	255,000	--	56,000	--	13,600
1992	17	--	141,000	--	255,000	--	56,000	--	13,600
1993	18	--	141,000	--	255,000	--	56,000	--	13,600
1994	19	--	141,000	--	255,000	--	56,000	--	13,600
1995	20	--	141,000	--	255,000	--	56,000	--	13,600
1996	21	--	141,000	--	255,000	--	56,000	--	13,600
1997	22	--	141,000	--	255,000	--	56,000	--	13,600
1998	23	--	141,000	--	255,000	--	56,000	--	13,600
1999	24	--	141,000	--	255,000	--	56,000	--	13,600
2000	25	--	141,000	--	255,000	--	56,000	--	13,600
Total		$ 1,100,000	$ 2,455,000	$ 3,980,000	$ 4,181,000	$ 1,370,000	$ 841,000	$ 470,000	$ 302,200
Annual Average		$ 44,000	$ 98,200	$ 159,200	$ 167,240	$ 54,800	$ 33,640	$ 18,800	$ 12,088

Calendar Year	Project Year	Wastewater Sludge Plan Element						Total	
		Village of Newburg		Village of Slinger		Allenton Sanitary District No. 1			
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 5,000	$ --	$ 8,000	$ --	$ 4,700	$ --	$ 172,900
1977	2	--	5,000	--	8,000	--	4,700	--	172,900
1978	3	--	5,000	--	8,000	--	4,700	250,000	172,900
1979	4	--	5,000	--	8,000	--	4,700	1,170,000	172,900
1980	5	--	5,000	--	8,000	--	4,700	1,420,000	206,900
1981	6	--	5,000	50,000	8,000	--	4,700	360,000	215,100
1982	7	30,000	5,000	250,000	8,000	--	4,700	280,000	215,100
1983	8	150,000	5,000	250,000	15,600	30,000	4,700	490,000	222,700
1984	9	150,000	8,100	--	15,600	120,000	4,700	530,000	225,800
1985	10	--	8,100	--	15,600	120,000	6,800	380,000	242,100
1986	11	--	8,100	--	15,600	--	6,800	--	242,100
1987	12	--	8,100	--	15,600	--	6,800	--	242,100
1988	13	--	8,100	50,000	15,600	--	6,800	380,000	242,100
1989	14	--	8,100	270,000	15,600	--	6,800	1,700,000	242,100
1990	15	--	8,100	270,000	45,000	--	6,800	1,700,000	525,500
1991	16	--	8,100	--	45,000	--	6,800	--	525,500
1992	17	--	8,100	--	45,000	--	6,800	--	525,500
1993	18	--	8,100	--	45,000	--	6,800	--	525,500
1994	19	--	8,100	--	45,000	--	6,800	--	525,500
1995	20	--	8,100	--	45,000	--	6,800	--	525,500
1996	21	--	8,100	--	45,000	--	6,800	--	525,500
1997	22	--	8,100	--	45,000	--	6,800	--	525,500
1998	23	--	8,100	--	45,000	--	6,800	--	525,500
1999	24	--	8,100	--	45,000	--	6,800	--	525,500
2000	25	--	8,100	--	45,000	--	6,800	--	525,500
Total		$ 330,000	$ 177,700	$ 1,140,000	$ 660,200	$ 270,000	$ 151,100	$ 8,660,000	$ 8,768,200
Annual Average		$ 13,200	$ 7,108	$ 45,600	$ 26,408	$ 10,800	$ 6,044	$ 346,400	$ 350,728

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

Table 74

SCHEDULE OF CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR THE WASTEWATER SLUDGE ELEMENT OF THE RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR WAUKESHA COUNTY: 1976-2000[a]

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		City of Brookfield		City of Oconomowoc		City of Waukesha		Village of Dousman	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 70,000	$ 147,000	$ 23,000	$ --	$ 81,000	--	$ 6,000
1977	2	--	70,000	659,000	23,000	--	81,000	--	6,000
1978	3	--	70,000	659,000	40,000	--	81,000	--	6,000
1979	4	--	70,000	--	40,000	290,000	81,000	--	6,000
1980	5	--	70,000	--	40,000	1,330,000	81,000	--	6,000
1981	6	--	70,000	--	40,000	1,330,000	94,000	30,000	6,000
1982	7	--	70,000	--	40,000	--	94,000	160,000	6,000
1983	8	110,000	70,000	--	40,000	--	94,000	160,000	10,800
1984	9	480,000	70,000	--	40,000	--	94,000	--	10,800
1985	10	480,000	106,000	--	40,000	--	94,000	--	10,800
1986	11	--	106,000	--	40,000	--	94,000	--	10,800
1987	12	--	106,000	--	40,000	--	94,000	--	10,800
1988	13	220,000	106,000	152,000	40,000	230,000	94,000	50,000	10,800
1989	14	970,000	106,000	687,000	40,000	1,020,000	94,000	240,000	10,800
1990	15	970,000	294,000	687,000	180,000	1,020,000	286,000	240,000	33,500
1991	16	--	294,000	--	180,000	--	286,000	--	33,500
1992	17	--	294,000	--	180,000	--	286,000	--	33,500
1993	18	--	294,000	--	180,000	--	286,000	--	33,500
1994	19	--	294,000	--	180,000	--	286,000	--	33,500
1995	20	--	294,000	--	180,000	--	286,000	--	33,500
1996	21	--	294,000	--	180,000	--	286,000	--	33,500
1997	22	--	294,000	--	180,000	--	286,000	--	33,500
1998	23	--	294,000	--	180,000	--	286,000	--	33,500
1999	24	--	294,000	--	180,000	--	286,000	--	33,500
2000	25	--	294,000	--	180,000	--	286,000	--	33,500
Total		$ 3,230,000	$ 4,394,000	$ 2,991,000	$ 2,506,000	$ 5,220,000	$ 4,397,000	$ 880,000	$ 486,100
Annual Average		$ 129,200	$ 175,760	$ 119,640	$ 100,240	$ 208,800	$ 175,880	$ 35,200	$ 19,444

Calendar Year	Project Year	Wastewater Sludge Plan Element							
		Village of Mukwonago		Village of North Prairie		Village of Wales		Delafield-Hartland Water Pollution Control Commission	
		Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance	Facility Construction	Operation and Maintenance
1976	1	$ --	$ 16,000	$ --	$ --	$ --	$ --	$ --	$ 9,000
1977	2	--	16,000	--	--	--	--	--	9,000
1978	3	--	16,000	--	--	--	--	--	9,000
1979	4	--	16,000	--	--	--	--	151,000	9,000
1980	5	--	16,000	--	--	--	--	684,000	9,000
1981	6	80,000	16,000	--	--	--	--	684,000	14,000
1982	7	350,000	16,000	--	--	--	--	--	14,000
1983	8	350,000	25,000	--	--	--	--	--	14,000
1984	9	--	25,000	30,000	--	--	--	--	14,000
1985	10	--	25,000	140,000	--	40,000	--	--	14,000
1986	11	--	25,000	140,000	7,500	170,000	--	--	14,000
1987	12	--	25,000	--	7,500	170,000	11,000	--	14,000
1988	13	90,000	25,000	--	7,500	--	11,000	99,000	14,000
1989	14	450,000	25,000	--	7,500	--	11,000	450,000	14,000
1990	15	450,000	69,000	--	7,500	--	11,000	450,000	92,000
1991	16	--	69,000	--	7,500	--	11,000	--	92,000
1992	17	--	69,000	--	7,500	--	11,000	--	92,000
1993	18	--	69,000	--	7,500	--	11,000	--	92,000
1994	19	--	69,000	--	7,500	--	11,000	--	92,000
1995	20	--	69,000	--	7,500	--	11,000	--	92,000
1996	21	--	69,000	--	7,500	--	11,000	--	92,000
1997	22	--	69,000	--	7,500	--	11,000	--	92,000
1998	23	--	69,000	--	7,500	--	11,000	--	92,000
1999	24	--	69,000	--	7,500	--	11,000	--	92,000
2000	25	--	69,000	--	7,500	--	11,000	--	92,000
Total		$ 1,770,000	$ 1,046,000	$ 310,000	$ 112,500	$ 380,000	$ 154,000	$ 2,518,000	$ 1,183,000
Annual Average		$ 70,800	$ 41,840	$ 12,400	$ 4,500	$ 15,200	$ 6,160	$ 100,720	$ 47,320

Table 74 (continued)

Calendar Year	Project Year	Total	
		Facility Construction	Operation and Maintenance
1976	1	$ 147,000	$ 205,000
1977	2	659,000	205,000
1978	3	659,000	222,000
1979	4	441,000	222,000
1980	5	2,014,000	222,000
1981	6	2,124,000	240,000
1982	7	510,000	240,000
1983	8	620,000	253,800
1984	9	510,000	253,800
1985	10	660,000	289,800
1986	11	310,000	297,300
1987	12	170,000	308,300
1988	13	841,000	308,300
1989	14	3,817,000	308,300
1990	15	3,817,000	973,000
1991	16	--	973,000
1992	17	--	973,000
1993	18	--	973,000
1994	19	--	973,000
1995	20	--	973,000
1996	21	--	973,000
1997	22	--	973,000
1998	23	--	973,000
1999	24	--	973,000
2000	25	--	973,000
Total		$ 17,299,000	$ 14,278,600
Annual Average		$ 691,960	$ 571,144

[a] *Costs are expressed in terms of August 1976 dollars (ENR Construction Cost Index = 2445 and Consumer Price Index = 169.1). The costs include capital and operation and maintenance but do not include the costs of debt retirement or the effects of inflation. The costs include engineering, legal, and administrative allowances and contingencies, as well as interest during construction.*

Source: SEWRPC.

cost and expenses of performing work or operations as authorized by court under Section 92.11 of the Wisconsin Statutes.

Sewer Service Charges: Section 66.076 of the Wisconsin Statutes provides that municipalities may establish sewer service charges. The revenues from such charges may be pledged as security for mortgage bonds or mortgage certificates. For the purpose of making equitable charges for all services rendered by a sewerage system, the property benefited may be classified, taking into consideration the volume of water, the character of the sewage or waste disposed, and the nature of the use made of the sewerage system. The Federal Water Pollution Control Act amendments of 1972 require as a condition to obtaining federal grants-in-aid the establishment of user charges and industrial cost recovery requirements in place of traditional property tax levies. The 1977 amendments to the Act, however, substantially modify the previous user charge and industrial cost recovery requirements. Ad valorem tax schedules may now be used as a method for imposing user charges among residential users, provided each class of users carries its proportionate share of operation and maintenance costs. The U. S. Environmental Protection Agency Administrator is now also authorized to exempt from industrial cost recovery requirements those industries with daily discharges of up to 25,000 gallons, provided that any waste discharge would not contaminate sludge or reduce the treatment process efficiency.

Rural Land Management Contributions: Section 92.08(9) of the Wisconsin Statutes provides that soil and water conservation districts may require contributions of money, services, or materials to support in whole or in part the provision by the district of services, material, equipment, or benefits for land or landowner.

Point Source-Related Grant-in-Aid Programs: One state and two federal grant programs are available to designated management agencies for the financing of sewerage facility improvements. These include the following programs:

1. Wisconsin Fund, Point Source Pollution Abatement Program—This program, administered by the Wisconsin Department of Natural Resources pursuant to Section 144.25 of the Wisconsin Statutes, provides financial assistance to designated point source management agencies for the cost of approved water pollution abatement and prevention projects. Approved projects are defined as those included in adopted areawide water quality management plans. Eligible projects include sewage treatment facilities; trunk and relief sewers; outfall sewers; and certain sewage collection systems. The state grant may total up to 60 percent of the total project cost, limited, however, to the cost of that portion of an approved project that is designed to accommodate urban development only through 1985.

2. Federal Waste Treatment Works Construction Program—This program is administered by the U. S. Environmental Protection Agency and provides federal financial assistance in the amount of 75 percent of the total cost of approved projects. Projects must be found to be in conformance with an approved areawide water quality management plan and an approved sewerage facilities plan. It is anticipated that all of the facilities included in the point source pollution abatement element of the recommended areawide water quality management plan will be eligible for 75 percent federal assistance under this program.

3. Federal Rural Waste Disposal Facilities Program—This program is administered by the U. S. Department of Agriculture, Farmers Home Administration, and provides grants in amounts up to 50 percent of the cost of developing rural waste collection and disposal systems. Those management agencies that are located outside of metropolitan areas and that serve up to 5,500 population are eligible for these grants.

Nonpoint Source-Related Grant-in-Aid Programs: Two state and five federal grant programs are available to designated management agencies for the financing of nonpoint source-related facility improvements. These include the following programs:

1. Wisconsin Fund, Nonpoint Source Pollution Abatement Program—This program, administered by the Wisconsin Department of Natural Resources pursuant to Section 144.25 of the Wisconsin Statutes, provides state grants up to 50 percent of the cost of constructing or otherwise carrying out approved nonpoint source water pollution abatement projects and practices. It is intended that this program be administered in conjunction with a similar federal program, discussed below, to provide up to 70 percent in state and federal funding of the cost of constructing or otherwise carrying out such facilities and practices. Eligible projects and practices are to be determined through the detailed facilities planning process for nonpoint source pollution abatement described earlier in this chapter. This planning process is referred to by the Wisconsin Department of Natural Resources as "priority watershed planning" and is discussed in Chapter NR 121 of the Wisconsin Administrative Code.

2. State Soil and Water Conservation Program—This program, administered by the Wisconsin Board of Soil and Water Conservation Districts, provides grants to the county soil and water conservation districts in amounts up to 50 percent toward the cost of installing approved soil and water conservation projects.

3. Federal Agricultural Conservation Program—This program, administered by the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, provides grants to farmers for carrying out approved soil, water, woodland, and wildlife conservation practices.

4. Federal Resource Conservation and Development Program (RC&D)—This program, administered by the U. S. Department of Agriculture, Soil Conservation Service, provides cost-sharing up to 100 percent for flood control and sediment control works and up to 50 percent for construction of water conservation works, structural recreation works, and improved land use measures. A comprehensive RC&D program application for the seven-county Southeastern Wisconsin Region was submitted to the U. S. Secretary of Agriculture in July 1973. This application has not to date been funded, however, and the current federal policy is not to fund new projects under this program.

5. Federal Cropland Adjustment Program—This program, administered by the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, provides grants in amounts up to 50 percent of the cost to farmers to divert cropland to protective conservation uses for 5- to 10-year periods, the cost being based upon the value of the crops that would be produced. This program also provides cost-sharing up to 50 percent toward the cost of carrying out good conservation practices such as the establishment of vegetation cover, forest cover, and good wildlife habitat, and the preservation of natural beauty.

6. Federal Multiple-Purpose Watershed Program—This program, administered by the U. S. Department of Agriculture, Soil Conservation Service, through the State Soil Conservation Board, provides cost-sharing up to 100 percent to qualified sponsors, such as soil and water conservation, flood control, drainage, or irrigation districts, for flood prevention works and up to 50 percent toward agricultural water management, public recreation, fish and wildlife development, acquisition of certain recreational land rights, and agricultural land planning and treatment.

7. Section 208 Agricultural Cost-Sharing Program—Section 208(j) of the Federal Water Pollution Control Act was created by the 1977 amendments to provide for agricultural cost-sharing for the implementation of measures incorporating "Best Management Practices" to control nonpoint source pollution in those areas with Section 208 certified plans. Practices must be consistent with the certified plan. The U. S. Secretary of Agriculture, acting through the Soil Conservation Service, is authorized to enter into agreements of not less than 5 nor more than 10 years in terms with owners and operators having control of rural lands. The landowner must agree to implement a plan approved by the Soil Conservation Service. In return, the U. S. Secretary of Agriculture agrees to provide technical assistance and authorize cost-sharing for those practices that he deems to be appropriate and in the public interest. The amount of cost-sharing shall not exceed 50 percent except in those cases where the main benefits will be to improve offsite water quality and where the burden placed on the landowner will be of such magnitude so as to prevent him from participating in the program.

Technical Assistance

Certain federal, state, regional, and county agencies upon request provide various types of technical assistance useful in water quality management plan implementation to local units of government. Limited guidance and assistance may be provided without cost, or such assistance may be provided for a nominal fee. In some cases, the local unit of government may contract with the agency for more extensive technical assistance services. A summary of the various levels and types of assistance available by agency follows:

1. Federal Agencies—At the federal level, the U. S. Environmental Protection Agency provides technical assistance and advice on request at no cost to state and local units of government and to private firms relative to water quality management problems and areawide water quality management plan implementation. The U. S. Department of Agriculture, Soil Conservation Service, provides technical assistance to local units of government and soil and water conservation districts for resource conservation, development, and utilization programs. The Soil Conservation Service also provides technical assistance to local units of government in the adaptation of the detailed operational soil survey and interpretive analyses to urban planning and development problems.

2. State Agencies—At the state level, the Wisconsin Department of Natural Resources is authorized under Section 144.025(2)(h), upon request and without charge, to consult with and advise owners and operators of sewage treatment facilities as to the best method of sewage disposal. The Department is not required, however, to prepare specific facility plans. In addition, the Department provides continuing technical assistance services to treatment plant operators regarding the proper operational procedures to be followed in achieving the necessary treatment levels and maintaining the performance standards recommended in areawide water quality management plans. The Department is authorized to extend assistance to local units of government for the purpose of securing uniformity of water resource protection regulations.

3. The University of Wisconsin-Extension, through the county agents and extension specialists, provides important educational and technical assistance to farmers and to local units of government in public affairs and soil and water conservation. Since the work of the Regional Planning Commission is entirely advisory, the importance of the organized educational efforts directed at achieving public understanding and acceptance of the regional plans cannot be overestimated. The University Extension can, in this respect, fulfill an indirect, yet very important, plan implementation function.

   The State Board of Soil and Water Conservations Districts is authorized to provide assistance to landowners and to the county soil and water conservation districts in carrying out soil and water conservation practices.

4. Areawide Agencies—At the regional level, the Regional Planning Commission staff as part of its continuing water quality management planning program stands ready and willing to provide whatever technical assistance it can to the implementing agencies in securing and ensuring continued compliance with the plan recommendations in the design of sewerage facilities, thereby also ensuring that such facilities will be eligible to receive maximum federal and state grants-in-aid. The Southeastern Wisconsin Regional Planning Commission, through its Community Assistance Division, provides educational, advisory, and review services to the local units of government, including participation in educational programs, such as workshops; the provision of speakers; the sponsorship of regional planning conferences; the publication of bimonthly newsletters; the selection of staff and consultants; the preparation of planning programs; special base and soil mapping; the preparation of suggested zoning, official mapping, sanitary, and land division ordinances; the provision of information regarding federal and state aid programs; and the review of local planning programs, plan proposals, ordinances, and most state and federal grant applications. In addition, the Commission is empowered to contract with local units of government under Section 66.30 of the Wisconsin Statutes to make studies and offer advice on land use, transportation, community facilities, and other public improvements.

   The county soil and water conservation districts are authorized to furnish technical assistance to landowners or occupiers and any public or private agency regarding the prevention of soil erosion and floodwater and sedimentation damage and the furthering of water conservation and development. Those counties with park or planning staffs provide certain technical services related to general community planning and development problems to local units of government and private groups.

CONTINUING AREAWIDE WATER QUALITY MANAGEMENT PLANNING PROGRAM

As noted earlier in this chapter, it is essential that a planning body remain on the scene to coordinate and advise on the execution of the recommended areawide water quality management plan and to undertake plan updating and extension efforts as may be necessitated by changing events. As the designated areawide water quality management planning agency, under Section 208 of the Federal Water Pollution Control Act, the Regional Planning Commission is charged with the responsibility of conducting this continuing areawide water quality management planning program. The following discussion concerns the general nature and scope of that continuing planning effort, as well as a recommendation concerning the best means of providing the necessary financial support for that effort.

Nature and Scope of Continuing Planning Effort

It is envisioned that the continuing areawide water quality management planning effort will require the

conduct of six major planning functions. These six functions are: plan surveillance; plan reappraisal; plan expansion; service and plan implementation; procedural development; and documentation. Each of these functions is briefly discussed below. It is anticipated that these functions will provide the basis of the continuing water quality management work program. That work program will be included in the annual overall work program prepared by the Commission in conformance with federal regulations.

Plan Surveillance: Under the plan surveillance function, regional development is to be carefully monitored in relation to the recommended areawide water quality management plan. The extensive data base created by the inventories conducted as part of the initial planning effort will have to be maintained and kept up to date. Of particular importance in this respect will be the inventories of existing water quality called for in the water quality monitoring plan element. While it is not envisioned that the Commission itself will be involved in primary water quality data collection activities, considerable staff effort will be required to analyze the data collected to determine whether progress is being made toward meeting the water quality standards that support the recommended water use objectives. In addition, careful monitoring will be required of secondary data sources with respect to existing sources of water pollution. Of particular importance in this respect will be the monitoring of waste discharge permits issued by the Wisconsin Department of Natural Resources in order to determine the extent to which the permit requirements seek to implement the plan. Finally, those factors pertaining to general regional development will have to be carefully monitored, including data pertaining to the amounts and spatial locations of changes in population, economic activity, and land use development. It is intended that the annual work program of the Commission will specify the precise scope of the plan surveillance function in any given year, as well as how frequently such data are to be collected.

Plan Reappraisal: Under the plan reappraisal function, the areawide water quality management plan elements and the forecasts and assumptions underlying these plan elements are to be continually reappraised in light of changes in actual regional development as those changes are revealed by the surveillance function. A major plan update and revision is proposed to be undertaken every five years beginning in 1985 unless the findings of the plan surveillance function indicate otherwise. The reappraisal will examine the continued validity of the areawide water quality management plan in light of identification changes in the water use objectives and standards, as well as in any basic assumptions and forecasts upon which the plan is based.

Plan Expansion: In a broad program like the areawide water quality management planning program, it is necessary to limit the initial plan development to consideration of the most urgent and highest priority needs. Under the plan expansion function of the continuing program, the scope of the initial planning effort can be expected to be expanded to address additional problems. It is envisioned, for example, that additional detailed inland lake water quality studies will be undertaken. In addition, it is possible that the program could include intensive water quality management studies of the Milwaukee, Kenosha, Racine, and Port Washington harbor estuary areas. Also, it is possible that the problems associated with the disposal of toxic substances could be addressed. Whether or not the plan is expanded into these additional areas will be largely dependent upon the availability of local, state, and federal funding.

Service and Plan Implementation: Under the service and plan implementation function, the initial areawide water quality management plan and the data and forecasts upon which that plan is based are to be extended to the designated management agencies as a basis for the making of day-to-day water quality management decisions, thereby promoting integration of federal, state, and local planning and plan implementation efforts. The service and plan implementation function is extremely important because, to be of use in decisionmaking, the adopted plan requires almost constant interpretation. In addition, the inventory data, analyses, and forecasts on which the plan is based must be made available on request for review and utilization in subsequent planning and plan implementation efforts. In addition, detailed facilities planning, necessary to refine the areawide plan, must be fully coordinated with that areawide plan. Commission experience in other planning efforts indicates that the service and plan implementation function is an important one indeed, and one which will require a great deal of resources, particularly during the early years of plan implementation.

Procedural Development: Under the procedural development function, the techniques and procedures used for water quality management planning are to be evaluated, improved upon, and, where necessary, replaced through the development of new techniques and procedures. This function includes maintaining a current state-of-the-art of water quality management planning capability at the regional level.

Documentation: The documentation function is used to meet the continuing need to provide an important historical record of the entire water quality management planning process. It is envisioned that the documentation effort under the continuing planning program will consist of at least the following: plan amendment documents; major planning reports documenting the plan reappraisal and expansion efforts; community assistance planning reports documenting the more detailed local planning efforts of communities in the Region, particularly in lake areas; technical reports and technical records documenting any precedural development activities; and annual reports setting forth a record of the salient water quality management planning and plan implementation activities in the Region. It is envisioned that such annual reports will be included in the Commission's statutorily required Annual Report.

Financial Support for Continuing Planning Effort

The federal statutes and regulations governing the areawide water quality management planning process require that a means be found to ensure a sustaining source of nonfederal funding for continuing areawide water quality management planning efforts. The most recent federal rules concerning this matter indicate that no federal support for continuing planning programs will be forthcoming after October 1, 1982.

In order to meet this federal planning requirement, the Commission considered a number of ways in which to fund a continuing areawide water quality management planning effort, including local property taxes, local sales taxes, user fees as established through surcharges on sewerage system bills and on septic tank permits, and direct state funding. After careful consideration of these various sources of nonfederal funding support, the Commission believes that the singularly best way to proceed is to seek direct state funding of such efforts through the Wisconsin Department of Natural Resources. This belief is based upon considerations of equity, the statewide nature and importance of the planning effort, and ease of administration.

As administered by the U. S. Environmental Protection Agency, areawide water quality management planning is required to be conducted over the entire State of Wisconsin. At the present time, there are only three designated planning agencies and areas; namely, the Dane County Regional Planning Commission for Dane County; the Fox Valley Water Quality Planning Agency for portions of Brown, Winnebago, Fond du Lac, Calumet, and Outagamie Counties; and the Southeastern Wisconsin Regional Planning Commission for Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties. The areawide water quality management planning efforts in these three designated areas are currently being supported by a combination of federal, state, and local funds. By contrast, the Department of Natural Resources itself is responsible for conducting the areawide water quality management planning throughout the remaining 59 counties of the State. That effort is being funded entirely by federal and state monies. Since it is unlikely that any additional areawide planning agencies will be designated in the near future for areawide water quality management planning in Wisconsin, and since such planning is required to be conducted statewide, equity alone would indicate that if no local funds are going to be required from counties outside the designated areas, then no local funds should be required from counties inside the designated areas. It would not be fair to tax the citizens of southeastern Wisconsin through a local property tax or a user fee to support the areawide water quality management planning effort in that Region and then tax them again as state and federal taxpayers to support all of the cost of a similar plan in nondesignated areas.

In addition to the foregoing considerations, and in light of the fact that recent trends in Wisconsin have sought to relieve local property taxes and not add to such taxes, thus ruling out for all practical purposes that source of revenue for any significant amount of support, it should be noted that any proposal to establish a system of user fees through surcharges on sewer service bills or septic tank permits would necessarily involve establishing a complex and cumbersome administrative structure. By contrast, the existing statewide structure for income, sales, and other taxes is already well established and can be readily used to secure whatever funds are necessary on a statewide basis to conduct continuing areawide water quality management planning efforts. Accordingly, it is recommended that the Wisconsin Department of Natural Resources seek direct state funding of all continuing areawide water quality management planning efforts in the State. The amount to be secured for each designated management agency should be based upon an agreed-upon overall work program prepared and approved annually, and should be related to the budget cycle currently followed by the State.

SUMMARY

This chapter has presented the recommended means for implementing the areawide water quality management plan for the seven-county Southeastern Wisconsin Region. The chapter includes the designation of management agencies, identification of implementation costs and schedules, and assignment of plan implementation responsibilities for point source pollution abatement, urban nonpoint source pollution abatement, rural nonpoint source pollution abatement, and sludge management. In addition, plan implementation recommendations are made with respect to the water quality monitoring plan element.

A summary of the local governmental management agencies designated to implement the recommended plan is set forth in Table 75. A total of 251 management agencies have been designated for plan implementation purposes. Of this total, all but 33 currently exist. The 33 new agencies would be sanitary, utility, and/or lake protection and rehabilitation districts required to carry out a variety of plan implementation responsibilities in direct drainage areas to lakes or, in a few instances, to isolated enclaves of urban development within unincorporated towns. A total of 133 management agencies have been designated for point source pollution abatement purposes, while 163 management agencies have been designated for urban nonpoint source pollution abatement, 64 management agencies for rural nonpoint source pollution abatement, and 131 management agencies for sludge management.

In Kenosha County, a total of 32 management agencies have been designated, as shown in Table 75. Of this total, only three new agencies would be created, these being a new sanitary or utility district to serve urban development along IH 94 in the Town of Bristol, a new sanitary or utility district to serve urban development in the Pleasant Park area of the Town of Pleasant Prairie, and a new sanitary, utility, or lake protection and rehabilitation district to serve the area tributary to Benedict and Powers Lakes.

Table 75

SUMMARY OF LOCAL GOVERNMENTAL MANAGEMENT AGENCY DESIGNATIONS FOR IMPLEMENTATION OF THE RECOMMENCED AREAWIDE WATER QUALITY MANAGEMENT PLAN FOR THE REGION

Designated Management Agency	Plan Implementation Responsibilities			
	Point Source Pollution Abatement	Urban Nonpoint Source Pollution Abatement	Rural Nonpoint Source Pollution Abatement	Sludge Management
KENOSHA COUNTY				
Kenosha County	--	X	X	X
Kenosha County Soil and Water Conservation District	--	X	X	X
City of Kenosha	X	X	--	X
Village of Paddock Lake	X	X	--	--
Village of Silver Lake	X	X	--	X
Village of Twin Lakes	X	X	--	X
Town of Brighton	--	--	--	X
Town of Bristol	--	--	--	X
Utility District No. 1	X	X	--	X
George Lake Protection and Rehabilitation District	--	X	X	--
New District--IH 94	X	--	--	--
Town of Paris	--	--	--	X
Town of Pleasant Prairie	--	X	--	X
Sewer Utility District No. 1	X	--	--	--
Sewer Utility District No. 2	X	--	--	--
Sewer Utility District A	X	--	--	--
Sewer Utility District B	X	--	--	--
Sewer Utility District C	X	--	--	--
Sewer Utility District D	X	--	--	X
Sewer Utility District E	X	--	--	--
Sanitary District No. 73-1	X	--	--	X
New District--Pleasant Park	X	--	--	--
Town of Randall	--	--	--	X
New District--Benedict and Powers Lakes	--	X	X	--
Town of Salem	--	--	--	X
Sewer Utility District No. 1	X	X	X	X
Sewer Utility District No. 2	X	X	X	X
Town of Somers	--	X	--	X
Sanitary District No. 1	X	--	--	--
Utility District No. 1	X	--	--	--
Town of Wheatland	--	--	--	X
Lilly Lake Protection and Rehabilitation District	--	X	X	--
MILWAUKEE COUNTY				
Milwaukee County	--	X	X	X
Milwaukee County Soil and Water Conservation District	--	X	X	X
Milwaukee Metropolitan Sewerage District	X	--	--	X
City of Cudahy	X	X	--	--
City of Franklin	X	X	--	X
City of Glendale	X	X	--	--
City of Greenfield	X	X	--	--
City of Milwaukee	X	X	--	--
City of Oak Creek	X	X	--	--
City of St. Francis	X	X	--	--
City of South Milwaukee	X	X	--	X
City of Wauwatosa	X	X	--	--
City of West Allis	X	X	--	--
Village of Bayside	X	X	--	--
Village of Brown Deer	X	X	--	--
Village of Fox Point	X	X	--	--
Village of Greendale	X	X	--	--
Village of Hales Corners	X	X	--	--
Village of River Hills	X	X	--	--
Village of Shorewood	X	X	--	--
Village of West Milwaukee	X	X	--	--
Village of Whitefish Bay	X	X	--	--
OZAUKEE COUNTY				
Ozaukee County	--	X	X	X
Ozaukee County Soil and Water Conservation District	--	X	X	X
City of Cedarburg	X	X	--	X
City of Mequon	X	X	--	X
City of Port Washington	X	X	--	X
Village of Belgium	X	X	--	X
Village of Fredonia	X	X	--	X
Village of Grafton	X	X	--	X
Village of Saukville	X	X	--	X
Village of Thiensville	X	X	--	--
Town of Belgium	--	--	--	X
New District--Lake Church	X	--	--	--
Town of Cedarburg	--	--	--	X
Town of Fredonia	--	--	--	X
Waubeka Area Sanitary District	X	--	--	--
Town of Grafton	--	--	--	X
Town of Saukville	--	--	--	X
Town of Port Washington	--	--	--	X

Designated Management Agency	Plan Implementation Responsibilities			
	Point Source Pollution Abatement	Urban Nonpoint Source Pollution Abatement	Rural Nonpoint Source Pollution Abatement	Sludge Management
RACINE COUNTY				
Wisconsin Department of Health and Social Services	X	--	--	--
Racine County	--	X	X	X
Racine County Soil and Water Conservation District	--	X	X	X
Western Racine County Sewerage District	X	--	--	X
City of Burlington	X	X	--	X
City of Racine	X	X	--	X
Village of Elmwood Park	X	X	--	--
Village of North Bay	X	X	--	--
Village of Rochester	X	X	--	--
Village of Sturtevant	X	X	--	--
Village of Union Grove	X	X	--	X
Village of Waterford	X	X	--	--
Village of Wind Point	--	X	--	--
Town of Burlington	--	--	--	X
Browns Lake Sanitary District	X	X	X	--
New District--Bohners Lake	--	X	X	--
New District--Long Lake	--	X	X	--
Town of Caledonia	--	X	--	X
Sewer Utility District No. 1	X	--	--	--
Caddy Vista Sanitary District	X	--	--	--
Crestview Sanitary District	X	--	--	--
North Park Sanitary District	X	--	--	--
Town of Dover	--	--	--	X
Eagle Lake Sewer Utility District	X	X	X	X
Town of Mt. Pleasant	--	X	--	X
Sewer Utility District No. 1	X	--	--	--
Town of Norway	--	--	--	X
Sanitary District No. 1	X	X	X	X
Town of Raymond	--	--	--	X
Town of Rochester	--	--	--	X
Sewer Utility District No. 1	X	X	--	--
Town of Waterford	--	--	--	X
Sanitary District No. 1	X	X	X	--
Town of Yorkville	--	--	--	X
Sanitary District No. 1	X	X	--	X
WALWORTH COUNTY				
Walworth County	X	X	X	X
Walworth County Soil and Water Conservation District	--	X	X	X
Walworth County Metropolitan Sewerage District	X	--	--	X
Geneva Lake Environmental Watershed Agency	--	X	X	--
City of Delavan	X	X	--	--
City of Elkhorn	X	X	--	--
City of Lake Geneva	X	X	--	X
City of Whitewater	X	X	--	X
Village of Darien	X	X	--	X
Village of East Troy	X	X	--	X
Village of Fontana	X	X	--	--
Village of Genoa City	X	X	--	X
Village of Sharon	X	X	--	X
Village of Walworth	X	X	--	X
Village of Williams Bay	X	X	--	--
Town of Bloomfield	--	--	--	X
New District--Pell Lake	--	X	X	--
Town of Darien	--	--	--	X
Town of Delavan	--	--	--	X
Delavan Lake Sanitary District	X	X	X	--
Town of East Troy	--	--	--	X
Sanitary District No. 1	--	X	X	--
Sanitary District No. 2	X	X	X	--
Town of Geneva	--	--	--	X
New District--Lake Como	X	X	X	--
Town of LaFayette	--	--	--	X
Town of La Grange	--	--	--	X
New District--Pleasant, Green, Middle, and Mill Lakes	--	X	X	--
Town of Linn	--	--	--	X
Sanitary District No. 1	X	X	X	--
Town of Lyons	--	--	--	X
Sanitary District No. 2	X	--	--	X
Town of Richmond	--	--	--	X
New District--Lake Loraine	--	X	X	--
New District--Turtle Lake	--	X	X	--
Town of Sharon	--	--	--	X
Town of Spring Prairie	--	--	--	X
Honey Lake Protection and Rehabilitation District	--	X	X	--
Town of Sugar Creek	--	--	--	X
New District--North Lake	--	X	X	--
New District--Silver Lake	--	X	X	--
New District--Wandawega Lake	--	X	X	--
Town of Troy	--	--	--	X
New District--Booth Lake	--	X	X	--
Town of Walworth	--	--	--	X
Town of Whitewater	--	--	--	X
New District--Rice and Whitewater Lakes	--	X	X	--

Table 75 (continued)

Designated Management Agency	Plan Implementation Responsibilities			
	Point Source Pollution Abatement	Urban Nonpoint Source Pollution Abatement	Rural Nonpoint Source Pollution Abatement	Sludge Management
WASHINGTON COUNTY				
Washington County	--	X	X	X
Washington County Soil and Water Conservation District	--	X	X	X
City of Hartford	X	X	--	X
City of West Bend	X	X	--	X
Village of Germantown	X	X	--	X
Village of Jackson	X	X	--	X
Village of Kewaskum	X	X	--	X
Village of Newburg	X	X	--	X
Village of Slinger	X	X	--	X
Town of Addison	--	--	--	X
Allenton Sanitary District No. 1	X	X	--	X
Town of Barton	--	--	--	X
Town of Erin	--	--	--	X
New District--Druid Lake	--	X	X	--
Town of Farmington	--	--	--	X
New District--Green Lake	--	X	X	--
New District--Lake Twelve	--	X	X	--
Town of Germantown	--	--	--	X
Town of Hartford	--	--	--	X
New District--Pike Lake	--	X	X	--
Town of Jackson	--	--	--	X
Town of Kewaskum	--	--	--	X
Town of Polk	--	--	--	X
Town of Richfield	--	--	--	X
New District--Bark Lake	--	X	X	--
New District--Freiss Lake	--	X	X	--
New District--Lake Five	--	X	X	--
Town of Trenton	--	--	--	X
Wallace Lake Sanitary District	X	X	X	--
Town of Wayne	--	--	--	X
Town of West Bend	--	--	--	X
Big Cedar Lake Sanitary District	--	X	X	--
Little Cedar Lake Sanitary District	--	X	X	--
Silver Lake Sanitary District	--	X	X	--
WAUKESHA COUNTY				
Waukesha County	--	X	X	X
Waukesha County Soil and Water Conservation District	--	X	X	X
Waukesha County Board of Health	--	X	--	--
Delafield-Hartland Water Pollution Control Commission	X	--	--	X
Menomonee South Sewerage Commission	X	--	--	--
Poplar Creek Sewerage Commission	X	--	--	--
Springdale Sewerage Commission	X	--	--	--
Underwood Sewerage Commission	X	--	--	--
City of Brookfield	X	X	--	X
City of Delafield	X	X	--	--
City of Muskego	X	X	--	X
City of New Berlin	X	X	--	X
City of Oconomowoc	X	X	--	X
City of Waukesha	X	X	--	X
Village of Big Bend	--	X	--	--
Village of Butler	X	X	--	--
Village of Chenequa	X	X	--	--
Village of Dousman	X	X	--	X
Village of Eagle	--	X	--	--
Village of Elm Grove	X	X	--	--
Village of Hartland	X	X	--	--
Village of Lac La Belle	X	X	--	--
Village of Lannon	X	X	--	--
Village of Menomonee Falls	X	X	--	X
Village of Merton	--	X	--	--
Village of Mukwonago	X	X	--	X
Village of Nashotah	X	X	--	--
Village of North Prairie	X	X	--	X
Village of Oconomowoc Lake	X	X	--	--
Village of Pewaukee	X	X	--	--
Village of Sussex	X	X	--	--
Village of Wales	X	X	--	X
Town of Brookfield	X	X	--	--
Town of Delafield	--	X	--	X
Town of Eagle	--	--	--	X
Eagle Spring Lake Sanitary District	--	X	X	--
Town of Genesee	--	X	--	X
Town of Lisbon	--	X	--	X
New District	X	--	--	--
Town of Merton	--	--	--	X
New District--North Lake	X	X	X	--
New District--Beaver Lake	X	X	X	--
New District--Lake Keesus	--	X	X	--
Town of Mukwonago	--	--	--	X
Phanton Lake Protection and Rehabilitation District	--	X	X	--
New District--Spring Lake	--	X	X	--
Town of Oconomowoc	--	--	--	X
New District--Lac La Belle	X	X	X	--
New District--Moose Lake	--	X	X	--
WAUKESHA COUNTY (continued)				
Okauchee Lake Protection and Rehabilitation District	--	X	X	--
Ashippun Lake Protection and Rehabilitation District	--	X	X	--
New District--Okauchee	X	--	--	--
Town of Ottawa	--	--	--	X
Pretty Lake Protection and Rehabilitation District	--	X	X	--
School Section Lake Protection and Rehabilitation District	--	X	X	--
Town of Pewaukee	--	X	--	X
Sanitary District No. 3	X	--	--	--
Pewaukee Lake Sanitary District	X	--	--	--
Town of Summit	--	X	--	X
New District--Nashotah-Nemahbin Lakes	X	--	--	--
New District--Silver Lake	X	--	--	--
Town of Vernon	--	X	--	X
Town of Waukesha	--	X	--	X

Source: SEWRPC.

In Milwaukee County, a total of 22 management agencies have been designated. All of these agencies currently exist.

In Ozaukee County, a total of 18 management agencies have been designated. Of this total, one new agency would be required, that being a sanitary or utility district to serve urban development in the Lake Church and Harrington Beach urban areas of the Town of Belgium.

In Racine County, a total of 35 management agencies have been designated. Of this total, only two new agencies would be created, these being a new sanitary, utility, or lake protection and rehabilitation district to serve the areas tributary to Bohners Lake and to Long Lake, both in the Town of Burlington.

In Walworth County, a total of 47 management agencies have been designated. Of this total, 10 new agencies would be created. These 10 agencies would consist of new sanitary, utility, or lake protection and rehabilitation districts to serve Pell Lake in the Town of Bloomfield; Lake Como in the Town of Genesee; Pleasant, Green, Middle, and Mill Lakes in the Town of La Grange; Lake Loraine and Turtle Lake, both in the Town of Richmond; North Lake, Silver Lake, and Wandawega Lake, all in the Town of Sugar Creek; Booth Lake in the Town of Troy; and Rice and Whitewater Lakes in the Town of Whitewater.

In Washington County, a total of 34 management agencies have been designated. All but seven of these agencies currently exist. The seven new agencies would be sanitary, utility, or lake protection and rehabilitation districts to serve Druid Lake in the Town of Erin; Green Lake and Lake Twelve, both in the Town of Farmington; Pike Lake in the Town of Hartford; and Bark Lake, Freiss Lake, and Lake Five, all in the Town of Richfield.

In Waukesha County, a total of 63 management agencies have been designated. All but 10 of these agencies currently exist. The 10 new agencies would consist of sanitary, utility, or lake protection and rehabilitation districts to serve existing and proposed urban development in the Town of Lisbon; North Lake, Beaver Lake, and Lake Keesus, all in the Town of Merton; Spring Lake in the Town of Mukwonago; Lac La Belle, Moose Lake, and Okauchee, all in the Town of Oconomowoc; and Nashotah-Nemahbin Lakes and Silver Lake, both in the Town of Summit.

In addition to designating all of the foregoing management agencies and assigning specific responsibilities to such agencies, this chapter includes a discussion of the financial and technical assistance available to such management agencies in carrying out their various assigned responsibilities. This chapter concludes with a discussion of the need to establish a continuing areawide water quality management planning program and recommends that funding for such a program be provided directly by the State of Wisconsin through the Department of Natural Resources.

Chapter IV

SUMMARY AND CONCLUSIONS

INTRODUCTION

Water resources constitute one of the most important elements affecting the overall quality of the environment, as well as the growth and development of an area. Water resources not only condition, but are conditioned by regional growth and development. Any meaningful comprehensive regional planning effort must, therefore, recognize water resources as an important element of a limited natural resource base to which both rural and urban development must be adjusted if serious developmental and environmental problems are to be avoided. This is particularly true in the highly urbanized seven-county Southeastern Wisconsin Region, a Region richly endowed with water resources. Properly husbanded, these water resources can constitute a renewable resource that can serve the Region for all time to come. Misused and mismanaged, however, these resources will become the focus of serious and costly developmental and environmental problems, and be a severe constraint on the sound social and economic physical development of the Region. Water pollution is one manifestation of the misuse of water resources, and the public has become increasingly aware of, and concerned over, such pollution, which has seriously interfered with desired water uses.

Recognizing the importance of water resources to the sound development of the Region, the Southeastern Wisconsin Regional Planning Commission in July of 1975, and pursuant to the requirements of Section 208 of the Federal Water Pollution Control Act, undertook an areawide water quality management planning program for the seven-county Southeastern Wisconsin Region. The findings and recommendations of that planning program are presented in a three-volume report.

The first volume of the report sets forth the basic principles and concepts underlying the water quality management study; discusses the relationship of the areawide water quality management planning program to the Commission's comprehensive regional planning program for southeastern Wisconsin, of particular relevance being the Commission's land use, park and open space, and air quality management planning efforts; describes the existing natural and man-made features of the Region which affect and are affected by water quality; describes the existing level of water quality in the lakes and streams of the Region; describes the existing sources of water pollution in the Region; and describes the legal and financial structures which are available to support implementation of recommended water quality measures.

The second volume of the report sets forth recommended water quality management objectives, principles, and standards, including specific water use objectives for the lakes and streams of the Region; discusses probable future growth and change in the population and economic activity levels and in land use within the Region; presents a comparison of existing and forecast year 2000 water quality conditions against the recommended water use objectives and supporting water quality standards; and presents and evaluates alternative plans to meet the recommended water use objectives. This, the third and final volume of SEWRPC Planning Report No. 30, Recommended Plan, presents the recommended regional water quality management plan, consisting of a land use plan element, a point source pollution abatement element, a nonpoint source pollution abatement element, a wastewater sludge management element, and a water quality monitoring element.

In addition, this volume presents recommendations for the staged implementation of these recommended plan elements over the plan design period, including the identification of water quality management agencies. An environmental assessment of the recommended plan has been published separately. For reader convenience this chapter sets forth a brief summary of the material included in all three volumes of SEWRPC Planning Report No. 30.

Together, the three-volume report is intended to present a sound basis for decisionmaking concerning water pollution abatement and control by the local, state, and federal units and agencies of government concerned. To this end, the report considered the economic and financial, as well as the technical and environmental, factors involved in such abatement and control, together with the social and political considerations involved in plan adoption and implementation.

STUDY ORGANIZATION AND OBJECTIVES

On September 27, 1974, the Governor of the State of Wisconsin designated the seven-county Southeastern Wisconsin Region as a water quality management planning area under the provisions of Section 208 of the Federal Water Pollution Control Act, and designated the Commission as the official areawide water quality management planning agency for this Region. Pursuant to these designations, the Commission in 1975 established a Technical Advisory Committee on Areawide Water Quality Management Planning to assist it in the conduct

of the federally mandated areawide water quality management planning program. A Citizens Advisory Panel was created to provide increased opportunity for representatives of citizen interest groups and for knowledgeable citizens to become familiar with and influence the planning program, the resulting plan, and the implementation measures proposed.[1] The technical work was carried out by the Commission staff with the assistance of cooperating governmental agencies, including the U. S. Department of the Interior, Geological Survey; the Wisconsin Department of Natural Resources; the University of Wisconsin-Extension Service; the soil and water conservation districts of the seven constituent counties; the Geneva Lake Watershed Environmental Agency; and private consultants engaged by the Commission, including Hydrocomp, Inc.; Stanley Consultants, Inc.; Camp Dresser and McKee, Inc.; Alster and Associates, Inc.; and Sommer-Frey Laboratories, Inc. Each of these organizations was selected by the Commission for participation in the areawide water quality management planning program because of its skill and experience in specialized phases of water resources planning, engineering, and management. The disciplines provided through such assistance included photogrammetric mapping and control surveys; streamflow measurement; surface and groundwater quality sampling and analysis; sludge quality sampling and analysis; hydrologic-hydraulic water quality simulation modeling; assessments of the costs and effectiveness of various pollution control measures, including soil erosion control and other nonpoint source pollution abatement measures; agronomy; wastewater sludge management; and public information, education, and participation.

The primary objective of the areawide water quality management planning program for southeastern Wisconsin was to prepare and adopt an areawide water quality management plan providing for the abatement and prevention of water pollution in the lakes and streams of the Region, and for the attainment of recommended water use objectives and supporting water quality standards to the year 2000. In addition, the plan was intended to include specific recommendations for the designation of water quality management agencies in order to ensure the effective implementation of the recommended plan. Other ancillary objectives of the planning program included:

1. Providing for full integration of regional water quality management planning with comprehensive regional planning, particularly regional land use, park and open space, and air quality management planning.

2. Providing for the conduct of a refined areawide water quality and qualtity monitoring and modeling program.

3. Preparing an areawide point source pollution abatement plan element through revision and refinement, as necessary, of the previously prepared and adopted Commission comprehensive watershed and regional sanitary sewerage system plans.

4. Preparing an areawide nonpoint source pollution abatement plan element, extending previous Commission watershed planning efforts.

5. Preparing a practical areawide wastewater sludge management systems plan element.

6. Assisting in the conduct of subarea detailed facilities planning for municipal wastewater conveyance and treatment facilities consistent with the plan.

7. Providing for the establishment of a continuing areawide water quality management planning program for southeastern Wisconsin.

The areawide water quality management planning program for southeastern Wisconsin was conducted using the basic seven-step planning process developed by the Commission for all of its regional systems planning programs. Major steps in this process as applied to water quality management included: the determination of the existing water quality of lakes and streams in the region; the determination of all sources of water pollution, including the determination of the quantity and characteristics of the pollutants developed by these sources; the analysis of existing water quality against both the current state-adopted water use objectives and supporting water quality standards and the national goal established by the U. S. Congress in 1972 of achieving "fishable and swimmable" waters throughout the United States; the investigation of anticipated growth and change in the Region, particularly as such growth and change may affect water quality; the preparation of alternative plans for the abatement of pollution from the various sources and the attainment of the agreed-upon water use objectives; and the preparation of a recommended comprehensive areawide water quality management plan, including the designation of management agencies and the assignment of plan implementation responsibilities.

The entire three-volume planning report only presents in brief summary form the large quantity of information assembled in the extensive data collection, analysis, forecasting, plan design, and plan evaluation phases of the areawide water quality management planning program for southeastern Wisconsin. Reproduction of all of the information gathered and developed in report form is impractical; however, all of the basic data developed under the program and presented in summary form in the three-volume planning report and in supplemental tech-

[1] *A third committee was envisioned and created to provide guidance to those aspects of the program having important intergovernmental and interagency policy implications of a statewide nature. This committee was not actually called upon to assist in the planning program. The issues with which this committee was to have dealt, particularly statewide funding of both point and nonpoint source pollution abatement programs, were instead dealt with by the Statewide Water Quality Advisory Committee and the State Nonpoint Source Coordinating Committee, committees created by the Secretary of the Wisconsin Department of Natural Resources.*

nical reports are on file in the Commission offices and are available for use to member units and agencies of government and to the general public upon specific request. The planning report serves, therefore, the additional purpose of indicating the types of water quality and related data that are available from the Commission and that may be of value to federal, state, or local units of government or to private interests within the Region.

INVENTORY, ANALYSIS, AND FORECAST FINDINGS

Since the areawide water quality management planning program was conducted within the context of the Commission's overall, ongoing, comprehensive regional planning programs, relevant data and analyses from related studies were used in the planning effort. Of particular importance in this respect were the Commission's intensive studies of the demography and economy of the Region, of land use development in the Region, and of the underlying and sustaining natural resource base of the Region. Previous Commission inventories of surface water quality and of sources of water pollution were updated under the areawide water quality management planning program. A summary of the most important inventory, analysis, and forecast findings relating to water quality management planning is presented in the following discussion.

Population and Economic Activity

Population and economic activity levels are the most basic determinant of pollution loadings and of the need for pollution abatement and water quality management actions. The resident population of the Region, which stood at about 1.79 million persons in 1975, has increased at the rate of more than 33,000 persons per year from 1950 to 1960, at a rate of more than 18,000 persons per year from 1960 to 1970, and at a rate of only about 6,800 persons per year from 1970 through 1975. Regional population growth rates have thus declined significantly from the very high rates of growth experienced in the recent past to rates that approximate those that prevailed in the Region prior to 1950. It appears unlikely that the very large absolute population increases of the 1950's and 1960's will recur in the Region in the foreseeable future, and the internal redistribution of population may be expected to be a more important consideration in water quality management planning than the accommodation of regional population growth.

The resident population of the Region in the design year of the water quality management plan—2000—may be expected to approximate 2.22 million persons, representing an increase of about 24 percent over the 1975 population level of about 1.79 million persons. The population forecasts indicate continued high population growth rates in Ozaukee, Washington, and Waukesha Counties, with lower rates of population growth in Kenosha, Racine, and Walworth Counties. While currently experiencing a decline in population, Milwaukee County would, under the forecast, be expected to nearly regain the 1970 population level of about 1 million persons by the year 2000.

It should be stressed that the county population forecasts are normative ones based upon the Commission's adopted land use development objectives, and assume that the continued diffusion of urban development into the outlying areas of the Region will be curtailed in the public interest through the exercise of land use controls and other public policy actions. The individual county forecasts assume that the present trend toward population decentralization will be stabilized, and in fact reversed in the mid-to-late 1980's, and that the central areas of the Region will again experience population growth. While at variance with existing trends, this assumption is consistent with federal policies that seek to discourage urban sprawl and protect critical environmental areas and prime agricultural lands, and thereby supports national urban policy.

It is also important to note that the Commission population forecasts meet the requirements set forth by the U. S. Environmental Protection Agency in the Federal Register of February 27, 1978. These requirements state that forecast population levels for a region to be used in areawide water quality management planning cannot exceed state population forecasts for the same region by more than 10 percent. The Commission's population forecast for the year 2000 of 2.22 million varies only 2.4 percent from the Wisconsin Department of Administration's independently prepared forecast of 2.27 million persons for the same year. The year 2000 Commission population forecast for the four-county Milwaukee Standard Metropolitan Statistical Area of 1.73 million varies only 2.2 percent from the state forecast of 1.77 million for the same year. In addition, the federal requirements indicate that the state population forecasts cannot vary from forecasts prepared jointly by the U. S. Department of Commerce, Office of Business Economics, and the U. S. Department of Agriculture, Economic Research Service (BEA-OBERS) by more than 5 percent. The Wisconsin Department of Administration forecast of 5.78 million residents for the State exceeds the BEA-OBERS forecast of 5.55 million by 4.1 percent.

The number of jobs in the Region increased from 552,700 in 1950 to 779,000 in 1975, an increase of about 41 percent, with the largest increases occurring over the last decade of this period. It is anticipated that by the year 2000 employment in the Region will reach about 1 million—an increase of about 237,000 jobs, or about 30 percent, over the 1975 level. The largest increases in jobs are forecast in Milwaukee and Waukesha Counties. Historically, employment in the Region has been heavily concentrated in manufacturing, although this concentration is changing, with the economy becoming more oriented toward public and private services and trade. The economic factors that promote population growth and urbanization in the Region are largely centered in and around the major urban areas of Milwaukee, Racine, and Kenosha, although diffusion of economic activity paralleling the diffusion of population into the outlying areas of the Region is occurring.

Land Use Development

One of the central concepts underlying the areawide water quality management planning program for southeastern Wisconsin is that land use development, water quality, and the need for water quality management facilities are closely interrelated. The type, intensity, and spatial distribution of land use is an important determinant of water quality, which in turn influences land use development patterns.

Although urban development in the Region has been continuous since 1850, the character of this development has changed dramatically since 1950 (see Map 6, Volume One). The earlier form of compact, concentric urban development has been supplanted by a highly diffused pattern of areawide urbanization. Between 1950 and 1970 a 47 percent increase in urban population was accompanied by a 188 percent increase in the amount of land committed to urban use. The spread of urban development within the Region has been accompanied by a marked reduction in the urban population density of the developed portions of the Region—from more than 11,300 persons per square mile in 1920 to about 4,400 persons per square mile in 1970. In 1970 urban lands occupied about 15 percent of the total area of the Region, while nonurban land uses occupied about 88 percent. The greatest proportion of nonurban lands is devoted to agricultural use, which occupies about 60 percent of the total area of the Region.

If trends in land use decentralization exhibited over the period 1965 to 1970 continued, land devoted to urban use within the Region would increase from about 512 square miles to about 831 square miles over the plan design period—an increase of 319 square miles, or about 62 percent. Moreover, the average population density of the urban area could be expected to decline further to about 2,300 persons per square mile. In direct contrast to these trends, the adopted regional land use plan for the year 2000, used as a basis for the development of the areawide water quality management plan, proposes that only about 113 square miles of land be converted from rural to urban use to accommodate growth and change in the Region through the year 2000, that the diffusion of urban development throughout the Region be halted, and that the decline in urban population density be arrested and the overall density of the developed urban area of the Region be held at a level of about 3,500 persons per square mile.

It should be noted that the highly diffused nature of urban development now occurring in the Region, together with the sharp decline in urban population density, has intensified many long-standing developmental and environmental problems, including problems of water pollution abatement and water quality management. In particular, the concentration of new year-round urban development around the shorelines of many of the inland lakes within the Region has intensified the need for water quality management in order to protect these particularly valuable recreational resources.

Physiography and Geology

The land forms and physical features of a planning area, including the topography and drainage pattern, are important determinants of regional growth and development. The physiography of an area must, therefore, be considered in any water quality management planning, as well as in comprehensive land use planning. Certain physiographic features are particularly important to water quality planning, including topography, subsurface geology, surface drainage pattern, and soils.

The seven-county Southeastern Wisconsin Region is located in the upper Midwest between Lake Michigan on the east, the Green Bay-Lake Winnebago lowlands on the north, the Rock River Basin on the west, and the low dunes and swampland at the headwaters of the Illinois River on the south. The Region encompasses approximately 2,621 square miles of land area and 68 square miles of inland water area exclusive of Lake Michigan, for a total gross land and water area of about 2,689 square miles. The Region lies astride a major subcontinental divide between the upper Mississippi River and the Great Lakes-St. Lawrence River drainage basins.

Glaciation has largely determined the physiography and topography, as well as the soils, of the Region. The dominant physiographic and topographic feature is the Kettle Moraine, an interlobate glacial deposit or moraine formed between the Green Bay and Lake Michigan tongues, or lobes, of the continental glacier that moved in a generally southerly direction from its point of origin and what is now Canada. The Kettle Moraine, which is oriented in a general northeast-southwest direction across western Waukesha, Washington, and Walworth Counties, is a complex system of kames or crudely stratified conical hills; kettle holes marking the site of glacial ice blocks that became separated from the ice mass and melted to form depressions; and eskers consisting of long narrow ridges of drift deposited in abandoned drainageways. Because of its still predominantly rural character and its exceptional natural beauty, the Kettle Moraine and the surrounding area is, and may be expected to continue to be, subjected to increasing pressure for urban development.

The regional surface drainge is characterized by a disordered dendritic pattern. There is a preponderance of ponds and lakes and much of the Region is covered by wetlands, with many streams being mere threads of water through those wetlands. The major subcontinental divide bisecting the Region places about 1,685 square miles, or 63 percent of the area of the Region, on the Mississippi River side of the divide, with the remaining 1,004 square miles, or 37 percent of the area of the Region, on the Great Lakes-St. Lawrence River drainage basin side of the divide. The surface water drainage pattern of the Region may be further subdivided so as to identify 11 individual major watersheds, 5 of which—the Root River, the Menomonee River, the Kinnickinnic River, the Oak Creek, and the Pike River watersheds—are wholly contained in the Region. In addition to the 11 watersheds, there are numerous small catchment areas contiguous to Lake Michigan that are drained directly to the lake by small natural streams and artificial drainageways (see Map 17, Volume One). The surface drainage pattern and location of watershed boundaries are particularly pertinent to areawide water quality management planning since one of the basic principles formulated

under the planning program is the resolution of problems on an in-watershed basis.

A variety of soil types have developed in southeastern Wisconsin. All of the diverse soil types of the Region have been mapped by the U. S. Soil Conservation Service in cooperation with and under contract to the Commission; their physical, chemical, and biological properties identified; and interpretations of those properties made for urban and rural and engineering planning purposes.

The soil survey data and interpretations indicate that about 716 square miles, or 27 percent of the area of the Region, are covered by soils that are poorly suited for residential development even with public sanitary sewer service (see Map 21, Volume One); about 1,637 square miles, or 61 percent of the Region, are covered by soils that are poorly suited for residential development without sanitary sewer service on lots smaller than one acre (see Map 22, Volume One); and about 1,181 square miles, or about 44 percent of the area of the Region, are covered by soils that are poorly suited for residential development without public sanitary sewer service even with lots of one acre or more in size (see Map 23, Volume One).

Woodlands and Wetlands

Man has increasingly influenced the quantity and quality of woodlands, wetlands, and aquatic vegetation in the Region. In 1970 woodlands in the Region covered a total area of about 125,300 acres, or 7 percent of the area of the Region (see Map 26, Volume One). Woodlands have significant environmental value, limiting runoff and promoting infiltration and attendant groundwater recharge, contributing oxygen to the atmosphere, and otherwise assisting and limiting air and water pollution. In addition, woodlands have significant wildlife habitat and aesthetic value when viewed in conjunction with the beauty of the Region's lakes, streams, and glacial land forms.

Water and wetland areas in the Region in 1970 covered about 181,000 acres, or about 11 percent of the area of the Region (see Map 28, Volume One). About 48,000 acres, or 27 percent, actually consisted of surface water, with the remaining 132,800 acres consisting of swamps, marshes, and other wetland areas. Wetlands attenuate peak flood flows, help to protect stream and lake water quality by serving as nutrient and sediment traps, and provide important wildlife habitat and aesthetic values.

Fish and Wildlife Resources

Most of the major lakes in southeastern Wisconsin and many of the perennial streams are capable of supporting significant fish populations under existing conditions. However, a regional decline in lake and stream water quality may be expected to continue in the absence of the adoption and implementation of a sound areawide water quality management plan. Dominant fish species of importance to the fisheries of the Region include, among others, bluegills, largemouth bass, northern pike, muskellunge, walleye, bullhead, crappie, yellow perch, and carp.

Wildlife habitat areas in 1970 in the Region covered about 259,800 acres, or about 15 percent of the total area of the Region (see Map 30, Volume One). About 1,300 acres of wildlife habitat areas were lost to urban development from 1963 to 1970. If the remaining wildlife habitat areas in the Region are to be preserved, the woodlands, wetlands, and related surface waters, together with the contiguous crop and pasture lands, must be protected from mismanagement and continued urban encroachment.

Groundwater Resources

A groundwater reservoir not only sustains lake levels and provides the base flow of the streams within the Region, but comprises a major source of water supply. The aquifers that underlie the Region may be divided into three distinct groundwater sources. These are, in order from the land surface downward, the sand and gravel deposits of the glacial drift, the shallow dolomitic strata of the underlying bedrock, and the deeper sandstone and dolomitic strata. The first two aquifers are commonly referred to collectively as the "shallow" aquifer, while the latter is referred to as the "deep" aquifer. The shallow and deep aquifers are separated by a layer of shale that forms a relatively impermeable barrier between the two aquifers. The shallow aquifer is recharged locally by downward percolation of precipitation of surface water. The shallow aquifer is more susceptible to pollution by wastewater than the deep aquifer because it is nearer both in distance and in time to potential pollution sources. The principal source of recharge to the deep aquifer is precipitation percolating downward from glacial deposits into the deep aquifer strata, such strata being in contact with the glacial deposits in the Region only in the westerly portions of Walworth and Waukesha Counties. It is estimated that a potential for severe groundwater pollution exists over about 18 percent of the total area of the Region, whereas a slight potential exists over about 37 percent of the area of the Region (see Map 36, Volume One).

Environmental Corridors

Environmental corridors are defined as elongated areas in the landscape encompassing concentrations of the best remaining elements of the natural resource base—areas which should, therefore, be preserved in essentially natural open uses in order to maintain a sound ecological balance, to protect the overall quality of the environment, and to preserve the unique natural beauty and cultural heritage of the Region. The preservation of such corridors in open land uses also avoids potential problems associated with improper urban development. For example, the placement of urban development in areas covered by wet, organic soils can not only lead to wet basements and foundation failures, but to excessive and costly clear water infiltration into sanitary sewers serving such development. Such corridors encompass, by definition, three or more of the following elements: lakes and streams and associated undeveloped shorelands and floodlands; woodlands, wetlands, and wildlife habitat areas and areas covered by organic soils; areas of rugged terrain and high relief topography, significant geological formations, and physiographic features; areas of groundwater recharge and discharge; sites of

historic, scientific, and cultural value; potential park and open space sites; and significant scenic areas and vistas. Such corridors occupy approximately 20 percent of the total area of the Region (see Map 37, Volume One). These corridors generally lie along major stream valleys, around major lakes, and through the Kettle Moraine area of the Region.

Prime Agricultural Lands

Agriculture is still the singularly largest land use in the Region, occupying more than 1 million acres of land, or 60 percent of the total area of the Region. The agricultural land use base of the Region declined by about 44,000 acres from 1963 to 1970, or by about 4 percent, with the decline being due primarily to the conversion of agricultural land uses to urban land uses as a result of the highly diffused pattern of urban development taking place within the Region. Prime agricultural lands total about 491,500 acres, or about 39 percent of all agricultural lands in the Region (see Map 24, Volume One). Between 1963 and 1970 the prime agricultural acreage decreased by 8,400 acres, or by about 2 percent.

A major objective of the Commission's regional planning effort has been the preservation in agricultural use of the remaining prime agricultural areas of the Region. Such areas have been delineated on the basis of soils, size of the individual farm units and of the aggregate area being farmed, the capital invested in irrigation, drainage, and good soil and water conservation practices, and the demonstrated ability of the areas to consistently produce higher than average crop yields. The preservation of these prime agricultural lands is important for economic reasons, as well as to ensure the overall wholesomeness of the regional environment. The preservation of these areas has particularly important implications for water quality management planning. The application of good soil and water conservation practices and the abatement of nonpoint pollution from agricultural runoff is dependent in part on the stability of the agricultural communities involved.

Air Quality

Air quality is not only a particularly important determinant of the overall quality of the environment of an area, but has important direct and indirect effects on water quality. Air always contains foreign matter in the form of smoke, soot, dust, fly ash, fumes, mists, odors, pollens, and spores which through atmospheric fallout and washout may directly affect surface quality. Because of the direct and indirect linkages involved, air and water quality management programs were conducted in a coordinated and integrated manner for southeastern Wisconsin. The abatement of air pollution within the Region through planning and implementation programs underway, and especially with respect to particulate matter, should assist in improving surface water quality.

Climate

Climate, especially the extreme variations in the principal elements of the climate—temperature, precipitation, and snow cover—directly affects water quality management, as well as the growth and development of an area. The Region has a continental-type climate characterized primarily by a continuous progression of markedly different seasons and a wide range of annual temperature and by frequent distinct changes in weather conditions which, particularly in the winter and spring, normally occur once every two or three days. Air temperatures within the Region are subject to great seasonal change and yearly variation, as well as to diurnal variations, and influence many of the chemical processes which occur in the lakes and streams of the Region. The annual temperature range, which is based on monthly means for six geographically representative weather observation stations, extends from a monthly average daily minimum of about 21°F in January to a monthly average daily maximum of about 71°F in July. The growing season averages about 165 days, with the last frost of spring occurring in late April or early May and the first frost of fall occurring in mid-October.

Based on precipitation and snowfall data for eight geographically representative observation stations in and near the Region, the average annual total precipitation is 31.3 inches, expressed as water equivalent, with monthly averages ranging from a February low of 1.19 inches to a high of 3.77 inches in June. Snow cover is most likely in southeastern Wisconsin during the months of December, January, and February and averages about 44.5 inches annually.

Surface Water Resources and Water Quality

Surface water resources consisting of lakes, streams, and associated floodlands form the most important element of the natural resource base of the Region. The water resources perform multifaceted functions, including the support of numerous popular water-oriented recreational activities; the provision of habitat for fish and wildlife; the provision of desirable sites for vacation homes and permanent residential development; and the provision of water for domestic, municipal, and industrial use. The Region contains 1,118 linear miles of perennial streams and 100 major lakes—lakes having a surface area of 50 acres of more (see Map 17, Volume One). The 100 major lakes have a total surface area of about 57 square miles, or about 2 percent of the total area of the Region, and a total shoreline length of 448 miles. There are an additional 228 lakes and ponds in the Region with surface areas of less than 50 acres. The surface water resources in general and many of the streams in the Region in particular are vulnerable to pollution because the low flows are small relative to existing and probable future municipal sewage treatment plant discharges and other waste loadings.

The term "water quality" refers to the physical, chemical, and biological characteristics of surface water and groundwater. Water quality is determined both by the natural environment and by the activities of man. The development of an areawide water quality management plan requires the collection of definitive data on existing levels of water quality in the streams and lakes of the planning area, together with an evaluation of the ability of those levels to support existing and proposed water uses. Accordingly, water quality conditions and long-term trends in such conditions were analyzed by the Commission from data obtained by the Commission at 87 sampling stations located at strategic points on the stream networks of the major watersheds of the

Region in 1964 and over the decade from 1965 through 1975. Water quality sampling data were available for a total of 459 miles of perennial streams in the Region.

In the Des Plaines River watershed, surface water quality conditions were found to be essentially unchanged over the 1965 to 1975 decade. Stream water quality conditions did not meet the water quality standards set by the State for dissolved oxygen and fecal coliform organisms. In addition, total phosphorus concentrations were found to be higher than those recommended by the Commission.

In the Fox River watershed, surface water quality conditions were found to be somewhat improved between 1965 and 1975. As a whole, however, stream water quality conditions did not meet the state water use objectives for recreational use and the maintenance of a warmwater fishery and other aquatic life. Supporting standards for dissolved oxygen, ammonia-nitrogen, and fecal coliform, as well as the recommended level for total phosphorus, were generally not met.

In the Kinnickinnic River watershed, surface water quality was found to be essentially unchanged over the decade, although water quality did exhibit some degradation as measured by dissolved oxygen, chlorides, and fecal coliform. Water quality did meet the state-established standards for restricted and minimum use.

Water quality remained generally unchanged over the decade in the Menomonee River watershed and in the Honey Creek and Underwood Creek tributaries to that river. The main stem of the Menomonee River upstream from Honey Creek, which had an assigned use objective for recreation and warmwater fishery, did not meet the supporting water quality standards associated with those uses, nor the recommended level of total phosphorus. Honey Creek and Underwood Creek, which are assigned restricted use and minimum standards by the State, both exhibited excessive levels of fecal coliform counts, thus violating even this minimum standard.

The water quality of the Milwaukee River and its major tributaries fluctuated over the study period as measured by different indicators between slightly improved, unchanged, or slightly degraded. Overall, the trend since 1964 indicates a slightly degraded water quality condition. In general, the water quality in the Milwaukee River watershed in 1975 did not meet the state-established water use objectives and supporting water quality standards.

In the Oak Creek watershed, surface water conditions were found to have degraded slightly for all water quality parameters except fecal coliform levels, which were somewhat improved. The waters generally did not meet the state-established water use objectives and supporting water quality standards.

In the Pike River watershed, dissolved oxygen levels increased over the decade, indicating that the water quality of the Pike River had improved slightly. In general, however, the waters of the Pike River watershed did not meet the state-established water use objectives and supporting water quality standards in 1975.

Several major tributaries of the Rock River originate within the seven-county Region. Over the decade, the Bark and Ashippun Rivers showed no significant change in water quality conditions. The same was true of the Rubicon River except for the improved oxygen levels below the City of Hartford sewage treatment plant. On the Oconomowoc River no significant changes were noted over the decade except below the City of Oconomowoc sewage treatment plant, where increased plant loadings caused a decline in water quality conditions. Whitewater Creek showed a slight improvement in water quality, particularly in fecal coliform counts over the decade. The water quality of Jackson Creek and Turtle Creek showed some degradation over the decade. In general the water quality of the Rock River tributaries lying within the Region, with the exception of portions of Jackson Creek, did not meet the supporting water quality standards for recreational use and warmwater fishery and aquatic life in 1975.

In the Root River watershed, water quality conditions, as measured by fecal coliform, exhibited some improvement as the result of the abandonment of sewage treatment facilities. Water quality conditions as measured by chloride loadings and dissolved oxygen levels, however, exhibited some decline. In general in 1975, the water quality conditions of the streams in the Root River watershed did not meet the applicable water quality standards.

In the Sauk Creek watershed, a slight decline in dissolved oxygen and chloride levels over the decade was found, along with generally stable levels of fecal coliform and high total phosphorus concentrations. The water quality standards established by the State for this stream were not, however, met.

In the Sheboygan River watershed, water quality conditions in Belgium Creek remained essentially unchanged over the decade. These conditions did not meet the established water use objectives and supporting water quality standards.

In general for the Region, no major shift in water quality conditions over the 1964 through 1975 period was found. A subtle decline was noted despite observed improvements at sampling stations below points of improved or reduced effluent discharges from sewage treatment plants, thus indicating that attention to the abatement of pollution from point sources alone will not be enough to meet the water use objectives and supporting water quality standards. Of the total network of 459 miles of perennial streams for which sampling data were available, only 88 miles, or 19 percent, met the adopted state water quality standards in 1975, compared to 164 miles, or 36 percent, in 1964 (see Map 39, Volume One). If Commission-recommended phosphorus levels are also taken into account, there being no state phosphorus standard at the present time, only about 9 miles of streams in 1975 would meet the water quality standards and criteria.

Of the 100 major lakes in the Region, water quality sampling data were available for only 49. Review of these sampling data indicates that only one lake—Mud Lake in Ozaukee County—met the recommended water use objectives and supporting water quality standards in 1975, and then only because of the very limited use objectives and low standards for this lake, which lies within the Cedarburg Bog. Water quality in some of the other lakes did not meet recommended levels for dissolved oxygen or ammonia-nitrogen, indicating the deleterious effects of human activities on the lakes. Although natural eutrophication or aging of lakes is a contributing factor to water quality problems, the increased nutrient loadings placed on the lakes due to urbanization and increased recreational uses threatened to limit the recreational and aesthetic values of the lakes.

Based upon the water quality data collected from 1964 through 1975, it is apparent that degradation of the lakes and streams of the Region continues. The improved techniques of sewage treatment coupled with the recently established more stringent regulations governing the discharge of effluent into the surface waters have resulted in only localized improvements on certain stream reaches. The majority of streams in the Region do not meet the state-established water use objectives and supporting water quality standards, and have declined in quality because of nonpoint, as well as point, source pollution. This was demonstrated in part by the observed water quality standards violations associated with wet weather events and by the location of some violations on reaches not affected by point sources.

Sources of Water Pollutants

A complete analysis of water pollution problems must include the identification of not only the location of the pollution sources, but of the type, quantity, and characteristics of pollutants contributed and of the probable effects of those pollutants on the quality of the receiving waters. Consequently, an inventory was conducted in 1975 of the known sources of water pollution in the Region. The inventory addressed as urban pollution sources: municipal wastewater treatment plant outfalls; sanitary sewerage system flow relief devices; combined sewer outfalls; private wastewater treatment plant outfalls; other point sources, including industrial wastewater outfalls; privately owned, onsite sewage disposal systems; and storm water runoff from residential, commercial, industrial, extractive, transportation, recreation, and construction lands. The inventory addressed as rural pollution sources: domestic livestock operations; storm water and snowmelt runoff from croplands, pasture lands, and unused rural lands; storm water runoff from woodlands; and direct atmospheric fallout and washout to surface waters.

Five pollutants were selected for use in the analyses of the kind and amount of pollutants contributed to the surface waters of the Region by the above-listed 19 categories of pollution sources. These five pollutants have been historically identified and studied both as important pollutants in themselves and as principal indicators of the presence of other polluting substances. The five specific indicators utilized were: total nitrogen, total phosphorus, biochemical oxygen demand (BOD), sediment, and fecal coliform organisms.

As of 1975 there were 61 municipally owned sewage treatment plants in operation in the Region (see Map 8, Volume One). Eight of these plants discharged an estimated total of 254 million gallons per day of treated effluent directly to Lake Michigan. The remaining 53 plants discharged a total of about 39 million gallons per day of treated effluent to the streams and watercourses or to soil absorption systems of the inland portions of the Region. In addition, 67 private wastewater treatment facilities were in operation within the Region. Five of these plants together discharged an estimated 1.3 million gallons per day of treated effluent directly to Lake Michigan. The remaining 62 plants discharged a total of about 4.1 million gallons per day of treated effluent of the streams and watercourses or to soil absorption systems of the inland portions of the Region.

In 1975 there were 619 known sanitary and combined sewer flow relief devices in the Region, which together discharged an estimated average of 5.04 billion gallons of wastewater per year directly to the surface waters of the Region, including Lake Michigan. Of this total, about 95 sanitary and combined sewer flow relief devices discharged about 880 million gallons per year directly to Lake Michigan, with the remaining 524 devices discharging the remaining 4.16 billion gallons to the inland streams and watercourses.

Of the total 619 flow relief devices in operation within the Region, 126 were combined sewer overflow outfalls—112 in Milwaukee and Shorewood, 10 in Racine, and 4 in Kenosha—discharging an estimated 3.89 billion gallons of raw sewage per year in an average of about 52 events per year. Of the 493 sanitary sewer flow relief devices, 110 were bypasses, 40 were relief pumping stations, 72 were portable pumping stations, and 271 were sanitary to storm sewer crossovers. Of the 353 square miles of urban development within the Region served by sanitary sewers, about 27 square miles, or 8 percent, were served by combined storm and sanitary sewerage systems. An estimated total of about 365,200 persons, or about 20 percent of the total resident population of the Region, resided in this combined sewer service area.

In 1975 there were a total of 261 industrial establishments discharging cooling, process, rinse, and wash waters directly to the surface waters of the Region and to Lake Michigan through 435 outfalls. Of these, 248 outfalls, or about 57 percent, were identified as discharging only cooling water. Of the 435 outfalls, 67, or about 15 percent, discharged to Lake Michigan. The remaining 368 discharged to the inland streams and watercourses of the Region. In addition to the 435 outfalls, 16 industrial facilities discharged effluent through 17 discharge points to soil absorption systems.

Sanitary wastewater treatment and disposal was also provided through an estimated 68,600 privately owned onsite sewage disposal systems, including 351 known holding tanks and 44 known mound systems as of 1975, with the balance being conventional septic tank soil absorption systems. These systems provided sanitary

sewage disposal for a total estimated resident population of 246,000 persons, or about 14 percent of the total resident population of the Region, and for a total area of about 2,336 square miles, or about 87 percent of the total area of the Region.

Diffuse or nonpoint source pollution consists of discharges that cannot be readily traced to discrete sources. Such pollution is carried from urban and rural areas of the Region to the surface waters by means of storm water runoff and snowmelt. Urban land uses as of 1970 comprised about 387 square miles—15 percent—of the total area of the Region. Residential land uses comprised about 60 percent of this area in urban use. There were 55 known urban storm water drainage systems in the Region in 1975 (see Map 9, Volume One). The 48 urban storm water drainage systems for which the service areas could be delineated encompassed a total tributary drainage area of about 180 square miles, or about 7 percent of the total area of the Region and about 37 percent of the developed urban area of the Region. These 48 mapped systems discharged through a total of 1,358 known storm water outfalls. The combined annual average discharge from these outfalls was estimated to total about 22.9 billion gallons in an average of about 70 events per year.

The rural areas of the Region total about 2,200 square miles, or about 85 percent of the total area of the Region. Of the total rural land area, about 45 percent is devoted to clean-tilled row crops, about 14 percent to hay production, about 5 percent to small grain production, and about 36 percent to woodlands, wetlands, and other open space. In 1975 there were an estimated 2,350 domestic livestock raising operations located within the Region—operations with 25 or more equivalent animal units. Each equivalent unit represents the amount of waste contributed by a 1,000-pound dairy cow. Of the total operations, 1,050, or about 45 percent, were found to be located within 500 feet of a perennial or intermittent stream, lake, or other surface water body.

Based on an analysis of the type, magnitude, and location of the known pollution sources, estimates were made of the annual contribution of total nitrogen, total phosphorus, biochemical oxygen demand, fecal coliform organisms, and sediment to the surface waters of the Region. These estimates helped to define the nature and scope of the water pollution loadings in the Region and, when interpreted in light of the current water quality conditions and the assimilative capacity of the receiving waters, helped to identify required pollution control measures. Because the loading estimates were expressed in terms of total annual loadings into the stream channel system of the Region, the point sources tend to appear understated in terms of the importance of their impact on surface water quality. The nonpoint sources contribute pollutants to lakes and streams primarily during wet weather, when streamflows are high, while the point sources are active and affect the ambient concentrations in receiving waters during both high and low flow conditions.

Because of the geography of the Region, the estimates must be considered with regard to three principal areas: the Region as a whole, that portion of the Region that drains to the inland lakes and streams and thereby indirectly to Lake Michigan or to the Mississippi River, and that portion of the Region that drains directly to Lake Michigan. The direct Lake Michigan contributions, as noted above, include pollution from major point sources such as the large sewage treatment plants located on the Lake Michigan shoreline, which discharge their treated effluent directly to the lake and serve large tributary drainage areas—areas that may even cross major watershed divides, although they do not in any major way cross the subcontinental divide.

For the Region as a whole in an average year, about 46 million pounds of nitrogen, 6.7 million pounds of phosphorus, 113 million pounds of biochemical oxygen demand, 6.7 million tons of sediment, and 3.2×10^{17} fecal coliform organisms are estimated to be discharged to the inland lakes and streams and to Lake Michigan from all sources of pollution within the seven-county Region. Of these total estimated amounts, urban sources are estimated to contribute 43 percent of the nitrogen, 66 percent of the phosphorus, 50 percent of the biochemical oxygen demand, and 55 percent of the sediment loads as well as 50 percent of the fecal coliform loads. Rural sources are thus estimated to contribute 57 percent of the nitrogen, 34 percent of the phosphorus, 50 percent of the biochemical oxygen demand, 45 percent of the sediment, and half of the fecal coliform loads.

The most significant urban point sources of pollution in the Region include municipal sewage treatment plants with respect to nitrogen, phosphorus, and biochemical oxygen demand, and combined sewer overflows with respect to fecal coliform organisms. Contrary to popular belief, industrial discharges do not constitute a major source of urban point source pollution within the Southeastern Wisconsin Region as a whole. The largest urban nonpoint sources of pollution include transportation and construction, the latter particularly with respect to sediment and the attendant nutrients. Onsite sewage disposal systems also constitute an important source of urban pollution loads, particularly with respect to biochemical oxygen demand and fecal coliform organisms.

The largest rural sources of pollution are nonpoint sources and include livestock raising operations and runoff from cropland. Both are major sources of nutrients and biochemical oxygen demand. While livestock raising operations constitute the major source of fecal coliform and biochemical oxygen demand pollution and are the largest phosphorus source, cropland constitutes the major source of sediment and nitrogen pollution.

Urban point sources contribute a significant proportion of the nitrogen, phosphorus, and biochemical oxygen demand within the Region as a whole. Because large amounts of treated municipal sewage are discharged directly to Lake Michigan, urban point sources are relatively minor sources of pollutant discharges to the inland lakes and streams of the Region. For example, while urban point sources are estimated to contribute 32 percent of the nitrogen, 34 percent of the phosphorus,

and 25 percent of the biochemical oxygen demand within the Region as a whole, these same sources contribute only 7, 14, and 8 percent of the respective pollutant loads to the inland lakes and streams of the Region. Conversely, these urban point sources are major contributors of the annual pollutant loads to Lake Michigan from the Southeastern Wisconsin Region, with 95, 93, and 87 percent of the nitrogen, phosphorus, and organic loadings, respectively.

With respect to the annual pollutant loads to inland lakes and streams of the Region, nonpoint sources contribute the preponderance of the total annual channel loads, contributing 93 percent of the nitrogen, 86 percent of the phosphorus, 92 percent of the biochemical oxygen demand, 60 percent of the fecal coliform organisms, and almost all of the sediment. Rural nonpoint sources of pollution are particularly important with respect to the inland lakes and streams, contributing almost 78 percent of the nitrogen, 45 percent of the phosphorus, 63 percent of the biochemical oxygen demand, 53 percent of the fecal coliform organisms, and 47 percent of the sediment loadings to these lakes and streams, with cropland and pasture lands contributing the predominant loads of nitrogen and sediment, and livestock operations constituting the singularly most important source of phosphorus, biochemical oxygen demand, and fecal coliform organisms.

Based upon the Commission's inventories of total annual pollutant loads, the following conclusions may be drawn about the existing sources of water pollution in southeastern Wisconsin:

1. Of the total estimated annual pollutant loading to the surface waters of southeastern Wisconsin, about 28 percent of the nitrogen, 26 percent of the phosphorus, 22 percent of the biochemical oxygen demand, 7 percent of the fecal coliform organisms, and 5 percent of the sediment are contributed directly to Lake Michigan. The remaining 72 percent of the nitrogen, 74 percent of the phosphorus, 78 percent of the biochemical oxygen demand, 93 percent of the fecal coliform organisms, and 95 percent of the sediment are contributed to the inland lakes and streams. Of this total loading to inland lakes and streams, the waters of the Mississippi River drainage basin received an estimated 62 percent of the nitrogen, 61 percent of the phosphorus, 57 percent of the biochemical oxygen demand, 37 percent of the fecal coliform organisms, and 60 percent of the sediment. The remaining inland waters pollutant load—38 percent of the nitrogen, 39 percent of the phosphorus, 43 percent of the biochemical oxygen demand, 63 percent of the fecal coliform organisms, and 40 percent of the sediment—was contributed to the inland waters of the Great Lakes drainage basin. The majority of the pollutant loading to the inland waters is from nonpoint sources, while the majority of the pollutant loading directly to Lake Michigan is from point sources.

2. Based on the estimated annual pollutant loads, point sources of pollution do not comprise the dominant pollution source for the inland lakes and streams of the Region. Point source contributions can be expected in the future to be further reduced in their magnitude as a result of state and federal pollution abatement requirements; increased expenditures for sewage treatment; and improved wastewater treatment technologies. The inventory findings thus indicate the importance of the nonpoint sources of pollution in the Region and support the need to develop and implement nonpoint source abatement plans for both the rural and urban areas of the Region.

3. Of the point sources of pollution, the sanitary wastewaters discharged from municipal and private sewage treatment plants and from sanitary and combined sewage flow relief devices together constitute the most important sources of pollution in terms of the annual contributions of all pollutants considered. On a regional basis industrial wastewater discharges are only minor sources of water pollution, contributing from less than 0.1 percent to about 1.4 percent of the total for the five pollutants discussed. These sources can, however, constitute important sources of such "exotic" substances as poisonous metals and dangerous chemicals.

4. Storm water runoff from croplands, pasture, and unused rural lands is the largest single contributor of nitrogen and sediment to the inland lakes and streams of the Region, and is a significant source of phosphorus and biochemical oxygen demand. Livestock operations are the largest single source of annual phosphorus, biochemical oxygen demand, and fecal coliform loads.

5. Runoff to inland lakes and streams from urban and suburban construction activities is the second largest single contributor of phosphorus—the most recognized direct cause of eutrophic waters—and is the largest urban source of sediment on an annual load basis.

6. Livestock operations and septic systems are important nonpoint source contributors of fecal coliform, and together account for an estimated 58 percent of the fecal coliform organisms potentially reaching the surface waters. Improperly installed or malfunctioning septic systems are important urban sources of surface water pollution, especially those in the poorly suited soils that predominate the eastern half of the Southeastern Wisconsin Region. In addition, flow relief devices, which contribute 30 percent of the total fecal coliform load to inland lakes and streams, and municipal sewage treatment plants, which contribute 10 percent of the total fecal coliform load, account for nearly all of the remaining nonagriculture-related fecal coliform loads in the Region.

7. The estimated annual loads from the inventoried pollution sources indicate that urban sources of pollution are predominant in the Kinnickinnic River watershed, Menomonee River watershed, Barnes Creek subwatershed, Pike Creek subwatershed, and Oak Creek watershed; whereas rural sources are predominant in the Des Plaines River watershed, Fox River watershed, Milwaukee River watershed, Sucker Creek subwatershed, Rock River watershed, Sauk Creek watershed, and Sheboygan River watershed. The pollution sources in the Pike River and Root River watersheds are about equally divided between rural and urban sources.

Institutional and Legal Structure

A total of 154 general-purpose local units of government operate within the Southeastern Wisconsin Region. These include 7 counties, 28 cities, 54 villages, and 65 towns. In addition, certain special-purpose districts have important responsibilities for water resource management, including the Metropolitan Sewerage District of the County of Milwaukee, the Western Racine County Sewerage District, the Walworth County Metropolitan Sewerage District, 44 town sanitary and utility districts, 7 soil and water conservation districts, and 19 inland lake protection and rehabilitation districts. Superimposed upon this multiplicity of local, general-purpose, and special-purpose units of government are the state and federal governments, and certain other agencies that have important responsibilities for water resources management.

An inventory was conducted under the areawide water quality management planning program concerning the legal and institutional structure available to implement potential water quality management plan recommendations. With regard to the control of pollution from point sources, these analyses indicated that there exists adequate authority to implement various elements of any areawide water quality management plan. With respect to control of pollution from nonpoint sources, it was found that cities and villages have sufficient authority to carry out sound nonpoint source pollution abatement programs within incorporated areas. Detailed plans, however, are lacking to provide a basis for exercising that authority. Within unincorporated areas, it was found that existing agencies would have only limited implementation authority if a regulatory approach were to be followed. A strong regulatory program for broad nonpoint source pollution control in rural areas would likely require new statutory authority, while a voluntary approach is probably implementable under existing authorities.

Financial Resources

Inventories were conducted of current public expenditures for water pollution abatement purposes. These inventories were required in order to provide a basis for establishing the financial feasibility of an areawide water quality management plan. The total government expenditures for sanitary sewerage systems in the Region in 1975 were estimated at $63.8 million, or about $42 per capita based upon the total sewered population of the Region. About 30 percent of this total, or $19.0 million, was reported as being devoted to operation and maintenance expenditures, with new capital improvements reported to be about $34.3 million, or 54 percent, and debt retirement on existing capital structures reported as $10.5 million, or the remaining 16 percent. Total expenditures by local units of government in the Region for sanitary sewerage purposes are projected to average $86 million annually over the 25-year period 1976 through 2000, measured in constant 1976 dollars. This represents about $47 per capita based on an assumed year 1985 sewered population of 1.81 million.

OBJECTIVES, PRINCIPLES, AND STANDARDS

Planning is a rational process for formulating and meeting objectives. The objectives chosen guide the preparation of alternative plans and, when converted to standards, provide the criteria for evaluating the alternatives and selecting a recommended plan from among those alternatives. In the formulation of objectives, the areawide water quality management planning program for southeastern Wisconsin built upon the previous planning work accomplished by the Commission by incorporating, amending, and extending as necessary the development objectives, principles, and standards formulated under the regional land use planning program, the regional sanitary sewerage system planning program, and the watershed planning programs.

Seven specific regional land use development objectives previously formulated were reaffirmed under the water quality management planning program, as were three water control facility development objectives formulated under the comprehensive watershed planning programs. Four development objectives formulated under the regional sanitary sewerage system planning program were expanded and reaffirmed. One new objective was formulated under the regional water quality management planning program, that relating to the development of water quality management institutions. In addition, six specific regional wastewater sludge management objectives were formulated and documented separately in SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin. Accompanying each of the 21 development objectives is a planning principle and a set of planning standards that were used as a guide in the preparation and evaluation of alternative plans.

PLAN DESIGN PROCESS

One of the water quality management objectives relates directly to achieving the water quality goals advanced by the U. S. Congress in Public Law 92-500, and is implemented in Wisconsin by the State Natural Resources Board through rules set forth in Chapters 102 through 105 of the Wisconsin Administrative Code. In Public Law 92-500, the Congress set as a national goal wherever attainable water quality conditions that permit the protection and propagation of fish, shellfish, and wildlife, and that permit recreation in and on the water. This national goal of "fishable and swimmable" surface waters was proposed to be achieved by 1983. The Congress and the U. S. Environmental Protection Agency

recognize, however, that, as a practical matter, more limited use objectives may have to be established for some streams and lakes after consideration by the states of the social and economic costs of achieving the full objectives and the practical potential of streams and lakes for recreational use and for the propagation of fish and wildlife.

In conducting the areawide water quality management planning program for southeastern Wisconsin, an attempt was made to assign to all surface waters in the Region an appropriate combination of specific water use objectives and supporting standards that would meet the national goal of "fishable and swimmable" waters. At the present time, the adopted water use objectives assigned to many miles of surface streams in southeastern Wisconsin are not consistent with that national goal. A basic objective, then, of the areawide planning program was the preparation of a plan that would call for cost-effective actions to control pollution from both point and nonpoint sources so as to meet the national goal or, if that was determined to be impractical, to meet some lesser goal as defined by revised water use objectives. The process of preparing the plan was iterative in nature, involving a series of successive attempts to design a practical plan that would meet the national goal to the maximum extent practicable.

A determination was first made of the extent to which surface water quality in the Region in the base year 1975 met the national goal of "fishable and swimmable" waters. This involved the application of the water quality simulation model developed for the study under existing conditions, the model being carefully calibrated using the water quality and pollution sources inventory data developed in the study. This analysis was conducted for a 1,180-mile network of streams and for each of the 100 major lakes in the Region. Of the 1,180 stream miles analyzed, 221 miles, or 19 percent, met the national goal of "fishable and swimmable" waters in 1975, with the remaining 959 miles, or 81 percent, exhibiting violations of one or more supporting water quality standards. The analysis also indicated that 19 of the 100 major lakes in the Region met the national water quality goal in 1975 (see Map 100, Volume Two).

A determination was then made of the extent to which the national goal of "fishable and swimmable" waters could be expected to be met in the year 2000 given future land use development in substantial conformance with the regional land use plan and given no significant change in current practices to control water pollution. In effect, this analysis amounted to an examination of a "do nothing" alternative. The only exceptions to the "do nothing" posture consisted of major trunk sewer and sewage treatment plant projects now underway and which were considered to be fully committed as of 1978. Of the 1,180-stream mile network analyzed, about 241 miles, or 20 percent, could be expected to meet the national goal of "fishable and swimmable" waters by the year 2000 under these conditions, while 14 of the 100 major lakes in the Region would similarly meet the national goal (see Map 101, Volume Two). The anticipated very modest improvement in stream water quality conditions was attributable to the completion of the committed pollution abatement projects.

An analysis was then conducted of the extent to which the national goal of "fishable and swimmable" waters could be met in the Region by the year 2000 if a point source pollution abatement plan were implemented using conventional treatment technology. This alternative would consist, in essence, of full implementation of the adopted regional sanitary sewerage system plan. Under this analysis, only about 239 stream miles, or 20 percent of the 1,180-stream mile network analyzed, as well as 18 of the 100 major lakes, could be expected to meet the national goal (see Map 102, Volume Two). Basically, the national goal would not be met under such a plan because of estimated violations of fecal coliform standards throughout the Region due to pollution from nonpoint sources, violations of phosphorus standards due to combinations of nonpoint and point sources, and violations of dissolved oxygen standards due principally to excessive plant growths and to sediment oxygen demand. One of the major conclusions, therefore, of the areawide water quality management planning program is that the national goal of "fishable and swimmable" waters cannot be met through a conventional point source pollution abatement control effort alone.

An analysis was then made to determine the extent to which the national goal would be met by the year 2000 if only nonpoint pollution source controls were implemented and no additional effort were made to improve point source pollution other than that assumed in the "do nothing" alternative. Under this analysis, about 701 stream miles, or 59 percent of the 1,180-stream mile network analyzed, could be expected to meet the national goal, as could 91 of the 100 major lakes (see Map 103, Volume Two). Those stream reaches not meeting the national goal are either those flowing through heavily urbanized areas or those lying directly downstream of sewage treatment plant outfalls. In both cases water quality standards violations involved excessive levels of phosphorus. Another major conclusion of the study, therefore, was that the national goal of "fishable and swimmable" waters could not be met through an intensive nonpoint source pollution control effort alone. Rather, a combination of intensive point and intensive nonpoint source pollution control measures would have to be identified in order for the national goal of "fishable and swimmable" waters to be met.

The determination of that appropriate combination of both point and nonpoint source pollution control measures involved postulation and analysis of many alternative plans. Out of that process came a recommended combination of point and nonpoint source pollution control measures that, if fully implemented, would result in about 1,054 stream miles, or 89 percent of the 1,180-stream mile network studied, as well as 95 of the 100 major lakes meeting the national goal of "fishable and swimmable" waters by the year 2000 (see Map 104, Volume Two). The remaining 126 stream miles, or

11 percent, and the remaining five major lakes could not as a practical matter achieve the standards that relate to that national goal. The 126 stream miles are located in the Root, Menomonee, Milwaukee, and Kinnickinnic River watersheds where, in many cases, the stream channels have been extensively changed through concrete lining to effect storm water management. The five major lakes involved—Kee Nong Go Mong, Echo, Buena, Crooked, and Mud—could not meet the national goal because of the impracticality of reducing phosphorus levels to the required standard given the relatively small size of the lakes in relation to the relatively large tributary drainage areas involved.

Nature of Alternatives for Point Source Pollution Control

Prior to the initiation of the areawide water quality management planning effort, the Commission had completed and adopted a series of plans setting forth recommendations for the abatement of pollution from the major point sources of pollution in the Region. Many of the decisions made in previous planning efforts had become committed. These committed decisions were not reconsidered in the areawide water quality management planning program. The point source pollution abatement planning effort thus consisted largely of refining the previously adopted plans. In some cases, such refinements consisted of an examination of sewage treatment plant interconnection alternatives previously screened as not being cost-effective, reconsidering land application for sewage effluent, and adjusting the location and sizing of intercommunity trunk sewers. A major sewerage facilities planning program for the Milwaukee Metropolitan Sewerage District began as the areawide water quality management planning effort was drawing to a close. It is expected that this facilities planning effort will include a reevaluation of the cost-effectiveness of retaining certain existing satellite sewage treatment facilities in relation to the construction of the remaining segments of the long-planned Milwaukee metropolitan trunk sewer system. Consequently, upon completion, this facilities plan will be considered by the Commission in light of the adopted areawide water quality management plan itself for adoption as an amendment to that plan.

Nature of Alternatives for Nonpoint Source Pollution Control

For nonpoint sources of pollution, the development of alternatives centered on the required reductions in the contributions of pollutants from such sources. An analysis was made of each drainage basin to determine whether an overall reduction of about 25 percent in pollutant loadings from nonpoint sources, when coupled with appropriate point source pollution abatement measures, would be sufficient to meet the water quality standards. If the analysis indicated that such a reduction would not be sufficient, then a further analysis was made assuming a reduction of about 50 percent in nonpoint source pollutant loadings. This process was continued until an appropriate minimum level of nonpoint source pollutant reduction was identified. This resulted in recommendations for nonpoint source pollutant loading reductions of 25, 50, or 75 percent of uncontrolled loadings, depending upon the characteristics of the individual drainage basins. The analysis recognized that detailed plans would be necessary to identify the specific measures and practices that should be taken to achieve the required level of nonpoint source pollutant loading reduction.

Minimum urban nonpoint source pollution control measures designed to achieve up to an overall reduction of 25 percent in pollutant loadings would consist of the following:

- Improved timing and efficiency of street sweeping, leaf collection and disposal, and catch basin cleaning activities.
- The establishment of a litter and pet waste control program to prevent the accumulation of litter and pet wastes.
- The controlled use of fertilizers and pesticides.
- The establishment of a construction erosion control program.
- Improved septic tank system performance monitoring and management.
- Additional stream bank and critical area protection practices and measures in erosion-prone areas.
- Construction of materials storage runoff control facilities.
- The establishment of a public educational program to raise the level of awareness of the need for nonpoint source pollution control as an integral element of both public and private land management—or "housekeeping"—practices.

In rural areas, such minimum nonpoint source pollution control measures would consist of the following:

- Basic soil conservation practices, including chisel tillage, pasture management, crop residue management, and contour plowing.
- Livestock waste management.
- Additional stream bank and critical area protection practices and measures in erosion-prone areas.
- The controlled use of fertilizers and pesticides.
- The establishment of a public educational program to raise the level of awareness of the need for nonpoint source pollution control as an integral element of land management practices.

Additional nonpoint source pollution control measures that could be applied in urban areas to achieve up to 50 and 75 percent reductions in pollutant runoff would include:

- The provision of onsite storm water storage measures in residential areas.
- The provision of storm water detention and retention basins.
- The provision of parking lot storm water runoff storage and treatment facilities in commercial and industrial areas.
- Increased street sweeping, catch basin cleaning, and leaf collection.
- Improved street maintenance and refuse collection and disposal.

Additional nonpoint source pollution control measures that could be applied in rural areas to achieve up to 50 and 75 percent reductions in pollutant runoff would include:

- Additional soil conservation practices, including crop rotation, contour strip-cropping, grassed waterways, diversions, wind erosion controls, and terraces.
- Additional stream bank protection measures and vegetative buffer strips along streams.
- Base-of-slope detention storage facilities.

Thus, the alternatives for nonpoint source pollution abatement investigated under the areawide water quality management planning program were primarily related to the level of effort needed rather than to the kind and extent of the specific recommended practices and facilities. The selection of specific combinations of practices and facilities for nonpoint source pollution control can only be properly made on the basis of subsequent localized facilities and practices planning because of the need for highly specific knowledge of the physical, managerial, social, and fiscal considerations that affect the landowners concerned.

RECOMMENDED PLAN

The recommended regional water quality management plan for southeastern Wisconsin consists of five major elements: a land use plan element, a point source pollution abatement element, a nonpoint source pollution abatement element, a sludge management element, and a water quality monitoring element.

Land Use Plan Element

The most fundamental and basic element of the regional water quality management plan is the land use element. The type, intensity, and distribution of urban and rural land uses within the Region will determine to a large degree the character, magnitude, and distribution of point and nonpoint sources of pollution; the location and size of wastewater treatment facilities and attendant collection and conveyance facilities; the kind and level of wastewater treatment required, and the need for and practicality of various forms of wastewater sludge disposal; and ultimately the quality of the surface waters of the Region.

The land use element of the regional water quality management plan is the regional land use plan for the design year 2000 prepared by the Commission in a concurrent work effort and adopted by the Commission on December 19, 1977 (see Map 1, Volume Three). This plan element seeks to centralize land use development to the greatest degree practicable; to encourage new urban development to occur at densities consistent with the provision of public centralized sanitary sewer, water supply, and mass transit facilities and services; to encourage new urban development to occur only in areas covered by soils well suited to urban use and not subject to special hazards, such as flooding; and to encourage new urban development and redevelopment to occur in areas in which essential urban facilities and services are available—particularly the existing urban centers of the Region—or into which such facilities and services can be readily and economically extended.

The land use plan element envisions converting about 113 square miles of land from rural to urban use over the period 1970 through 2000, substantially less than the approximately 235 sqare miles that would have to be converted under a continuation of existing trends toward decentralization of urban development in the Region. More than 60 percent of all new urban residential land and about half of the incremental population within the Region would, under the plan, be located within 20 miles of the central business district of the City of Milwaukee. The plan envisions that new urban development will occur primarily in planned neighborhood units at medium-density population levels; that is, at about four dwelling units per net residential acre, or about 5,000 persons per gross square mile.

The regional land use plan seeks to discourage development of subdivisions served by septic tanks and private wells with lot sizes ranging from less than one up to about three acres per dwelling unit. Such growth represents neither sound rural nor sound urban development. The plan recommends that that portion of the housing market demanding rural living be satisfied through very low-density estate-type developments with lot sizes averaging at least five acres per dwelling unit. With proper attention to soil and other natural resource base limitations, such truly rural residential development can be sustained without public sanitary sewer, water supply, or urban storm drainage facilities; high-value woodland and wetland areas can be preserved; and wildlife can continue to sustain itself in the area.

Primary Environmental Corridors: The most important elements of the natural resource base of the Region, including the best remaining woodlands; wetlands; wildlife habitat areas; surface waters and associated undeveloped shorelands and floodlands; areas covered by organic soils; areas containing rough topography and

significant geological formations; the best remaining sites having scenic, historic, and scientific value; groundwater recharge and discharge areas; and the best remaining potential park and related open space sites all have been found to occur together in linear patterns in the natural landscape. These linear patterns have been termed primary environmental corridors. Like the Commission's original design year 1990 regional land use plan, the year 2000 regional land use plan proposes that these environmental corridors be protected and preserved in essentially natural, open space use. Such protection and preservation is considered essential to the protection and wise use of the natural resource base; to the preservation of the Region's cultural heritage and natural beauty; and to the enrichment of the physical, intellectual, and spiritual development of the resident population, as well as to the prevention of new and intensification of existing environmental problems such as flooding and, importantly, water pollution. The topography, soils, and flood hazard existing in these corridors, moreover, make them particularly poorly suited to intensive urban development of any kind, but well suited to recreational and conservancy uses.

Together, these primary environmental corridors encompass about 542 square miles, or about 20 percent of the total area of the Region. Of this total, about 437 square miles, or 16 percent of the area of the Region, is considered "net" corridor; that is, not in an urban land use or covered by surface waters. The regional park and open space plan adopted by the Commission in 1977 includes definitive recommendations for the protection and preservation of these lands, including identifying which areas of the corridors should be publicly acquired and which should be preserved through private ownership and appropriate land use regulation. About 72 square miles, or 16 percent of the net corridor area, are already publicly owned. The adopted regional park and open space plan calls for public acquisition of an additional 113 square miles of net corridor, or an additional 26 percent. The remaining 252 square miles of net corridor land are recommended to be protected through appropriate local use controls.

Prime Agricultural Lands: Like the Commission's original design year 1990 regional land use plan, the design year 2000 regional land use plan proposes to preserve to the greatest extent practicable those areas of the Region identified as prime agricultural lands. In 1970 these lands totaled about 746 square miles, or 28 percent of the area of the Region. The year 2000 plan proposes to convert to urban use only those prime agricultural lands that have already been committed to urban development due to the proximity to existing and expanding concentrations of urban uses and the prior commitment of heavy capital investments in utility extensions. Only about 8,000 acres, or about 2 percent, of the prime agricultural lands would be converted to urban use under the plan.

The preservation of prime agricultural lands has important implications for water quality management planning. Prime agricultural land preservation will assist in the implementation of sound soil and water conservation practices and nonpoint source water pollution abatement measures, such as conservation tillage, crop rotation, contour plowing, cover crops, terracing, diversion structures and dikes, water and grade control structures, and grassed waterways, and will facilitate implementation of appropriate wind erosion measures, stream bank erosion measures, and pesticide, fertilizer, and animal controls. Well-managed agricultural land contributes less pollutants to surface waters than urban land uses. However, landowners are willing to invest in such practices only on lands located in what are perceived to be "permanent" agricultural areas. Investments in such practices will not likely be made on lands proposed to be converted to other uses. Accordingly, implementation of the prime agricultural land component of the regional land use plan element will be important to the implementation of the nonpoint source pollution abatement plan element and to the achievement of the recommended water use objectives and supporting water quality standards.

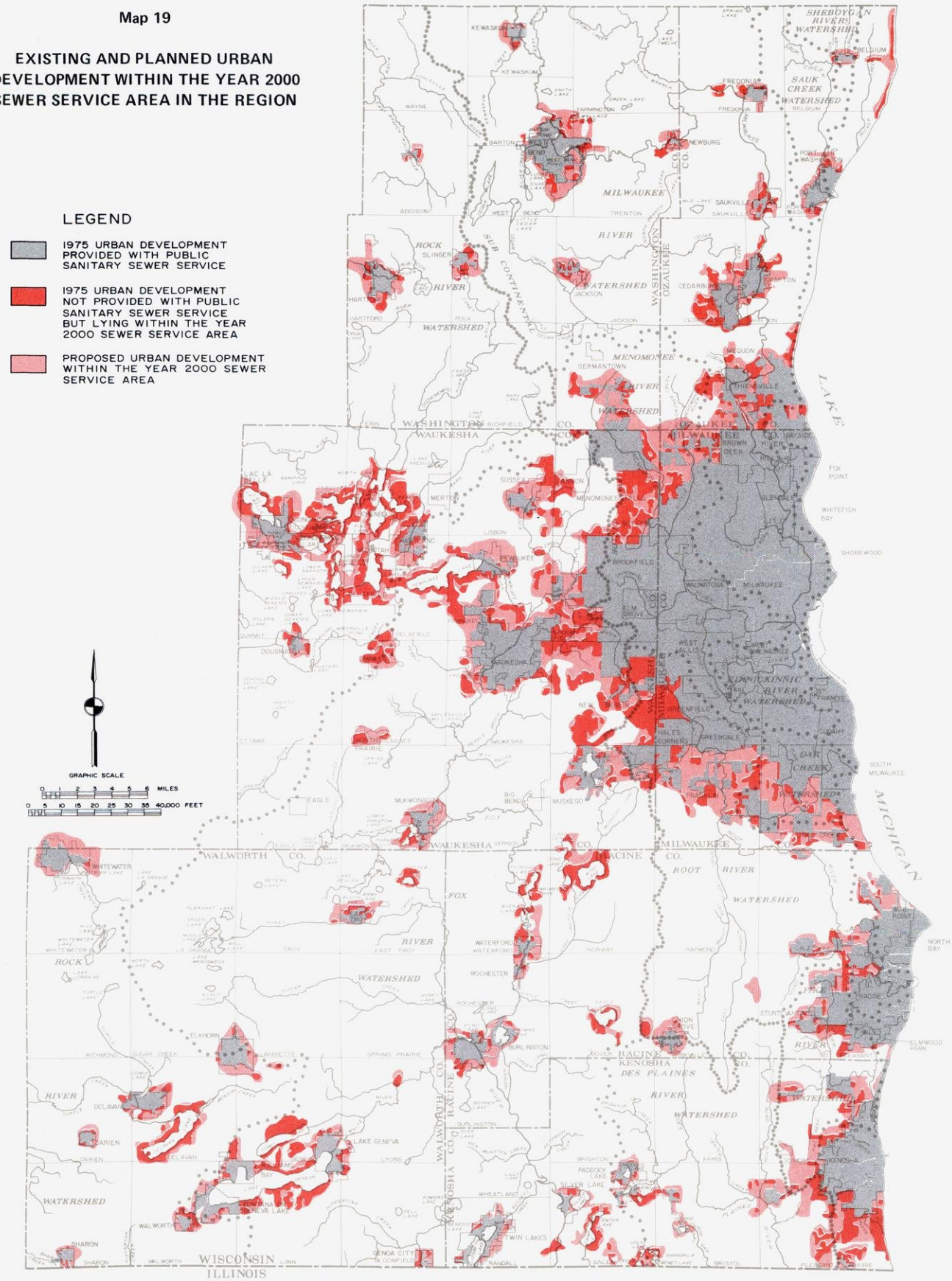
Point Source Pollution Abatement Element

The point source pollution abatement plan element includes recommendations concerning the location and extent of sanitary sewer service areas; the location, type, and capacity of sewage treatment facilities and the level of treatment required to meet the recommended water use objectives; the location, configuration, and size of trunk sewers; the abatement of pollution from separate and combined sewer overflows; and the abatement of pollution from miscellaneous point source discharges. The point source pollution abatement element represents the second generation system level plan for point source water pollution abatement in the Region, the first generation plan consisting of the regional sanitary sewerage system plan adopted by the Commission in 1974. This second generation system plan has been designed to take into account all of the decisions made in the first generation system plan, as well as in the local facilities planning that has taken place since completion of the first system plan.

Sewer Service Areas: Recommended sanitary sewer service areas were developed based upon the urban land use pattern envisioned in the adopted regional land use plan. In 1975 centralized sanitary sewer service in the Region was provided to a total area of about 353 square miles, or 13 percent of the area of the Region. The extension of sewer service to all of the areas designated for such service in the plan would result in service being provided to a total area of about 640 square miles, or about 24 percent of the area of the Region (see Map 4, Volume Three). Of the 287 square miles of incremental sewer service area proposed in the plan, about 124 square miles, or 44 percent, consist of land already developed for urban purposes, with the remaining 163 square miles, or 56 percent, consisting of proposed new urban development. These 163 square miles are located, as shown on Map 19, Volume Three, predominantly within undeveloped pockets of the existing urban areas; or within new areas contiguous to and immediately outward from existing sewered urban development. The

Map 19

EXISTING AND PLANNED URBAN DEVELOPMENT WITHIN THE YEAR 2000 SEWER SERVICE AREA IN THE REGION



Under the areawide water quality management plan, 163 miles of incremental sewer service area, or 56 percent of the 287 square miles proposed for sewer service, would consist of new urban development. These 163 square miles are located predominantly within undeveloped pockets of the existing urban areas, or within new areas contiguous to and immediately outward from existing sewered urban development. The largest expanses of new "outward" urban development are located north, south, and west of Racine; north, south, and west of Kenosha; around Waukesha and West Bend; in Oak Creek; in Franklin; in the northeast corner of Muskego; in the northwest side of the City of Milwaukee; in the south-central portion of Germantown; and in the southern portion of Mequon.

Source: SEWRPC.

largest expanses of new "outward" urban development are located north, south, and west of Racine; north, south, and west of Kenosha; around Waukesha and West Bend; in Oak Creek; in Franklin; in the northeast corner of Muskego; in the northwest side of the City of Milwaukee; in the south-central portion of Germantown; and in the southern edge of Mequon.

Public Sewage Treatment Facilities: In 1975 there were a total of 61 public sewage treatment facilities within the Region, having a combined capacity of about 293 million gallons per day (mgd). A total of 48 public sewage treatment facilities are recommended to serve the Region in the year 2000, having a combined capacity of 470 mgd (see Map 5, Volume Three). Of these 48 facilities, 21, having a combined capacity of 17 mgd, are recommended to discharge sewage effluent to land through irrigation, with the remaining 27 plants, having a combined capacity of 453 mgd, recommended to discharge sewage effluent to surface waters. About 7,000 acres of land, or less than 1 percent of the total agricultural land in the Region, would be required for the application of wastewater from the 21 facilities recommended to discharge effluent to land. All 27 public sewage treatment plants recommended to discharge sewage effluent either to streams or to Lake Michigan would be required to provide an advanced level of waste treatment, with 9 of the facilities required to remove phosphorus so as to achieve an effluent phosphorus level of 1.0 milligram per liter (mg/l), and the remaining 18 facilities, having a combined capacity of 70 mgd, required to achieve an effluent phosphorus level of 0.1 mg/l.

Implementation of the plan would permit the abandonment of the following 21 existing public sewage treatment facilities and the connection of the tributary service areas to larger areawide systems: Caddy Vista, Elkhorn, Fontana, Germantown, Hales Corners, Hartland, Menomonee Falls—Lilly Road, Menomonee Falls—Pilgrim Road, Muskego—Big Muskego Lake, Muskego—Northeast District, New Berlin—Regal Manors, North Park, Paddock Lake, Pewaukee, Pleasant Park, Rawson Homes, [2] Somers, Sturtevant, Sussex, Thiensville, and Williams Bay. A total of 8 new public sewage treatment plants would be provided: Delafield-Hartland, Eagle Lake, Lyons, North Prairie, Salem, Wales, Wind Lake,[3] and Yorkville. All of the other public sewage treatment plants in the Region would be renovated, expanded, and/or replaced.

Private Sewage Treatment Plants: In 1975 there were a total of 67 private sewage treatment facilities in the Region generally serving isolated enclaves of urban land uses, including public and private recreational facilities, institutional facilities, commercial service facilities, isolated residential areas such as mobile home parks, and industries. These 67 facilities had a combined capacity of about 8.1 mgd. Since 1975 one additional private sewage treatment facility, having a capacity of 0.1 mgd, has been constructed to serve the Alpine Valley Music Center in Walworth County, and the Wisconsin Department of Natural Resources has proposed the construction of a new private sewage treatment facility, having a capacity of 0.01 mgd, to serve the Bong Recreation Area in Kenosha County. Together, the 67 then existing private sewage treatment facilities had a combined discharge of 5.4 mgd in 1975.

Under the recommended plan, 35 of the 68 now existing private sewage treatment facilities, having a combined capacity of 1.8 mgd, would be abandoned and the land uses they serve connected to public sanitary sewerage systems (see Map 5, Volume Three). Abandonment of these 35 existing facilities would eliminate effluent discharge from such facilities to the streams and groundwaters of the Region and would ensure that the wastes from such facilities would be adequately treated through the public sanitary sewerage systems.

The remaining 33 existing private sewage treatment facilities, and the one new facility proposed to serve the Bong Recreation Area, are recommended to remain in operation, with their treatment levels improved as necessary to meet the recommended water use objectives and supporting water quality standards. Definitive recommendations concerning the type and level of treatment to be provided at these 34 facilities, having a combined capacity of 6.4 mgd, are to be formulated on a case-by-case basis during plan implementation. The regional plan recommends, however, that careful consideration be given in most instances to the disposal of treated effluent through land irrigation or soil absorption sewage lagoons, thus avoiding discharge of sewage effluent to surface waters.

Intercommunity Trunk Sewers: In order to extend centralized sanitary sewer service throughout the proposed sewer service areas and to enable the abandonment of certain public sewage treatment plants, the plan recommends the construction of 69 intercommunity trunk sewers and force mains, ranging in size from 6 to 96 inches in diameter and totaling 220 miles in length (see Map 5, Volume Three). A number of these sewers and force mains are located in the Milwaukee metropolitan subregional area. It is recognized in the plan that a major sewerage facilities planning effort now underway by the Milwaukee Metropolitan Sewerage District will reopen system level decisions that have been made in past years, including decisions concerning trunk sewer construction and retention of existing satellite sewage plants. Accordingly, the trunk sewer and treatment plant recommendations set forth in the plan are intended to serve as guidelines for decisionmaking until such time as the sewerage facilities plan for the District is completed and adopted by all parties concerned as an amendment to the areawide water quality management plan.

[2] *This facility was abandoned as of 1977.*

[3] *This facility was placed into operation in 1978.*

Combined Sewer Overflow Abatement: Combined sewer overflows constitute a water pollution and environmental health problem in the older central portions of the Kenosha, Milwaukee, and Racine urbanized areas. Detailed combined sewer overflow studies are now nearing completion in each of these three areas. Two basic alternatives remain under consideration in the Milwaukee area; namely, full separation of the combined sewer areas through the construction of a new system of sanitary sewers, or the construction of a deep tunnel system to collect and store combined sewer overflows, with subsequent treatment and disposal. In the Kenosha and Racine areas, the preliminary recommendations are to complete a program of partial separation for the combined sewer areas. Such a program would consist of the construction of a new system of storm sewers to convey storm water flow from street inlets and catch basins, while using the existing combined sewers as partially separated sanitary sewers. It is intended that upon completion the final recommendations of these three combined sewer overflow studies be considered by the Commission for incorporation into the areawide water quality management plan as amendments to that plan upon formal adoption by the Commission.

Miscellaneous Point Source Discharges: In 1975 there were 435 known point sources of wastewater discharge to surface waters other than public and private sewage treatment plants and combined and separate sanitary sewerage system flow relief devices. In addition, there were 17 such discharges to land. These sources consist primarily of industrial cooling, process, rinse, and wash waters that are discharged directly, sometimes following treatment, to the streams and watercourses of the Region or to storm sewers tributary to such streams and watercourses. The plan recommends that the concentration of pollutants in the surface water discharges from these sources be reduced to levels that are, at a minimum, consistent with the effluent characteristics recommended for public and private sewage treatment facilities discharging to the same or similar surface watercourses. Furthermore, the plan recommends that these point sources reduce the discharge of other pollutants, such as sediment, grease, heavy metals, organics, and heat, to levels attainable by application of the "Best Available Technology" and "Best Conventional Control Technology" as identified on a case-by-case basis under the Wisconsin Pollutant Discharge Elimination System permit process.

Auxiliary Point Source-Related Recommendations: The point source pollution abatement plan element contains a series of auxiliary recommendations designed to improve the operation and maintenance of the sanitary sewerage systems and to achieve the recommended water use objectives. These auxiliary recommendations include the conducting, as necessary, of clear water infiltration and inflow studies; the undertaking of public education efforts to encourage voluntary reduction of both domestic and industrial water use; the undertaking of steps to ensure that all sewage flows are metered at appropriate points in the system; the undertaking of steps designed to eliminate the 493 known points of sewage flow relief in the sanitary sewerage system; and the undertaking of steps to ensure the proper operation and maintenance of sewage treatment plants.

Nonpoint Source Pollution Abatement Element

The nonpoint source pollution abatement plan element includes recommendations relating to nonpoint sources of water pollution. These sources include urban sources, such as runoff from residential, commercial, industrial, transportation, and recreational land uses; construction activities; and onsite septic tank sewage disposal systems; and rural sources, such as runoff from cropland, pasture, and woodland; atmospheric contributions; and livestock wastes. These nonpoint sources of pollutants discharge to surface waters by direct land drainage, by drainage through natural channels, by drainage through engineered storm water drainage systems, and by deep percolation into the ground and return flow to the surface waters. Analyses conducted under the program indicated that a reduction in the transport of pollutants from nonpoint sources will be essential, in combination with the point source pollutant abatement measures, to the achievement of the recommended water use objectives and supporting water quality standards.

For planning purposes, measures for nonpoint source water pollution control were grouped into two categories: minimum, consisting generally of less costly practices, and additional, consisting generally of more costly practices. Application of the minimum practices can generally be expected to achieve up to a 25 percent reduction of pollutant runoff. The category of additional nonpoint source control measures was subdivided into three subcategories based upon the estimated cost and effectiveness of the measures. When applied in combination with the minimum category, the first subcategory of additional practices can be expected to generally result in up to a 50 percent reduction in pollutant runoff. The second subcategory of additional practices can be expected to generally result in up to a 75 percent reduction in pollutant runoff. The third subcategory can be expected to achieve a reduction in pollutants in the runoff of more than 75 percent.

Minimum urban and minimum rural nonpoint source control practices are recommended in the plan to be implemented throughout the entire urban and rural area of the Region except in the combined sewer area in Milwaukee. Such minimum practices include, with respect to urban land uses, a septic tank system management program; a construction erosion control program; and improved timing and efficiency of street sweeping, leaf collection, and catch basin cleaning. In rural areas, such practices include a livestock waste control program; better management of fertilizer and pesticide application; contour plowing; and conservation tillage.

Additional urban nonpoint source controls designed to provide about a 50 percent reduction in pollutant runoff are recommended to be applied to a total of 109 square miles of urban area (see Map 8, Volume Three). These areas lie largely in the Oak Creek and Root River watersheds, in the Barnes Creek subwatershed portion of the drainage area directly tributary to Lake Michigan, and in the direct drainage area tributary to Pewaukee Lake, Big and Little Muskego Lakes, Lake Denoon, Waubeesee Lake, Wind Lake, and Hooker Lake. Rural nonpoint

source pollution abatement measures designed to achieve an approximate 50 percent reduction in pollutant runoff are recommended in the plan to be applied to about 118 square miles of rural land. These lands lie largely in the Oak Creek watershed, in Root River Canal drainage area, and in the direct drainage areas tributary to George Lake, Benedict/Tombeau Lake, Waubeesee Lake, Long Lake, Dyer Lake, Pell Lake, North Lake (Walworth County), Lulu Lake, and the Saylesville Millpond. In addition, rural nonpoint source pollution abatement measures designed to achieve an approximate 75 percent reduction in pollutant runoff are recommended to be applied to about 58 square miles of rural lands in the direct drainage areas tributary to Lake Twelve, Bark Lake, Pewaukee Lake, Big and Little Muskego Lakes, Eagle Spring Lake, Lake Denoon, Center Lake, Wind Lake, and Hooker Lake.

The plan recommends that the practices indicated as needed for nonpoint source pollution control be refined by local level nonpoint source control practices planning. This recommendation is made because the design of nonpoint source pollution abatement practices should be a highly localized, detailed, and individualized effort requiring, as it does, highly specific knowledge of the physical, managerial, social, and fiscal considerations which affect the landowners concerned.

Sludge Management Plan Element

In 1975 there were 225 sources generating about 390 dry tons of sludge per day within the Region. These sources include public and private sewage treatment plants, industrial wastewater treatment facilities, and water supply treatment plants. The 61 public sewage treatment plants in the Region generated about 90 percent of the total sludge. A total of 46 of the 61 public sewage treatment plants rely exclusively on land application or fertilizer production for sludge disposal.

Analyses conducted under the program indicated that there was about three times the amount of agricultural land in the Region needed to accommodate land disposal of the sewage sludges expected to be generated in the Region by the year 2000. The analyses further indicated that there were no substantial economies to be gained in considering any significant degree of centralization of sludge management for public sewage treatment facilities. Accordingly, the plan recommends the provision of individual sludge management facilities at each public sewage treatment plant.

Specific sludge management processes are recommended in the plan for each individual major public sewage treatment facility (see Map 13, Volume Three). The two large Milwaukee Metropolitan Sewerage District treatment plants will continue to generate the majority of sludge in the Region. At the Jones Island plant, the plan recommends that about one-half of the design sludge loading continue to be dewatered and used in the production of Milorganite fertilizer and that the remaining one-half of the sludge be digested, dewatered, and applied on agricultural land in a partially dried form. At the South Shore plant, the plan recommends that about 20 percent of the design sludge loading be dewatered and used in the production of compost, with the remaining 80 percent being digested, dewatered, and disposed of by landfill.

With respect to the other major plants in the Region, the plan recommends that a combination of incineration and land application of partially dried sludge be used at the Brookfield plant; that land application of partially dried sludge be used at the Kenosha, South Milwaukee, Cedarburg, Grafton, Racine, Union Grove, Lake Geneva, Whitewater, Hartford, Oconomowoc, and Waukesha treatment plants; that land application of sludge in a liquid form be used at the Port Washington and Walworth County Metropolitan Sewerage District sewage treatment plants; that land application of sludge in both liquid and partially dried form be used at the Twin Lakes, Burlington, Western Racine County Sewerage District, Delafield-Hartland, and Walworth treatment plants; and that a combination of land application of sludge in a partially dried form and landfill be followed at the West Bend treatment plant.

At the remaining smaller public sewage treatment plants and at the private sewage treatment plants, the plan generally recommends the land spreading of sludge, unless more detailed studies show that other options are less costly and more beneficial.

In addition to the foregoing recommendations, the plan recommends that each sewage treatment plant operator secure a landfill capability for sludge disposal in order to avoid sludge disposal problems that may arise as a result of severe weather conditions or new regulatory requirements that may curtail or prohibit land spreading of sludge. The plan also recommends that sewage treatment plant operators work with local industries to develop a contaminant control program, which would be necessary to control the concentrations of heavy metals and toxic substances in the wastewater and in the sludges. In addition, the plan recommends that a complete record be kept of where, when, and in what amounts sludge of a known composition has been applied to a given parcel of land. Finally, the plan recommeds that the public sewage treatment operations in the Region develop a receiving capability for septage and holding tank wastes (see Map 13, Volume Three).

Water Quality Monitoring Element

The plan recommends that steps be taken to ensure the establishment of a sound program for continuing water quality monitoring within the Region to determine the extent to which the recommended water use objectives and supporting water quality standards are being met over time. In particular, the plan recommends that the Southeastern Wisconsin Regional Planning Commission and the Wisconsin Department of Natural Resources cooperatively prepare a prospectus for a comprehensive water quality monitoring program. Such a program should serve both the needs of the Commission as an areawide water quality management planning agency and of the Department as a regulatory agency. In addition, this plan element recommends that special demonstration water quality sampling of nonpoint source pollution

abatement practices be conducted to demonstrate the effects of special water pollution abatement practices that may be undertaken. Such "before and after" sampling efforts would greatly contribute to the state-of-the-art of water quality planning and management.

PLAN COSTS AND REVENUES

The full capital investment cost of implementing the recommended regional water quality management plan is estimated at $1.26 billion in constant 1976 dollars over the 25-year plan implementation period. Of this total cost, nearly $855 million, or 68 percent, is required to implement the recommended point source plan element; about $209 million, or 16 percent, is required to implement the nonpoint source plan element; and about $199 million, or 16 percent, is required to implement the sludge management plan element. Of the total capital cost of about $1.26 billion, about $1.09 billion, or 87 percent, would be required for projects in the public sector, with the remaining $170 million, or 13 percent, required for projects in the private sector.

Public sector capital costs for implementing the point source pollution abatement element are estimated at about $841 million (see Figure 1). Of this total, about $246 million, or 29 percent, would be required for sewage treatment plant construction; about $193 million, or 23 percent, for intercommunity trunk sewer construction; and about $402 million, or 48 percent, for combined sewer overflow abatement. Total public sector capital costs for nonpoint source pollution abatement are estimated at $56 million. Of this total, about $39 million, or 70 percent, would be required for construction erosion control; about $3 million, or 5 percent, would be required for the institution of urban land practices; about $11 million, or 20 percent, would represent one-half of the total cost of installing livestock waste control facilities on private lands; and about $3 million, or 5 percent, would represent one-half of the total cost of installing rural land management practices on private lands.

The total public capital costs for sludge management are estimated at $194 million. Of this total, about $183 million, or 94 percent, would be required to accommodate sludge disposal for sludges generated at public sewage treatment plants, with the remaining $11 million, or 6 percent, required to dispose of sludges from combined sewer overflow abatement programs.

The average annual cost in the public sector of implementing the plan, including capital and operation and maintenance costs, is estimated at $89.6 million. Of this total, about $43.7 million, or 49 percent, represents the average annual capital investment required, with the remaining $45.9 million, or 51 percent, representing the average annual operation and maintenance costs. This $89.6 million may be compared with an actual annual expenditure of $63.7 million for municipal point source control in 1975. On a per capita basis, the total public cost of carrying out the recommended plan is estimated at $46 per capita, the per capita cost being based on an estimated 1985 regional population of 1.95 million people. This may be compared with an actual per capita expenditure of about $42 for water pollution abatement within the Region in 1975. Consequently, it may be concluded that full implementation of the plan will require a relatively modest increase in public outlays, an increase, however, that will be necessary if the national goal of "fishable and swimmable" waters is to be met within the Region to the maximum extent practicable.

The estimated per capita costs of implementing the point source and sludge elements of the plan in each sewerage system area of the Region are shown in Table 76. Table 66 in Chapter III of this volume identifies the estimated unit costs for the various recommended nonpoint source pollution abatement measures. For urban residents in the Region, it is estimated that plan implementation costs will approximate $6 per capita for nonpoint source pollution abatement. About half of this cost would be expended in the public sector, while half would be in the private sector. In the rural area of the Region, the average annual cost of implementing the nonpoint source pollution abatement measures is estimated at $770 per farm, there being about 6,100 farms in the Region. This total may be expected to be shared in part by the public and private sectors in varying proportions depending upon the findings and recommendations of detailed rural nonpoint source abatement plans.

PLAN IMPLEMENTATION

While the recommended plan described above is designed to achieve the water use objectives and the supporting water quality standards, the plan is not complete in a practical sense until the steps required to implement the plan—that is, to convert the plan into action policies and programs—are specified. In addition, federal law requires that specific designations be made of the water quality management agencies required to implement the plan and that the plan implementation responsibilities of such agencies be identified. Accordingly, the report includes recommendations for management agency designations and sets forth the various actions that must be taken by these agencies in order for the recommended plan to be fully carried out by the plan design year 2000. The plan also includes a series of proposed implementation schedules, with particular regard to the point source pollution abatement and sludge management elements of the recommended plan. These schedules include proposed dates for sewage treatment plant construction, trunk sewer extension, and the abatement of combined sewer overflows.

In total, it is proposed that 251 management agencies be designated for plan implementation purposes. All but 33 of these agencies currently exist. The 33 new agencies would be sanitary, utility, and/or lake protection and rehabilitation districts required to carry out a variety of plan implementation responsibilities in direct drainage areas to lakes, or, in a few instances, to isolated enclaves of urban development within unincorporated areas.

Table 76

COMPARISON OF EXISTING AND PLANNED PER CAPITA EXPENDITURES FOR PUBLIC SANITARY SEWERAGE SYSTEMS IN SOUTHEASTERN WISCONSIN

Sewerage System	Sewer Service Areas	Reported per Capita Expenditures[a] (dollars)			Recommended Plan per Capita Expenditures: 1975-2000[a] (dollars)		
		1970	1975	Average 1970 and 1975	Point Source Element	Sludge Management Element	Total 1975-2000
Milwaukee Metropolitan Subregional Area Milwaukee Metropolitan Sewerage District	Milwaukee Metropolitan Sewerage District Brookfield East, Germantown, Thiensville, Mequon, Butler, Menomonee Falls, Elm Grove, Muskego, Caddy Vista, New Berlin	45	40	43	38[b]	7[b]	45[b]
City of South Milwaukee	South Milwaukee	19	16	18	16[b]	2[b]	18[b]
Upper Milwaukee River Subregional Area							
City of Cedarburg	Cedarburg	12	32	22	33	7	40
City of West Bend	West Bend	27	22	25	37	11	48
Village of Fredonia	Fredonia, Waubeka	N/A	18	18	84	22	106
Village of Grafton	Grafton	30	25	28	32	4	36
Village of Jackson	Jackson	N/A	19	19	99	26	125
Village of Kewaskum	Kewaskum	24	54	39	81	8	89
Village of Newburg	Newburg	68	40	54	130	15	145
Village of Saukville	Saukville	35	35	35	55	10	65
Sauk Creek Subregional Area							
City of Port Washington	Port Washington	30	28	29	38	3	41
Village of Belgium	Belgium-Lake Church	23	10	17	119	13	132
Kenosha-Racine Subregional Area							
City of Kenosha	Kenosha, Somers, Pleasant Park	19	22	21	30[b]	19[b]	49[b]
City of Racine	Racine	53	96	75	22[b]	3[b]	25[b]
Root River Canal Subregional Area							
Village of Union Grove	Union Grove Center for the Developmentally Disabled	49	22	36	64	22	86
Town of Yorkville Sanitary District No. 1	Yorkville	0	0	0	441[c]	86[c]	527[c]
Des Plaines River Subregional Area							
Town of Bristol Utility District No. 1	Bristol-George Lake	190	28	109	89	12	101
Town of Pleasant Prairie Sewer Utility District D	Pleasant Prairie-North Bristol IH 94	82	54	68	130	14	144
Town of Pleasant Prairie Sanitary District No. 73-1	Pleasant Prairie-South	0	903	451	180	24	184
Town of Salem Sewer Utility District No. 1	Paddock Lake, Hooker-Montgomery Lakes	N/A	60	60	53	6	59
Upper Fox Subregional Area							
City of Brookfield	Brookfield West, Sussex-Lannon, Pewaukee	42	59	51	40	7	47
City of Waukesha	Waukesha	40	17	29	33	6	39

Table 76 (continued)

Sewerage System	Sewer Service Areas	Reported per Capita Expenditures[a] (dollars)			Recommended Plan per Capita Expenditures: 1975-2000[a] (dollars)		
		1970	1975	Average 1970 and 1975	Point Source Element	Sludge Management Element	Total 1975-2000
Lower Fox River Subregional Area							
Western Racine County Sewerage District	Waterford-Rochester, Tichigan Lake	72	35	54	63	3	66
City of Burlington	Burlington	46	N/A	46	40	10	50
City of Lake Geneva	Lake Geneva-Lake Como	35	69	52	77	10	87
Village of East Troy	East Troy-Potter Lake	30	29	30	72	8	80
Village of Genoa City	Genoa City	55	23	39	88	10	98
Village of Mukwonago	Mukwonago	6	12	9	62	17	79
Village of North Prairie	North Prairie	0	0	0	137	17	154
Village of Silver Lake	Silver Lake	96	81	89	88	10	98
Village of Twin Lakes	Twin Lakes	37	96	67	51	7	58
Town of Dover—Eagle Lake Sewer Utility District No. 1	Eagle Lake	0	0	0	126	50	176
Town of Lyons Sanitary District No. 1	Lyons	0	0	0	83	19	102
Town of Norway Sanitary District No. 1	Wind Lake	0	0	0	87	27	114
Town of Salem Sanitary District No. 2	Camp-Center Lakes, Wilmot, Cross Lake, Rock Lake	0	0	0	85	22	107
Upper Rock River Subregional Area							
Allenton Sanitary District No. 1	Allenton	40	N/A	40	126	13	139
City of Hartford	Hartford	24	42	33	51	14	65
Village of Slinger	Slinger	N/A	31	31	107	25	132
Middle Rock River Subregional Area							
Delafield-Hartland Water Pollution Control Commission	Hartland, Delafield-Nashotah, Nashotah-Nemahbin Lakes	N/A	14	14	76	12	88
City of Oconomowoc	Oconomowoc Lake, Oconomowoc-Lac La Belle, Okauchee Lake, North Lake, Pine Lake, Beaver Lake, Silver Lake	19	16	18	52	9	61
Village of Dousman	Dousman	82	31	57	103	31	134
Village of Wales	Wales	0	0	0	83	9	92
Lower Rock River Subregional Area							
Walworth County Metropolitan Sewerage District	Delavan, Delavan Lake, Elkhorn, Walworth County Institutions	91	46	69	55	29	84
City of Whitewater	Whitewater	16	35	26	52	18	70
Village of Darien	Darien	N/A	N/A	N/A	115	13	128
Village of Sharon	Sharon	32	27	30	81	9	90
Village of Walworth	Fontana, Walworth, Williams Bay	35	N/A	35	64	13	77

NOTE: N/A indicates data not available.

[a] *All costs are reported in terms of August 1976 dollars. Recommended plan costs do not assume the receipt of state and federal grants-in-aid. Costs include all sanitary sewer expenditures, including those relating to industrial and commercial users divided by the estimated resident population.*

[b] *Costs do not include those more stringent performance standards set forth in the stipulation by the Milwaukee Sewerage District or agreements by the Cities of Kenosha, Racine, and South Milwaukee with the State of Illinois resulting from litigation regarding treatment levels.*

[c] *The Town of Yorkville Sanitary District No. 1 has a high percentage of industrial-commercial flow, with a relatively low resident population. Thus, a relatively high per capita cost is indicated.*

Source: SEWRPC.

A total of 133 management agencies are proposed to be designated for point source pollution abatement purposes, while 163 management agencies are proposed to be designated for urban nonpoint source pollution abatement, 64 management agencies for rural nonpoint source pollution abatement, and 131 management agencies for sludge management.

The plan implementation program includes the establishment of a continuing areawide water quality management planning effort. As the designated Section 208 water quality management planning agency, the Commission would bear primary responsibility for the conduct of that effort. The plan recommends that, since such areawide water quality management planning must be carried on throughout the entire State of Wisconsin, funding for such continuing efforts be provided directly by the State of Wisconsin through the Department of Natural Resources.

Several major issues relating to water quality management policies and programs were raised during the conduct of the areawide water quality management planning program for southeastern Wisconsin. The issues relate to the interpretation of water quality standards, the most cost-effective balance between control of point and nonpoint sources of pollution, the levels of phosphorus removal at sewage treatment plants, advanced waste treatment at sewage treatment plants, land disposal of sewage effluent, sewer extension policies, and the design of major sewerage facilities so as to provide capacity for anticipated growth beyond the plan design year. Regarding these issues, it was the Commission's position that a probabilistic approach to water quality standards and interpretation should be used to supplement the current exemption in the standards for extreme low flow conditions; that both point and nonpoint source controls are needed but that neither is sufficient to satisfy the recommended water use objectives to the maximum extent practicable; that a high level of phosphorus removal at 18 sewage treatment plants is economically and technically feasible; that advanced waste treatment is a sound investment and is based on reliable technical data related to achieving the stream water quality goals; that land application of sewage effluent is an alternative worthy of consideration for 21 sewage treatment plants; that the recommended extensions in sewer service areas will provide for the controlled growth of urban land areas while protecting valuable agricultural and environmental corridor lands from the adverse effects of urban development; that excess capacity in sewerage facilities should be fully utilized before making new capital investments in additional capacity; and that local facilities planning efforts should address the cost-effectiveness of developing sewerage systems to serve development expected beyond the year 2000. These complex issues were discussed in detail along with the recommended plan in Chapter II of this volume.

PUBLIC REACTION TO RECOMMENDED PLAN

Overview of Public Information Effort

As outlined in Volume One, Chapter II of this report, the general approach used by the Commission in the selection of a recommended plan from among alternatives is to proceed through the use of advisory committees, interagency meetings, public informational meetings, and public hearings to a final decision and plan adoption by the Commission in accordance with the provisions of the state regional planning enabling legislation. Because plan selection and adoption necessarily involve both technical and nontechnical policy determinations, such selection and adoption must involve the various governmental bodies, technical agencies, and private interest groups concerned. Such involvement is particularly important in light of the advisory role of the Commission in shaping regional development. The use of advisory committees, public informational meetings, and public hearings, as well as media events in the form of newspaper articles and radio and television appearances, appears to be the most practical and effective procedure available for attaining the necessary involvement of elected and appointed public officials and interested citizens in the planning process, and for eventually arriving at agreement on plans that can be jointly adopted and cooperatively implemented.

As an integral part of the areawide water quality management planning program, and in accordance with the requirements set forth by the U. S. Environmental Protection Agency in Title 40 of the Code of Federal Regulations, Chapter I, Part 131, published in the Federal Register on November 28, 1975, the Commission conducted an extensive public informational program upon completion of the preliminary recommended plan in order to solicit public reaction to the plan. This effort consisted of the following key steps:

1. A presentation of the preliminary plan to the SEWRPC Citizens Advisory Panel for Public Participation in order not only to solicit review comments from the citizen leaders serving on this Panel, but to ensure that these leaders were informed on the plan and could in turn inform others about the framework of the plan, the issues involved, and the public meetings and hearings scheduled on the plan.

2. The issuance of a special SEWRPC announcement of a schedule of informational meetings, a regional planning conference, and a public hearing on the water quality management plan. This special announcement was provided to nearly 3,000 elected or appointed public officials, technicians, interested citizens, and educators, as well as to media in the Region.

3. The preparation and publication of two consecutive SEWRPC newsletter issues, which together presented an extensive summary of the findings and recommendations of the areawide water quality management planning program.[4] These newsletters were provided to about 2,700 indi-

[4] *See SEWRPC Newsletters Volumes 18, No. 6, Nov.-Dec. 1978 and 19, No. 1, Jan.-Feb. 1979.*

viduals throughout the Southeastern Wisconsin Region, including the chief elected officials of all of the local units of government in the Region as required by federal regulation. These newsletters also contained a schedule of the public meetings to be held on the plan.

4. The issuance of two SEWRPC news releases concerning the water quality management plan. The first release set forth the schedule of informational meetings, a regional planning conference, and a public hearing and briefly summarized the plan recommendations for each county. The second news release announced the keynote address speaker at the regional planning conference. These news releases were provided to 55 newspapers and 33 radio and television stations serving the Region.

5. The publication of a legal announcement setting forth the schedule of informational meetings, the regional planning conference, and the public hearing in the Milwaukee Journal on Sunday, March 18, 1979, as required by federal regulation. The Sunday edition of the Milwaukee Journal has a circulation of about 535,000, and is the newspaper of widest circulation in the Region.

6. The publication and distribution of an issue of Update, a fact sheet concerning clean water planning prepared by the University of Wisconsin-Extension in cooperation with the Commission. The fact sheet contained a brief summary of the recommended plan plus a list of all proposed water quality management agencies by county. This fact sheet was distributed to more than 3,500 individuals in the Region, with a heavy emphasis on citizens involved in, and groups concerned with, environmental quality and those engaged in farming activities. In addition, the University of Wisconsin-Extension offices throughout the Region widely publicized the plan and the informational meetings and hearings concerning the plan in local newsletters and special local mailings.

7. The conduct of five special public informational meetings at locations throughout the Southeastern Wisconsin Region over the period March 27, 1979, through April 10, 1979. This meeting schedule is set forth for the record in Table 77. The purpose of these informational meetings was both to: 1) provide a briefing on the preliminary water quality management plan recommendations; 2) answer any questions that interested citizens and local public officials may have had on the plan; and 3) solicit constructive comments and criticism on the preliminary plan.

8. The conduct of a day-long regional planning conference on the areawide water quality management plan on April 19, 1979, in the City of Milwaukee. This conference was attended by about 300 individuals. The conference included not only a presentation by the Commission staff on the findings and recommendations of the plan, but also reaction to the plan by federal, state, and local public officials and by private citizens. The record of the conference is set forth in a published document.[5]

9. The conduct of a formal public hearing on the water quality management plan in the City of Milwaukee on the evening of April 19, 1979. This hearing was attended by about 130 individuals, of whom 29 formally entered statements into the record of the hearing. The public hearing record was held open until April 30, 1979, during which time an additional 51 statements were entered. The record of the public hearing, together with the minutes of the previous informational meetings, is set forth in a separately published document.[6]

10. The conduct of five special intergovernmental meetings to seek clarification of comments submitted for the public hearing record by local units of government. These special meetings are documented in Table 77.

It should be noted that the foregoing summary of public informational efforts concerning the preliminary recommended areawide water quality management plan does not include the significant ongoing public informational program conducted by the University of Wisconsin-Extension throughout the duration of the nearly four-year planning program, nor does it include the special public informational efforts conducted by the Commission at the time of completion of the sludge management element of the water quality management plan. The University of Wisconsin-Extension efforts, which were guided by a full-time extension agent assigned to work directly with the Commission staff, are separately documented.[7] The public reaction to the recommended sludge element of the plan is set forth on pages 261 through 272 of SEWRPC Planning Report No. 29, A Regional Wastewater Sludge Management Plan for Southeastern Wisconsin.[8]

Overview of Public Reaction

In general, and with but one overriding exception, the preliminary recommendations of the areawide water quality management plan were well received by those

[5] *See Proceedings of the 11th Regional Planning Conference on A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000.*

[6] *See Minutes of Informational Meetings and Public Hearing, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000.*

[7] *See Public Participation Report in Areawide Water Quality Management Planning in Southeastern Wisconsin.*

citizens and public officials who reacted to the plan as presented at the series of meetings held during the public information period. The record of the public informational meeting and public hearing reveals considerable support for the basic objective of achieving "fishable and swimmable" surface waters wherever practicable. The single overriding exception pertains to the level of phosphorus removal proposed at 18 of the 48 planned sewage treatment plants in the Region. Much opposition to this recommendation, primarily from local public officials, was recorded, although some support was also recorded from concerned citizens. Other opinions raised at the hearing included opposition to the land disposal of sewage effluent by some public officials, the preliminary plan having recommended detailed consideration of land disposal at 21 of the 48 planned treatment plants, and specific objection to the proposed abandonment of the Village of Paddock Lake treatment facility, the Regal Manors treatment facility in the City of New Berlin, the North Park Sanitary District treatment facility in the Village of Wind Point, and the Pleasant Park Utility Company treatment facility in the Town of Pleasant Prairie. In addition, several questions were raised concerning the proposed extent of sewer service areas and the extensions of trunk sewers to serve these areas.

Curiously, given the fact that many of the new water quality recommendations—that is, recommendations not previously advanced in other regional plan elements, and particularly in the adopted regional sanitary sewerage system plan—contained in the plan pertained to nonpoint source pollution abatement, there is little in the record of the public informational meetings and public hearing to indicate either much support for, or opposition to, the nonpoint source pollution abatement recommendations. Questions concerning the costs of implementing such recommendations were raised by the Cities of Franklin and Oak Creek in Milwaukee County. Other than those comments and expressed concern about "nonvoluntary" aspects of implementation of the nonpoint source pollution abatement recommendations contained in the preliminary plan, however, there was little specific reaction to the plan recommendations for nonpoint source control.

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[8] *A summary of the regional wastewater sludge management plan was presented in SEWRPC Newsletter Volume 18, No. 1, Jan.-Feb. 1978. A regional planning conference was also held on this subelement of the plan, with the record of the conference published in the Proceedings of the Tenth Regional Planning Conference on Wastewater Sludge Management in Southeastern Wisconsin. In addition, three subregional sludge management workshops and a formal public hearing on the plan were held. The record of these workshops and the hearing is set forth in Minutes of Informational Meetings and Public Hearing on the Regional Wastewater Sludge Management Plan for Southeastern Wisconsin: 2000.*

The following discussion presents the reaction of the Technical Coordinating and Advisory Committee and the Commission to the issues raised in the public informational meetings and public hearing. As appropriate, changes to the recommended areawide water quality management plan as described in Chapter II of this volume are set forth in response to the public reaction to the preliminary plan.

Phosphorus Removal at Sewage Treatment Facilities

The most significant issue raised in the informational meetings and public hearing on the preliminary areawide water quality management plan dealt with the high level of phosphorus removal proposed to be provided at 18 of the 48 public sewage treatment plants envisioned to serve the Region in the design year of the plan. At these 18 plants, the preliminary plan proposed that the effluent discharged into the receiving surface waters contain no more than 0.1 mg/l of phosphorus, measured as total phosphorus on a monthly average basis. This recommended level was based upon analyses of alternative means of attaining a proposed instream phosphorus standard of 0.1 mg/l, measured as total phosphorus. This proposed level of phosphorus control was significantly more stringent than the currently accepted practice within much of the Region, based upon recommendations originally advanced in the adopted regional sanitary sewerage system plan, of providing a treatment plant effluent having a phosphorus content of 1.0 mg/l.

This recommendation received by far the most attention during the public review of the proposed plan. The operators of 10 of the 18 directly affected sewage treatment plants registered objections to the proposed level of phosphorus control. These 10 operators consisted of the Walworth County Metropolitan Sewerage District; the Cities of Brookfield, Cedarburg, Oconomowoc, Waukesha, and West Bend; the Village of Jackson; the Town of Salem Sewer Utility District No. 2; the Eagle Lake Sewer Utility District in the Town of Dover; and the Delafield-Hartland Water Pollution Control Commission. In addition, the City of Delafield, the Villages of Pewaukee and Nashotah, and the Delavan Lake Sanitary District, all of whom, under the plan, were to contract for sewage treatment at one of the 18 directly affected plants, registered opposition to the phosphorus removal recommendation. The Delafield-Hartland Water Pollution Control Commission opposed any level of phosphorus removal.

In addition to these objections, eight other communities whose plants under the plan were to provide land disposal of treated sewage effluent or, if such application is shown through more detailed facilities planning efforts not to be cost-effective, to provide a high level of phosphorus removal filed objections to the phosphorus removal recommendation. These eight communities are the City of Lake Geneva; the Villages of East Troy, Walworth, Sharon, and Darien; the Towns of Pleasant Prairie and Salem; and the Western Racine County Sewerage District. Two other communities also filed objections to the phosphorus removal recommendation even though they were not directly affected by the recommendation.

Table 77

PUBLIC MEETINGS HELD CONCERNING PRELIMINARY RECOMMENDED REGIONAL WATER QUALITY MANAGEMENT PLAN

Type of Meeting	Place of Meeting	Date and Time of Meeting
Public Informational Meeting—Waukesha County	Waukesha County Fairgrounds—Youth Building, Waukesha, Wisconsin	March 27, 1979 7:30 p.m.-9:45 p.m.
Public Informational Meeting—Racine and Kenosha Counties	J. I. Case High School, Racine, Wisconsin	April 2, 1979 7:30 p.m.-9:26 p.m.
Public Informational Meeting—Milwaukee County	Milwaukee County Courthouse, Milwaukee, Wisconsin	April 5, 1979 7:30 p.m.-8:42 p.m.
Public Informational Meeting—Walworth County	Walworth County Courthouse, Elkhorn, Wisconsin	April 9, 1979 7:30 p.m.-9:20 p.m.
Public Informational Meeting—Ozaukee and Washington Counties	Washington County Courthouse, West Bend, Wisconsin	April 10, 1979 7:30 p.m.-9:35 p.m.
Regional Planning Conference	Red Carpet Hotel, Milwaukee, Wisconsin	April 19, 1979 8:15 a.m.-5:00 p.m.
Public Hearing	Red Carpet Hotel, Milwaukee, Wisconsin	April 19, 1979 7:00 p.m.-9:15 p.m.
Special Intergovernmental Meeting—Village of Paddock Lake, Town of Salem, Wisconsin Department of Natural Resources, and SEWRPC	Salem Town Hall, Salem, Wisconsin	April 17, 1979 7:00 p.m.-9:15 p.m.
Special Intergovernmental Meeting—City of Franklin, City of Oak Creek, Milwaukee Metropolitan Sewerage District, Wisconsin Department of Natural Resources, and SEWRPC	Franklin City Hall, Franklin, Wisconsin	May 16, 1979 2:00 p.m.-3:15 p.m.
Special Intergovernmental Meeting—Town of Pleasant Prairie, City of Kenosha, Wisconsin Department of Natural Resources, and SEWRPC	Pleasant Prairie Town Hall, Kenosha, Wisconsin	May 22, 1979 10:30 a.m.-1:15 p.m.
Special Intergovernmental Meeting—City of Brookfield, City of New Berlin, Village of Lannon, Village of Menomonee Falls, Village of Pewaukee, Village of Sussex, Town of Brookfield, Town of Lisbon, Town of Pewaukee, Pewaukee Lake Sanitary District, Wisconsin Department of Natural Resources, and SEWRPC	SEWRPC Offices, Waukesha, Wisconsin	June 1, 1979 10:00 a.m.-11:20 a.m.
Special Intergovernmental Meeting—City of Racine, Town of Caledonia Sewer Utility District No. 1, North Park Sanitary District, Crestview Sanitary District, Wisconsin Department of Natural Resources, and SEWRPC	SEWRPC Offices, Waukesha, Wisconsin	June 1, 1979 2:00 p.m.-3:45 p.m.

Source: SEWRPC.

The preliminary plan recommended that these two communities—the Villages of Newburg and Silver Lake—provide either effluent land application facilities or a conventional level of phosphorus removal prior to discharge to surface waters. Finally, opposition to the proposed high level of phosphorus removal was also registered by two industries in the Region—the Joseph Schlitz Brewing Company and the West Bend Company; three sanitary engineering consulting firms that operate in the Region—Donohue & Associates, Inc., Graef-Anhalt-Schloemer & Associates, Inc., and R. W. Nicholson; and three individual citizens.

The phosphorus removal recommendation was supported by nine environmental interest groups and six individual citizens. The environmental interest groups registering support for the recommendation included the Milwaukee River Restoration Council, the Kettle Moraine Audubon Society, the Waukesha County Sportsmen's Group, the Ecology Association of New Berlin, the Waukesha Environmental Action League, the Citizens for a Better Environment, the Izaak Walton League, the Wisconsin Sportsmen's Association, and the Sierra Club.

Opposition to the phosphorus removal recommendation centered on three major points. First, nearly all those who testified in opposition to the recommendation cited the added cost burden to the local property taxpayer of providing the required additional capital facilities and of supporting the attendant additional operation and maintenance costs. This concern was particularly evident in the testimony of the public officials who objected to the recommendation. In this respect, it should be noted that the incremental average annual cost of providing the proposed high level of phosphorus removal at the 18 plants was estimated at $6.7 million, or about 10 percent of the total average annual point source pollution abatement plan implementation cost and about 7 percent of the total average annual plan implementation cost. Many of the public officials noted that this incremental cost burden would have to be borne by a relatively few residents of the Region, since none of the Lake Michigan treatment facilities, which serve the great majority of the population of the Region, would be required to provide a similarly high level of phosphorus control. Public officials who testified also noted that several new sewage treatment facilities were now under construction and had been designed in accordance with the adopted regional sanitary sewerage system plan to provide a treated effluent having a content of 1.0 mg/l of phosphorus, that the proposed plan could result in a situation where these new treatment facilities would not be in compliance with waste discharge permits, and that changing requirements in the "middle" of facility construction programs was ill-advised and objectionable. Several of those who testified against the proposed high level of phosphorus removal also questioned whether the added cost burden of providing the proposed level of phosphorus removal was worth the added benefits that might be obtained through the provision of what, in their opinion, would be only marginally cleaner waters.

The second point raised by those objecting to the proposed level of phosphorus removal concerned the technical feasibility of achieving an effluent discharge of 0.1 mg/l phosphorus on a continuous basis. The state-of-the-art studies completed for the Commission under the areawide water quality management planning program by Stanley Consultants, Inc. concluded that treatment facilities could be designed that would provide an effluent with a phosphorus concentration of no more than 0.1 mg/l. This conclusion was challenged by the consulting engineering firms of Donohue & Associates, Inc. and R. W. Nicholson, who maintained that the consistent attainment of an effluent phosphorus concentration of 0.1 mg/l was impractical given the current state-of-the-art. Accordingly, these two firms recommended that the level of phosphorus removal proposed be eliminated from the plan. The testimony of the consulting firm of Graef-Anhalt-Schloemer & Associates, Inc. differed from that submitted by the other two engineering firms, indicating that while it would probably be technically feasible to design and operate a treatment facility that would provide an effluent discharge of 0.1 mg/l phosphorus, it was unreasonable to assume that such a plant could be successfully operated by the smaller communities in the Region. Accordingly, this engineering firm recommended that the proposed high level of phosphorus removal be postponed.

A third point raised by many of those who objected to the phosphorus removal recommendation pertained to the increased energy use that would be required to operate the sewage treatment plants providing a high level of phosphorus removal. The Commission state-of-the-art study indicated that significant increases in direct and indirect energy use would be entailed in the operation of sewage treatment facilities designed to produce an effluent with a phosphorus content of only 0.1 mg/l. The Commission staff estimated that this increase in energy use would approximate the total energy requirements for the operation and maintenance of about 2,000 residences, based upon average annual energy use rates.

Those individuals and interest groups who favored the high level of phosphorus removal generally agreed with the Commission staff and the Technical Coordinating and Advisory Committee that more than a conventional level of phosphorus removal would be required if the recommended water use objectives are to be attained. The citizens who supported the recommendation, as well as several of the representatives of environmental interest groups, indicated that as taxpayers they would be willing to support the relatively modest additional costs that may be necessary to fully achieve the water use objectives. In addition, these individuals and groups stressed that, while there may be added costs associated with the proposed high level of phosphorus removal, there were also additional benefits which, in their view, outweighed the added costs—benefits regarding the use of surface waters for recreation. In addition, testimony presented by a representative of the Citizens for a Better Environment organization stressed the importance of the con-

trol of phosphorus to the provision of clean water and a healthy biological environment. Studies were cited in the testimony to show a correlation between the amount of phosphorus and species diversity within surface water bodies.

In addition to the testimony at the public informational meetings and public hearing concerning the high level of phosphorus removal recommendation of the preliminary plan, the remarks of the keynote speaker at the regional planning conference were directed at the need to provide higher levels of phosphorus removal in order to restore and maintain healthy conditions in surface waters. Mr. Robert J. Sugarman, U. S. Chairman of the International Joint Commission, noted in his remarks that the one central theme emerging from all of the studies on water quality in the Great Lakes Basin was that to maximize the likelihood of restoring and maintaining the health of surface water bodies, it is essential to minimize the discharge of phosphorus. He further noted that studies in the Great Lakes Basin had indicated that the current requirement resulting from the Lake Michigan enforcement conference that treated effluent have a phosphorus content of 1.0 mg/l will probably be inadequate to protect water quality in some areas, and consideration is already being given to requiring a phosphorus level in treated effluent of 0.5 mg/l at some plants. He noted that it was quite likely that future studies will show, as the areawide water quality management planning program has shown in this case, that sewage treatment plants will need to provide even more stringent levels of phosphorus removal if the national water quality goal is to be attained.

Significantly, there was no testimony given challenging the recommendation of the preliminary plan that an instream phosphorus standard of 0.1 mg/l be adopted by the Wisconsin Department of Natural Resources. This instream concentration was first advanced in the Commission's comprehensive plan for the Milwaukee River watershed, adopted in 1972, and reaffirmed in the Commission's regional sanitary sewerage system plan, adopted in 1974. The engineering consulting firm of Graef-Anhalt-Schloemer & Associates, Inc., while acknowledging that the available data supported such an instream standard as a threshold value above which excessive algae blooms can be expected, noted that other conditions also affect algae blooms, including sunlight, wind currents, water velocity, and the presence of other nutrients, such as nitrates. For this reason, that firm urged that a cautious approach be taken to requiring phosphorus removal beyond the currently accepted level, suggesting that detailed case-by-case studies be made of the effect of each treatment plant upon each receiving stream.

In considering this important and controversial issue, the Technical Coordinating and Advisory Committee made the following recommendations, and the Commission concurred on these recommendations, on the control of phosphorus from point sources of pollution:

1. Phosphorus should be recognized as an important indirect pollutant. The accumulation of phosphorus supports the growth of algae and noxious weeds. Such algae and weeds, in addition to causing turbidity, noxious odors, safety hazards, and unsightly conditions, can, upon death and decay, deplete the dissolved oxygen content of surface waters to the point that fish and other desirable forms of aquatic life cannot survive.

2. The recommended phosphorus concentration for streams of 0.1 mg/l, measured as total phosphorus, should be retained, subject, however, to a redetermination on a reach-by-reach basis based upon more detailed instream water quality studies to be conducted jointly by the Wisconsin Department of Natural Resources and the Regional Planning Commission. It is recognized that site-specific stream conditions may require adoption of an instream phosphorus standard either somewhat more or less stringent than 0.1 mg/l, because of such factors as stream velocity, turbulence, turbidity, color, and temperature; light incidence; availability of other nutrients; bottom sediments; and presence or absence of other plant life. The purpose of the proposed instream water quality studies would be to determine the precise instream standard to be applied. It would be desirable to conduct such instream water quality studies in that portion of the Region draining to Lake Michigan simultaneously and in a coordinated manner with a water quality management study of the Lake Michigan estuaries and direct drainage areas. The Commission has proposed such a study but has not to date been able to secure funding for the study.[9] Furthermore, the long-term effect of phosphorus discharge on Lake Michigan needs to be specifically addressed. While such a study is beyond the scope of work of the Regional Planning Commission, it is recommended that such a study be undertaken by the Great Lakes Basin Commission or the International Joint Commission.

3. Having determined a more precise instream standard on a reach-by-reach basis, the studies proposed herein would further determine to what extent any contributing sewage treatment facilities must provide an effluent discharge having a phosphorus concentration more stringent than the 1.0 mg/l standard also recommended herein.

4. A schedule for undertaking the necessary instream water quality studies with regard to phosphorus should be jointly developed by the Wisconsin Department of Natural Resources and the Commission under the continuing area-

[9] *See SEWRPC's Lake Michigan Estuary and Direct Drainage Area Subwatersheds Planning Program Prospectus, September 1978.*

wide water quality management planning process following adoption of this plan. As guidelines for determining that schedule, it is proposed that the studies be conducted in such an order as to ensure that the study findings are available for incorporation into the compliance schedules of any waste discharge permits issued after January 1, 1990, and into any facilities planning process initiated after January 1, 1990, for sewage treatment plant construction, improvement, and expansion projects.

5. Actual implementation of any subsequent recommendations for the discharge to streams of a treated effluent with a phosphorus concentration more stringent than 1.0 mg/l should be contingent upon a discovery that there exists a proven, reliable sewage treatment technology capable of institution in small, as well as large, communities. To the greatest extent possible, such a technology should be energy-efficient and should result in an incremental cost increase in sewage treatment within the ability to pay of those communities directly affected.

6. Pending the results of the instream water quality studies, all sewage treatment plants within the Region, except those that provide for the discharge of sewage effluent to land, should provide for a level of phosphorus removal that will provide an effluent having a phosphorus concentration of 1.0 mg/l, measured as total phosphorus on a monthly average basis.

These recommendations were made to assure a plan that was politically implementable. Given the intense and widespread opposition to the originally proposed high level of phosphorus removal as evidenced in the record of the public informational meetings and the public hearing, particularly by local elected public officials, the Advisory Committee and the Commission deemed that the plan, while technically sound, would not be acceptable and implementable as initially proposed. The comments of the public officials responsible for sewerage system management are presumed to be reflective of the local residents' willingness to support and implement water quality control measures where differences exist in the interpretation of issues by the technicians involved in water pollution control projects.

In making these findings, the Advisory Committee and the Commission also considered questions relating to the interrelationship of the point source and nonpoint source recommendations with regard to phosphorus removal. It was determined that it would not be possible to substitute higher levels of nonpoint source pollution abatement for the previously proposed high level of phosphorus removal at selected sewage treatment facilities. This conclusion was reached because simulation model applications indicated that even if the maximum possible nonpoint source pollution control practices were to be instituted in the watersheds tributary to the streams to which the 18 affected plants discharge, the instream phosphorus standard would still not be met downstream from the plants. This is because point sources contribute a significant proportion of the total mass loading of phosphorus on the system; point sources contribute these loads during the most critical periods of low streamflow; and point sources contribute a higher proportion of dissolved phosphorus, the form most readily available for use by aquatic vegetation.

The Advisory Committee and the Commission also considered whether questions of equity might dictate a reduction in the level of nonpoint source pollution control that is called for in the plan given the reduction in the level of point source pollution control as set forth herein. This contention was rejected because the nonpoint source pollution abatement recommendations, particularly in the rural areas of the Region, are basic and elementary in nature, are generally required for the control of other pollutants, and may be considered to be equivalent to the basic and elementary level of phosphorus removal that is currently being practiced in the Region at sewage treatment facilities and that is called for in the revised plan. The plan as revised may be viewed as requiring farmers and other rural landowners to implement basic water pollution control practices in much the same way as the operators of major point sources of pollution are already doing. The plan as revised was, accordingly, judged to be fair and equitable in this respect.

Effect of Change in Recommended Phosphorus Level on Land Disposal Recommendation: The foregoing decision to rescind the previously recommended high level of phosphorus removal at 18 sewage treatment plants, at least until future instream studies determine the precise level of phosphorus removal needed, also affects the preliminary plan recommendations concerning land disposal of treated effluent at 21 additional sewage treatment plants. An analysis was made of each of these 21 treatment facilities to determine where land disposal of effluent would probably be no longer cost-effective if only a conventional level of phosphorus removal were required for the alternative of water disposal of treated effluent. This analysis indicated that at 5 of the 21 affected plants—the Western Racine County Sewerage District, the City of Lake Geneva, and the Villages of East Troy, Twin Lakes, and Walworth—land disposal of sewage effluent would probably no longer be cost-effective given the change in the plan to a conventional level of phosphorus removal. At the remaining 16 plants, however, land disposal of sewage effluent continues to be a promising alternative and one that should be carefully considered in the subsequent facilities planning process.

Effect of Change in Recommended Phosphorus Level on Plan Costs: The impact on plan costs of the change in the plan recommendations to a conventional level of phosphorus removal is summarized for each affected sewage treatment facility in Table 78. The average annual capital and operation and maintenance cost over the period 1990 to 2000 for the point source and sludge management plan elements at each of the 23 treatment facilities directly

Table 78

PRELIMINARY AND FINAL PLAN COSTS AT SELECTED SEWAGE TREATMENT FACILITIES IN THE REGION

Sewage Treatment Facility	Average Annual Capital[a] and Operation and Maintenance[b] Costs During the Period 1990-2000 for Point Source and Sludge Management Plan Elements					
	Preliminary Plan (0.1 mg/l phosphorus or land disposal)		Final Plan (1.0 mg/l phosphorus)		Difference Between Preliminary and Final Plan	
	Total	Per Capita[c]	Total	Per Capita[c]	Total	Per Capita[c]
Treatment Facilities Initially Recommended to Discharge 0.1 mg/l of Total Phosphorus to Surface Waters						
West Bend	$ 2,022,000	$ 49	$ 1,614,000	$ 39	$ 408,000	$10
Jackson	535,000	89	377,000	63	158,000	26
Cedarburg	825,000	45	513,000	28	312,000	17
Union Grove	606,000	80	432,000	52	231,000	21
Brookfield	2,527,000	37	1,727,000	25	800,000	12
Waukesha	2,903,000	37	2,230,000	29	673,000	8
Mukwonago	639,000	69	370,000	40	269,000	29
Norway	649,000	88	456,000	62	193,000	26
Eagle Lake	307,000	171	214,000	119	93,000	52
Burlington	849,000	51	523,000	32	326,000	19
Salem Sewer Utility District No. 2	629,000	82	422,000	55	207,000	27
Slinger	430,000	98	299,000	68	131,000	30
Hartford	908,000	59	651,000	45	257,000	17
Oconomowoc	1,770,000	53	1,307,000	39	463,000	14
Delafield-Hartland	609,000	33	286,000	16	323,000	18
Dousman	299,000	150	201,000	101	98,000	49
Whitewater	1,049,000	49	737,000	34	312,000	15
Walworth County Metropolitan Sewerage District	1,277,000	54	857,000	36	420,000	18
Subtotal	$18,833,000	$ 49	$13,216,000	$ 35	$5,617,000	$15
Treatment Facilities Initially Recommended to Discharge to Land Application Systems						
East Troy	$ 379,000	$ 57	$ 310,000	$ 46	$ 69,000	$11
Lake Geneva	764,000	44	556,000	32	208,000	12
Western Racine County Sewerage District	455,000	48	334,000	36	121,000	12
Twin Lakes	321,000	52	280,000	45	41,000	7
Walworth	675,000	44	528,000	34	147,000	10
Subtotal	$ 2,594,000	$ 47	$ 2,008,000	$ 37	$ 586,000	$10
Total	$21,427,000	$ 49	$15,224,000	$ 35	$6,203,000	$14

[a] *Average annual cost of capital was computed by dividing the total capital cost by 25 years based upon the life of the facility to be constructed.*

[b] *Operation and maintenance is the average cost for the years during which the facilities designated to achieve a high level of phosphorus removal would be installed (1990-2000).*

[c] *Per capita costs based upon year 2000 population levels.*

Source: SEWRPC.

affected by the plan change are shown in this table. As the plan was presented at the public hearing, the total average annual cost at these 23 plants was estimated at $21.4 million, with an average per capita cost of about $49. Given the change in the plan to a conventional level of phosphorus removal, the total average annual cost at these 23 affected plants over the period 1990 to 2000 would be reduced to about $15.2 million, or about $35 per capita. Thus, the cost reduction effected by the plan change amounts in the aggregate to $6.2 million annually over the 10-year period that was assumed for implementation of the higher level of phosphorus removal, i.e., 0.1 mg/l a reduction of about $14 per capita per year.

Effect of Change in Recommended Phosphorus Level on Water Quality Conditions: As the preliminary plan went to public hearing, it was estimated that 1,054 stream miles, or about 89 percent of the 1,180-stream mile network in the Region, and 95 of the 100 major lakes in the Region could be expected to ultimately meet the Congressionally mandated national goal of "fishable and swimmable" waters. The remaining 126 stream miles and five lakes would not meet that goal due essentially to irreversible man-made changes in the watercourses, to naturally high levels of pollutants, and to high levels of in-place pollutants. The stream miles and lakes that would not meet the national goal under the plan as originally proposed are shown in red on Map 20, and consist primarily of the Root River Canal system, Lincoln Creek, the Menomonee River and its tributaries, the Kinnickinnic River and its tributaries, and Buena, Crooked, Echo, Kee Nong Go Mong, and Mud Lakes.

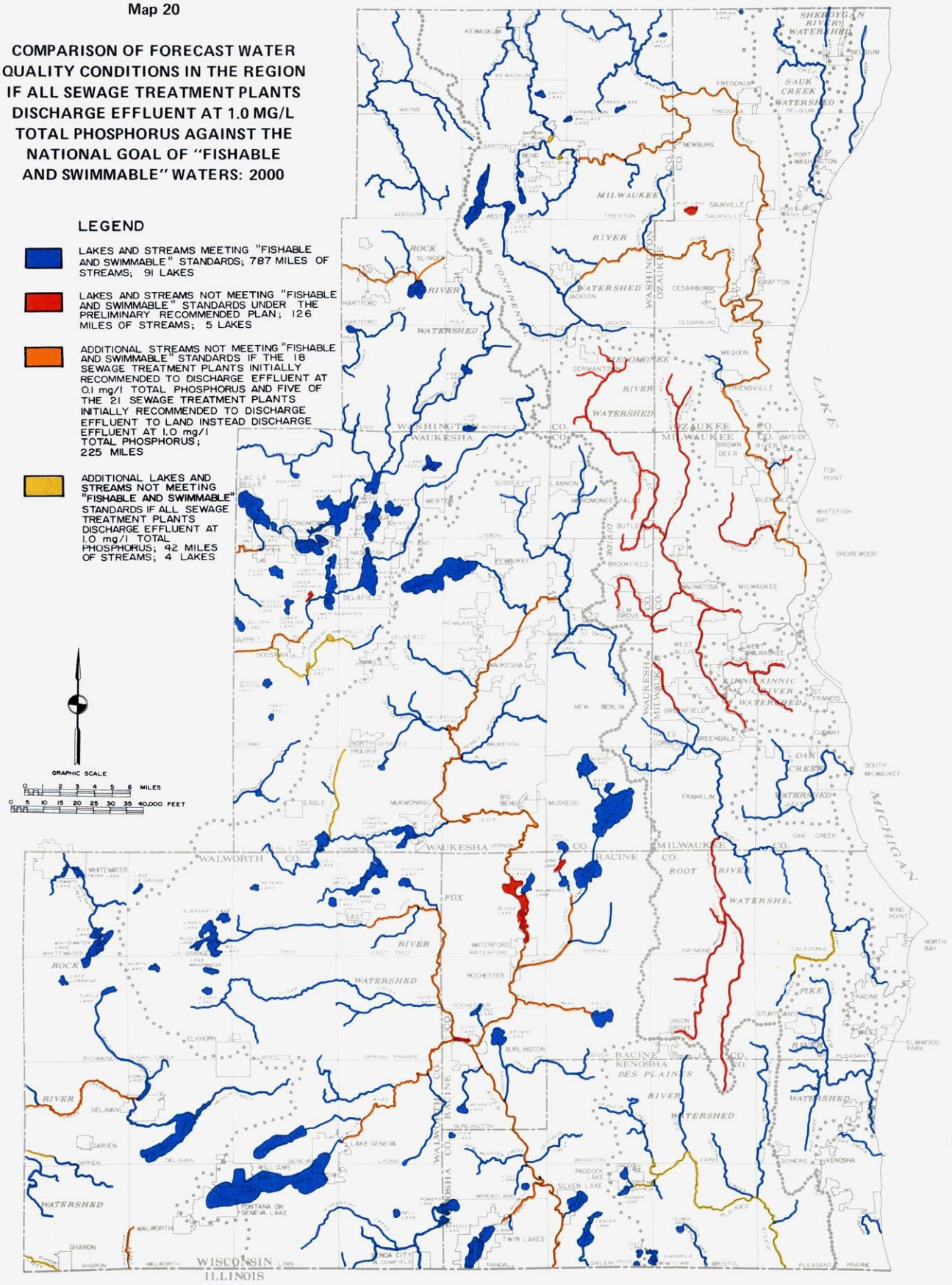
The recommendation to forego the previously recommended high level of phosphorus removal, at least until future instream studies determine the precise level of phosphorus removal needed at each treatment facility discharging to a stream, based upon more refined, desirable instream phosphorus levels, and until a more favorable energy-efficient treatment technology becomes available, could have an effect on the extent to which the lakes and streams in the Region would meet the national goal of "fishable and swimmable" waters by the year 2000. If all of the required instream water quality studies were completed, and if appropriate actions were taken at the affected treatment facilities to provide for a phosphorus discharge in accordance with the findings of those studies, then the number of stream miles and lakes that would not meet the national goal within the Region by the year 2000 would be the same as under the preliminary plan. If, however, a reliable, energy-efficient, and relatively low-cost treatment technology to effect a level of phosphorus removal beyond that now being practiced in the Region fails to become available, then it is possible that fewer stream miles in the Region would meet the national goal by the year 2000. The results of an analysis based on this assumption are shown on Map 20. Under this analysis, which assumes that only a conventional level of phosphorus removal is provided at all sewage treatment plants discharging to streams and that the 16 remaining sewage treatment facilities—where land disposal of sewage effluent appears attractive—eventually do implement land disposal, it is estimated that 829 stream miles, or 70 percent of the 1,180-stream mile network studied, would ultimately meet the national goal. The remaining 351 stream miles not expected to meet the goal under these conditions include the 126 miles that would not have met the goal even under the preliminary recommended plan, shown in red on Map 20, and 225 additional miles that would not be expected to meet the goal because of the change in phosphorus discharge requirements at 23 affected sewage treatment facilities, shown in orange on Map 20. The additional stream miles consist primarily of all or portions of the Milwaukee River, Cedar Creek, and the Fox River.

An additional analysis was performed to determine the number of stream miles in the Region that would not meet the national goal if the 16 sewage treatment facilities identified for land disposal did not implement such disposal. This analysis assumes that future facilities planning for these 16 plants will result, for whatever reasons, in recommendations for surface water discharge of sewage effluent rather than for land disposal. Given the resistance to land disposal noted in the public record, this is not an improbable assumption. The results of this analysis are also summarized on Map 20. In total, 787 stream miles, or about 67 percent of the 1,180-stream mile network in the Region, as well as 91 of the major lakes could be expected to meet the national goal under these assumptions. Thus, a total of 393 stream miles and nine major lakes would not meet the goal. These 393 stream miles and nine lakes consist of the 126 stream miles and five lakes that would not have met the goal even under the preliminary plan, shown in red on Map 20; the 225 stream miles that will not meet the goal because of the change in phosphorus discharge requirements for the 23 affected sewage treatment plants, shown in orange on Map 20; and 42 additional stream miles and four major lakes—West Bend Pond, Barton Pond, Waterville Pond, and Hunters Lake—that would not meet the goal if facilities planning efforts determine that land application of sewage effluent cannot be successfully implemented at the 16 plants identified for land disposal, shown in yellow on Map 20.

One of the results of changing the plan recommendation to a conventional level of phosphorus removal is the possibility that degradation of water quality over existing conditions may occur in some stream reaches. An analysis was conducted to determine where a potential for such degradation exists. Map 21 identifies those stream reaches where stream water degradation is likely to occur because of the the new recommendation. A total of 92 stream miles could be expected to meet the proposed phosphorus standard of 0.1 mg/l instream a lesser proportion of time than it is met under current conditions. As shown on Map 21, the stream reaches directly affected are located primarily on the Milwaukee and Fox River systems. Map 21 also identifies an additional 22 stream miles that could be expected to meet the proposed phosphorus standard a lesser proportion of the time if the 16 plants identified for land disposal eventually

Map 20

COMPARISON OF FORECAST WATER QUALITY CONDITIONS IN THE REGION IF ALL SEWAGE TREATMENT PLANTS DISCHARGE EFFLUENT AT 1.0 MG/L TOTAL PHOSPHORUS AGAINST THE NATIONAL GOAL OF "FISHABLE AND SWIMMABLE" WATERS: 2000



Under the areawide water quality management plan, as revised in response to the information provided through the public hearing process, it is estimated that 829 stream miles, or 70 percent of the 1,180 miles of stream within the Region, and 95 of the 100 major lakes within the Region could be expected to meet the national goal of "fishable-swimmable" waters by the design year of the plan. This analysis reflects the final recommendation to provide a conventional level of phosphorus removal at 32 of the 49 public sewage treatment facilities recommended to serve the Region in the year 2000, and assumes the use of land application of treated effluent at the remaining 17 public sewage treatment plants. Also shown on the map are 42 additional miles of stream and four lakes that would not meet that national goal if local facilities planning efforts determine that land application of sewage treatment plant effluent at 17 plants cannot be successfully implemented.

Source: SEWRPC.

determine to discharge sewage effluent to surface waters. In order to avoid stream water quality degradation, it is recommended that the Wisconsin Department of Natural Resources examine this possibility on a case-by-case basis as new waste discharge permits for treatment facilities located on the affected stream reaches are considered.

An analysis was also conducted of the proportion of time that the proposed instream phosphorus standard would be met over the 225 stream miles which will likely not meet the "fishable-swimmable" standards as a result of the new recommendation. Under existing conditions, and based upon data from 52 water quality analysis stations located on these 225 stream miles, the instream phosphorus standard of 0.1 mg/l is met from a low of 20 percent of the time to a high of 100 percent of the time, with the average for the 52 stations being 63 percent of the time. Under the preliminary water quality management plan as taken to public hearing, the instream phosphorus standard would have been been met from a low of 90 percent of the time to a high of 100 percent of the time, with the average for the 52 stations being 91 percent of the time. The preliminary plan would thus have fully met the proposed standard that calls for achieving the instream phosphorus concentration 90 percent of the time. Under the plan as changed, at least until future instream studies determine the precise level of phosphorus removal needed at each treatment facility and until a more favorable energy-efficient treatment technology becomes available, it is estimated that the phosphorus standard will be met from a low of 25 percent of the time to a high of 88 percent of the time, with the average for the 52 stations being 52 percent of the time over the affected stream reaches.

An analysis was also conducted to determine the potential effects of the new recommendation on other water quality indicators. This analysis indicated that, if higher levels of phosphorus removal are not ultimately provided, dissolved oxygen could be affected, as well as turbidity and plant growth. Since instream phosphorus promotes algae and weed growth, and since decaying algae and weeds consume oxygen, failure to meet the instream phosphorus standard of 0.1 mg/l will, in some cases, result in a failure to meet the dissolved oxygen standard as well. This process is manifested as sediment oxygen demand calibrated into the water quality simulations to reflect the importance of the in-place pollutants. Given the existing state-of-the-art, however, it is not possible to quantify the severity of the impact of the new phosphorus removal recommendation on dissolved oxygen. This is because the dissolved oxygen is also affected indirectly by the sediment oxygen demand from nonpoint pollutant discharges of phosphorus and sediment.

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[10] *The 52 stations represent water quality conditions in 225 stream miles, or 19 percent of the 1,180 miles of stream studied. The remaining 81 percent was characterized by simulation data at 73 additional water quality analysis stations. Thus, there were in all 125 stations, or an average of one per 9.4 miles, over the 1,180 stream miles studied.*

The proportion of the sediment oxygen demand that will be abated by the plan can only be determined by field studies of the stream response to plan implementation on a reach-by-reach basis. However, Commission studies have indicated that the reaches potentially affected by dissolved oxygen problems under the revised plan total 110 miles, or 12 percent of the total stream mileage studied. As shown on Map 22, these potentially affected reaches include portions of the Fox, Milwaukee, and Rubicon Rivers and of Cedar Creek.

Land Application of Sewage Effluent

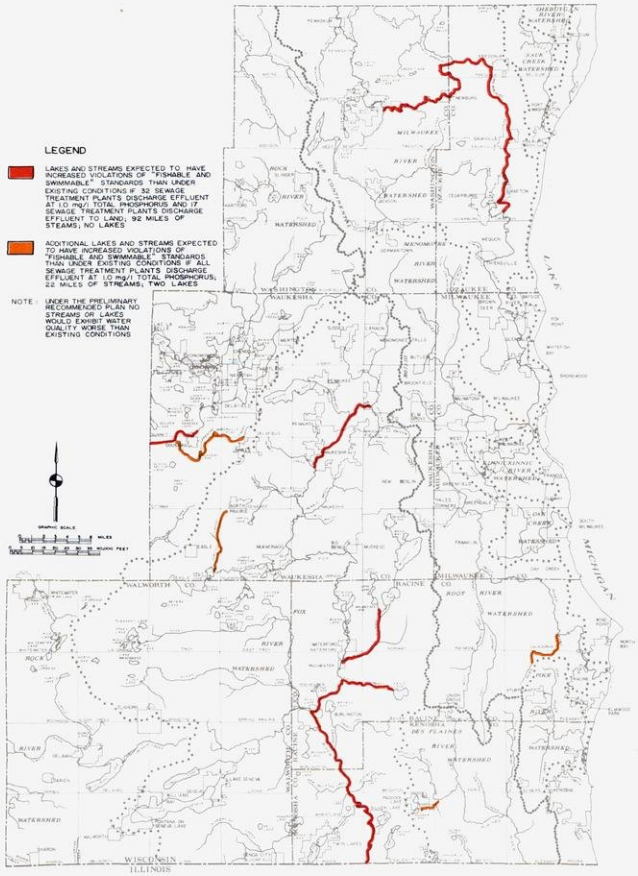
As noted earlier, the record of the public informational meetings and hearing on the preliminary areawide water quality management plan reflects considerable concern on the part of local public officials over the recommendation that 21 of the 48 planned sewage treatment plants in the Region consider land disposal of treated effluent. Formal objections to this recommendation were filed by the operators of 12 of the 21 affected plants—namely, the Western Racine County Sewerage District; the City of Lake Geneva; the Villages of Sharon, Kewaskum, Darien, Silver Lake, East Troy, and Walworth; the Town of Pleasant Prairie (two treatment plants); the Town of Salem Sewer Utility District No. 1; and the Allenton Sanitary District. Most of the objections were centered on the lack of available land for such effluent disposal, the possible adverse effects on agriculture, the possible impact on the local tax base of removing land from the tax rolls through public purchase and operation of "sewage farms," and the potential problems of well pollution and of odors.

In considering the land disposal of sewage effluent, the Technical Coordinating and Advisory Committee and the Commission noted that it was national policy to promote land disposal of sewage effluent and that the Commission, as the areawide water quality management planning agency, had a responsibility to identify those situations where land disposal appeared to be technically feasible and potentially cost-effective. The national policy of promoting land disposal of sewage effluent goes so far as to provide an additional 10 percent commitment to federal funding for those sewage treatment works construction projects where land disposal is to be used, thus raising the federal share of such a project from the normal 75 percent to 85 percent and reducing the local capital investment required from 25 percent to 15 percent. In addition, a project proposing to utilize land disposal will be federally funded even if it is up to 15 percent more costly than the most cost-effective alternative. Finally, in such situations the federal government will pay for all of the cost of any modifications or replacement facilities required should operational problems ensue in the implementation of the land disposal scheme.

The Committee and the Commission noted that the preliminary plan as taken to public hearing did not recommend that land disposal of effluent be required at the 21 identified sewage treatment plants, but rather that any facilities planning efforts give careful consideration to land disposal as an alternative to water disposal.

Map 21

LAKES AND STREAMS EXPECTED TO HAVE INCREASED VIOLATIONS OF "FISHABLE AND SWIMMABLE" STANDARDS OVER EXISTING CONDITIONS IF ALL SEWAGE TREATMENT PLANTS DISCHARGE EFFLUENT AT 1.0 MG/L TOTAL PHOSPHORUS: 2000

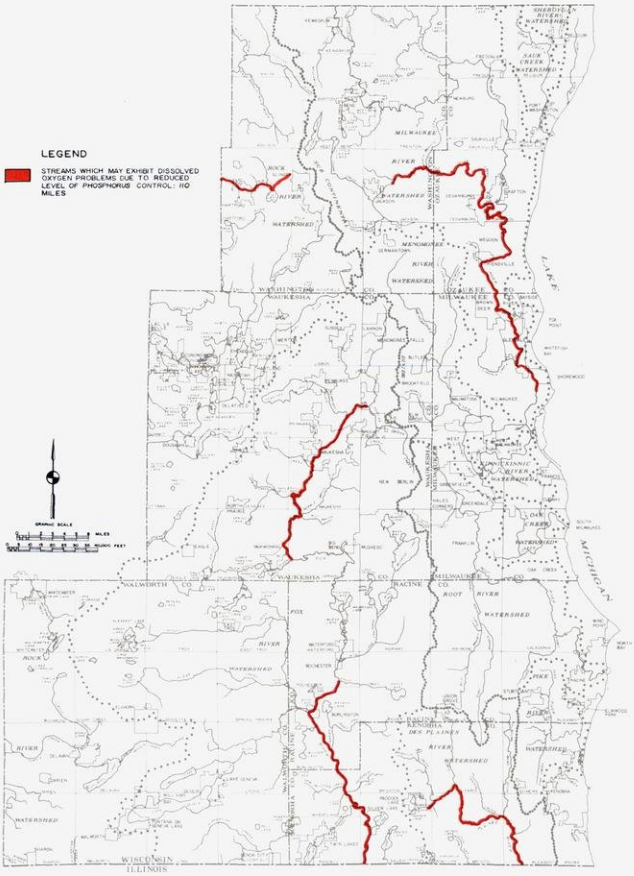


Because the final water quality plan does not provide for the high level of phosphorus removal at 18 sewage treatment plants originally proposed to provide such removal, it is possible that some degradation of stream water quality over existing conditions with respect to phosphorus could occur. This map identifies in red the 92 stream miles that may be expected to meet the proposed phosphorus standard a lower percentage of time than under current conditions, assuming that 17 sewage treatment plants identified in the plan discharge treated effluent to land. Also shown on the map are an additional 22 stream miles that may be expected to meet the proposed phosphorus standard a lower percentage of time than under current conditions if local facilities studies rule out land disposal of effluent at the 17 treatment plants.

Source: SEWRPC.

Map 22

STREAMS WHICH MAY EXHIBIT DISSOLVED OXYGEN PROBLEMS UNDER POINT SOURCE ALTERNATIVES: 2000



This map identifies those potentially affected stream reaches that may be expected to exhibit dissolved oxygen problems as a result of the change made in the preliminary plan regarding the level of phosphorus removal at sewage treatment facilities in response to the information provided through the public hearing process. As shown on this map, portions of the Des Plaines, Fox, Milwaukee, and Rubicon Rivers, as well as of Cedar Creek, may be expected to exhibit violations of the dissolved oxygen standard, as well as of the proposed instream phosphorus standard, because a high level of phosphorus removal is not to be provided at the related sewage treatment plants.

Source: SEWRPC.

Such consideration will be required in any case if federal funding for a plant construction, expansion, or improvement project is sought. If the required facilities planning efforts conclude for good reasons that land disposal of sewage effluent either is not cost-effective or is not implementable, then the facilities involved can utilize surface water disposal, provided the treatment level proposed is adequate to meet the water use objectives and supporting water quality standards. Accordingly, the Committee and the Commission concluded that the objections filed concerning this issue stemmed from a probable misunderstanding of the preliminary plan recommendation.

As already discussed, the change in the plan involving the required level of phosphorus removal for treatment plants discharging to surface waters affects the potential cost-effectiveness of providing for land disposal of treated effluent at 5 of the 21 treatment facilities identified in the preliminary plan for possible land application of effluent. Given the reduced level of phosphorus removal to be at least initially required, land disposal of sewage effluent no longer appears to be a cost-effective alternative at the treatment plants operated by the Western Racine County Sewerage District, the City of Lake Geneva, and the Villages of Twin Lakes, East Troy, and Walworth. However, land disposal of effluent continues

to be a potentially cost-effective and practical alternative for the 16 treatment facilities operated by the Villages of Belgium, Newburg, Kewaskum, Wales, North Prairie, Silver Lake, Genoa City, Sharon, and Darien; the Allenton Sanitary District; the Yorkville Sanitary District No. 1; the Lyons Sanitary District No. 2; the Salem Sewer Utility District No. 1; the Bristol Sewer Utility District No. 1; the Town of Pleasant Prairie Sewer Utility District D; and the Town of Pleasant Prairie Sanitary District No. 73-1. Future facilities planning efforts for these treatment plants should give careful consideration to land disposal of effluent. [11]

Sewage Treatment Plant Issues

The following site-specific sewage treatment plant issues were raised by the Village of Paddock Lake, the City of New Berlin, the North Park Sanitary District, and the Town of Pleasant Prairie.

Village of Paddock Lake: The preliminary areawide water quality management plan recommended that the existing Village of Paddock Lake sewage treatment facility be abandoned and that its tributary sewer service area be connected through the construction of a trunk sewer to the sewage treatment facility operated by the Town of Salem Sewer Utility District No. 1. This preliminary recommendation was objected to by both the Village Board of the Village of Paddock Lake and the Town Board of the Town of Salem. Both the Village Board and the Town Board noted that the current treatment facility operated by the Town of Salem Sewer Utility District No. 1 was meeting its current waste discharge permit requirements, had no operational problems, and, in terms of hydraulic capacity, should be sufficient to serve the needs of the District through the year 2000. The two boards further noted that the Village of Paddock Lake was nearing completion of a facilities plan that would provide for the expansion of the Paddock Lake treatment facility, and that studies in that facilities plan had shown that, without the need to consider a very high level of phosphorus removal, there were no cost savings to be achieved in effecting consolidation of the two treatment plants.

In response to this issue, the Technical Coordinating and Advisory Committee recommended, and the Commission concurred, that the plan be changed to recommend the retention, improvement, and expansion of the Village of Paddock Lake sewage treatment facility. This recommendation was based upon a finding that, since the high 0.1 mg/l level of phosphorus removal was no longer to be recommended in the system plan, there were no significant cost savings to be effected through a consolidation of the two treatment facilities. Accordingly, the plan was changed to reduce the previously planned size of the Salem Sewer Utility District No. 1 treatment facility, and to include the expansion and improvement of the existing Paddock Lake treatment facility.

As proposed under the revised plan, the Salem facility would have a design capacity of 0.25 million gallons per day (mgd), would provide a secondary level of waste treatment, and would either discharge sewage effluent to land or provide advanced waste treatment for nitrification and an effluent with a phosphorus concentration of not more than 1.0 mg/l. The Paddock Lake sewage treatment facility would have a design capacity of 0.46 mgd, would provide secondary waste treatment, and would also either discharge sewage effluent to land or provide advanced waste treatment for nitrification and phosphorus removal. In both cases, the decision as to whether to utilize land disposal of sewage effluent or to provide an advanced level of waste treatment should be made in the facilities planning process.

City of New Berlin: The City of New Berlin filed a formal statement for the hearing record noting that over the past 15 years the Milwaukee Metropolitan Sewerage District had consistently failed to meet its responsibilities to complete extensions of major trunk sewers in order to provide adequate sanitary sewer service to the eastern portion of the City of New Berlin. The City further noted that the existing Regal Manors sewage treatment facility operated by the City has the potential to become the nucleus of a permanent public sewage treatment facility to serve a substantial portion of the City, thereby eliminating the need for certain long-planned trunk sewer construction projects by the Milwaukee Metropolitan Sewerage District. In so doing, the City maintained that the continued operation of the Regal Manors facility would be the most cost-effective approach to resolving long-standing sewerage problems in the City. In addition, the City noted that it would rather consider the construction of a new sewage treatment plant to serve the northwest portion of the City than continue to plan for the provision of sewer service to that portion of the City through the Brookfield sewage treatment plant. Since the preliminary areawide water quality management plan proposed neither the retention or expansion of the Regal Manors sewage treatment facility nor the construction of a new sewage treatment facility to serve the northwest portion of the City of New Berlin, the City formally objected to the areawide plan.

In considering these objections, the Technical Coordinating and Advisory Committee and the Commission noted that the question of whether or not the retention and possible expansion of the Regal Manors treatment facility represents a cost-effective solution to the problem of providing expanded sanitary sewer service to the City of New Berlin was currently being examined as part of the major facilities planning effort of the Milwaukee Metropolitan Sewerage District. The possibility of retaining the Regal Manors sewage treatment facility as a permanent facility and of foregoing certain trunk

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[11] *Consideration of land disposal of sewage effluent should also be given in facilities planning for a 17th treatment facility—that operated by the Village of Paddock Lake. This treatment facility, which was not included as a planned treatment facility in the preliminary plan, was added to the final plan for reasons set forth in the text.*

sewer construction was recognized in the preliminary plan that was taken to the hearing. Accordingly, the Committee and the Commission concluded that the question raised by the City of New Berlin with respect to the Regal Manors facility would be addressed through the cooperative facilities planning process being conducted by the Milwaukee Metropolitan Sewerage District.

With respect to the proposal by the City of New Berlin to construct a new sewage treatment facility to serve the northwest portion of the City, the Technical Coordinating and Advisory Committee recommended, and the Commission concurred, that the plan remain as presented at the hearing. It was noted that the City of New Berlin is by contract a fully participating member of the Poplar Creek Sewerage Commission, a cooperative sewer commission formed by and between the City of Brookfield, the Town of Brookfield, and the City of New Berlin. The Poplar Creek Sewerage Commission has, in accordance with the recommendations contained in the adopted regional sanitary sewerage system plan, begun construction of the Poplar Creek trunk sewer that will jointly serve the three communities. The initial portion of that sewer is in place and was fully funded by the City of Brookfield. That initial portion of the sewer has capacity reserved for use by the City of New Berlin in future years. Similarly, the facilities planning program for the City of Brookfield treatment facility now underway is taking into account the required capacity needed by the City of New Berlin to provide sanitary sewer service in the northwest portion of the City. Accordingly, the Advisory Committee and the Commission concluded that the decision to expand the Brookfield sewage treatment plant and to build the Poplar Creek trunk sewer represents a committed decision that should be honored by all parties concerned.

North Park Sanitary District: The preliminary areawide water quality management plan recommended that the sewage treatment plant operated by the North Park Sanitary District be abandoned and its tributary service area connected through the construction of a new trunk sewer to the City of Racine treatment facility. This recommendation was formally objected to in statements filed by the North Park Sanitary District, the Crestview Sanitary District, which contracts with the North Park Sanitary District for treatment services, and the Town Board of the Town of Caledonia. These three units of government expressed a desire to retain local control over the provision of treatment services, and questioned the cost-effectiveness of the plan proposal.

A special intergovernmental meeting was held on June 1, 1979, to discuss the objections raised by the three units of government. In attendance at that meeting in addition to representatives of the North Park Sanitary District, the Crestview Sanitary District, and the Town of Caledonia were representatives of the City of Racine, the Wisconsin Department of Natural Resources, and the Regional Planning Commission. At that meeting the history of the proposal to abandon the North Park Sanitary District sewage treatment facility was reviewed, including the previous work accomplished by the Racine Urban Planning District Citizens Advisory Committee and the Technical Coordinating and Advisory Committee on Regional Sanitary Sewerage System Planning. It was noted that out of that planning work, which was accomplished in the early 1970's, came a decision by the Commission, reflected in the adopted regional sanitary sewerage system plan, to provide for an interim expansion of the North Park Sanitary District treatment facility to solve immediate, pressing needs, together with long-term abandonment of the facility and the construction of a trunk sewer to the City of Racine sewage treatment facility. This decision was carried over into the preliminary areawide water quality management plan without further analysis.

The Wisconsin Department of Natural Resources representatives at the meeting noted that there was again a pressing need by 1982 to either improve the level of treatment provided by the North Park Sanitary District treatment facility or abandon that treatment facility. If the 1982 deadline is not practical, then such action would have to be taken at a future date to be determined by court order. It was agreed by all parties in attendance at the meeting that it would be both necessary and desirable to immediately undertake whatever facilities planning and engineering work is necessary to specifically determine, in response to the deadline being imposed by the Wisconsin Department of Natural Resources, whether or not it would be more cost-effective to abandon the North Park treatment facility and construct a new trunk sewer to convey sewage to the City of Racine sewage treatment facility, or to expand and improve the North Park treatment facility and possibly construct an outfall sewer to permit the discharge of sewage effluent to Lake Michigan. It was further noted that the City of Racine had under consideration a proposal to conduct a facilities planning program for its entire proposed sewer service area, and that the questions raised concerning the cost-effectiveness of abandoning the North Park treatment facility could be addressed as part of that facilities planning effort. Alternatively, a separate but coordinated facilities planning effort by the North Park Sanitary District could be undertaken. Thus, it was agreed to take appropriate steps to ensure that either the Racine areawide facilities planning effort or a separate North Park Sanitary District planning effort would reexamine the question of cost-effectiveness of abandonment of the North Park treatment facility and that, pending the results of this additional planning effort, the areawide water quality management plan would remain as it was presented at the public hearing. Should the subsequent facilities planning effort conclude that it is more cost-effective to expand and improve the North Park Sanitary District sewage treatment facility, then it was further agreed that the areawide water quality management plan would be appropriately amended to reflect that conclusion.

In considering this matter, the Technical Coordinating Advisory Committee and the Commission concurred with the agreement reached at the intergovernmental meeting held on June 1, 1979. Accordingly, the areawide water quality management plan was not changed with respect

to the North Park Sanitary District sewage treatment facility. The Advisory Committee and the Commission recognized, however, that the plan could change should a subsequent facilities planning effort determine that it is more cost-effective to improve and expand the North Park Sanitary District treatment facility than to abandon that facility and construct the necessary trunk sewer system.

Town of Pleasant Prairie: The preliminary areawide water quality management plan recommended that a new trunk sewer be extended south from the Kenosha sewage treatment facility in the Sheridan Road corridor of the Town of Pleasant Prairie. The construction of this trunk sewer would enable the abandonment of the small, inadequate sewage treatment facility operated by the Pleasant Park Utility Company and would further permit the Town of Pleasant Prairie to solve existing water pollution and public health hazard problems caused by malfunctioning onsite sewage disposal systems in the eastern portion of the Town. The Town Board of the Town of Pleasant Prairie filed a statement endorsing the preliminary plan proposal as an ultimate solution to the problems of providing expanded sanitary sewer service to the eastern portion of the Town, but also called for the construction of a major new sewage treatment facility to serve the Carol Beach area of the Town and for the reconstruction and expansion of the Pleasant Park Utility Company sewage treatment facility. The Town thus requested that the plan be changed to provide for the improvement and expansion of the Pleasant Park sewage treatment facility, as well as the construction of a new Carol Beach treatment facility, while postponing further consideration of the Sheridan Road corridor trunk sewer to a period beyond the plan design year 2000.

An intergovernmental meeting was held on May 22, 1979, to discuss the proposals raised by the Town of Pleasant Prairie. In attendance at that meeting, in addition to representatives of the Town, were representatives of the City of Kenosha, the Wisconsin Department of Natural Resources, and the Regional Planning Commission. At that meeting the previous planning and engineering work concerning the provision of sanitary sewer service to the eastern portion of the Town of Pleasant Prairie was reviewed. It was noted that the proposal to abandon the Pleasant Park sewage treatment facility through the construction of a Sheridan Road trunk sewer was first advanced in the mid-1960's as part of the comprehensive plan for the Kenosha Planning District. That proposal was carried forward into the regional sanitary sewerage system plan adopted by the Commission in 1974. The proposal was further reevaluated as part of a facilities planning effort conducted by the City of Kenosha and in which the Town of Pleasant Prairie and other concerned units and agencies of government participated. The results of that facilities planning effort confirmed that from a long-range planning perspective, the most cost-effective solution to the sewerage problems in the eastern portion of the Town of Pleasant Prairie is the construction of the Sheridan Road corridor trunk sewer.

There was considerable discussion at the meeting on the practical problems faced by the Town in effecting construction of the recommended trunk sewer. Since the Town is unincorporated, lands lying within the Town and within the service area of the subject sewer could possibly be annexed to the City of Kenosha in the future, and that tax base could thereby be lost to the Town. Thus, the Town is concerned from a practical point of view that should it proceed with the construction of the subject trunk sewer and incur significant debt in relation thereto, it may be left with a steadily declining tax base upon which to service that debt. Several ways in which this potential problem could be avoided were discussed at the meeting, including the creation of a metropolitan sewerage district, the incorporation by the Town, thus ending annexation issues, and the negotiation of an intergovernmental agreement between the City of Kenosha and the Town that would result in the establishment of a jurisdictional boundary between the City of Kenosha and the Town of Pleasant Prairie. It was agreed by all those present at the meeting that one of these approaches to resolving the practical problems faced by the Town needed to be taken in order for the Town to commit itself to construction of the much needed trunk sewer.

In considering this matter, the Technical Coordinating Advisory Committee recommended, and the Commission concurred, that the long-range plan to construct the Sheridan Road corridor trunk sewer in the Town of Pleasant Prairie remain unchanged. The Committee and the Commission recommended that the City of Kenosha and the Town of Pleasant Prairie undertake negotiations to determine the best way in which the practical problems faced by the Town with respect to construction of the trunk sewer could be resolved. The Committee and the Commission further acknowledged that it may be necessary, should public health problems created by malfunctioning onsite sewage disposal systems become very severe and should no practical way be found to fund the construction of the necessary trunk sewer, to again consider the construction of an interim, temporary sewage treatment facility in the Carol Beach area of the Town.

Sewer Service Area and Trunk Sewer Issues

The following site-specific sewer service area and trunk sewer issues were raised in the public informational meetings and hearing by the Delavan Lake Sanitary District, the Town of Pleasant Prairie, the Town of Somers, and the Town of Mt. Pleasant. In addition, while not formally a part of the public hearing record, such issues were raised by actions taken during the public informational period by the Milwaukee Metropolitan Sewerage District, the Town of Pewaukee, and the City of Brookfield under concurrent facilities planning efforts.

Delavan Lake Sanitary District: The Delavan Lake Sanitary District filed a statement at the public hearing on the preliminary plan indicating that the proposed sewer service area for that District, as shown on the preliminary plan materials, was not fully consistent with the sewerage facilities plan previously approved by the

Regional Planning Commission, the Wisconsin Department of Natural Resources, and the U. S. Environmental Protection Agency. The District accordingly asked that the final plan reflect the sewer service area that corresponds to the major sewer collection system construction project now being undertaken in the District.

In response to this request, the sewer service area in the previously approved sewerage facilities plan for the District was compared with the sewer service area as identified in the preliminary water quality management plan taken to hearing. It was determined that these two sewer service areas were fully consistent. Upon further discussion with Delavan Lake Sanitary District officials, it was learned that the sewer service area for the District had been changed slightly in the preparation of detailed plans and specifications preliminary to the construction of the sewer collection system. This change in sewer service area occurred after the Regional Planning Commission, the Wisconsin Department of Natural Resources, and the U. S. Environmental Protection Agency had approved the sewerage facilities plan. The additional sewer service area subsequently approved by the Wisconsin Department of Natural Resources as part of its approval of the detailed plans and specifications would extend sanitary sewer service to about 13 existing homes and 22 vacant platted lots, constituting approximately an 100-acre addition to the 2,030-acre District sewer service area. The Advisory Committee recommended, and the Commission concurred, that this additional sewer service area be considered committed and added to the proposed sanitary sewer service area set forth in the areawide water quality management plan. The revised Delavan Lake Sanitary District sewer service area is shown on Map 23.

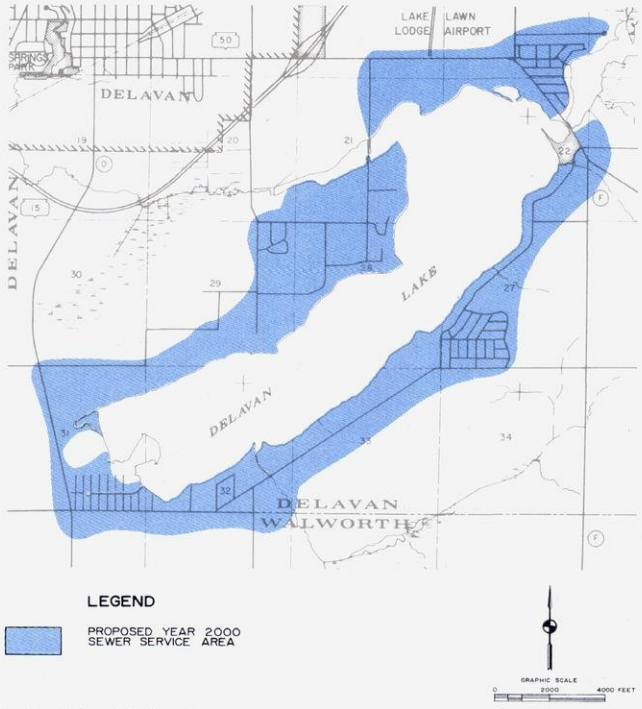
Town of Pleasant Prairie: The Town Board of the Town of Pleasant Prairie filed a statement at the public hearing requesting that certain changes be made to the proposed sewer service areas of two treatment facilities operated by the Town—the Sewer Utility District D treatment facility and the Sanitary District 73-1 treatment facility. These matters were discussed at an intergovernmental meeting held on May 22, 1979, and attended by representatives of the Town, the City of Kenosha, the Wisconsin Department of Natural Resources, and the Regional Planning Commission.

With respect to the service area of Sewer Utility District D, the Town of Pleasant Prairie requested that the service area be expanded both north of STH 50 and south of Bain Station Road. The Town indicated that while it agreed with the planned population level for Sewer Utility District D as shown in the preliminary plan, it was probable that the land use densities at which the Town would permit urban development were such as to require somewhat more land area for new urban development than identified in the adopted regional land use plan. Such development would, however, continue to occur within the planned medium-density range of residential development as identified in the regional land use plan. A portion of the proposed expansion of the District D service area lying north of STH 50, east of STH 192, and west of the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks lies within the Pike River watershed and was proposed in the preliminary plan to be served through expansion of the Kenosha sewerage system. It was agreed at the intergovernmental meeting to recommend to the Commission that these minor refinements in sewer service area delineation for the Pleasant Prairie Sewer Utility District D treatment facility be included in the final plan. The original District D service area encompassed about three square miles. The additions total about two square miles, thus resulting in a revised service area of about five square miles.

The second change proposed by the Town of Pleasant Prairie involved the addition of about three square miles of land to the planned sewer service area of the Sanitary District 73-1 treatment facility. The lands in question lie generally along either side of CTH H south of CTH T,

Map 23

POST PUBLIC HEARING DELINEATION OF THE DELAVAN LAKE SEWER SERVICE AREA: 2000



During the public hearing process on the areawide water quality management plan, the Delavan Lake Sanitary District indicated that the service area originally included in the local facility plan and in the preliminary areawide water quality management plan had been slightly modified during the preparation of detailed facility construction plans and specifications. A small area totaling about 100 acres located adjacent to and south of the Delavan Lake outlet in Section 21 of the Town of Delavan was to be provided with sewer service, and sewers to serve that area were under construction. This added sewer service area was thus considered to be committed and was added to the recommended sewer service area set forth in the areawide water quality management plan.

Source: SEWRPC.

which is the southern boundary of the major electric power generation plant now under construction by the Wisconsin Electric Power Company. Concomitantly, certain reductions in that portion of the District 73-1 treatment facility service area lying east of STH 31 were proposed. The Town Board noted that, in particular, that portion of the proposed sewer service area bounded by CTH T on the north, CTH H on the west, CTH ML on the south, and the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks on the east was being held out as a prime site for future industrial development, particularly development that would require sites of 100 acres or more in area. The Town indicated that it had no desire to accommodate new residential development in this portion of the District 73-1 service area.

This proposal by the Town was discussed at the intergovernmental meeting. It was noted in particular that the creation of a new major sewer service area in this portion of the Town represented a significant departure from the recommendations contained in the adopted comprehensive plan for the Kenosha Planning District. [12] Representatives of the City of Kenosha and the Town agreed, however, that there was a need to provide within the Kenosha Planning District land for major new industrial development, and in particular for industries that may require very large sites. Accordingly, it was agreed by all those in attendance at the meeting that the sewer service area for the Town of Pleasant Prairie Sanitary District 73-1 should be changed to reflect both the addition of lands lying south of CTH T in the Town for industrial land use development purposes and a concomitant reduction in that portion of the sewer service area lying east of STH 31 as proposed by the Town. The original District 73-1 service area encompassed about three square miles. The net change in service area as proposed would result in adding about one square mile, thus resulting in a revised service area of about four square miles.

In considering these matters, the Technical and Advisory Committee recommended to the Commission, and the Commission concurred, that the sewer service areas of the Town of Pleasant Prairie Sewer Utility District D and Sanitary District 73-1 be revised as proposed. The revised sewer service area delineations for these two treatment facilities as incorporated in the final areawide water quality management plan are identified on Maps 24 and 25.

Town of Somers and Town of Mt. Pleasant: The Town Board of the Town of Somers filed a statement for the public hearing record supporting the construction of the Parkside trunk sewer in the City of Kenosha and the Town of Somers that would ultimately allow the abandonment of the sewage treatment facility operated by the Town of Somers Utility District No. 1. The Board expressed concern, however, that the sewer service area attendant to that future trunk sewer as shown in the materials submitted as part of the preliminary plan would not permit the provision of sanitary sewer service to certain lands lying adjacent to the proposed trunk sewer in an area lying between the University of Wisconsin-Parkside and the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks just east of the unincorporated village of Somers. The Board expressed agreement with the objective of preserving prime agricultural land, but indicated that, in the opinion of the Town Board, it would be impractical to preserve such land immediately adjacent to a major trunk sewer. Similar comments were made by a representative of the Town of Mt. Pleasant concerning the sewer service area connecting the Sturtevant-Mt. Pleasant trunk sewer to the Racine sewage treatment plant.

In considering these matters, the Technical Coordinating and Advisory Committee and the Commission concurred with the comments of the Town Board of the Town of Somers and Town of Mt. Pleasant representative and indicated that the sewer service areas for the proposed Parkside and Sturtevant-Mt. Pleasant trunk sewers should be appropriately revised in cooperation with the local governments concerned. In this respect, the Advisory Committee and the Commission recommended that a procedure be developed for refining and detailing all sanitary sewer service areas in cooperation with the local units of government and other management agencies involved as part of the continuing water quality management planning process. This procedure is discussed below.

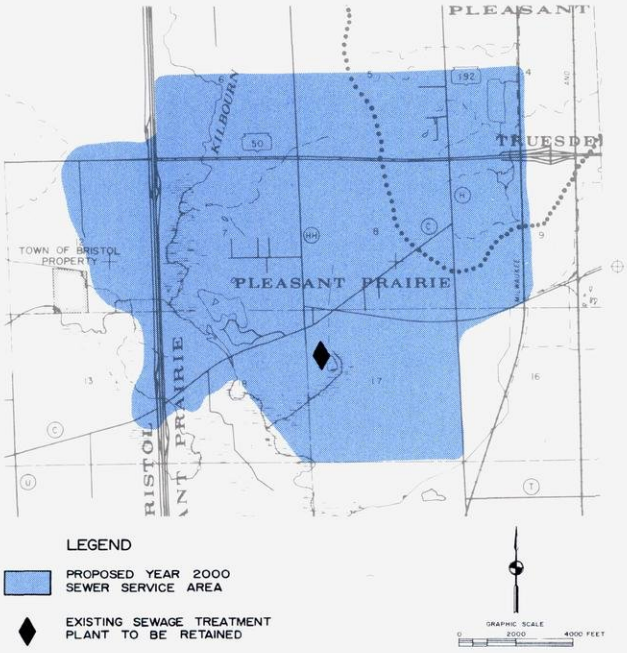
Milwaukee Metropolitan Sewerage District: During the public informational period for the areawide water quality management plan, the Milwaukee Metropolitan Sewerage District was proceeding with its sewerage facilities planning program. As a part of that effort, the District decided to postpone detailed planning for four previously planned major trunk sewers to serve portions of the Cities of Franklin and Oak Creek and the Caddy Vista Sanitary District in the Town of Caledonia until the need for such planning is indicated by revised land use planning. These four trunk sewers are the Ryan Creek trunk sewer, the Oak Creek South trunk sewer, the Oak Creek Southwest trunk sewer, and the Caddy Vista trunk sewer. The locations of these four trunk sewers, as well as their respective ultimate service areas, are identified on Map 26. The District indicated in a communication to the Commission that planning for these four trunk sewers was being postponed because it appeared that they would not be needed by the plan design year 2000. In the preliminary water quality management plan, the Commission had proposed that one of the trunk sewers—the Ryan Creek trunk sewer—be delayed for construction beyond the year 2000. Thus, the action taken by the Milwaukee Metropolitan Sewerage District confirmed the Commission's finding with respect to the Ryan Creek trunk sewer and to a lesser degree because of the extent of existing and proposed urban development extended that finding to include the other three trunk sewers.

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[12] *See SEWRPC Planning Report No. 10, A Comprehensive Plan for the Kenosha Planning District. This plan was completed in 1967 and adopted by the Regional Planning Commission on June 1, 1972, and by the City of Kenosha on October 16, 1971.*

Map 24

POST PUBLIC HEARING DELINEATION OF THE SEWER SERVICE AREA TRIBUTARY TO THE TOWN OF PLEASANT PRAIRIE SEWER UTILITY DISTRICT D TREATMENT FACILITY: 2000

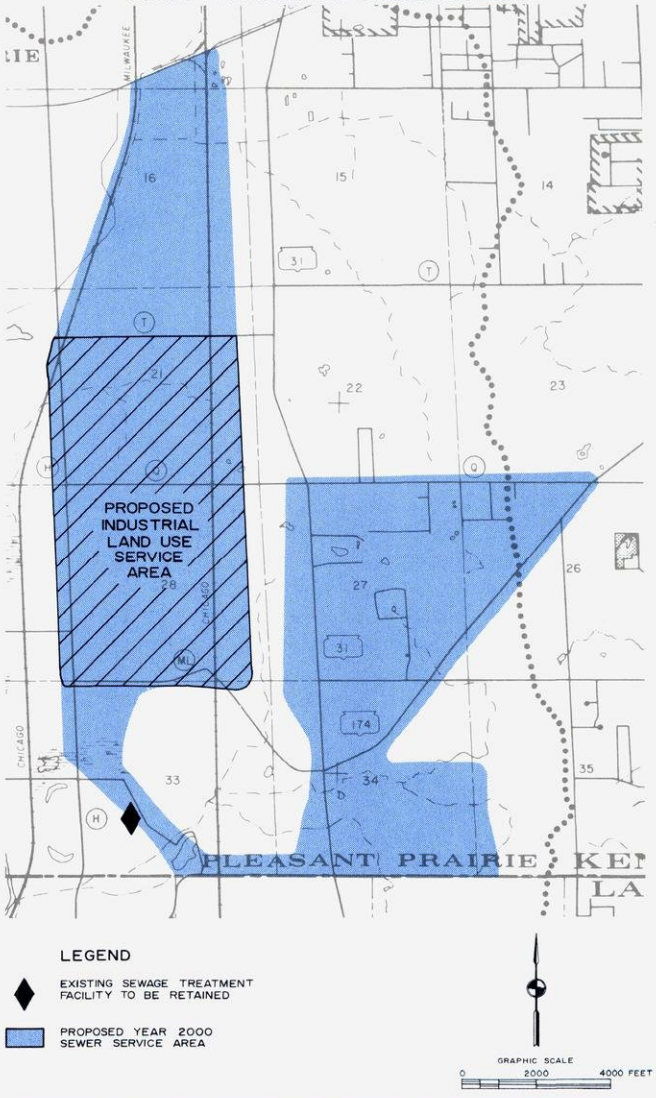


During the public hearing process on the areawide water quality management plan, the Town Board of the Town of Pleasant Prairie requested that certain changes be made in the proposed sewer service area tributary to the Town of Pleasant Prairie Sewer Utility District D treatment facility. This request was discussed at an intergovernmental meeting involving representatives of the Town, the City of Kenosha, the Wisconsin Department of Natural Resources, and the Regional Planning Commission. The Town requested that the service area be expanded both north of STH 50 and south of Bain Station Road. The Town indicated that while it agreed with the planned population level for Sewer Utility District D as shown in the preliminary plan, it was probable that the land use densities at which the Town would permit urban development were such as to require somewhat more land area for new urban development than identified in the adopted regional land use plan. Such development would, however, continue to occur within the planned medium-density range of residential development as identified in the regional land use plan. It was agreed at the intergovernmental meeting that these minor refinements in sewer service area delineation for the Pleasant Prairie Sewer Utility District D treatment facility be recommended to the Commission for inclusion in the final plan. Accordingly, the final plan includes a modified sewer service area for portions of the Town of Pleasant Prairie.

Source: SEWRPC.

Map 25

POST PUBLIC HEARING DELINEATION OF THE SEWER SERVICE AREA TRIBUTARY TO THE PLEASANT PRAIRIE SANITARY DISTRICT NO. 73-1 TREATMENT FACILITY: 2000



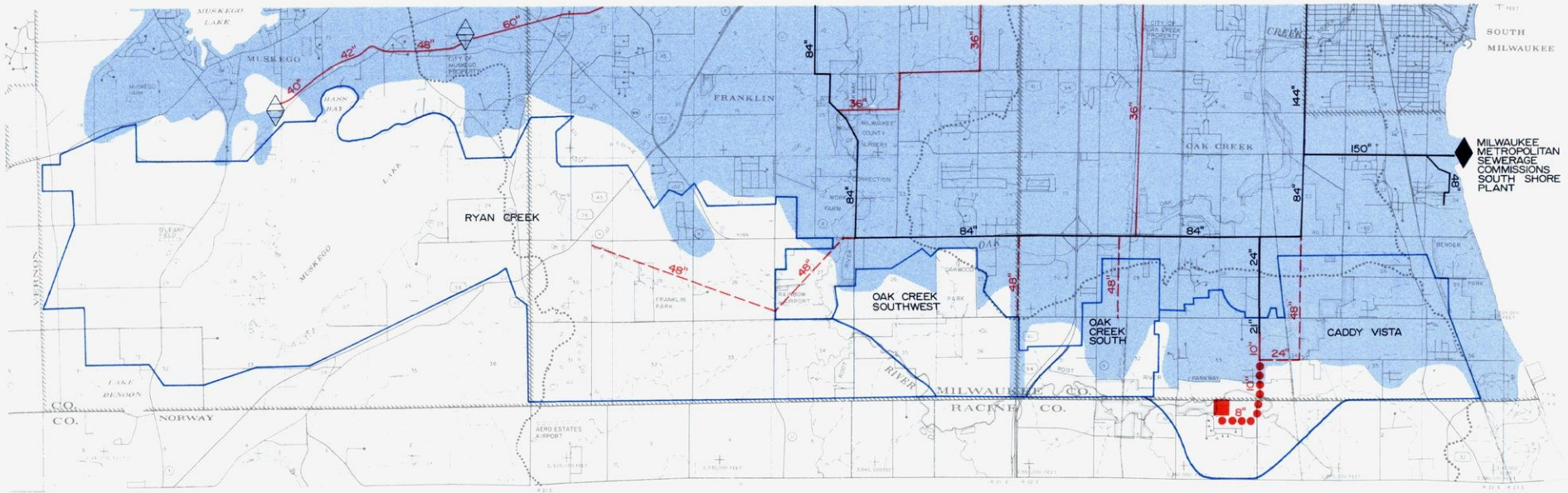
During the public hearing process on the areawide water quality management plan, the Town Board of the Town of Pleasant Prairie requested that certain changes be made in the proposed sewer service area tributary to the Town of Pleasant Prairie Sanitary District No. 73-1 treatment facility. This request was discussed at an intergovernmental meeting involving representatives of the Town, the City of Kenosha, the Wisconsin Department of Natural Resources, and the Regional Planning Commission. The lands in question lie generally along either side of CTH H south of CTH T, which is the southern boundary of the major electric power generation plant now under construction by the Wisconsin Electric Power Company. Concomitantly, certain reductions in that portion of the District 73-1 treatment facility service area lying east of STH 31 were proposed. The Town Board noted that, in particular, that portion of the proposed sewer service area bounded by CTH T on the north, CTH H on the west, CTH ML on the south, and the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks on the east was being held out as a prime site for future industrial development, particularly new industrial development that would require sites of 100 acres or more in area. It was agreed that the sewer service area for the Town of Pleasant Prairie Sanitary District 73-1 should be changed to reflect both the addition of lands lying south of CTH T in the Town for industrial land use development purposes and a concomitant reduction in that portion of the sewer service area lying east of STH 31 as proposed by the Town. The service area was adjusted accordingly in the final recommended areawide water quality management plan.

Source: SEWRPC.

This matter was discussed at an intergovernmental meeting held on May 16, 1979. In attendance at the meeting were representatives of the Milwaukee Metropolitan Sewerage District, the Cities of Franklin and Oak Creek, the Wisconsin Department of Natural Resources, and the Regional Planning Commission. It was agreed at the meeting by all parties that the forecast population and land use demand within the service areas of these four trunk sewers as determined at this time were insufficient to warrant their construction before the year 2000. Some concern was expressed, however, by the officials of Franklin and Oak Creek that further delay in the construction of these trunk sewers could make it much more difficult for the local officials to eliminate

Map 26

POSTPONED MILWAUKEE METROPOLITAN SEWERAGE DISTRICT TRUNK SEWERS



LEGEND

- PROPOSED SEWER SERVICE AREA 2000
- ULTIMATE TRUNK SEWER SERVICE AREA BOUNDARY
- EXISTING TRUNK SEWER
- POSTPONED TRUNK SEWER
- PROPOSED TRUNK SEWER
- PROPOSED FORCE MAIN
- PROPOSED PUMPING STATION
- EXISTING TREAMENT PLANT TO BE RETAINED
- EXISTING TREATMENT PLANT TO BE ABANDONED

Based upon the findings of local facility planning for the Milwaukee metropolitan subregional area, it was determined to postpone the planning for four major trunk sewers previously included in the long-range plans of the Milwaukee Metropolitan Sewerage District because the forecast population and land use demand within the service areas of these trunk sewers were insufficient to warrant their construction before the year 2000. The four trunk sewers are the Ryan Creek trunk sewer, the Oak Creek Southwest trunk sewer, the Oak Creek South trunk sewer, and the Caddy Vista trunk sewer. These four trunk sewers will continue to be included in the planning by the District for ultimate sewer service needs. Local problems that may be expected to occur as a result of the delay in constructing these trunk sewers, in particular problems concerning the operation of existing pumping and lift stations without these four sewers, are to be addressed in the local facility planning program.

Source: SEWRPC.

existing sewerage system problems, particularly problems that might arise in connection with the operation of sewage lift and pumping stations. It was agreed that the District's facilities planning effort would address any such documented problems that might occur in the absence of the construction of these trunk sewers during the plan design period and, if such problems were found to exist, the facilities plan would be reviewed and reevaluated with regard to the need for these trunk sewers. In addition, it was agreed at the meeting that there remains a long-term need to continue to plan for the ultimate construction of the four above-noted trunk sewers, it being probable that construction of the sewers will be required for urban growth and development that might occur beyond the plan design year 2000.

Accordingly, it was agreed that while the four sewers should not be shown on the areawide water quality management plan and the District facilities plan now under preparation, those plans having a design year of 2000, the four trunk sewers would continue to be shown by the District in its ultimate sewerage facilities plan. In addition, it was noted that this recommendation would mean that the previously proposed interim connection that would enable the abandonment of the Caddy Vista sewage treatment facility in the Town of Caledonia, which would consist of a pumping station and force main and the use of an existing City of Oak Creek sewer to enable sewage to flow from the presently developed area of the Caddy Vista Sanitary District to the Milwaukee metropolitan trunk sewer system, would be used until such time that a District facility would replace it. Should a decision be made at some future date to build the Caddy Vista trunk sewer or some other District facility, then the use of the Oak Creek trunk sewer by the Caddy Vista Sanitary District could be terminated and further development of the Sanitary District could be accommodated.

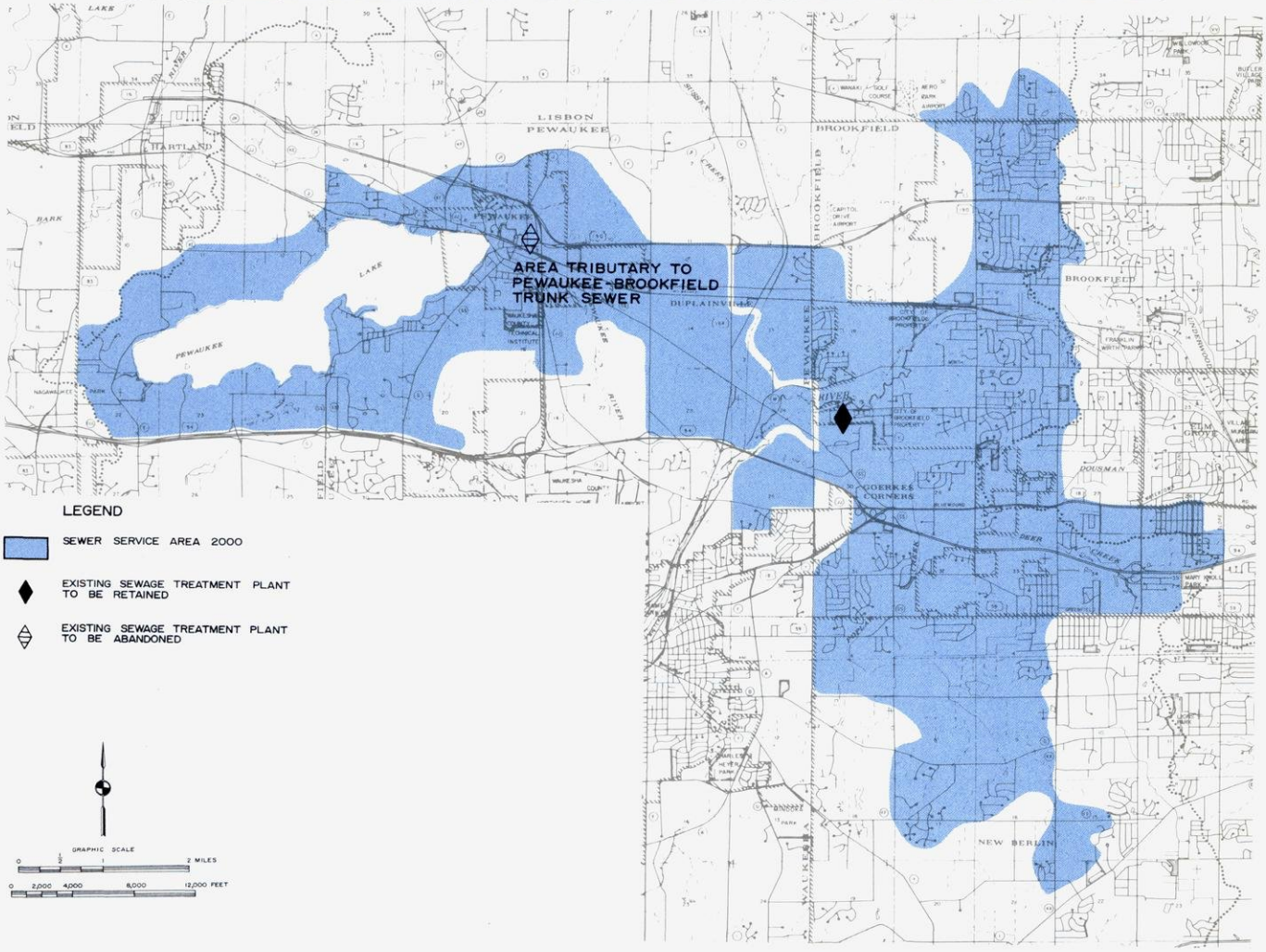
City of Brookfield and Town of Pewaukee: The City of Brookfield, in cooperation with other communities lying in the Upper Fox River watershed, was in the process of completing the preparation of a sewerage facilities plan pertaining to the expansion of the Brookfield treatment facility and the construction of certain trunk sewers leading to that treatment facility during the public informational period on the areawide water quality management plan. Two issues arose in the conduct of that facilities planning effort which, while not explicitly included in the record of the public hearing on the plan, bear upon the final areawide plan. These two issues pertain to the sewer service area in the Town of Pewaukee to be served by the trunk sewer under construction at the time of the hearing between the Brookfield sewage treatment facility and the Village of Pewaukee, and the alignment and sizing of a major trunk sewer north of the Brookfield treatment facility to serve not only the City of Brookfield but the Towns of Brookfield, Pewaukee, and Lisbon and the Villages of Lannon, Menomonee Falls, and Sussex. These issues were discussed at an intergovernmental meeting held on June 1, 1979. In attendance at that meeting were representatives of the Cities of Brookfield and New Berlin; the Villages of Lannon, Menomonee Falls, Pewaukee, and Sussex; the Towns of Brookfield, Lisbon, and Pewaukee; the Lake Pewaukee Sanitary District; the Wisconsin Department of Natural Resources; and the Regional Planning Commission. Additional intergovernmental meetings were subsequently held between the Village and Town of Pewaukee and the Lake Pewaukee Sanitary District in an attempt to agree on a final sewer service area with respect to the Pewaukee trunk sewer issue.

The sewer service area attendant to the major trunk sewer designed to serve the Village of Pewaukee, a portion of the Town of Pewaukee, and the Lake Pewaukee Sanitary District was initially delineated as part of the adopted regional sanitary sewerage system plan, and was refined and detailed in the sewerage facilities planning effort that supported the federal grant received by the Village of Pewaukee to construct the subject trunk sewer. It was not envisioned that that initial sewer service area would provide service to existing or new urban development in that portion of the Town of Pewaukee generally bounded by CTH F on the west, STH 190 on the north, the Soo Line Railroad tracks on the east, and IH 94 on the south. During the various meetings held concerning this matter it was apparent that, in addition to extensive existing development in the area, a number of land use development and water utility construction commitments had been made by the Town of Pewaukee and by Waukesha County that assumed the future availability of centralized sanitary sewer service to this general area. These commitments related primarily to industrial development, the area being highly attractive for industrial land use because of natural terrain, the availability of rail service, and accessibility to the regional freeway system. Some industrial land uses have already been developed in the area, utilizing holding tanks as a temporary measure pending the availability of sanitary sewer service. After carefully reviewing this matter, all parties concerned agreed that the sewer service area attendant to the Pewaukee-to-Brookfield trunk sewer should be revised to reflect commitments made to accommodate industrial and commercial land use development in that portion of the Town of Pewaukee generally bounded by CTH F on the west, the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks on the north, the Soo Line Railroad tracks on the east, and IH 94 on the south, with residential development to be accommodated in that portion of the Town generally bounded by CTH F on the west, STH 190 on the north, Springdale Road on the east, and the Chicago, Milwaukee, St. Paul & Pacific Railroad tracks on the south. Concomitantly, reductions in planned sewer service area in both the Village and Town of Pewaukee north of STH 190 were made. The proposed revised sewer service area for this trunk sewer for the year 2000 is shown on Map 27. This area totals about 15 square miles, representing an increase of 5 square miles over the previously proposed service area of about 10 square miles.

The concern over the construction of a major new trunk sewer north from the Brookfield sewage treatment plant primarily was centered on the relative cost-effectiveness of building a single trunk sewer—as initially envisioned in the regional sanitary sewerage system

Map 27

POST PUBLIC HEARING DELINEATION OF THE PEWAUKEE AND BROOKFIELD-WEST SEWER SERVICE AREAS



During the public hearing process on the areawide water quality management plan, questions arose regarding the planned sewer service area in the Town of Pewaukee to be served by the trunk sewer that is under construction from the Village of Pewaukee to the Brookfield sewage treatment plant. This issue was discussed at several intergovernmental meetings during which it became apparent that, in addition to extensive existing development in the area, a number of land use development and water utility construction commitments had been made by the Town of Pewaukee and by Waukesha County that assumed the future provision of centralized sanitary sewer service to this general area. These commitments primarily involved industrial development. After carefully reviewing this matter, all parties concerned agreed that the sewer service area attendant to the Pewaukee-to-Brookfield trunk sewer should be revised to reflect commitments made to accommodate industrial and commercial land use development in the Town of Pewaukee, and the sewer service area was adjusted accordingly.

Source: SEWRPC.

plan—as opposed to building two trunk sewers, one to be built in the near future by the City of Brookfield and one to be built toward the end of the plan design period jointly by the other communities involved. Based upon an economic analysis presented by the City of Brookfield to all of the parties concerned at the June 1, 1979, intergovernmental meeting, it was agreed that the costs involved in either alternative would be about the same. It was further agreed that there appeared to be several advantages in changing the plan to reflect a two-sewer approach to the problem, particularly since the City of Brookfield was faced with resolving a serious problem of sewage bypassing at a lift station in the Imperial Estates area, which could be resolved by the construction of the initial sewer. Accordingly, it was agreed that a recommendation should be presented to adjust the areawide water quality management plan to reflect the proposal to construct two northerly trunk sewers in the upper Fox River area rather than a single trunk sewer as initially proposed. One sewer would be initially constructed by the City of Brookfield to solve immediate sewage bypass problems and the other would be constructed jointly by all communities concerned near the end of the plan design period. The recommended alignment and sizing for the two trunk sewers, along with the attendant initial sewer service areas to the two

trunk sewers along the Fox River north of the Brookfield sewage treatment facility, are shown on Map 28.

In considering these two matters in the Upper Fox River watershed, the Technical Coordinating and Advisory Committee recommended to the Commission, and the Commission concurred, that the changes in sewer service areas and trunk sewer alignments as agreed to in the intergovernmental meetings be accepted as proposed. Accordingly, the final areawide water quality management plan was revised as recommended by the communities affected.

General Approach to Sewer Service Area Refinement and Detailing

The sewer service area issues raised in the public participation process indicated a need to develop a general procedure under the continuing water quality management planning process for refining, detailing, and, as necessary, amending the sanitary sewer service areas identified in the areawide water quality management plan. A recent change in the process for the review and approval of sewer extensions by the Wisconsin Department of Natural Resources, which requires the Commission to review and comment on all sanitary sewer extensions with respect to their relationship to the areawide water quality management plan, further indicated a need to achieve intergovernmental agreement on the delineated sanitary sewer service areas.

It was initially envisioned in the areawide water quality management plan that sanitary sewer service areas would be refined and detailed as necessary as part of the formal sewerage facilities planning programs to be conducted on a community-by-community basis as the need arose to consider the construction of major new sewerage facilities. It was envisioned that sewer service areas identified in the systems level plan would be amended and refined through the review and approval by all parties concerned of any revised sewer service area delineations produced by such local facilities planning efforts. Given the recent change in processing sewer service extensions, however, it appears that relying entirely on the facilities planning process to perform this function may be inadequate. Accordingly, it is recommended that the Regional Planning Commission, as a part of the continuing areawide water quality management planning process, undertake a program to refine and detail all sanitary sewer service areas identified in the areawide plan in a manner consistent with the adopted regional land use plan. This program should be coordinated insofar as possible with any sewerage facilities planning work that may be underway. It is envisioned that this program will consist of the following seven steps:

1. The preparation of a base map at an appropriate scale for each sewer service area identified in the areawide systems plan.

2. The delineation on that base map of the design year 2000 sewer service area as that area is proposed in the areawide systems plan.

3. The conduct of intergovernmental meetings among all affected local water quality management agencies at which the initial sewer service area delineation would be discussed and the position of the local agencies solicited. This discussion would include an explanation of the rationale underlying the proposed sanitary sewer service delineation, including an explanation of the basis for the delineation of the primary environmental corridors and other environmentally sensitive areas which the regional land use plan and the regional water quality management plan indicate should not be developed for intensive urban use and which, therefore, should not be included in sanitary sewer service areas.

4. The modification of the proposed sewer service area to reflect adjustments agreed upon by all parties at the intergovernmental meetings and which reflect the basic objectives set forth in the adopted regional land use plan, and the documentation of a design year population and land use density as the configuration for the modified service area.

5. The holding of a public hearing jointly by the Commission and the local management agencies involved to obtain public reaction to the site-specific sewer service area issues that might be raised by the proposed sewer service area delineation.

6. The preparation of a final refined and detailed sanitary sewer service area map and the certification of copies of that map to all parties and agencies concerned.

7. Adoption of the refined and detailed service area map by the Commission and the local management agencies concerned, and certification of the sewer service area map to the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency as amendments to the adopted areawide water quality management plan.

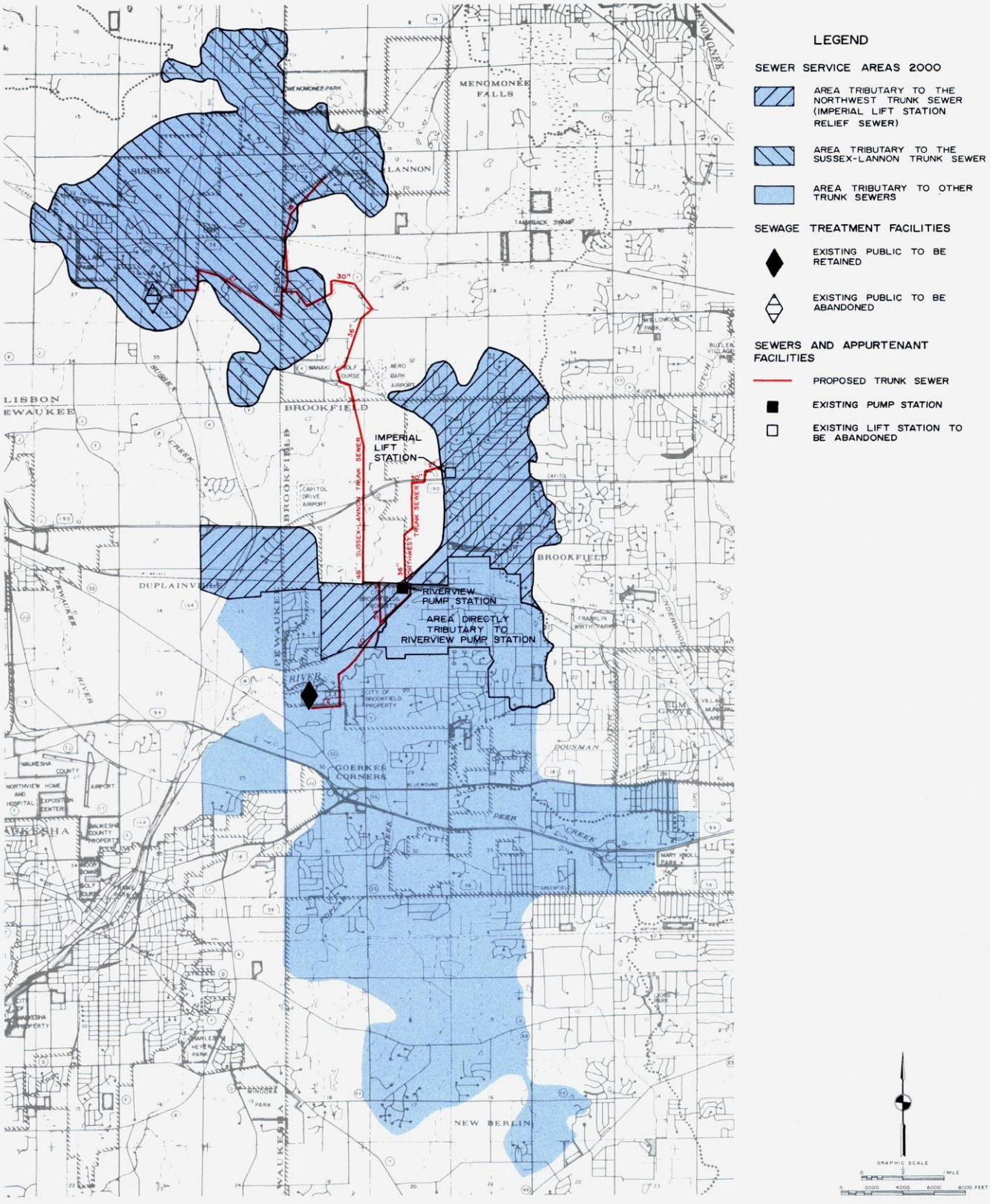
It is the intent of the Commission that this process be completed as rapidly as possible, following adoption of the initial areawide water quality management plan. This process will ensure that the needs and desires of local communities are fully taken into account, and that the sanitary sewer service areas ultimately determined will truly reflect an intergovernmental consensus. It is also the intent of the Commission that subsequent amendments to the sewer service areas be considered as needs may dictate and local management agencies may request within the context of the adopted regional land use plan.

Urban Nonpoint Source Pollution Abatement Issues

The record of the public hearing reflects concern on the part of officials of the Cities of Oak Creek and Franklin

Map 28

POST PUBLIC HEARING ALIGNMENT OF TRUNK SEWERS TO SERVE THE SUSSEX-LANNON SEWER SERVICE AREA AND THE NORTHERLY PORTION OF THE BROOKFIELD-WEST SEWER SERVICE AREA



During the public hearing process on the areawide water quality management plan, the City of Brookfield proposed a modification to the Sussex-Lannon trunk sewer. The City proposed the construction of two trunk sewers, one to be built in the near future by the City of Brookfield and one to be built toward the end of the plan design period jointly by the other communities involved, as opposed to building a single trunk sewer—as envisioned in the preliminary plan. Based upon an economic analysis presented by the City of Brookfield to all of the parties concerned at an intergovernmental meeting, it was agreed that from an economic viewpoint the costs involved in either alternative would be about the same. It was further agreed that there appeared to be several advantages in changing the plan to reflect a two-tier approach to the problem. Accordingly, it was agreed that a recommendation should be presented to adjust the areawide water quality management plan to reflect the proposal to construct in a staged manner two northerly trunk sewers in the upper Fox River area rather than a single trunk sewer as initially proposed.

Source: SEWRPC.

over the preliminary plan proposal to provide for an approximate 50 percent reduction in nonpoint source pollutant runoff for the Root River and Oak Creek watersheds. These officials primarily objected to the costs that could be incurred in achieving such a reduction, particularly since the preliminary plan recommended that many other communities in the Region provide only a 25 percent reduction in such pollutant runoff.

In response to these concerns, the Technical Coordinating and Advisory Committee recommended, and the Commission concurred, that the areawide water quality management plan remain unchanged in this respect pending completion of a second level of more detailed local planning that will be necessary to determine the procedures to be followed and the actions to be taken in achieving the pollutant runoff goal expressed in the areawide plan. It was noted that the concept of reducing pollutant runoff, particularly in urban areas, is relatively new and that the state-of-the-art in this respect is not yet well developed. Accordingly, the costs associated with such an effort can only be approximated at the areawide level of planning. A more detailed level of planning is essential in order to identify the specific activities and actions that should be undertaken and the precise costs associated with such activities and actions. It was further noted that grant programs at the state and federal levels of government are available to assist local communities in nonpoint source pollution abatement activities, and that such programs could be directed at those areas of the Region bearing the greatest cost burden and could thus mitigate any inherent disparity in the local costs of urban nonpoint source pollution abatement. Consequently, the plan in this respect was not changed and the communities involved were encouraged to proceed with the necessary second level planning effort.

Concluding Remarks—Public Reaction

In summary, it may be concluded that except for the question on the level of phosphorus removal at 18 sewage treatment facilities, the preliminary recommendations of the areawide water quality management plan met a very favorable response at the public informational meetings and hearing. In reviewing all of the comments, opinions, and data presented at these meetings and hearing and in the series of special intergovernmental meetings held subsequent to the public hearing, the Commission upon recommendation of the Technical Coordinating and Advisory Committee made the following changes to the preliminary plan recommendations:

1. The recommendation to provide a very high level of phosphorus removal at 18 sewage treatment facilities was changed to a recommendation that the facilities concerned provide a level of phosphorus removal adequate to obtain a treated effluent with a phosphorus content of 1.0 mg/l measured as total phosphorus on a monthly average basis. The recommended phosphorus concentration for streams of 0.1 mg/l was retained subject to redetermination on a reach-by-reach basis upon the conduct of more detailed water quality studies. If such studies find that contributing sewage treatment facilities must provide an effluent discharge having a phosphorus concentration more stringent than 1.0 mg/l in order to meet the appropriate instream phosphorus standard; and if there exists at that time a proven, reliable sewage treatment technology capable of institution in small as well as large communities to provide for such more stringent phosphorus removal; and if the incremental cost in sewage treatment needed to effect such additional phosphorus removal is found to lie within the ability to pay of those communities directly affected, then the institution of such more stringent effluent discharge limitations should be required for implementation after 1990.

2. Land disposal of sewage effluent should be investigated as an alternative to advanced waste treatment at the following 17 sewage treatment facilities: Kewaskum, Allenton Sanitary District, Newburg, Belgium, Wales, North Prairie, Yorkville Sanitary District, Pleasant Prairie Sewer Utility District D, Pleasant Prairie Sanitary District 73-1, Bristol Sewer Utility District No. 1, Silver Lake, Paddock Lake, Salem Sewer Utility District No. 1, Genoa City, Darien, Sharon, and Lyons Sanitary District No. 2. This additional investigation should be an integral part of detailed sewerage facilities planning efforts. Sewage treatment facilities at five locations identified in the preliminary plan for possible land disposal of sewage effluent need not consider land disposal in such detail in the facilities planning effort, based upon the reduced phosphorus removal recommendation incorporated into the final plan. These five plants are those operated by the Western Racine County Sewerage District, the City of Lake Geneva, and the Villages of East Troy, Twin Lakes, and Walworth.

3. The preliminary plan recommendation to abandon the Village of Paddock Lake sewage treatment facility was changed to provide for the retention, expansion, and improvement of that facility, there being no significant cost savings to be achieved in effecting the previously proposed consolidation of the Paddock Lake and Town of Salem Sewer Utility District No. 1 treatment plants, given the reduced phosphorus removal recommendation incorporated into the final plan. Facility planning efforts for the Paddock Lake treatment facility, however, should include a detailed investigation of the land disposal of sewage effluent in lieu of advanced waste treatment.

4. A facilities planning effort should determine whether or not it would be more cost-effective to abandon the North Park Sanitary District treatment facility and construct a new trunk sewer to convey sewage to the City of Racine sewage treatment facility, or to expand and

improve the North Park treatment facility as a permanent plant. Pending completion of that study, the areawide water quality management plan will continue to recommend abandonment of the North Park plant.

5. The sewer service area for the Delavan Lake Sanitary District was changed to reflect the final sewer service area approved by the Wisconsin Department of Natural Resources as part of its approval of the detailed plans and specifications for the sewer collection system for the District. This change constitutes about a 100-acre addition to the 2,030-acre District sewer service area.

6. The sewer service area attendant to the Town of Pleasant Prairie Sewer Utility District D treatment facility was changed to include additional lands lying north of STH 50 and south of Bain Station Road. This change constitutes about a 2-square-mile addition to the original 3-square-mile District D sewer service area.

7. The sewer service area attendant to the Town of Pleasant Prairie Sanitary District 73-1 treatment facility was changed to include additional lands south of the Wisconsin Electric Power Company electric power generator plant in the Town and a reduction in sewer service area for that portion of the Town east of STH 31. The net effect of these two proposals results in a 1-square-mile addition to the original 3-square-mile sewer service area for this plant.

8. Upon adoption of the areawide water quality management plan, the Regional Planning Commission should undertake a program to refine and detail the sewer service areas identified in the plan. This program should be undertaken in cooperation with the local water quality management agencies involved, and should include the holding of a public hearing to obtain public reaction to the site-specific sewer service issues that might be raised during the refining and detailing of each sewer service area. The process should conclude with the adoption of a refined and detailed sewer service area map by the Commission and the local water quality management agencies concerned, and the certification of that sewer service area map to the Wisconsin Department of Natural Resources and the U. S. Environmental Protection Agency as an amendment to the adopted areawide water quality management plan.

9. The Oak Creek South, Oak Creek Southwest, and Caddy Vista trunk sewers in the Milwaukee Metropolitan Sewerage District should be removed from the year 2000 plan. The District should continue, however, to reflect these three trunk sewers, together with the previously proposed Ryan Creek trunk sewer, in the long-term plans of the District. The previously proposed interim connection that would enable the abandonment of the Caddy Vista sewage treatment facility in the Town of Caledonia through a pumping station and force main and the use of an existing City of Oak Creek sewer would be used until the Caddy Vista trunk sewer or some other District facility is constructed.

10. The sewer service area attendant to the trunk sewer now under construction between the Village of Pewaukee and the City of Brookfield treatment facility was changed primarily to reflect existing and committed industrial and commercial development in the Town of Pewaukee, as well as a reduction in sewer service area in other portions of the Town of Pewaukee. The net effect of these changes is a 5-square-mile addition to the previously proposed 10-square-mile sewer service area.

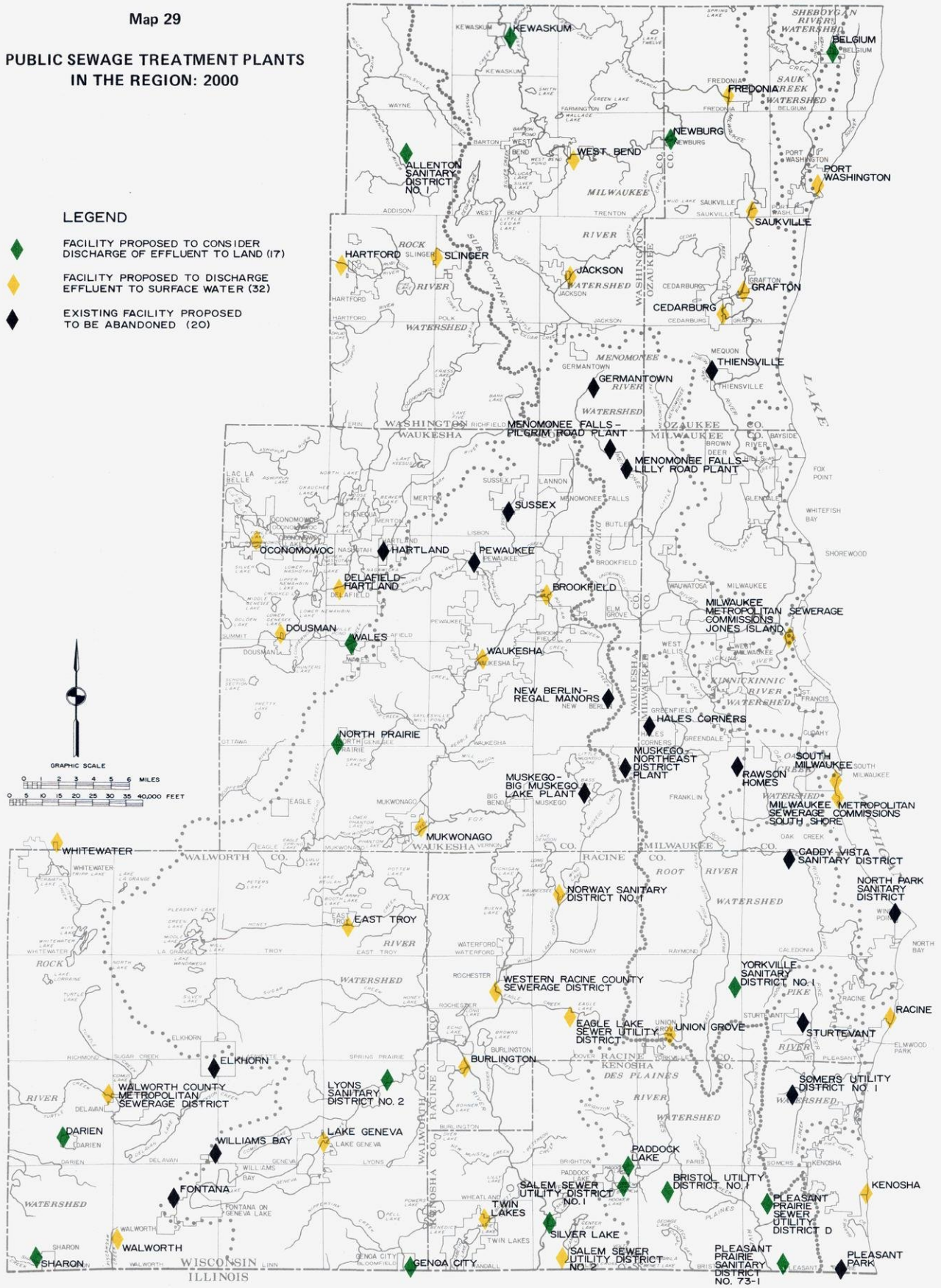
11. The trunk sewer proposed to be constructed north from the City of Brookfield sewage treatment facility should be constructed as two individual trunk sewers, one to be initially constructed by the City of Brookfield to solve immediate pressing sewage bypass problems and the other to be constructed jointly by all communities concerned near the end of the plan design period.

The plan as thus revised provides for a total of 49 public sewage treatment facilities in the Region by the year 2000. The location of these 49 facilities is set forth on Map 29. Map 30 sets forth a graphic summary of the point source elements of the water quality management plan, taking into account the aforementioned changes. The treatment levels proposed to be provided at each of the 49 public sewage treatment facilities are summarized in Table 79.

The above-noted changes in the plan together act to reduce total plan implementation costs. The total estimated capital cost of implementing the plan as that plan went to public hearing was $1.262 billion. The changes in the plan serve to reduce the total capital cost by about $69 million, or by about 5 percent, thus resulting in a final estimated capital cost of plan implementation of $1.193 billion. Similarly, the average annual cost of implementing the plan, including not only capital costs but the operation and maintenance costs, is reduced. The original average annual cost of implementing the plan was estimated at $102 million. The changes to the plan serve to reduce that cost by about $7 million annually, or by about 7 percent, resulting in a final average annual cost of plan implementation of $95 million.

Map 29

PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION: 2000



Under the recommended areawide water quality management plan as revised to reflect the issues raised during the public hearing process, a total of 49 public sewage treatment facilities are proposed in the Region by the year 2000. Of these 49 facilities, it is recommended that 32 discharge sewage treatment plant effluent to surface waters following advanced waste treatment. At the remaining 17 plants, the studies indicated the discharge of effluent to land through irrigation or other land application practices to be cost-effective. For these 17 plants, it is recommended that land application be evaluated further at the local facility planning level as an alternative to discharge to surface waters following advanced levels of treatment.

Source: SEWRPC.

FINAL RECOMMENDED SEWER SERVICE AREAS, SEWAGE TREATMENT FACILITIES, AND INTERCOMMUNITY TRUNK SEWERS IN THE REGION: 2000

LEGEND

SEWER SERVICE AREAS

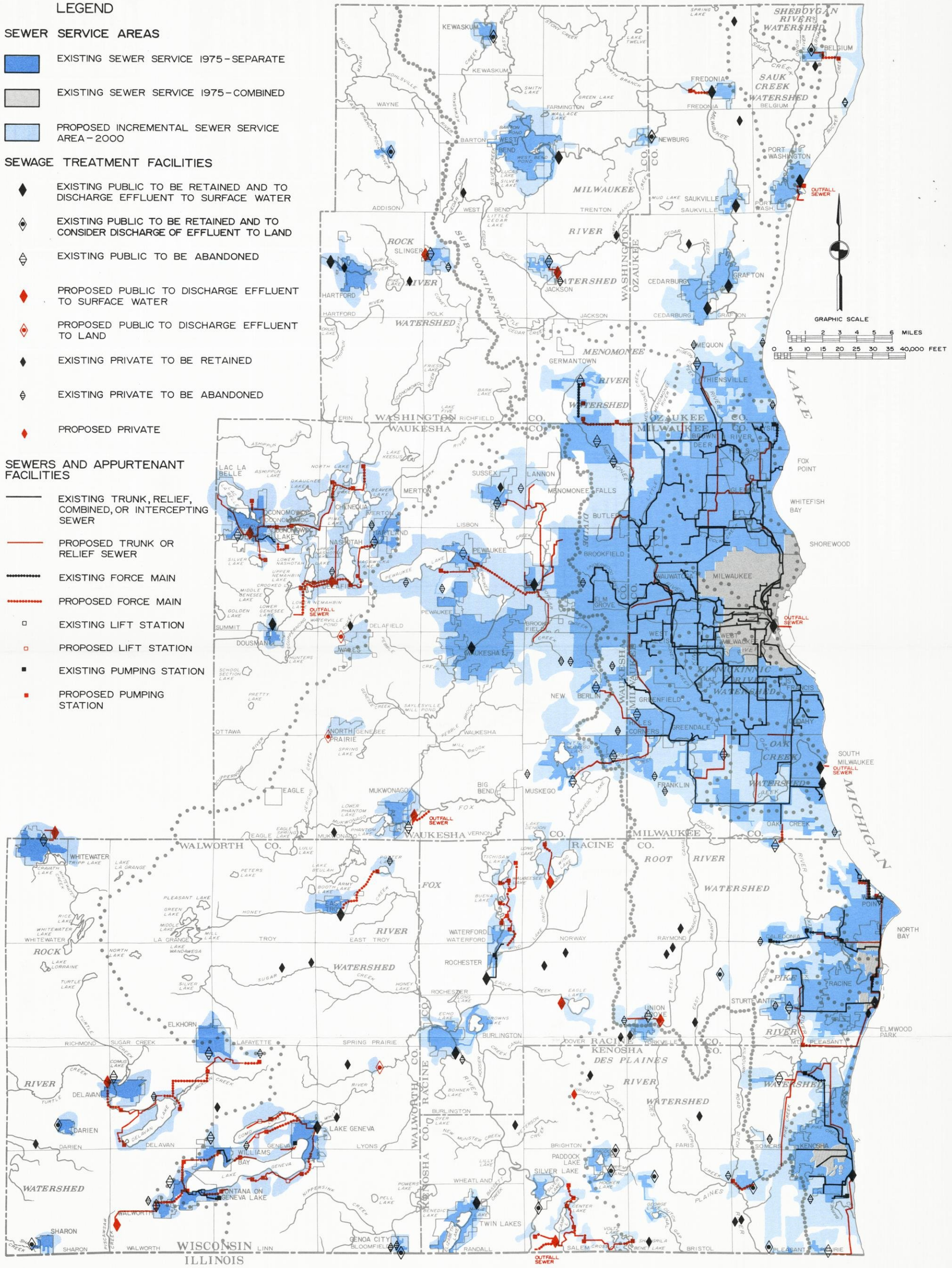
- EXISTING SEWER SERVICE 1975 – SEPARATE
- EXISTING SEWER SERVICE 1975 – COMBINED
- PROPOSED INCREMENTAL SEWER SERVICE AREA – 2000

SEWAGE TREATMENT FACILITIES

- EXISTING PUBLIC TO BE RETAINED AND TO DISCHARGE EFFLUENT TO SURFACE WATER
- EXISTING PUBLIC TO BE RETAINED AND TO CONSIDER DISCHARGE OF EFFLUENT TO LAND
- EXISTING PUBLIC TO BE ABANDONED
- PROPOSED PUBLIC TO DISCHARGE EFFLUENT TO SURFACE WATER
- PROPOSED PUBLIC TO DISCHARGE EFFLUENT TO LAND
- EXISTING PRIVATE TO BE RETAINED
- EXISTING PRIVATE TO BE ABANDONED
- PROPOSED PRIVATE

SEWERS AND APPURTENANT FACILITIES

- EXISTING TRUNK, RELIEF, COMBINED, OR INTERCEPTING SEWER
- PROPOSED TRUNK OR RELIEF SEWER
- EXISTING FORCE MAIN
- PROPOSED FORCE MAIN
- EXISTING LIFT STATION
- PROPOSED LIFT STATION
- EXISTING PUMPING STATION
- PROPOSED PUMPING STATION



Under the recommended areawide water quality management plan, as revised to resolve the issues raised during the public hearing process, a total of 49 public sewage treatment plants would exist in the Region in the year 2000, including eight new sewage treatment plants. Twenty of the existing (1975) 61 sewage treatment plants would be abandoned upon full implementation of the point source pollution abatement plan. Of the 49 facilities proposed to be in service in the year 2000, 32 are recommended to provide advanced waste treatment prior to discharge of plant effluent to surface waters. It is recommended that the remaining 17 facilities consider land application of plant effluent as an alternative to providing advanced waste treatment and discharge to surface waters. Of the 68 private sewage treatment facilities currently serving isolated enclaves of urban land use development, 35 are recommended to be abandoned and the land uses served connected to centralized sanitary sewer systems. The remaining 33 private facilities, together with one new private facility proposed to serve the Bong Recreational Area in Kenosha County, are recommended to remain in operation, with treatment levels improved as necessary to meet water use objectives. The above map also identifies the intercommunity trunk sewers needed to extend centralized sanitary sewer service and to enable abandonment of public sewage treatment facilities.

Source: SEWRPC.

Table 79

RECOMMENDED TREATMENT LEVELS AND PERFORMANCE STANDARDS FOR PUBLIC SEWAGE TREATMENT PLANTS IN THE REGION UNDER THE FINAL RECOMMENDED AREAWIDE WATER QUALITY MANAGEMENT PLAN: 2000

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Milwaukee Metropolitan						
Milwaukee Metropolitan Sewerage District--Jones Island Plant	Milwaukee Metropolitan Sewerage District Mequon Thiensville Germantown Menomonee Falls Butler Brookfield-East Elm Grove New Berlin Muskego Caddy Vista	200.0	1,250,900	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Milwaukee Metropolitan Sewerage District--South Shore Plant		120.0		Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 20 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of South Milwaukee	South Milwaukee	2.67	22,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Upper Milwaukee River						
Village of Kewaskum	Kewaskum	0.93	4,900	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml
City of West Bend	West Bend	8.03	41,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Jackson	Jackson	1.24	6,000	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection Effluent Aeration	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml Dissolved Oxygen in Effluent: 6.0 mg/l
Village of Newburg	Newburg	0.45	2,400	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Fredonia	Fredonia Waubeka	0.54	2,700	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Grafton	Grafton	2.56	16,800	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
City of Cedarburg	Cedarburg	3.07	18,300	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Saukville	Saukville	1.17	6,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Sauk Creek City of Port Washington	Port Washington	2.56	13,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Belgium	Belgium Lake Church	0.36	2,200	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/1 Fecal Coliform Concentration: 200/100 ml
Kenosha-Racine City of Racine	Racine	26.2	153,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/1 Phosphorus Discharge: 1.0 mg/1 Fecal Coliform Concentration: 200/100 ml
City of Kenosha	Kenosha Somers Pleasant Park	27.8	135,100	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/1 Phosphorus Discharge: 1.0 mg/1 Fecal Coliform Concentration: 200/100 ml
Root River Canal Village of Union Grove	Union Grove Center for the Developmentally Disabled	1.39	8,300	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Yorkville Sanitary District No. 1	Yorkville	0.07	100	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 mi --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Des Plaines River						
Town of Pleasant Prairie Sewer Utility District D	Pleasant Prairie-North Bristol-IH 94	0.85	3,300	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Effluent Aeration Disinfection	Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Pleasant Prairie Sanitary District No. 73-1	Pleasant Prairie-South	0.22	1,000	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Effluent Aeration Disinfection	Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Paddock Lake	Paddock Lake	0.46	3,300	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nutrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Effluent Aeration Disinfection	Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Salem Sewer Utility District No. 1	Hooker-Montgomery Lakes	0.25	1,800	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Effluent Aeration Disinfection	Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Bristol Sewer Utility District No. 1	Bristol-George Lakes	0.32	2,000	Secondary Auxiliary	Activated Sludge Disinfection	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml
				Advanced	Effluent Land Application	--
				Secondary Advanced	Activated Sludge Phosphorus Removal Nitrification	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l
				Auxiliary	Effluent Aeration Disinfection	Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Upper Fox River						
City of Brookfield	Brookfield-West Sussex-Lannon Pewaukee	13.4	72,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml
City of Waukesha	Waukesha	15.5	77,900	Secondary Advanced Auxiliary	Trickling Filter Phosphorus Removal Nitrification Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Fecal Coliform Concentration: 200/100 ml
Lower Fox River						
Village of Mukwonago	Mukwonago	1.66	9,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of East Troy	East Troy Potter Lake	1.20	6,700	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of Lake Geneva	Lake Geneva Lake Como	3.18	17,300	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Lyons Sanitary District No. 2	Lyons	0.15	700	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Genoa City	Genoa City	0.22	1,800	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Norway Sanitary District No. 1	Wind Lake	1.55	7,400	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Town of Dover-Eagle Lake Sewer Utility District No. 1	Eagle Lake	0.38	1,800	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Western Racine County Sewerage District	Waterford-Rochester Tichigan Lake	1.50	9,400	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of Burlington	Burlington	2.70	16,600	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Silver Lake	Silver Lake	0.38	2,400	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Twin Lakes	Twin Lakes	1.00	6,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Town of Salem Sanitary District No. 2	Camp-Center Wilmot Cross Lake Rock Lake	1.61	7,700	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of North Prairie	North Prairie	0.36	1,700	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Upper Rock River Allenton Sanitary District No. 1	Allenton	0.33	2,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Village of Slinger	Slinger	0.81	4,400	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
City of Hartford	Hartford	3.03	15,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Middle Rock River City of Oconomowoc	Oconomowoc- Lac La Belle Oconomowoc Lake Okauchee Lake North Lake Pine Lake Beaver Lake Silver Lake	6.52	33,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Delafield-Hartland Water Pollution Control Commission	Hartland Delafield-Nashotah Nashotah-Nemahbin Lakes	3.37	18,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Dousman	Dousman	0.34	2,100	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Wales	Wales	0.65	3,100	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Lower Rock River City of Whitewater	Whitewater	3.37	19,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Table 79 (continued)

Sewage Treatment Plant (by subregional area)	Area(s) Served[a]	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Sewage Treatment Levels	Type of Sewage Treatment Assumed for Cost Analysis Purposes in Plan Preparation	Recommended Performance Standards in Terms of Effluent Quality[b,c] (all standards represent average monthly limits)
Walworth County Metropolitan Sewerage District	Delavan Delavan Lake Elkhorn Walworth County Institutions	4.08	23,500	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Darien	Darien	0.35	2,000	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Walworth	Fontana Williams Bay Walworth	3.12	15,200	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogem Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Village of Sharon	Sharon	0.33	2,600	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
				Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Indicates performance standards recommended if effluent land application is not selected and implemented.

[a] *See Map 4.*

[b] *The recommended sewage effluent concentrations set forth in this table are directly related to the sewage treatment levels recommended in the plan, and to the type of sewage treatment assumed for analytical purposes in the planning program. The recommended levels of treatment and their attendant effluent concentrations are those which were found sufficient, based upon the regional systems level analyses, to meet the water quality standards associated with the recommended water use objectives. The recommended effluent standards should be regarded as preliminary in nature and subject to refinement based upon detailed instream water quality and related effluent limitation studies which more precisely reflect localized stream conditions and such factors as seasonal variations. Thus, the recommended effluent limitations set forth in this table are not meant to be directly incorporated into waste discharge permits issued by the Wisconsin Department of Natural Resources. The recommended effluent concentrations do, however, represent what a well-operated plant will achieve given the influent characteristics and the particular configuration of treatment levels and processes assumed for systems planning purposes.*

[c] *Recommended sewage effluent criteria for suspended solids are not specifically provided in this table. However, values of suspended solids are expected to correlate closely with effluent BOD_5 values. Estimates of the suspended solids concentrations associated with each set of treatment levels are discussed in greater detail in Volume Two, Chapter IV of this report and in SEWRPC Technical Report No. 18, State of the Art of Water Pollution Control in Southeastern Wisconsin, Volume One, Point Sources.*

Source: SEWRPC.

CONCLUSION

The areawide water quality management plan provides another important element of the evolving comprehensive plan for the physical development of the seven-county Southeastern Wisconsin Region, and thereby provides a sound basis for the social and economic development of the Region. Together with the adopted regional land use and regional park and open space plans and the soon to be completed regional air quality attainment and maintenance plans, the areawide water quality management plan provides the Region and its public officials and citizens with a sound coordinated guide to land use development and pollution abatement.

The areawide water quality management plan is based upon extensive inventories and analyses of the Region's socioeconomic and natural resource base, of existing and historic water quality, of existing sources of water pollution, and of the governmental and institutional framework for water quality management, and has been carefully selected from among many alternatives. The plan has been endorsed by a technical advisory committee comprised of knowledgeable and experienced individuals, including sanitary and municipal public works engineers drawn from public agencies in the Region and from the Region's leading universities. In addition, the plan has been reviewed by a panel of representatives from citizen organizations throughout the Region. The recommended plan and the alternatives thereto were also subject to extensive public review at a series of five public informational meetings, at an all-day regional planning conference attended by more than 270 interested and concerned public officials and citizen leaders, and at a formal public hearing. The results of such public review are documented in published minutes of the meetings, conference, and hearing, and in the previous section of this chapter.

The water quality management analyses conducted by the Commission indicated that there are no significant substitutes for relatively high levels of control at the major point sources of pollution in the Region. Significant efforts will have to be made to improve the quality of sewage treatment plant effluent if the water quality standards are to be met and the water use objectives attained, although in most cases such efforts will not be sufficient to fully meet the objectives. New efforts will have to be mounted to abate pollution from nonpoint sources in both rural and urban areas. Such pollution control efforts are likely to be more difficult to bring about than point source pollution control measures, and will require an enlightened public for implementation.

The areawide water quality management plan includes definitive recommendations for land use development; for the establishment of sewer service areas; for the configuration and sizing of major trunk sewers; for the location of sewage treatment plants; for treatment levels and performance standards at sewage treatment plants; for the abatement of pollution from combined sewer overflows; for reduction levels in pollutant runoff from both urban and rural land; and for wastewater sludge management. Within the context of the overall regional program, the recommended areawide water quality management plan should meet all applicable federal and state areawide planning requirements and thereby should be able to serve as the official water quality management plan of the Region. As such, the plan should serve as a sound basis for the approval of waste discharge permits and state and federal grants-in-aid. It is recognized that the plan recommendations will need to be further refined and detailed through preparation at the local governmental level of specific facilities and practices plans. In this respect, the plan should serve as a sound point of departure for the necessary local studies. Most importantly, implementation of the plan will contribute toward enhancing the overall quality of the environment in the Region and thereby contribute toward making the Region a safer, more healthful, and more attractive area in which to live and work.

APPENDICES

Appendix A

ROSTERS OF SEWRPC WATER QUALITY MANAGEMENT ADVISORY COMMITTEES

TECHNICAL ADVISORY COMMITTEE ON AREAWIDE WATER QUALITY MANAGEMENT PLANNING

Joel Wesselman*	Executive Director, Milwaukee-Metropolitan Sewerage Commissions Chairman
Raymond J. Kipp	Dean, College of Engineering, Marquette University Vice-Chairman
Lyman F. Wible	Chief Environmental Planner, Southeastern Secretary Wisconsin Regional Planning Commission
Vinton W. Bacon*	Professor, College of Applied Science and Engineering, University of Wisconsin-Milwaukee
Anthony S. Bareta	Director, Milwaukee County Planning Commission
Kurt W. Bauer*	Executive Director, Southeastern Wisconsin Regional Planning Commission
Frank R. Boucher	Director, Environmental Department, Wisconsin Electric Power Company
J. R. Castner*	Executive Director, Wisconsin Solid Waste Recycling Authority
Frederick H. Chlupp	Land Use and Park Administrator, Washington County
Arnold L. Clement*	Planning Director and Zoning Administrator, Racine County
Norbert H. Dettmann	Washington County Board Supervisor
Alvin A. Erdman	District Conservationist, U. S. Soil Conservation Service, Milwaukee and Waukesha Counties
Kent B. Fuller	Chief, Planning Branch, Region V, U. S. Environmental Protection Agency
Herbert A. Goetsch	Commissioner of Public Works, City of Milwaukee
Thomas N. Hentges	Former Racine County Board Supervisor; Former Chairman, Town of Burlington
Lester O. Hoganson	General Manager, Racine Water and Wastewater Utility
Helen M. Jacobs*	League of Women Voters
Myron E. Johansen*	Former District Conservationist, U. S. Soil Conservation Service, Ozaukee and Washington Counties
Leonard C. Johnson	Research and Development Director, Wisconsin Board of Soil and Water Conservation Districts
Melvin J. Johnson	Chairman, Town of Norway, Racine County Board Supervisor
Erwin G. Leet*	Racine County Agricultural Agent
William G. Murphy	Professor, College of Engineering, Marquette University; Chairman, SEWRPC Citizens Advisory Panel for Public Participation on Areawide Wastewater Treatment and Water Quality Management Planning
O. Fred Nelson*	Manager, Kenosha Water Utility
Wayne A. Pirsig	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 F. Ryan	Washington County Board Supervisor
Marvin E. Schroeter	Associated Public Works Contractors of Greater Milwaukee, Inc.; Wisconsin Underground Related Material Suppliers
Bernard G. Schultz*	Assistant District Director, Southeast District, Wisconsin Department of Natural Resources
Walter J. Tarmann*	Executive Director, Park and Planning Commission, Waukesha County
Rodney M. Vanden Noven	Director of Public Works, City of Waukesha
Emmerich F. Wantschik*	Walworth County Planner
Frank A. Wellstein	City Engineer, City of Oak Creek

*Regional Sludge Management Planning Subcommittee.

INTERGOVERNMENTAL COORDINATING COMMITTEE ON AREAWIDE WATER QUALITY MANAGEMENT PLANNING

Joel Wesselman . . . . . Executive Director, Milwaukee-Metropolitan Sewerage Commissions
Stephen M. Born . . . . . Director, Office of State Planning and Energy, Wisconsin Department of Administration
Richard E. Carlson . . . . . Chief, Planning Division, Department of the Army, Chicago District, Corps of Engineers
Richard E. Cohen . . . . . Research Analyst, Statistics Division, Wisconsin Department of Agriculture
Kent B. Fuller . . . . . Chief, Planning Branch, Region V, U. S. Environmental Protection Agency
Herbert A. Goetsch . . . . . Commissioner of Public Works, City of Milwaukee
Lester O. Hoganson . . . . . General Manager, Racine Water and Wastewater Utility
George A. James . . . . . Director, Bureau of Local and Regional Planning, Wisconsin Department of Local Affairs and Development
Leonard C. Johnson . . . . . Research and Development Director, Board of Soil and Water Conservation Districts
Thomas A. Kroehn . . . . . Administrator, Division of Environmental Standards, Wisconsin Department of Natural Resources
O. Fred Nelson . . . . . Manager, Kenosha Water Utility
Gerald W. Root . . . . . State Conservationist, U. S. Soil Conservation Service
Harvey E. Wirth . . . . . State Sanitary Engineer, Division of Health, Wisconsin Department of Health and Social Services

CITIZENS ADVISORY PANEL FOR PUBLIC PARTICIPATION ON AREAWIDE WASTEWATER TREATMENT AND WATER QUALITY MANAGEMENT PLANNING

William G. Murphy, Chairman — Professor, Marquette University; Engineers and Scientists of Milwaukee
Miriam G. Dahl, Vice-Chairman — Representative, Izaak Walton League of America, Wisconsin State Division
Francis A. Martin, Secretary — Representative, Racine-Kenosha Citizens for the Environment
Alice G. Altemeier — Designee, League of Women Voters of Wisconsin, Inc.
Richard F. Ashley — Designee, Schlitz Audubon Center
Cari C. Backes — Chairperson, Equality and Quality of Life (EAQQL)
Ralph C. Blum — Representative, American Society of Civil Engineers
Lucile S. Bonerz — Designee, Milwaukee Board of Realtors
Roger Caron — Executive Director, Kenosha Area Chamber of Commerce
Catherine G. Collins — Designee, Wisconsin Academy of Sciences, Arts, and Letters
Delbert J. Cook — Representative, Cedar Creek Restoration Council
John Drake — Executive Director, Associated Public Works Contractors
Tom Eisele — Designee, Lake Michigan Federation
Philip J. Fogle — Director, Geneva Lake Watershed Environmental Agency
Richard M. Franz — Representative, Ecology Association of New Berlin
Norman N. Gill — Executive Director, Citizens Governmental Research Bureau of Milwaukee
Allen Goldmann — Supervisor, Ozaukee County; Ozaukee County Air and Water Pollution Study Committee
James Gramling — Student, Arrowhead Ecology Club
Carroll W. Halsted — Professional Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Kenneth Holtje — Citizen Member, Village of Dousman
Robert O. Hussa — President, Citizens for Menomonee River
Helen M. Jacobs — President, Southeast Wisconsin Coalition for Clean Air
Mrs. Richard J. Jensen — Secretary, Root River Restoration Council, Inc.
Marlin Johnson — Field Station Manager, University of Wisconsin-Waukesha Center
Paul B. Juhnke — Manager, Metropolitan Milwaukee Association of Commerce, Urban Research and Development
Anthony Kau — President, Waukesha County Farm Bureau
Richard Lansing — Staff Representative, Plumbers and Gasfitters Local 75, Wisconsin State AFL-CIO
Alfred G. Lustig — Designee, Milwaukee River Restoration Council
Lawrence R. Olsen — Representative, Kenosha County Farm Bureau
Charles Opitz — Representative, Ozaukee County Farm Bureau
Wayne M. Paulus — First Wisconsin Mortgage Company
Lynn Peterson — President, Racine County Farm Bureau
Lanis P. Pfolsgrof — Representative, Sierra Club
John R. Rampetsreiter — Designee, District 9, Division of Highways, Wisconsin Department of Transportation
Allen E. Reininger — Plumbing and Health Inspector, City of Glendale
Annabelle Reuter — Designee, Izaak Walton League
Karen Rutz — Representative, Wisconsin Friends of Animals, Inc.
Phil Sander — Executive Secretary, Southeastern Wisconsin Sportsman's Federation
Dr. Abraham Scherr — Representative, Citizens Regional Environmental Coalition
Peter J. Schultz — Representative, Racine Chamber of Commerce
William B. N. Schultz — Professional Engineer, Wisconsin Society of Professional Engineers
David Sharpe — Community Development Agent, University of Wisconsin-Extension
Arthur C. Swanson — Representative, Arrowhead Ecology Club
Robert J. Thill — Representative, Ozaukee County Farm Bureau
Bruce R. Thompson — Representative, Sierra Club
Merv Thompson — Construction Supervisor, Washington County Sedimentation and Erosion Control Project
Howard R. Tietz — Representative, Friends of Havenswood
Joseph C. Waters — President, Wisconsin Association of Campground Owners
Ray Watz — Representative, Ozaukee County Farm Bureau
Kenneth Weddig — Representative, Washington County Recreation and Resource Council
John A. White — Maintenance Engineer, District 2, Division of Highways, Wisconsin Department of Transportation
Steven Woll — Executive Director, Metropolitan Builders Association of Greater Milwaukee

Appendix B

ROSTERS OF SELECTED SEWRPC 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; and 7) Traffic Studies, Models, and Operations Subcommittee.

Stanley E. Altenbern (5) . . . . . President, Wisconsin Coach Lines, Inc., City of Waukesha
Anthony S. Bareta (3) . . . . . Director, Milwaukee County Planning Commission
John M. Bennett (1,4) . . . . . City Engineer, City of Franklin
Robert P. Birchler (2) . . . . . City Engineer, City of Burlington
Stephen M. Born (1) . . . . . Director, State Planning Office, Wisconsin Department of Administration
Richard Brandt (1) . . . . . Manager, Energy Requirements, Wisconsin Gas Company, City of Milwaukee
Robert W. Brannan (2,5,7) . . . . . Deputy Director, Department of Public Works, Milwaukee County
Donald M. Cammack (7) . . . . . Chief Planning Engineer, Division of Aeronautics, Wisconsin Department of Transportation
Frederick H. Chlupp (1,4) . . . . . Land Use and Park Administrator, Washington County
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
Lucien M. Darin (2) . . . . . Director of Public Works, City of Hartford
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
William E. Dow . . . . . District Manager, Network Planning, Wisconsin Telephone Company
William R. Drew (1,2,3,4,5,6,7) . . . . . Commissioner, Department of City Development, City of Milwaukee
Raymond T. Dwyer (6) . . . . . City Engineer, City of Greenfield
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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, City of Milwaukee
Herbert A. Goetsch (2,4,6) . . . . . Commissioner of Public Works, City of Milwaukee
George Gundersen (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
Chester J. Harrison (5) . . . . . Town Engineer, Town of Caledonia
John M. Hartz (5) . . . . . Chief, Urban Transit Assistance Section, Division of Planning, Wisconsin Department of Transportation
Frank M. Hedgcock (7) . . . . . City Planner, City of Waukesha
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John O. Hibbs (2,5,7) . . . . . Division Engineer, U. S. Department of Transportation, Federal Highway Administration, City of 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
Ronald Hustedde (1,4) . . . . . Resource Agent, Walworth County

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

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Paul G. Jaeger (1,2,4) . . . . . County Agricultural Agent, Kenosha County
Edward A. Jenkins (5) . . . . . Transportation Director, City of Kenosha
Dr. Leonard C. Johnson (4) . . . . . Soil and Water Conservation Specialist, Board of Soil and Water Conservation, State of Wisconsin
Roger A. Johnson (1) . . . . . City Planner, City of New Berlin
Paul Juhnke (3) . . . . . Manager, Urban Research and Development, Metropolitan Milwaukee Association of Commerce
Russell E. Julian (3) . . . . . Executive Director, Southeastern Wisconsin Health Systems Agency, Inc., City of Milwaukee
John E. Kane (1,3) . . . . . Director, Milwaukee Area Office, U. S. Department of Housing and Urban Development
William J. Katz . . . . . Director of Technical Services, Milwaukee-Metropolitan Sewerage Commissions
Richard A. Keyes (2) . . . . . Environmental Engineer, Milwaukee County Department of Public Works
Thomas R. Kinsey (2) . . . . . District Director, District 2, Wisconsin Department of Transportation
David L. Kluge (6) . . . . . Director of Public Works, Village of Pewaukee
Douglas C. Knox (4) . . . . . Soil Conservationist, U. S. Conservation Service
Robert F. Kolstad (1,2,4,5) . . . . . Director of Community Development, City of Kenosha
Edwin J. Laszewski, Jr. (2) . . . . . City Engineer, City of Milwaukee
Wilmer F. Lean (2,7) . . . . . County Highway Commissioner, Walworth County
Gerald P. Lee (1) . . . . . Building Inspector, City of Muskego
Elwin G. Leet (1,3,4) . . . . . County Agricultural Agent, Racine County
Russell H. Leitch (3) . . . . . Trade Specialist, Field Services, U. S. Department of Commerce, City of Milwaukee
Edward G. Lemmen (6) . . . . . Water Utility Manager, City of Lake Geneva
James H. Lenz (6) . . . . . Village Engineer, Village of Hartland
J. William Little (2,6) . . . . . City Administrator, City of Wauwatosa
Gilbert R. Loshek (2) . . . . . Area General Manager, Greyhound Lines-West, City of Milwaukee
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John Margis, Jr. (2,4,7) . . . . . County Highway Commissioner, Racine County
William L. Marvin (2,7) . . . . . Director, Traffic Engineering Department, American Automobile Association, City of Madison
Antoinette Matthews (3,5) . . . . . Assistant Director, Southeastern Wisconsin Area Agency on Aging
Henry M. Mayer (5) . . . . . Managing Director, Milwaukee Transport Services, Inc.
Norman H. McKegney (5) . . . . . Terminal Superintendent, The Milwaukee Road, City of Milwaukee
George Mead (3) . . . . . Marketing Research Manager, The Milwaukee Journal
Raymond F. Michaud (2) . . . . . City Engineer, City of Delavan
Robert J. Mikula (2,4) . . . . . General Manager, Milwaukee County Park Commission
William A. Muth (6) . . . . . Director of Public Works, Village of Germantown
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Melvin J. Noth (2,6) . . . . . Director of Public Works, Village of Menomonee Falls
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Nick T. Paulos (1,2) . . . . . Village Engineer, Village of 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, City of Chicago
John B. Prince (1,3,6) . . . . . Director of Corporate Planning, Wisconsin Electric Power Company, City of 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
Donald A. Roensch (1,6) . . . . . Director of Public Works, City of Mequon

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

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Gordon Rozmus (1,3) . . . . . City Planner, City of Wauwatosa
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John E. Schumacher (2,7) . . . . . City Engineer, City of West Allis
Gerald Schwerm (2) . . . . . Village Manager, Village of Brown Deer
Harvey Shebesta (2,3,5,7) . . . . . District Director, District 9, Wisconsin Department of Transportation
Leland C. Smith (4) . . . . . County Horticultural Agent, Kenosha County
Philip A. Sundal (3) . . . . . Deputy Administrator, Division of State Economic Development, Wisconsin Department of Local Affairs and Development
George A. Swier (1,2) . . . . . County Highway Commissioner, Kenosha County
G. D. Tang (1,3) . . . . . District Business Research Manager, Wisconsin Telephone Company, City of Milwaukee
Walter J. Tarmann (1,4) . . . . . Executive Director, Waukesha County Park and Planning Commission
Jack Taylor (5) . . . . . President, Flash City Cab, Racine
Norbert S. Theine (1) . . . . . Administrator, City of South Milwaukee
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Rodney M. VandenNoven (6) . . . . . Director of Public Works, City of Waukesha
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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) . . . . . City Planner, City of West Allis
Bruce B. Wilson (1) . . . . . Chief, Urban and Regional Planning Assistance, Wisconsin Department of Transportation
Dan Wilson (4) . . . . . Resource Development Agent, UW Extension, Washington County
Thomas N. Wright (1,3,5) . . . . . Director of Planning, City of Racine

ROOT RIVER WATERSHED COMMITTEE

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Vice-Chairman
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John M. Bennett . . . . . City Engineer, City of Franklin
Raymond T. Dwyer . . . . . City Engineer, City of Greenfield
Alvin A. Erdman . . . . . District Conservationist, U. S. Soil Conservation Service,
Waukesha and Milwaukee Counties
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Donald W. Hermann . . . . . Mayor, City of Oak Creek
Lester O. Hoganson . . . . . City Engineer, City of Racine
Elwin G. Leet . . . . . County Agricultural Agent, Racine County
John Margis, Jr. . . . . Chairman, Racine County Board of Supervisors;
Commissioner, Southeastern Wisconsin Regional Planning Commission
Stephen F. Olsen . . . . . Mayor, City of Racine
Nick T. Paulos . . . . . Village Engineer, Village of Greendale
Anthony A. Pitrof . . . . . Manager of Engineering Services,
Milwaukee-Metropolitan Sewerage Commissions
John Schultz . . . . . District Engineer, Southeast District, Wisconsin Department of Natural Resources
John E. Schumacher . . . . . City Engineer, City of West Allis
Frank A. Wellstein . . . . . City Engineer, City of Oak Creek

FOX RIVER WATERSHED COMMITTEE

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Shoreland Management, Wisconsin Department of Natural Resources
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Robert Bucholtz . . . . . Chairman, Town of Waterford
Arnold L. Clement . . . . . Planning Director and Zoning Administrator, Racine County
Alvin A. Erdman . . . . . District Conservationist, Milwaukee and Waukesha Counties,
U. S. Soil Conservation Service
Willard R. Evans . . . . . Supervisor, Waukesha County; Member, County Health Board
Jerome T. Gottfried . . . . . Mayor, City of Muskego
Thomas Grady . . . . . Chairman, Town of Wheatland
Robert Graf . . . . . President, Village of Waterford
H. Copeland Greene . . . . . Citizen Member, Genesee Depot
Henry F. Halter . . . . . Commissioner, Norway-Dover Drainage District
Franklin E. Hazelo . . . . . Supervisor, Town of Rochester
Karl B. Holzworth . . . . . Park Director, Racine County
Ronald Hustedde . . . . . County Agent, Walworth County
Dr. Leonard C. Johnson . . . . . Soil and Water Conservation Specialist, Board of Soil and
Water Conservation Districts, University of Wisconsin-Extension
Melvin J. Johnson . . . . . Chairman, Town of Norway
Elwin G. Leet . . . . . County Agri-Business Agent, Racine County
Walter Mass . . . . . Member, Town of Rochester Plan Commission
John H. Mielke . . . . . Consulting Engineer, City of Waukesha

FOX RIVER WATERSHED COMMITTEE
(Continued)

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Phil Sander. . . . . Executive Secretary, Southeastern Wisconsin Sportsmen's Federation
Dr. Bruno E. Schiffleger . . . . . Citizen Member, City of Elkhorn
John Schneider . . . . . President, Village of Rochester
Bernard G. Schultz . . . . . Assistant District Director, Southeast District, Wisconsin Department of Natural Resources
Art Stratton . . . . . Commissioner, 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
Emmerich P. Wantschik . . . . . County Planner, Walworth County
Stan Wilson . . . . . Citizen Member, City of Burlington
John R. Zillmer. . . . . Secretary, Ice Age Park and Trail Foundation, City of Milwaukee

MILWAUKEE RIVER WATERSHED COMMITTEE

Richard W. Cutler . . . . . Attorney, Quarles and Brady, City of Milwaukee; Member, Village of Fox Point Plan Commission; Commissioner, Southeastern Wisconsin Regional Planning Commission
Chairman
Kurt W. Bauer. . . . . Executive Director, Southeastern Wisconsin Regional Planning Commission
Secretary
Donald R. Benzella . . . . . Director, Department of Environmental Health, Ozaukee County
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
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
Mrs. Robert H. 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 . . . . . Former President, Village of Saukville
Robert L. Konik . . . . . County Planner, Fond du Lac County
Adolph Laubenstein. . . . . President, Laubenstein Roofing Company, Village of Saukville
Thomas P. Leisle . . . . . Supervisor, Ozaukee County
Robert J. Mikula . . . . . General Manager, Milwaukee County Park Commission
Rudolph Mikulich . . . . . Business Administrator, Clerk-Treasurer, City of Glendale
Dennis E. Nulph . . . . . District Engineer, Wisconsin Department of Natural Resources
Anthony A. Pitrof . . . . . Manager of Engineering Services, Milwaukee-Metropolitan Sewerage Commissions
Albert Schroeder. . . . . Former Chairman, Town of Trenton
George Watts . . . . . President, George Watts & Son, Inc., City of Milwaukee
Donald W. Webster . . . . . Supervisor, Town of Fredonia; Consulting Civil Engineer, City of Milwaukee
Richard E. Zarling . . . . . Director of Elementary Education, Kewaskum Community Schools

MENOMONEE RIVER WATERSHED COMMITTEE

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Chairman
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Vice-Chairman
Kurt W. Bauer. . . . . Executive Director, Southeastern
Secretary Wisconsin Regional Planning Commission
Arthur D. Doll . . . . . Director, Bureau of Planning,
Wisconsin Department of Natural Resources
Glenn H. Evans . . . . . Member, Citizens for Menomonee River Restoration, Inc.
Frederick E. Gottlieb . . . . . Village Manager, Village of Menomonee Falls
Frank S. Hartay . . . . . Plant Engineer, The Falk Corporation, City of Milwaukee
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 . . . . . Supervisor, Ozaukee County
Robert J. Mikula . . . . . General Manager, Milwaukee County Park Commission
Thomas J. Muth . . . . . Director of Public Works, Village of Germantown
Dennis E. Nulph . . . . . District Engineer, Wisconsin Department of Natural Resources
Anthony A. Pitrof . . . . . Manager of Engineering Services,
Milwaukee-Metropolitan Sewerage Commissions
Richard G. Reinders. . . . . Trustee, Village of Elm Grove
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

KINNICKINNIC RIVER WATERSHED COMMITTEE

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Chairman
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Vice-Chairman
Kurt W. Bauer. . . . . Executive Director, Southeastern
Secretary Wisconsin Regional Planning Commission
Raymond T. Dwyer . . . . . City Engineer, City of Greenfield
Anthony A. Pitrof . . . . . Manager of Engineering Services,
Milwaukee-Metropolitan Sewerage Commissions
Stanley Polewski . . . . . Proprietor, Polewski Pharmacy, City of Milwaukee
Ronald J. Rutkowski . . . . . Director of Public Works, City of Cudahy
Rodolfo N. Salcedo . . . . . Environmental Scientist,
Department of City Development, City of Milwaukee
Frank Schultz. . . . . District Engineer, Southeast District,
Wisconsin Department of Natural Resources
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

TECHNICAL COORDINATING AND ADVISORY COMMITTEE ON REGIONAL AIR QUALITY MAINTENANCE PLANNING

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Chairman — County Department of Public Works
Barbara J. Becker . . . . . President, Southeastern Wisconsin Coalition for Clean Air
Vice-Chairman
Alice Altemeier . . . . . League of Women Voters, Ozaukee County
Norman N. Amrhein . . . . . President, Federal Malleable Company, City of West Allis
Kurt W. Bauer . . . . . Executive Director, Southeastern Wisconsin Regional Planning Commission
Gerald D. Bevington . . . . . Coordinator of Air Programs, Wisconsin Department of Natural Resources, City of 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, City of Madison
Elroy C. Jagler . . . . . Meteorologist in Charge, National Weather Service Forecast Office, City of Milwaukee
Thomas R. Kinsey . . . . . District Director, District 2, Wisconsin Department of Transportation
Paul Koziar . . . . . Meteorologist, Division of Environmental Protection, Wisconsin Department of Natural Resources
Dr. Kenneth W. Ragland . . . . . Associate Professor, Department of Mechanical Engineering, University of Wisconsin-Madison
Fred R. Rehm . . . . . Director, Milwaukee County Division of Environmental Service
Herbert E. Ripley . . . . . Health Officer, Waukesha County Health Department
Rodolfo N. Salcedo . . . . . Environmental Scientist, Department of City Development, City of Milwaukee
Harvey Shebesta . . . . . District Director, District 9, Wisconsin Department of Transportation
James Sinapoli . . . . . Planning Analyst, Office of State Planning and Energy, Wisconsin Department of Administration
Mark Steinberg . . . . . Senior Meteorologist, Environmental Planning and Policy Division, Wisconsin Electric Power Company
Michael S. Treitman . . . . . Environmental Protection Agency, Region V, City of Chicago
Emmerich P. Wantschik . . . . . County Planner, Walworth County
George A. Zimmer . . . . . Supervisor, Environmental Health, Kenosha Health Department

TECHNICAL AND CITIZEN ADVISORY COMMITTEE ON COASTAL MANAGEMENT IN SOUTHEASTERN WISCONSIN

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Acting Chairman
Hubert J. Albert . . . . . Port Washington Yacht Club
W. J. Blong . . . . . Former Village Engineer, Village of Fox Point
Josephine H. Boucher . . . . . North Shore League of Women Voters
Thomas H. Buestrin . . . . . Commissioner, Southeastern Wisconsin Regional Planning Commission, Ozaukee County
Sol Burstein . . . . . Executive Vice-President, Wisconsin Electric Power Company
Col. Benjamin C. Chapla . . . . . Health Officer, Town of Caledonia
H. A. Goetsch . . . . . Commissioner of Public Works, City of Milwaukee
James L. Haskell . . . . . Port Director, City of Milwaukee Harbor Commission
Wayne E. Koessl . . . . . Supervisor, Kenosha County Board; Member, Town of Pleasant Prairie Planning Commission
George O. Lampert . . . . . Mayor, City of Port Washington
Dr. Norman P. Lasca . . . . . Associate Professor, Department of Geological Sciences, University of Wisconsin-Milwaukee

TECHNICAL AND CITIZEN ADVISORY COMMITTEE ON COASTAL MANAGEMENT IN SOUTHEASTERN WISCONSIN
(Continued)

Elwin G. Leet . . . . . County Agricultural Agent, Racine County
Thomas P. Leisle . . . . . Supervisor, Ozaukee County
Thomas W. Lisota . . . . . Alderman, City of Cudahy
Anthony L. Luljak . . . . . Alderman, City of Cudahy
R. Richard Mett . . . . . Supervisor, Milwaukee County
Dr. Harold M. Meyer . . . . . Professor, Department of Geography, University of Wisconsin-Milwaukee
Robert J. Mikula . . . . . General Manager, Milwaukee County Park Commission
Dr. William G. Murphy . . . . . Professor, Soil Mechanics, College of Engineering, Marquette University
Mary C. Nelson . . . . . Alderman, City of South Milwaukee
Dr. William T. Painter . . . . . President, Foundation Engineering, Inc., Milwaukee
Anthony A. Pitrof . . . . . Manager of Engineering Services, Milwaukee-Metropolitan Sewerage Commissions
Francis J. Pitts . . . . . Commissioner, Southeastern Wisconsin Regional Planning Commission, Kenosha County
Fred R. Rehm . . . . . Director, Environmental Services Division, Department of Public Works, Milwaukee County
Ronald J. Rutkowski . . . . . Director of Public Works, City of Cudahy
Phil Sander . . . . . Executive Secretary, Southeastern Wisconsin Sportsmen's Federation
Norbert S. Theine . . . . . Administrator, City of South Milwaukee

TECHNICAL AND CITIZEN ADVISORY COMMITTEE ON REGIONAL PARK AND OPEN SPACE PLANNING

Robert J. Mikula . . . . . General Manager, Milwaukee County Park Commission
Chairman
Loren R. Anderson . . . . . President, Geneva Lake Development Corporation, Village of Williams Bay
Anthony S. Bareta . . . . . County Planning Director, Milwaukee County Planning Commission
Donald B. Brick . . . . . Recreation Agent, Walworth County
Frederick H. Chlupp . . . . . Land Use and Park Administrator, Washington County
Delbert J. Cook . . . . . Chairman, Cedar Creek Restoration Council
Norbert Dettmann . . . . . County Board Supervisor, Washington County
Arthur D. Doll . . . . . Director, Bureau of Planning, Wisconsin Department of Natural Resources
David F. Egelhoff . . . . . Supervisor, Ozaukee County
Booker T. Hamilton . . . . . Production Supervisor, Rexnord Corporation
Karl B. Holzwarth . . . . . Park Director, Racine County
Charles O. Kamps . . . . . Attorney, Quarles and Brady, City of 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, Southeastern Wisconsin Regional Planning Commission
Kathleen Pfister . . . . . Cultural Specialist, Department of City Development, City of Milwaukee
Robert D. Ross . . . . . General Manager, The Journal Times, City of Racine
Phil Sander . . . . . Executive Secretary, Southeastern Wisconsin Sportsmen's Federation
George L. Schiltz . . . . . 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
Elwood R. Voigt . . . . . Park Manager, Ozaukee County
Joseph Waters . . . . . Proprietor, Lazy Day Campground, Town of Farmington
Dr. Harry J. Wilkins . . . . . Outdoor Sportsman, Wauwatosa
Dr. George T. Wilson . . . . . Visiting Lecturer, Department of Continuing and Vocational Education, University of Wisconsin-Madison
Thomas N. Wright . . . . . Director of Planning, City of Racine

Appendix C

WATER QUALITY MANAGEMENT PLANNING RECOMMENDATIONS FOR THAT PORTION OF THE MILWAUKEE RIVER WATERSHED LYING IN FOND DU LAC AND SHEBOYGAN COUNTIES

INTRODUCTION

As discussed in Volume Two, Chapter IV of this report, a series of specific recommendations pertaining to sanitary sewerage facility development and water pollution abatement for that portion of the Milwaukee River watershed lying in Dodge, Fond du Lac, and Sheboygan Counties outside the Southeastern Wisconsin Region was initially set forth in the comprehensive plan for the Milwaukee River watershed and was updated in the regional sanitary sewerage system plan.[1] The designation of the Southeastern Wisconsin Region as a Section 208 water quality management planning area did not include those portions of the Milwaukee River watershed lying in Fond du Lac and Sheboygan Counties that drain to the Region. This portion of the Milwaukee River watershed lies in a portion of the State of Wisconsin not within the jurisdiction of a designated Section 208 water quality management planning area, and for which, therefore, the Wisconsin Department of Natural Resources has assumed Section 208 planning responsibilities. Accordingly, the areawide water quality management plan set forth in this report, while proposing specific recommendations for water pollution abatement with respect to that portion of the Milwaukee River watershed lying outside of the Region, addresses those recommendations to the Wisconsin Department of Natural Resources as the official areawide water quality management planning agency for that portion of the Milwaukee River watershed.

In order to make recommendations for water pollution abatement in that part of the Milwaukee River watershed lying outside of the Southeastern Wisconsin Region, certain assumptions had to be made concerning growth and change in population and economic activity and in loadings from both point and nonpoint sources of pollution in that portion of the Milwaukee River watershed. It is intended that this appendix document these assumptions, as well as the recommendations for pollution abatement. The assumptions are based largely upon the previous recommendations set forth in the Milwaukee River watershed and regional sanitary sewerage system plans, and were made after discussions with the Wisconsin Department of Natural Resources in order to coordinate the areawide water quality management planning work. It is recommended herein that the Wisconsin Department of Natural Resources utilize these assumptions and recommendations in the completion of its areawide water quality management planning responsibilities for that portion of the Milwaukee River watershed lying in Dodge, Fond du Lac, and Sheboygan Counties.

ANTICIPATED GROWTH AND CHANGE IN THE UPPER WATERSHED AREA

That portion of the Milwaukee River watershed lying in Dodge, Fond du Lac, and Sheboygan Counties is largely rural in nature. Much of the Northern Unit of the Kettle Moraine State Forest is located in this upper watershed area. Four relatively small villages are located entirely in the watershed, the Villages of Adell, Cascade, and Random Lake in Sheboygan County, and the Village of Campbellsport in Fond du Lac County. In conjunction with the Sheboygan County Planning Department and the East Central Wisconsin Regional Planning Commission, the Wisconsin Department of Natural Resources staff provided to the Commission estimates of future population growth for these four villages. The population of the Village of Adell is expected to increase from about 500 in 1975 to about 600 in the year 2000. The population of the Village of Cascade is expected to increase from 630 in 1975 to about 1,500 in the year 2000. The population of the Village of Random Lake is expected to increase from about 1,125 in 1975 to about 3,000 in the year 2000. The population of the Village of Campbellsport is expected to increase from about 1,760 in 1975 to about 3,400 in the year 2000. These population forecasts are compared in Table C-1 to those prepared and used by the Commission for its Milwaukee River watershed and for regional sanitary sewerage system planning purposes.

Table C-1

COMPARISON OF POPULATION FORECASTS FOR SEWER SERVICE AREAS IN THE UPPER MILWAUKEE RIVER WATERSHED

Sewer Service Area	Population		
	Existing 1975[a]	Forecast 2000[b]	Forecast 1990[c]
Adell	504	600	500
Campbellsport	1,763	3,400	2,000
Cascade	631	1,500	1,800
Random Lake	1,125	3,000	1,900
Forest Lake	--	600	600
Kettle Moraine Lake	--	800	800

[a] *Estimate by Wisconsin Department of Natural Resources.*

[b] *Forecast by Wisconsin Department of Natural Resources.*

[c] *Forecast by SEWRPC under previous studies.*

Source: SEWRPC.

[1] *See SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volume Two, Alternative Plans and Recommended Plan, October 1971; and SEWRPC Planning Report No. 16, A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin, February 1974.*

At the present time, centralized sanitary sewer service is provided in these four villages. The Milwaukee River watershed plan and the regional sanitary sewerage system plan recommended the provision of sanitary sewer service to serve existing urban development along the shorelines of Forest Lake and Kettle Moraine Lake, both in Fond du Lac County. The design populations recommended for these two lakes are 600 and 800 persons, respectively, as shown in Table C-1 and represent no significant change from the existing populations.

The design year populations noted above were used by the Commission staff to estimate design sewage flows in the same manner as described in Volume Two, Chapter IV of this report for those communities located within the Region. Based upon the forecast design year 2000 populations of the several towns and the four villages provided by the Wisconsin Department of Natural Resources, it was determined that no significant land use changes may be expected to occur in the upper watershed except in the four villages. It was assumed that the new population growth in these villages would occur at medium densities as defined in the Commission land use planning efforts. This additional urban growth was allocated to each subbasin in the four villages concerned based upon the percentage of existing village civil division area in each subbasin. Given this increase in urban land use within each of the affected subbasins and the assumption that the existing land uses in the remainder of the upper watershed area would not change significantly, it was possible to estimate future nonpoint source pollution loading rates for urban and rural land uses in each of the subbasins in the upper watershed for the plan design year 2000. Existing land use and land cover data were determined through inventories conducted by air photo interpretation. The air photos were obtained for the year 1975 at the same time they were obtained for the seven-county Southeastern Wisconsin Region.

DEVELOPMENT OF POLLUTION ABATEMENT RECOMMENDATIONS

The level of pollution abatement needed to meet the water use objectives for the streams in the Milwaukee River watershed as those streams enter the Region was attained in a manner similar to that utilized to develop the pollution control strategies within the Region. The basic analytic tool used to evaluate alternative plans was the hydrologic-hydraulic water quality simulation model. The procedure used to develop the alternative water quality management plans was to first identify the factors affecting water quality in each stream reach studied. The initial step in the determination of needed controls was the identification of the sources of pollution. These sources are summarized in Volume One, Chapter V of this report and are described in more detail in SEWRPC Technical Report No. 21, Sources of Water Pollution in Southeastern Wisconsin: 1975. These sources of pollution, as well as other factors affecting water quality, were analyzed to identify potential approaches to required water pollution abatement. The determination of the most practical combination of point and nonpoint source pollution control measures was largely an iterative, "cut and try" process, which began with an evaluation of the point source controls recommended in the regional sanitary sewerage system plan, followed by an assessment of the need for additional point or nonpoint source pollution controls as necessary to meet the applicable water use objectives. This iterative process, therefore, involved a series of successive attempts to design a plan that would meet the national goal of "fishable and swimmable" waters. The analysis indicated that if the proposed combination of point and nonpoint source pollution control measures set forth below is implemented, the streams in the Milwaukee River watershed as they enter the Region will meet the national goal of fully "fishable and swimmable" waters by the year 2000.

POINT SOURCE POLLUTION ABATEMENT RECOMMENDATIONS

Public Sewage Treatment Facilities

A total of six public sewage treatment facilities are proposed to provide treatment for sewage generated in the Milwaukee River watershed within Sheboygan and Fond du Lac Counties. The location of these six facilities is shown on Map C-1 and the facilities are listed in Table C-2, together with certain key design data for the facilities, such as capacity and level of treatment proposed to be provided.

The public sewage treatment facility proposals for the out-of-Region portion of the Milwaukee River watershed may be summarized as follows:

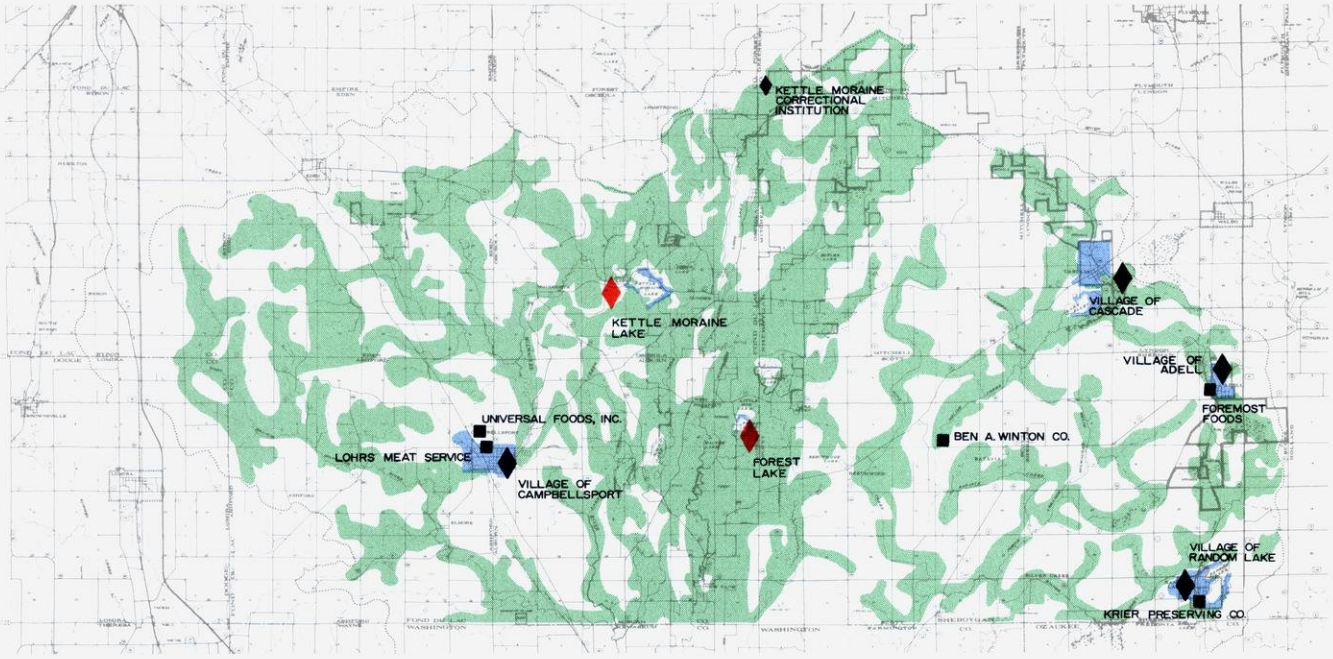
1. The provision of secondary waste treatment followed by land application in the form of effluent seepage lagoons at the public sewage treatment plant serving the Village of Campbellsport. Completed local facility planning studies have determined this alternative to be more desirable and cost-effective than the provision of treatment and discharge to surface waters.

2. The provision of secondary waste treatment, advanced waste treatment for phosphorus removal and nitrification, and auxiliary waste treatment for effluent aeration and disinfection at the public sewage treatment facility serving the Village of Random Lake.

3. The provision of secondary waste treatment followed by auxiliary waste treatment for effluent disinfection and land application of plant effluent; or the provision of secondary waste treatment, advanced waste treatment for phosphorus removal, auxiliary waste treatment for effluent disinfection, and low flow augmentation prior to discharge to surface waters at the public sewage treatment facility serving the Village of Cascade.

Map C-1

LOCATION OF POINT SOURCES OF POLLUTION IN THAT PORTION OF THE MILWAUKEE RIVER WATERSHED LYING IN FOND DU LAC AND SHEBOYGAN COUNTIES: 2000



LEGEND

- PROPOSED SEWER SERVICE AREA
- PRIMARY ENVIRIONMENTAL CORRIDOR

POINT SOURCES OF POLLUTION

- EXISTING PUBLIC SEWAGE TREATMENT PLANT TO BE RETAINED
- PROPOSED PUBLIC SEWAGE TREATMENT PLANT
- EXISTING PRIVATE SEWAGE TREATMENT PLANT TO BE RETAINED
- KNOWN POINT SOURCE OF WASTEWATER OTHER THAN SEWAGE TREATMENT PLANTS

GRAPHIC SCALE
0 1 2 3 MILES
0 4000 8000 12,000 16,000 20,000 FEET

Source: SEWRPC.

4. The provision of secondary waste treatment and auxiliary waste treatment for effluent disinfection followed by effluent land application through seepage lagoons at the public sewage treatment plant serving the Village of Adell.

5. The provision of secondary waste treatment followed by auxiliary waste treatment for effluent disinfection and land application of plant effluent at the public sewage treatment facility proposed to serve urban development along the shoreline of Forest Lake. If future detailed facilities planning indicates that land disposal of sewage effluent is impractical and not cost-effective, it is recommended that the treatment facility provide secondary waste treatment, advanced waste treatment for nitrification and phosphorus removal, and auxiliary waste treatment for effluent acration and disinfection.

6. The provision of secondary waste treatment followed by auxiliary waste treatment for effluent disinfection and land application of plant effluent at the public sewage treatment facility proposed to serve urban development along the shoreline of Kettle Moraine Lake. If future detailed facilities planning indicates that land disposal of sewage effluent is impractical and not cost-effective, it is recommended that the treatment facility provide secondary waste treatment, advanced waste treatment for nitrification and phosphorus removal, and auxiliary waste treatment for effluent aeration and disinfection.

Table C-2

WASTEWATER TREATMENT LEVELS AND PERFORMANCE STANDARDS ASSUMED FOR THOSE SEWAGE TREATMENT PLANTS LOCATED IN THAT PORTION OF THE MILWAUKEE RIVER WATERSHED LYING IN FOND DU LAC AND SHEBOYGAN COUNTIES

Wastewater Treatment Plant	Estimated 2000 Average Hydraulic Design Capacity (mgd)	Estimated 2000 Population Served	Recommended Wastewater Treatment Levels	Type of Wastewater Wastewater Treatment Assumed	Recommended Performance Standards in Terms of Effluent Quality (all standards represent average monthly limits)
Campbellsport	0.62	3,400	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
Random Lake	0.58	3,000	Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Cascade	0.36	1,500	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
			Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Disinfection Low Flow Augmentation	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Fecal Coliform Concentration: 200/100 ml --
Adell	0.06	600	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
Forest Lake	0.08	600	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
			Secondary Advanced Auxiliary	Activated Sludge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml
Kettle Moraine Lake	0.10	800	Secondary Auxiliary Advanced	Activated Sludge Disinfection Effluent Land Application	BOD_5 Discharge: 30 mg/l Fecal Coliform Concentration: 200/100 ml --
			Secondary Advanced Auxiliary	Activated Slusge Phosphorus Removal Nitrification Effluent Aeration Disinfection	BOD_5 Discharge: 15 mg/l Phosphorus Discharge: 1.0 mg/l Ammonia-Nitrogen Discharge: 1.5 mg/l Dissolved Oxygen in Effluent: 6.0 mg/l Fecal Coliform Concentration: 200/100 ml

Indicates performance standards if land application of sewage effluent is not selected and implemented.

Source: SEWRPC.

Private Sewage Treatment Plants

There is only one private sewage treatment plant located in the Milwaukee River watershed outside the Region. That plant serves the Kettle Moraine Correctional Institution. This facility currently discharges treated secondary plant effluent to a soil absorption system. Continuation of that system was assumed in the development of the areawide water quality management plan.

Other Known Point Sources of Wastewater

There are a total of five known point sources of wastewater other than wastewater treatment plants in the Milwaukee River watershed outside the Region. These other point sources consist primarily of industrial cooling and process waters which are discharged without treatment, or following pretreatment, directly to surface waters or to storm sewers tributary to such streams and

watercourses. The discharge characteristics of these point sources of wastewater are reported in Chapter III of SEWRPC Technical Report No. 21, Sources of Water Pollution in Southeastern Wisconsin: 1975. It has been assumed that these point sources would reduce the effluent concentration of five-day biochemical oxygen demand (BOD_5), ammonia-nitrogen, phosphorus, and fecal coliform to levels generally recommended as performance standards for the public and private wastewater treatment plants in the upper watershed discharging to the same or similar surface water bodies, and that these point sources will maintain discharge temperatures of 89°F or less, oils and grease of less than 10 milligrams per liter (mg/l), and heavy metals, organics, and other pollutant concentrations at levels required by "Best Available Technology," or as identified on a case-by-case basis under the state permit system process.

NONPOINT SOURCE POLLUTION ABATEMENT RECOMMENDATIONS

A discussion of the existing and projected water quality conditions, as well as of the level of nonpoint source control assumed for the Milwaukee River watershed in Fond du Lac and Sheboygan Counties, is presented in Volume Two, Chapter IV of this report. Minimum levels of diffuse source control were assumed for the entire Milwaukee River watershed outside the Region. For a detailed discussion of practices generally considered in the category of "minimum practices," see Volume Two, Chapter IV of this report.

LAND USE DEVELOPMENT RECOMMENDATIONS

It is recommended that the Wisconsin Department of Natural Resources include within the areawide water quality management plan for the Upper Milwaukee River watershed area the land use development recommendations contained in the Milwaukee River watershed plan. These recommendations include confining new urban development to the four villages in the upper watershed where centralized sanitary sewer service can be made available. In addition, the plan recommends that the primary environmental corridors in the upper watershed, as shown on Map C-1, be protected and preserved through appropriate land use controls. Such corridor lands should not be utilized for urban development. The remaining lands in the upper watershed area should be kept in essentially rural open space land uses, including, where appropriate, the preservation of prime agricultural lands.

CONCLUDING REMARKS

The foregoing point source pollution abatement, nonpoint source pollution abatement, and land use development recommendations have been addressed to the Wisconsin Department of Natural Resources for use in the areawide water quality management plan for that portion of the Milwaukee River watershed lying outside the seven-county Southeastern Wisconsin Region. It is further recommended that the Department, in completing its planning work for the Upper Milwaukee River watershed area, determine the costs associated with implementing the foregoing plan recommendations. Finally, it is recommended that the Department designate appropriate water quality management agencies to carry out these recommendations.

Appendix D

GLOSSARY OF TERMS USED IN THE SEWRPC REGIONAL WATER QUALITY MANAGEMENT PLANNING PROGRAM

Activated Sludge Process—A biological waste treatment process in which a mixture of sewage and activated sludge is agitated and aerated in a tank to oxidize organic matter in the sewage. The activated sludge, which consists of a growth of zoogleal organisms, is subsequently separated from the treated sewage by sedimentation and wasted or returned to the process as needed.

Aeration, Extended—A modification of the activated sludge process which provides for aerobic sludge digestion within the aeration system.

Aeration, Step—A procedure for adding increments of settled sewage along the line of flow in the aeration tanks of an activated sludge sewage treatment plant.

Appurtenances—Appliances or auxiliary structures comprising an integral part of a sewerage system, such as manholes, manhole covers, ladders, frames, and screens to provide for ventilation, inspection, or maintenance of the sewerage system, or the specialized structures, such as depressed siphons and junctions, for conveying sewage.

Best Available Technology (BAT)—The best available technology economically achievable, and the most advanced levels of waste treatment that have been or are capable of being achieved economically. The phrase is sometimes abbreviated as BATEA, and is established in federal law and regulations as the wastewater treatment methods required to be achieved by industrial point sources of wastewater by no later than July 1, 1983. The technology represents the treatment processes defined by the U.S. Environmental Protection Agency for different categories of industrial point source—generally on the basis of Standard Industrial Classification (S.I.C.) codes. (See Section 301(b)(2)(A) of Public Law 92-500.) The analogous requirement for municipal sewage treatment plants is termed "Best Practicable Waste Treatment Technology" (BPWTT) and is defined case by case under the terms of Section 201(b) of Public Law 92-500.)

Best Management Practices—The land management techniques or practices determined to be the most effective and practicable means of preventing or reducing diffuse source pollutants.

Best Practicable Control Technology (BPCT), or Best Practicable Technology (BPT)—For industry, a minimum level of wastewater treatment required nationally. The treatment level is defined by the U.S. Environmental Protection Agency, generally on the basis of Standard Industrial Classification (S.I.C.) Codes. For municipal sewage treatment plants, secondary treatment—as defined by the U.S. Environmental Protection Agency—represents the corresponding treatment level. (See Sections 301(b)(1)(A) and 301(b)(1)(B) of Public Law 92-500.)

BOD_5—Five-day biochemical oxygen demand

Bypass—A flow relief device by which sanitary sewers entering a lift station, pumping station, or sewage treatment plant can discharge a portion or all of their flow, by gravity, directly into a receiving body of surface water to alleviate sewer surcharge; also, a flow relief device by which intercepting or main sewers can discharge a portion or all of their flow, by gravity, into a receiving body of surface water to alleviate surcharging of intercepting or main sewers.

CFS—Cubic feet per second, a measure of rates of flow commonly applied to rates of stream flow in natural drainage channels.

Chlorination—The application of elemental chlorine gas to sewage effluent, generally for purposes of disinfection.

Clarification—Any process or combination of processes of which the primary purpose is to reduce the concentration of suspended matter in a liquid.

Clarifier—A unit such as a sedimentation tank or basin of which the primary purpose is to secure clarification of wastewater.

COD—Chemical oxygen demand

Flash Mixer—A device for quickly dispersing chemicals uniformly throughout a liquid.

Force Main—A pipeline joining the discharge of a pumping station with a point of gravity flow and designed to transmit sewage under pressure flow throughout its length.

Grit Chamber—A detention chamber designed to reduce the velocity of the influent sewage to permit the removal of coarse minerals from organic solids by differential sedimentation.

Groundwater—The supply of fresh water under the land surface and present either in the "saturated" zone below the water table level or above it in the "unsaturated" zone.

Heavy Metals—Metallic elements of high atomic weights, generally including iron, mercury, manganese, copper, chromium, cadmium, lead, and vanadium. These elements are generally found in trace amounts in natural waters, may be toxic to plant or animal life at relatively low concentrations, and may exhibit properties of biological accumulation.

Holding Tank—An onsite storage tank for short-term storage of sewage as part of a sewage disposal process whereby the wastes are periodically removed from the tank and transported by tank truck to a suitable treatment and discharge facility. The systems are generally only utilized where centralized sanitary sewerage service is unavailable and soils are not suitable for septic system installation and use.

Incinerator—A mechanical device for controlled combustion. Special design may be used to incinerate or to maximize energy recovery or volume reduction, or destruction of toxic or hazardous materials.

Infiltration—The water entering a sanitary sewerage system from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections, or manhole walls. Infiltration does not include, and is distinguished from, inflow.

Inflow—The water discharged into a sanitary sewerage system from such sources as, but not limited to, roof leaders; cellar, yard, and area drains; foundation drains; cooling water discharges; drains from springs and swampy areas; manhole covers; cross connections from storm sewers and combined sewers; and catch basins. Inflow consists of storm water runoff, street wash waters, and other forms of surface drainage and does not include, and is distinguished from, infiltration.

Intercepting Structure—A structure designed to intercept all dryweather sanitary sewage flow in a combined sewer and a proportionate amount of the mixed storm water and sanitary sewage flow during periods of rainfall or snowmelt and discharge such flows to an intercepting sewer.

Interflow—The component of subsurface (groundwater) flow which passes from surface infiltration during precipitation to groundwater discharge to a stream at a later time.

Intermittent Stream—A watercourse with a defined stream channel, but a natural seven-day, one-in-ten-year-recurrence interval flow of less than one-tenth of a cubic foot per second, and characterized by groundwater infiltration rather than groundwater discharge during dry periods.

Lake or Flowage—Bodies of standing water which lack a unidirectional current, or in which the current is generally very slow.

Leachate—Contaminated groundwater in the saturated or unsaturated zones resulting from the percolation of storm waters through soils and other materials which contain pollutants and are thereby transported to groundwater or surface waters through the discharge of the leachate.

Loading, Average Hydraulic—The arithmetic average of the total metered daily flow at a sewage treatment plant for any selected year.

Loading, Average Organic—The arithmetic average of the total daily loading of $CBOD_5$ at a sewage treatment plant for any selected year.

Loading, Maximum Monthly Hydraulic—The arithmetic average of the total metered daily flow at a sewage treatment plant for any month during any selected year.

Loading, Peak Hydraulic—The greatest total daily sewage flow received by a treatment plant in any selected year.

MGD—Million gallons per day, a unit of measurement of flow commonly applied to rates of wastewater flow in engineered wastewater conveyance and treatment systems.

μ g/l—Micrograms per liter, a measure of the mass per unit volume of a substance in an aqueous solution, and commonly utilized for the measurement of pollutant concentrations in wastewaters or in natural surface waters or groundwaters.

Mg/l—Milligrams per liter, a measure of the mass per unit volume of a substance in an aqueous solution, and commonly utilized for the measurement of pollutant concentrations in wastewaters or natural surface waters or groundwaters. The term is frequently interchanged with the expression "parts per million," since at the specific density of water, a liter of water weighs one kilogram.

Microstrainer—An extremely fine rotating screen for the removal of small suspended solids in sewage.

Multimedia Filter—A treatment utilized to process wastewater by passing the liquid through a sequence of three media—usually combinations of sand, anthracite, activated carbon, weighted spherical resin beds, and garnet—for the removal of suspended or colloidal matter.

NH_3-N—Ammonia-nitrogen.

Nonpoint Source—One of many pollution sources not able to be ascribed to a discrete location but which collectively result in the generalized or diffuse discharge of water pollutants to a body of water. Thus, the term refers to any source of pollution which is not able to be identified as a "point source." It should be noted that piped storm sewer outfalls through which pollutants of diffuse origin are discharged are regarded within this report as diffuse sources despite the point source nature of the actual discharge site, as in the case of runoff carried in pipes or other closed or open conduits, roadside ditches, drainage swales, or watercourses.

NO_3-N—Nitrate-nitrogen.

NO_2-N—Nitrite-nitrogen.

NPDES—National Pollutant Discharge Elimination System, the system of permit issuance established under Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, whereby the regulation of effluent discharge characteristics and pollution abatement schedules is specified in surface water discharge permits issued under the authority of the U.S. Environmental Protection Agency.

OP or PO-P_4—Orthophosphate phosphorus, or phosphate-phosphorus, or soluble phosphorus, or inorganic phosphorus.

Package Plant—A relatively small, usually prefabricated, sewage treatment plant.

PCB's—Polychlorinated biphenyls, a group of organic compounds which are used in the manufacture of plastics or electrical equipment, have low rates of degradation resulting in their persistence in the environment, and are biologically accumulative in the food chain resulting in a potential to be highly toxic for aquatic life and humans.

Point Source—A discrete site at which collected wastewater is discharged into a body of water, thereby rendering the wastewater amenable to treatment, elimination, or other control of the 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 from which pollutants are or may be discharged directly or indirectly to surface waters or groundwaters. Point sources also include outfalls from sanitary sewerage system flow relief devices, sewage treatment plants, and industrial waste discharges. It should be noted however, that because the pollutants associated with storm water runoff are directly related to the tributary land uses and associated land management practices, urban storm sewer systems have been included within this report as nonpoint sources of pollution.

Polishing Lagoon—An unaerated lagoon designed and intended to upgrade or stabilize secondary, tertiary, or advanced wastewater treatment process effluent by natural oxidation of organic matter and settling.

Pollutant Channel Loadings—The pollutant loads which enter continuous or intermittent drainage channels, drainage swales, streams, or lakes. On a short-term basis, many of the pollutant loads entering a drainage channel may be stored in the channel and not transported any great distance downstream.

Pollutants—Substances which did not originate from natural sources and are present in such quantities as to adversely affect certain beneficial water uses.

Population Equivalent—The existing or design organic loading to a sewage treatment plant expressed in population and based on an average normal domestic sewage strength and flow.[1]

Potential Pollutant Runoff—The pollutant loads which are generated directly as a result of specified natural processes and human activities and which may be available for transport by storm water runoff. These pollutants may be transported only short distances and may not necessarily reach drainage channels, streams, or lakes. Examples include the exposed soil of a construction site and the entire amount of manure generated by a herd of livestock.

Pretreatment—The conditioning of a waste at its source before discharge to remove or neutralize substances injurious to sewers and treatment processes or to effect a partial reduction in load on the treatment process. The term generally applies to the conditioning of industrial wastes before discharge to municipal sewerage systems.

Private Sanitary Sewerage System—A waste water disposal system providing conveyance, treatment, and final disposal for wastes from users who have agreed-upon rights to the benefits of the facility which is owned and operated by an individual owner, either a private business or a public institution.

Public Law 92-500 (PL 92-500)—The Federal Water Pollution Control Act Amendments of 1972, as established in Section 1251 of the 33rd Volume of the United States Code of Federal Statutory Enactments (33 USC 1251 et. seq.)

Public Sanitary Sewerage System—A waste water disposal system providing conveyance, treatment, and final disposal for wastes from users who all have equal rights to the benefits of the utility which is owned and operated by a legally established governmental body.

Q—A symbol frequently used for a rate of flow of wastewater or of streamflow.

Screening—The removal of floating and suspended solids in sewage by straining through racks or screens.

Sedimentation—The process of subsidence and deposition of the suspended matter in sewage by gravity, usually accomplished by reducing the velocity of the sewage below the point at which it can carry suspended matter. Primary sedimentation occurs in a complete sewage treatment process before biological or chemical treatment; secondary sedimentation occurs after such treatment.

Septic System (Mound Type)—A septic system which incorporates as a drain field, granular material placed on a mound above the existing grade and receiving a dosed application of pumped septic tank effluent for discharge to the inside of the mounded bed through tile lines. The granular material allows the liquid to be lifted to the surface by capillary action to evaporate or be used by vegetation atop the mound, or allows the liquid to infiltrate the underlying soil after undergoing some filtration within the mound.

Septic Tank—A settling tank in which organic solids are settled and decomposed by anaerobic bacterial action, with the settled sludge being in immediate contact with sewage flowing through the tank. The treated sewage is then discharged to the groundwater reservoirs by underground tile lines.

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.

Sewage Lagoon—A shallow body of water containing partially treated sewage in which aerobic stabilization occurs.

Sewage Treatment Plant—An arrangement of devices and structures for treating sewage in order to remove or alter its objectionable constituents and thus render it less offensive or dangerous.

Sewage Treatment Plant Efficiency—The ratio of the amount of pollutant removed by the sewage treatment plant to the amount of pollutant in the influent sewage expressed in percent.

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[1] *In the areawide water quality planning program, the average sewage strength is assumed to be 200 mg/l of $CBOD_5$, and the average domestic sewage flow is assumed to be 125 gallons per capita per day. This concentration and daily per capita flow are equivalent to 0.21 pound of $CBOD_5$/capita/day. The population equivalent is computed for either the existing or design loading by dividing the daily $CBOD_5$ loading in pounds by 0.21 pound of $CBOD_5$/capita/day. The computation of equivalent population can also be based on suspended solids by dividing the daily suspended solids loading in pounds by 0.21 pound suspended solids/capita/day.*

Sewer—A pipe or conduit, generally closed but not normally flowing under pressure, for carrying sewage.

Sewer, Branch—A common sewer receiving sewage from two or more lateral sewers serving relatively small tributary drainage areas.

Sewer, Building—A private sewer conveying sewage from a single building to a common sewer; also called housing connection.

Sewer, Combined—A common sewer intended to carry sanitary sewage, with component domestic, commercial, and industrial wastes, at all times, and which, during periods of rainfall or snowmelt, is intended to also carry storm water runoff from streets and other sources.

Sewer, Common—A sewer in which all abutters have equal rights; also called public sewer.

Sewer, Intercepting—A common sewer that receives dry weather sanitary sewage flows from a combined sewer system and predetermined proportionate amounts of mixed storm water and sanitary sewage flows during periods of rainfall or snowmelt and conducts these flows to a point of treatment or disposal.

Sewer, Lateral—A common sewer discharging into a branch or other common sewer and having no other common sewer tributary to it.

Sewer, Main—A common sewer which receives flows from many lateral and branch sewers serving relatively large tributary drainage areas for conveyance to a treatment plant; also called trunk sewer.

Sewer, Outfall—A sewer that receives flows from a collection system or treatment plant and conveys the untreated or treated waste flows to a point of discharge into a receiving body of surface water.

Sewer, Relief—A common sewer built to carry the flows in excess of the capacity of an existing sewer, thus relieving surcharging of the latter.

Sewer, Sanitary—A common sewer which carries sewage from residences, commercial buildings, and institutions, and certain types of liquid wastes from industrial plants, together with minor amounts of storm, surface, and ground waters that are not intentionally admitted.

Sewer, Storm—A common sewer which carries surface water and storm water runoff from open areas, rooftops, streets, and other sources, including street wash and other wash waters, but from which sanitary sewage and industrial wastes are specifically excluded.

Sewerage System—A system of piping treatment facilities and appurtenances for collecting, conveying, and treating wastewater.

Sludge—An aqueous suspension of residual solids generated through the treatment of a municipal or industrial wastewater, and of such a nature and concentration as to require special consideration for disposal. Industrial residuals having economic value without significant processing are not included under this definition.

Station, Lift—A relatively small sewage pumping installation designed to lift sewage from a gravity flow sewer to a higher elevation when the continuance of the gravity flow sewer would involve excessive depths of trench, or designed to lift sewage from areas too low to drain into available sewers. Lift stations normally discharge through relatively short force mains to gravity flow points located at or very near the lift station.

Station, Portable Pumping—A point of flow relief at which flows from surcharged sanitary sewers are discharged into storm sewers or directly into a receiving body of surface water through the use of portable pumping units.

Station, Pumping—A relatively large sewage pumping installation designed not only to lift sewage to a higher elevation but to convey it through force mains to gravity flow points located relatively long distances from the pumping station.

Station, Relief Pumping—A flow relief device by which flows from surcharged main sewers are discharged into storm sewers or directly into a receiving body of surface water through the use of permanent lift or pumping stations.

Stream Reach—A drainageway having a specified location and course of direction, identified by defined terminus points.

Stream Segment—See "stream reach."

Storm Water Management System—A system of conveyance and storage facilities—including but not limited to subsurface pipes and conduits, surface ditches and channels, and appurtenant inlet, outlet, storage, pumping, and treatment facilities—located in urbanized areas and constructed—or improved—and operated for purposes of collecting storm water runoff from tributary developed areas and conveying such runoff to natural watercourses for disposal.

Subbasin—A relatively small surface drainage unit, generally encompassing no more than 10 square miles, defined by its common drainage to a single, identifiable, downstream point of storm water discharge.

Subwatershed—A surface drainage unit larger than a subbasin but smaller than a watershed, and comprised of the area tributary to a named, generally recognized, continuously flowing stream or lake.

TKN—Total Kjeldahl nitrogen.

TN—Total nitrogen.

Treatment, Advanced—Additional biological, or physical, and chemical treatment to provide removal of additional constituents, particularly phosphorus and nitrogen compounds, by such means as chemical coagulation, sedimentation, charcoal filtration, and aeration. Although advanced treatment is traditionally conceived of as following secondary treatment or as combined with tertiary treatment, it can be performed following primary treatment or as an integral part of secondary treatment. Advanced treatment may remove 90 percent or more of the raw influent phosphorus and up to 90 percent of the raw influent nitrogen, or effect up to 95 percent reduction in the oxygen demand of ammonia in the sewage treatment plant influent by converting the ammonia compounds to nitrates.

Treatment, Auxiliary—A treatment measure which is used in combination with all other treatment methods, and which includes, for example, effluent aeration and disinfection by chlorination.

Treatment, Primary—The physical treatment of raw sewage in which the coarser floating and settleable solids are removed by screening and sedimentation. Primary treatment normally provides 50 to 60 percent reduction of the influent suspended matter and 25 to 35 percent reduction of the influent carbonaceous biochemical oxygen-demanding organic matter ($CBOD_{ult}$). It removes little or no colloidal and dissolved matter.

Treatment, Secondary—The biological treatment of the effluent from primary treatment in which additional oxygen-demanding organic matter is removed by trickling filters or activated sludge tanks and additional sedimentation. Secondary treatment normally provides up to 90 percent removal of the raw influent suspended matter and 75 to 95 percent removal of the raw influent $CBOD_{ult}$. Secondary treatment facilities can be designed and operated to also remove 30 to 50 percent of the raw influent nitrogenous biochemical oxygen demand ($NBOD_{ult}$) and 30 to 40 percent of the raw influent phosphorus content of the influent sewage. In addition to this definition used by the SEWRPC, it should be noted that a definition has been set forth by the U.S. Environmental Protection Agency for the "secondary treatment" requirements to be achieved by all publicly owned treatment works (municipal sewage treatment plants) by 1977; or by July 1, 1983 if sufficient construction time or timely federal financial assistance is not available, providing that a request for extension is submitted by the municipality. That federal definition calls for treatment which is either adequate to achieve an effluent quality of 30 mg/l of biochemical oxygen demand and 30 mg/l of suspended solids, or is adequate to achieve a reduction of at least 85 percent in the concentrations of biochemical oxygen demand and of suspended solids.

Treatment, Tertiary—The physical and biological treatment of the effluent from secondary treatment in which additional oxygen-demanding matter is removed by use of shallow detention ponds to provide additional biochemical treatment and settling of solids or filtration using sand or other media filters or mechanical screening or filtration. Tertiary treatment normally provides up to 99 percent removal of the raw influent suspended matter and 95 to 97 percent of the raw influent $CBOD_{ult}$.

Trickling Filter Process—A biological waste treatment process in which sewage is applied in spray form from nozzles or other distribution devices over a filter consisting of an artificial bed of coarse material, such as broken stone, through which the sewage trickles to underdrains, giving opportunity for the formation of zoogleal slimes which clarify and oxidize the sewage.

TS—Total solids.

TSS—Total suspended solids.

Un-ionized ammonia—The fraction of ammonia present in surface waters, which is toxic to fish and other aquatic life. At higher temperatures and higher pH, the proportion of ammonia which is un-ionized is greater than at low temperature and low pH.

Vacuum filter—A filter consisting of a cylindrical metal drum covered with cloth or other media revolving on a horizontal axis with partial submergence in liquid sludge. A vacuum is maintained under the media to extract moisture from the sludge which adheres to the cloth or media and which is scraped off continuously for disposal.

Water Pollution—The condition in which substances which do not originate from natural sources are present in such quantities as to adversely affect certain beneficial water uses. The principal forms of pollution are: organic, nutrient, inorganic, pathogenic, thermal, aesthetic and radiological.

Water Quality Limited Segment—A stream segment which would not meet the applicable water quality standard except by the application of wastewater treatment technology more advanced than "best practicable treatment" or "secondary treatment."

Water Quality Standards—Statements of the characteristics of water which must be maintained in order to make it suitable for specific uses, and commonly expressed in terms of specific water quality indicators, relating the maximum or minimum concentrations of desirable and undesirable chemical substances in waters, or relating to other physical characteristics of the waters. Such standards are generally specified as ambient stream or lake water quality conditions, but the term is sometimes applied to criteria for the quality of discharged wastewater effluents.

Watershed—A relatively large, geographic area of overland drainage contributing surface runoff to the flow of a particular watercourse at a particular point, and having within the area natural and man-made features so interrelated and mutually interdependent as to create a significant community of interest among its residents. The term is applied by the Commission in its major planning programs with the reference to 11 major drainage units lying wholly or partially within the Southeastern Wisconsin Region. These include the Des Plaines River watershed; Fox River watershed; Kinnickinnic River watershed; Menomonee River watershed; Milwaukee River watershed; Oak Creek watershed; Pike River watershed; Rock River watershed; Root River watershed; Sauk Creek watershed; and Sheboygan River watershed. In addition, Commission work programs include collectively as a 12th major drainage unit the watersheds of the minor streams directly tributary to Lake Michigan, including but not limited to the areas tributary to Barnes Creek, Pike Creek, and Sucker Creek. It should be noted that the Southeastern Wisconsin Region is divided by a subcontinental divide which separates these 12 watersheds into those tributary to Lake Michigan, and those which drain ultimately to the Mississippi River.

Watershed Pollutant Transport—The pollutant loads transported, and modified by processes occurring during transport, by a surface water system from all of the upstream sources and channels past a given point on a stream network. The quantity of such loads would generally be measured near the downstream end of a watershed, and reported on either an annual or a storm event basis.

WPDES—Wisconsin Pollutant Discharge Elimination System, a system of permit issuance established under Chapter 147 of the Wisconsin Statutes whereby the regulation of effluent discharge characteristics and pollution abatement schedules is specified in surface water and groundwater discharge permits issued under the authority of the Wisconsin Department of Natural Resources, as that authority was explicitly delegated to the State of Wisconsin Department of Natural Resources by the U.S. Environmental Protection Agency, and in accordance with state authority established under Chapter 147 of Wisconsin Statutes.

Appendix E

MODEL RESOLUTION FOR ADOPTION OF THE REGIONAL WATER QUALITY MANAGEMENT PLAN FOR SOUTHEASTERN WISCONSIN

WHEREAS, the Southeastern Wisconsin Regional Planning Commission, which was duly created by the Governor of the State of Wisconsin in accordance with Section 66.945(2) of the Wisconsin Statutes on the 8th day of August 1960 upon petition of the Counties of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha, has the function and duty of making and adopting a master plan for the physical development of the Region; and

WHEREAS, the Governor of the State of Wisconsin has designated the seven-county Southeastern Wisconsin Region as an areawide water quality management planning area and the Southeastern Wisconsin Regional Planning Commission as the official water quality management planning agency for that area, all in accordance with the procedural requirements set forth in Section 208 of the Federal Water Pollution Control Act; and

WHEREAS, the Southeastern Wisconsin Regional Planning Commission, pursuant to its function and duty as a regional planning agency and its designation as a water quality management planning agency, has prepared and adopted at its meeting held on the 12th day of July 1979, an areawide water quality management plan set forth in a report entitled, SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, Volume One, Inventory Findings, published in September 1978; Volume Two, Alternative Plans, published in February 1979; and Volume Three, Recommended Plan, published in June 1979; and

WHEREAS, the Commission has transmitted certified copies of its resolution adopting the regional water quality management plan, together with the aforementioned SEWRPC Planning Report No. 30, to the local units of government concerned and to the appropriate state and federal agencies; and

WHEREAS, the (name of local governing body) has supported, participated in the financing of, and generally concurred in the regional planning programs undertaken by the Southeastern Wisconsin Regional Planning Commission, and believes that the regional water quality management plan prepared by the Commission is a sound and valuable guide to water quality management in the development of not only the Region but also the local community, and that the adoption of such plan by the (name of local governing body) will assure a common understanding by the units and agencies of government concerned and enable these units and agencies of government to program the necessary plan implementation work.

NOW, THEREFORE, BE IT HEREBY RESOLVED that, pursuant to Section 66.945(12) of the Wisconsin Statutes, the (name of local governing body) on the _____ day of _____ 19__, hereby adopts the regional water quality management plan previously adopted by the Southeastern Wisconsin Regional Planning Commission as set forth in SEWRPC Planning Report No. 30 as a guide for regional and community development.

BE IT FURTHER HEREBY RESOLVED that the _____ clerk transmit a certified copy of this resolution to the Southeastern Wisconsin Regional Planning Commission and to the Secretary of the Wisconsin Department of Natural Resources.

_____
(President, Mayor, or Chairman
of the Local Governing Body)

ATTESTATION

_____
(Clerk of Local Governing Body)