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WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHI--ETC(U)
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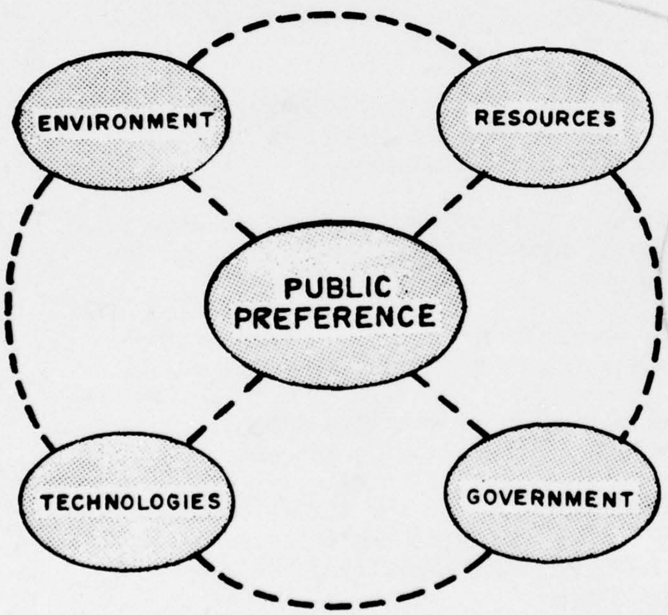
WASTEWATER MANAGEMENT STUDY FOR

CHICAGO SOUTH END of LAKE MICHIGAN



APPENDIX A

BACKGROUND INFORMATION

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT CORPS OF ENGINEERS
219 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

JULY 1973

REPORT COMPOSITION

The survey report is divided into a Summary, and 9 Appendices. A charge for each appendix and summary report to cover the cost of printing will be required, should purchase be desired. The appendices each contain a different category of information. Alphabetically identified, the appendices are:

A. Background Information - This appendix includes the population and industrial projections, wastewater flows and the engineering data used as a basis for planning.

B. Basis of Design and Cost - This appendix contains the criteria and rationale used to design and cost the final alternative wastewater treatment system components.

C. Plan Formulation - The appendix presents the planning concepts and procedures used in developing the alternative wastewater management plans that were examined during the study.

D. Description and Cost of Alternatives - This appendix contains a cost description and construction phasing analysis for each of the final five regional wastewater management alternatives. Components of these alternatives are described in detail in Appendix B.

E. Social - Environmental Evaluation - This report provides an assessment of the social and environmental impacts likely to arise from the implementation of the final five alternatives.

F. Institutional Considerations - This report presents an assessment of the institutional impacts likely to arise from implementation of the final five alternatives.

G. Valuation - This appendix presents a broad evaluation of the implications and use potential inherent in the final five alternatives.

H. Public Involvement/Participation Program - This appendix documents the program used to involve the public in the planning process.

I. Comments - This appendix contains all of the formal comments from local, State and Federal entities as the result of their review of the other appendices and the Summary Report. Also capsulized are the views of citizens presented at public meetings.

The Summary document presents an overview of the entire study.

CHICAGO-SOUTH END LAKE MICHIGAN AREA

WASTEWATER MANAGEMENT STUDY

APPENDIX A
BACKGROUND INFORMATION

DEPARTMENT OF THE ARMY
Chicago District, Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

PREFACE

Extensive background data was gathered and used as a starting base in the development of the Chicago-South End of Lake Michigan (C-SELM) Wastewater Management Study. Much of the background data is summarized in this appendix. During the course of the study, some data was refined. These revisions are reflected in the design of the final array of alternatives. Specifically, the appendix includes descriptions of C-SELM area and climatological conditions; land use, population and industrial and wastewater flow projections; water management needs; area planning objectives; planning restrictions for water management; and current and planned water management proposals.

APPENDIX A: BACKGROUND INFORMATION

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SECTION VI:- PLANNING RESTRICTIONS FOR WATER MANAGEMENT, and

SECTION VII - CURRENT AND PLANNED WATER MANAGEMENT ACTIVITIES.

LIST OF TABLES - APPENDIX A

LIST OF FIGURES - APPENDIX A

APPENDIX A: BACKGROUND INFORMATION

SECTION I: LAND, CLIMATOLOGICAL-PHYSICAL AND BIOLOGICAL CONDITIONS

THE C-SELM STUDY AREA

The C-SELM study area is regional by definition since it crosses county and State boundaries. It encompasses the drainage basins of the Chicago, Des Plaines, DuPage, Little Calumet and Grand Calumet Rivers and the lands in Illinois and Indiana that drain into Lake Michigan, as shown in Figure A-I-1. The area was specified in the Congressional authorization for the C-SELM study. Seven contiguous counties including Lake, Cook, DuPage and Will Counties in Illinois, and Lake, Porter, and LaPorte Counties in Indiana, are wholly or partly inside the study area. Nearly 90 townships are included in the C-SELM area with a 1970 population of approximately 7.1 million people.

TOPOGRAPHY - GEOLOGY

The C-SELM study area lies entirely within the Central Lowland Physiographic Province. Except for a small area in the southwestern portion, the study area lies within the Great Lakes Section of the Province. The Great Lakes Section is further subdivided into the Chicago Lake Plain Subsection and the Wheaton Morainal County Subsection. The Chicago Lake Plain Subsection extends from near LaGrange, Illinois, on the west, to Winnetka, Illinois, on the north, and the Indiana border on the south, sloping gently towards Lake Michigan on the east. It is a low flat area interrupted by only a few low ridges. The Wheaton Morainal County Subsection surrounds the Chicago Lake Plain Subsection to the west. It is hilly, with broad ridges paralleling Lake Michigan, and contains numerous lakes and swamps. A small portion of the Kankakee Plain Subsection of the Till Plain Section in western Will County, Illinois, encompasses the remaining land in the study area (1) .

The surface character of the area resulted from past glacial activity. Three glaciers covered the study area, each advancing and retreating a number of times. The area is overlain with a glacial drift or till of an extremely heterogeneous nature which varies in depth from 0 to 400 ft. Bedrock outcroppings occur in portions of Will and Cook Counties. Figure A-I-2 is a glacial map of the study area and contiguous counties.

DRAINAGE

The C-SELM study area has a drainage area of 2,600 sq. mi. Drainage is ultimately to the Illinois River via the Illinois Waterway System or to Lake Michigan via a number of rivers and channels (Figure A-I-3). This drainage is controlled by the generally flat topography of the area and is

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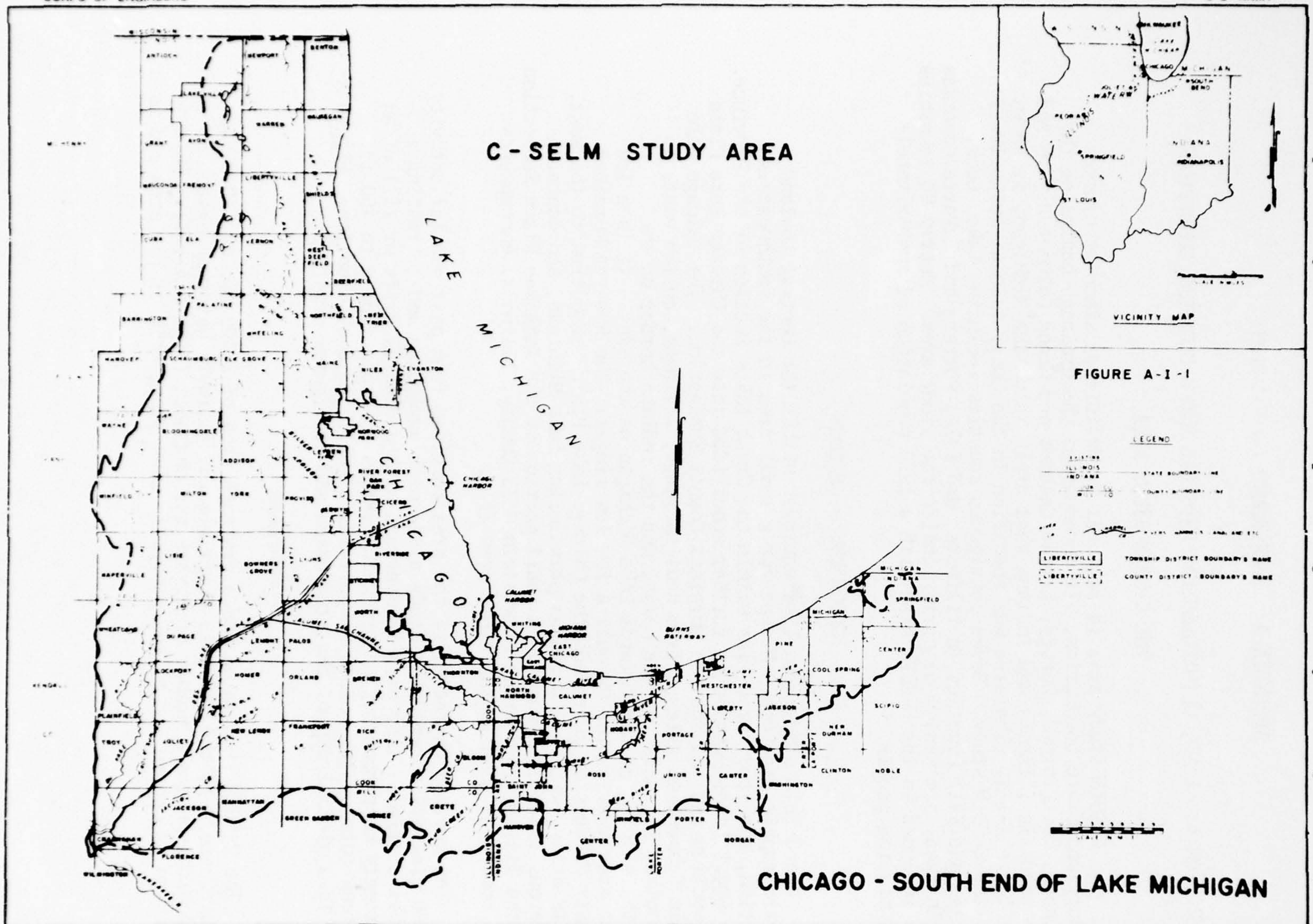
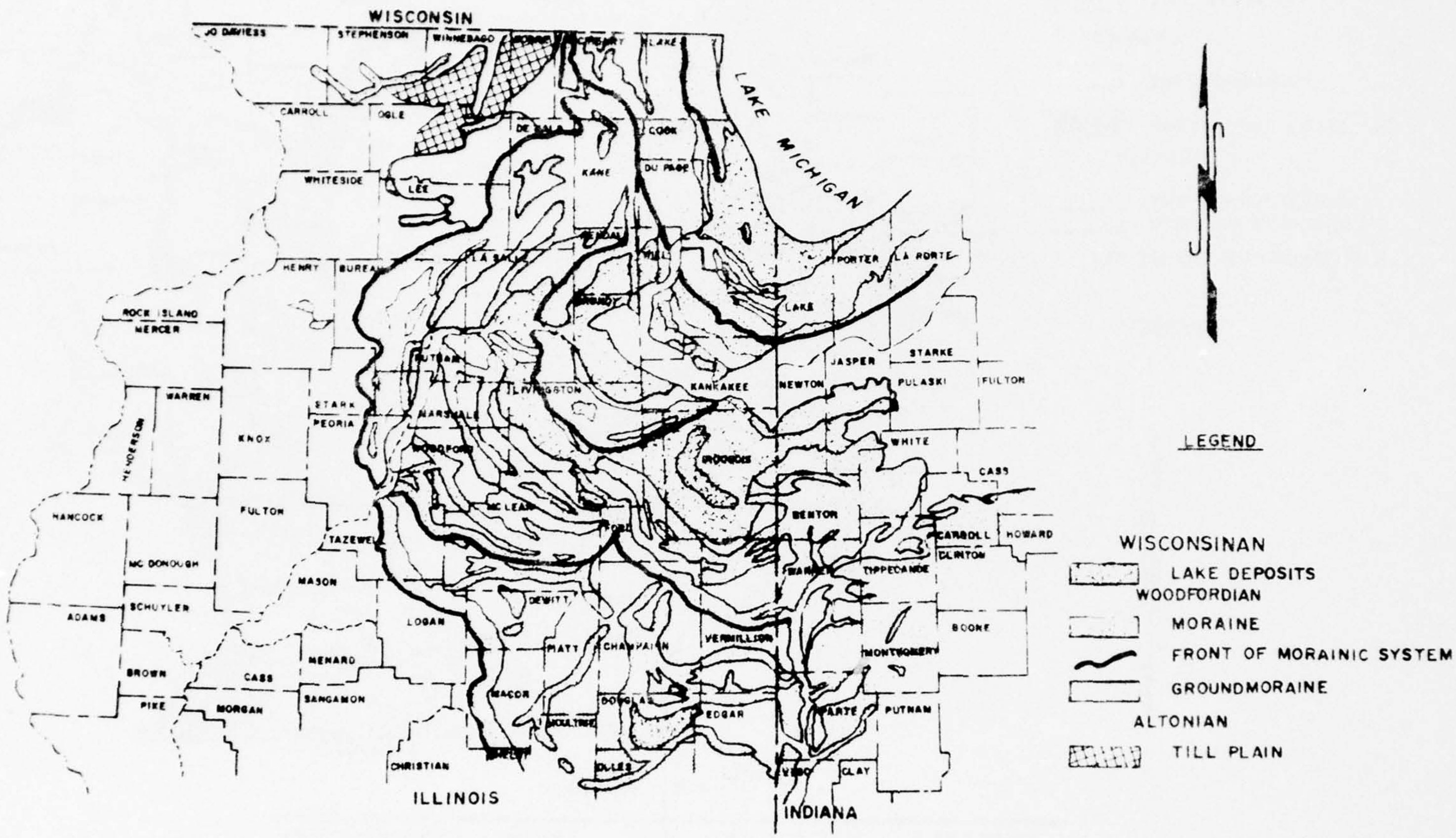


FIGURE A-I-1

GLACIAL MAP OF STUDY AREA

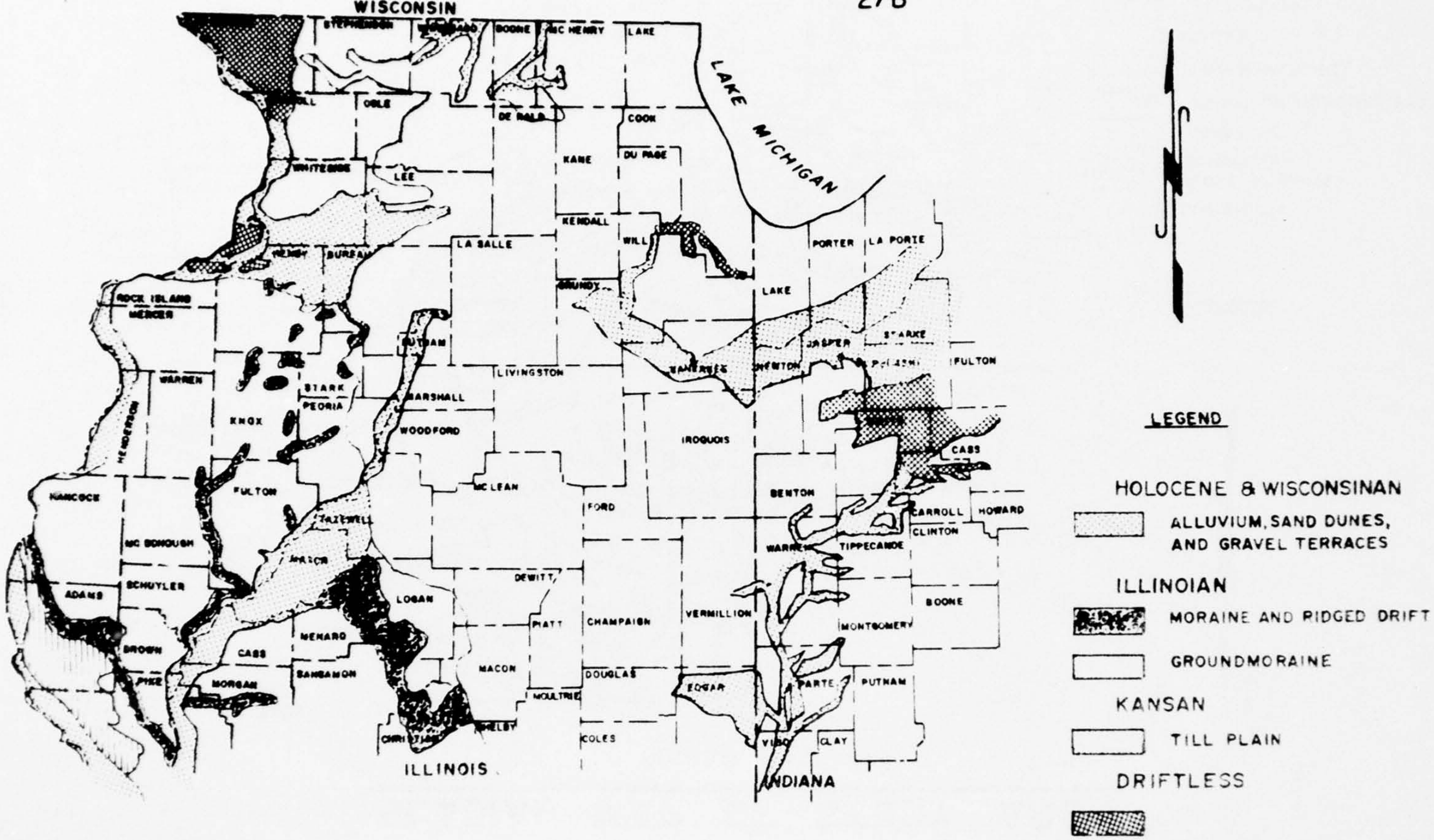
FIGURE A-I-2/A

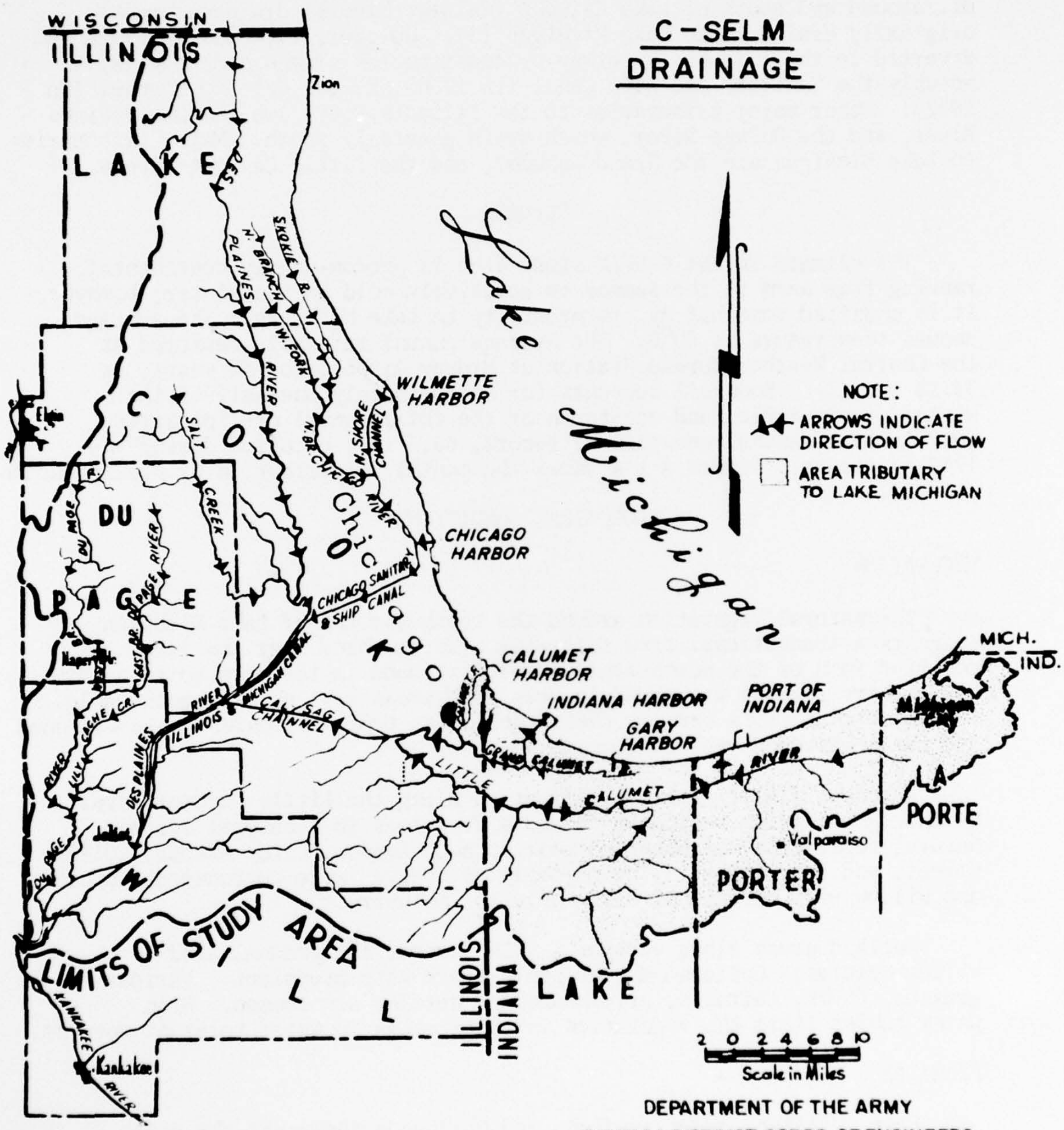


GLACIAL MAP OF STUDY AREA

FIGURE A-I-

2/B





DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS

FIGURE A-I-3

poorly defined in certain areas. About 70 sq. mi. along Lake Michigan north of downtown Chicago (Chicago River drainage area) and about 290 sq. mi. around and south of Lake Calumet (Calumet Rivers' drainage areas) originally drained into Lake Michigan (2). However, flow was reversed and diverted to the Illinois Waterway by construction of man-made canals, notably the Sanitary and Ship Canal (in 1900) and the Cal-Sag Channel (in 1922). Other major tributaries to the Illinois River are the Des Plaines River, and the DuPage River, which drain generally south. Major tributaries to Lake Michigan are the Grand Calumet, and the Little Calumet Rivers.

CLIMATE

The climate in the C-SELM study area is predominantly continental, ranging from warm in the summer to relatively cold in the winter; however, it is modified somewhat by its proximity to Lake Michigan. The average annual temperature is 50°F. The average annual rainfall, measured at the Central Weather Bureau Station at Midway Airport for 42 years, is 33.18 in. (3). Snowfall accounts for approximately one-half of the winter precipitation and one-tenth of the total annual precipitation. The maximum seasonal snowfall of record, 68.4 in., occurred during the 1967-68 season. Figure A-I-4 shows the monthly distribution of precipitation.

BIOLOGICAL CONDITIONS

VEGETATION

The natural vegetation around the southwest end of Lake Michigan suggests a transitional zone following a narrow band near the lake. A modified form of the beech-maple forest is found in the more moist areas. Oak-hickory forests are found in more open areas west of the beech-maple. A transitional flora between these two forest types indicates maple-basswood and maple-basswood-red oak forest (74).

A recent (1973) field investigation along the Little Calumet River by Chicago District personnel showed a few areas in a natural state. Natural vegetation was observed near Kennedy Avenue, Cline Avenue, Colfax Street, and Burr Street. The majority of species were cottonwoods, poplars and willow with occasional oak, maple and mulberry.

Wetland areas along various C-SELM streams are predominated by willow species. Cottonwoods and poplars are also prevalent. Various grasses, forbs, cattails, arrowheads and nettles are common. High water tables limit the vegetation in these areas to water tolerant species.

FISHLIFE

Carp, catfish, green sunfish, and bullheads represent the most prolific fish populations in C-SELM streams (73). Recent (1970) fish sampling data obtained from the Illinois Natural History Survey and the Museum of

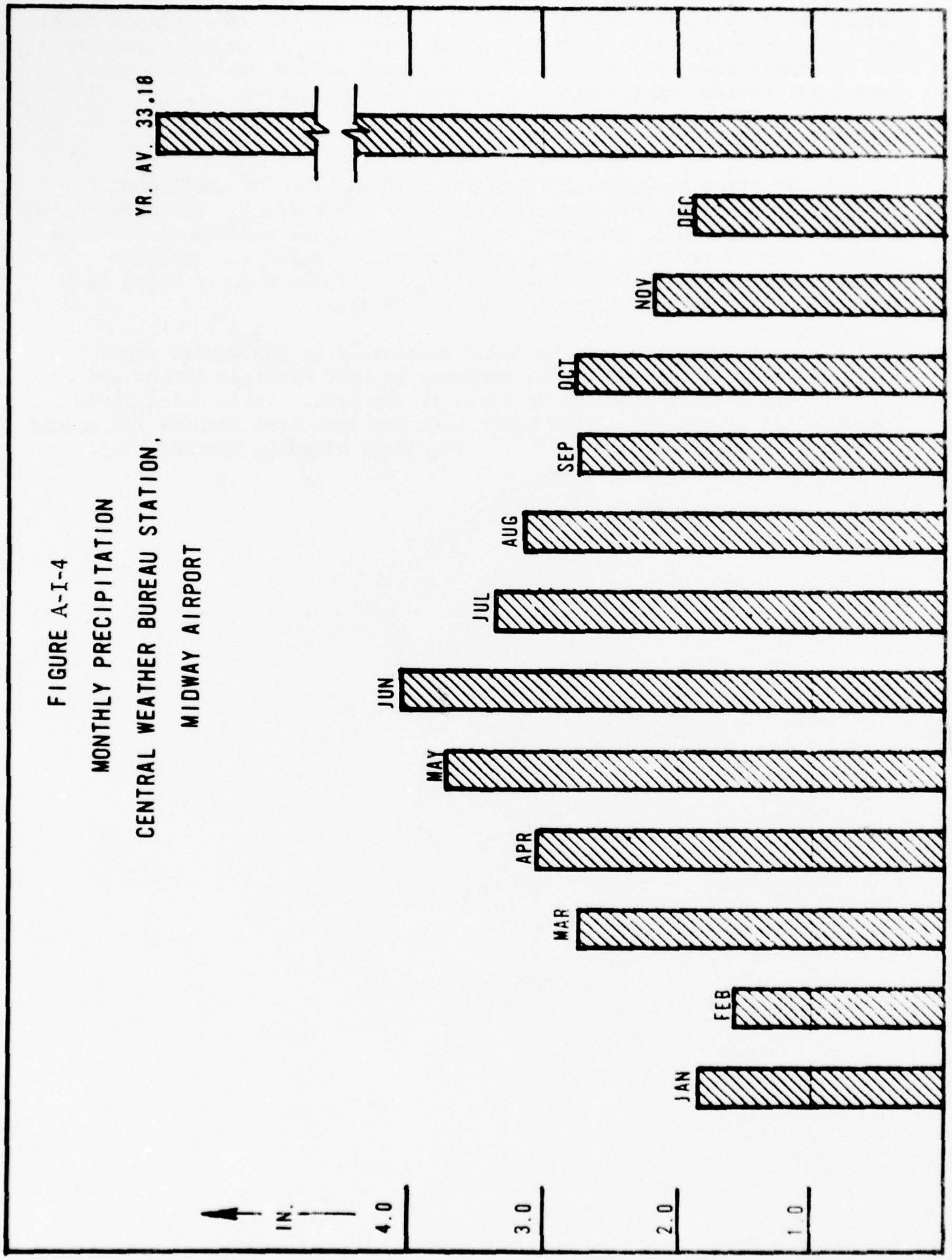


FIGURE A-I-4
MONTHLY PRECIPITATION
CENTRAL WEATHER BUREAU STATION,
MIDWAY AIRPORT

Natural History indicates that numerous smaller tributaries contain small but good fisheries (75). Improvement of water quality should result in the reestablishment of desirable species, such as the smallmouth bass, rock bass, various darter and stream type minnow species.

TERRESTRIAL FAUNA

The existing terrestrial fauna consist primarily of small mammal and bird species characteristic of urban and shore areas. Wildlife includes a number of waterfowl, pheasant, quail and the usual assortment of urban animals such as rabbits, squirrels, opossums and raccoons. Over 300 varieties of birds have been identified in the Indiana Dunes State Park which is in the southeast part of the C-SEIM area.

Migratory songbirds may be found seasonally in the wooded areas, while migratory waterfowl can be expected in Lake Michigan harbor and shore areas, as well as a few wetlands in the area. Table A-I-1 lists common birds of the area. The south Lake Michigan area records 200 species of regularly occuring birds with 115 regularly breeding species (76).

TABLE A-I-1

THE BIRDS OF THE CHICAGO REGION
(LAKE MICHIGAN SHORELINE)

Pied-billed Grebe	Chimney Swift
Great Blue Heron	Belted Kingfisher
Black-crowned Night Heron	Horned Lark
Mallard	Tree Swallow
Black Duck	Bank Swallow
Semipalmated Plover	Rough-winged Swallow
Killdeer	Barn Swallow
American Golden Plover	Purple Martin
Black-bellied Plover	Common Crow
Ruddy Turnstone	Long-billed Marsh Wren
Common Snipe	Short-billed Marsh Wren
Spotted Sandpiper	Catbird
Solitary Sandpiper	Starling
Greater Yellowlegs	Myrtle Warbler
Lesser Yellowlegs	Black-throated Green Warbler
Pectoral Sandpiper	Palm Warbler
Baird's Sandpiper	Yellowthroat
Least Sandpiper	House Sparrow
Dunlin	Redwinged Blackbird
Short-billed Dowitcher	Brown-headed Cowbird
Semipalmated Sandpiper	Common Grackle
Sanderling	Cardinal
Herring Gull	Indigo Bunting
Ring-billed Gull	American Goldfinch
Forster's Tern	Slate-colored Junco
Common Tern	White-crowned Sparrow
Black Tern	White-throated Sparrow
Mourning Dove	Song Sparrow

TABLE A-I-1 (Cont'd)

THE BIRDS OF THE CHICAGO REGION
(URBAN AND SUBURBAN AREAS)

Sparrow Hawk
Killdeer
Herring Gull
Ring-billed Gull
Bonaparte's Gull
Rock Dove
Yellow-billed Cuckoo
Screech Owl
Chimney Swift
Ruby-throated Hummingbird
Yellow-shafted Flicker
Red-headed Woodpecker
Downy Woodpecker
Great Crested Flycatcher
Eastern Phoebe
Barn Swallow
Purple Martin
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown Creeper
House Wren
Catbird
Brown Thrasher
Robin
Wood Thrush
Hermit Thrush
Swainson's Thrush
Gray-cheeked Thrush
Veery
Golden-crowned Kinglet
Ruby-crowned Kinglet
Cedar Waxwing
Starling
Yellow-throated Vireo
Solitary Vireo
Red-eyed Vireo
Warbling Vireo
Black-and-white Warbler
Tennessee Warbler
Nashville Warbler
Yellow Warbler
Magnolia Warbler
Myrtle Warbler
Black-throated Green Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Wilson's Warbler
Canada Warbler
American Redstart
House Sparrow
Baltimore Oriole
Common Grackle
Brown-headed Cowbird
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Purple Finch
American Goldfinch
Rufous-sided Towhee
Slate-colored Junco
Chipping Sparrow
White-crowned Sparrow
White-throated Sparrow
Fox Sparrow
Song Sparrow
Yellow Throat
Northern Waterthrush
Ovenbird
Blackpoll Warbler
Bay-breasted Warbler

SECTION II: LAND USE

GENERAL

In order to get a view of the study area from a regional planner's viewpoint, information was gleaned from recent planning papers prepared by the Northeastern Illinois Planning Commission (NIPC) (4) and the Lake-Porter County Regional Transportation and Planning Commission (LPCRTPC) (5). Existing land-uses are specifically identified for restricted categories. Projected uses are estimates based on known factors and mathematical relationships. Land-use projection methods have been defined in both the NIPC and LPCRTPC papers.

Regional planning philosophies emphasize that there is a strong relationship between land use planning and water resource planning. The relationship is most obvious in terms of the effect on water resources by overland runoff from developed areas and other changes in natural drainage patterns. During 1972, several streams in the C-SELM area illustrated flooding problems that were aggravated by runoff from developed areas. Effective development planning can minimize the adverse impacts by controlling environmentally incompatible land uses and assuring balanced development.

PRESENT AND PROJECTED LAND USE--C-SELM COUNTIES

Three categories have been used to distinguish between types of land use. They are Residential, Regional Open Space, and Agricultural and Vacant Land. Tables A-II-1, 2, and 3 give breakdowns in land use in acres.

LAND USE PLANNING

One of the principal concerns involved in regional planning is the location of private developments. The desired result is to guide private developments in order to enable a greater accessibility between people and opportunities within the region. Most people leaving their homes to work, shop, recreate, go to school, to the doctor, or other reasons, are concerned with the time and expense of travel. Therefore, NIPC and LPCRTPC have expressed a need for logical, patterned developments. NIPC and LPCRTPC feel that developments should follow transportation corridors, with open-space and recreational needs provided between the corridors (6)(7).

AWARENESS OF CORE CITY AND RURAL AREAS

The same principals of development presented in the previous paragraph which implicitly apply to suburban areas, should be applied to rural areas and to the redevelopment of urban core areas.

TABLE A-II-1

RESIDENTIAL LAND FORECASTS

FOR C-SELM COUNTIES
(acres)

	Existing	Forecast		
ILLINOIS	1970*	1975	1985	1995
City of Chicago	NA**	46,400	47,300	47,500
Suburban Cook County	122,700	134,400	150,700	164,500
DuPage County	53,567	58,800	70,900	79,800
Lake County	40,256	45,600	57,400	73,800
Will County	24,448	30,050	43,200	62,600
INDIANA				
Lake County	31,465	48,042	57,626	80,954
Porter County	12,692	23,018	31,875	41,853
LaPorte County	NA	NA	NA	NA

* 1971 for Indiana

** Not available

TABLE A-II-2

REGIONAL OPEN SPACE FORECASTS

FOR C-SELM COUNTIES
(acres)

	Existing	Forecast		
ILLINOIS	1970*	1975	1985	1995
City of Chicago	10,750	32,200	60,000	60,000
Suburban Cook County	68,500	78,300	111,200	114,000
DuPage County	13,700	25,700	37,000	37,000
Lake County	14,000	39,900	49,400	49,400
Will County	10,500	27,000	42,500	42,500
INDIANA				
Lake County	4,075	12,864	18,675	27,491
Porter County	1,491	3,718	12,762	28,992
LaPorte County	NA**	NA	NA	NA

* 1971 for Indiana

** Not available

TABLE A-II-3

AGRICULTURAL AND VACANT LAND FORECASTS

FOR C-SELM COUNTIES
(acres)

	Existing	Forecast		
ILLINOIS	1970*	1975	1985	1995
City of Chicago	0	0	0	0
Suburban Cook County	155,900	112,600	60,200	35,200
DuPage County	111,000	83,100	61,000	52,300
Lake County	212,900	174,600	154,400	135,600
Will County	430,400	400,700	354,400	335,200
INDIANA				
Lake County	234,201	205,174	179,590	138,570
Porter County	233,461	223,235	199,504	169,562
LaPorte County	NA	NA**	NA	NA

* 1971 for Indiana

** Not available

SECTION 3: POPULATION AND INDUSTRIAL PROJECTIONS--CORRELATION TO FLOWS

DEVELOPMENT OF SOCIO-ECONOMIC PROJECTIONS

The development of reliable socio-economic projections provides the basis for viable wastewater management planning. Essential elements of these projections are trends in the economic development of a community as reflected in or controlled by the land use patterns in an area. These economic trends include the population and industrial growth of an area, and hence the planning and construction of sewage treatment facilities to meet the demands of this growth. Regional trends, such as the decentralization of economic activity and the rapid growth of suburban population in close proximity to the areas of population saturation will affect all local planning. It was therefore of utmost importance to assess and evaluate these trends, and to incorporate them into a comprehensive plan for the C-SELM area.

Since the quantity of sewage to be removed and treated is partly dependent upon the population and its per capita contribution to sewage, detailed population studies were made to accurately predict these trends. Such an analysis was made to predict flow quantities, a primary prerequisite to design of treatment facilities. A projection of the trends in per capita use by area was also made. Similarly, industrial trends in expected recycle rates for the major water using industries were assessed.

The distribution of population in the C-SELM area, as in any area, is dependent upon an intermix of complex factors. These include the educational, occupational, and income characteristics of the population; the land use and zoning patterns within each community; and the influence of local regulations. For example, single family housing would tend towards a lesser density than multiple family housing and thus require lesser size of facilities per unit area. Similarly, the socio-economic structure of a community as well as the population density is different for a community with young families with children than for retired couples.

BASIS FOR EVALUATION

The selection of the projection methodology for future municipal and industrial loads is dependent upon the amounts and types of data available, including, of course, the information on communities cited above. The assessment of the study area's future wastewater loads thus necessitated an evaluation and estimate of the socio-economic indicators of wastewater production. Thus a methodology was developed to determine the future estimates of the two principal indicators -- population and industry. Wastewater resulting from stormwater runoff is a function of land use, i.e. degree of urbanization, and is addressed in section IV of this appendix.

The pattern of area growth was evaluated on a county basis and subsequently disaggregated to townships and city of Chicago Zip Code zones. The disaggregated profile then served as a base for qualifying the intermix of the quantity and type of both municipal and industrial wastewater loads. The economic analysis thus served as a basis for determination of future municipal and industrial flow-rates pursuant to selection of design criteria for facilities, and projections of future needs for facilities.

In response to this need, population and industrial projections were developed for each decade from 1980 through 2020. Constraints on population and industrial expansion, e.g. availability of land, current land use plans, and transportation, were used to assess the limits on growth within each of the 86 townships comprising the study area. The projections are considered to be reasonable estimates of future conditions developed from data current at the time of the analysis. Hence, while the actual future development may differ somewhat from the projections, the general relationships are considered realistic. (Note that such projections usually indicate a smooth line on a population vs. time curve, regardless of which projection methodology is used; whereas actual (past) population curves do not.)

MUNICIPAL PROJECTIONS

RELATIONSHIP WITH OTHER STUDIES

The basic population projections used for this study were a compilation (and modification as required) of those prepared by other Federal, state, and regional agencies. Each of these selected agencies utilized the county as the basic unit in allocating the expected socio-economic growth and depicting trend patterns. The projection sources included the U. S. Department of Commerce, Office of Business Economics (OBE); the State of Indiana Department of Natural Resources (IDNR); and Northeastern Illinois Planning Commission (NIPC).

The OBE data, dated March 1971, was disaggregated from the larger Economic Region -- that of the Great Lakes Basin planning subarea "Southwest Lake Michigan" -- by the North Central Division, U. S. Army Corps of Engineers. This was done as part of a (Type A) Regional Study for the Water Resources Council (9). The OBE projection data was included to provide a regional limit on the aggregation of projections prepared by various agencies and local interests. The intent was to insure compatibility of the region to the national economy by considering OBE's projections for all counties collectively.

The State of Indiana projections and those of NIPC were updated in March and July 1971, respectively, to incorporate the 1970 final census count. The NIPC forecasts were made through the year 1995 whereas the projections of OBE and Indiana extended to the year 2020. (Note that although LPCRTPC is an A-95 planning entity for the State of Indiana, the projections of this agency were not utilized. This was because the 1970 census results were not then available for this agency, and the fact that no common base existed with the other studies.)

In developing the Chicago District projections and in resolving differences between projections, the "development corridor" concept by NIPC was used as a framework and is thus of particular note. The concept is that "...most new suburban growth will occur in development corridors consisting of land with convenient access to adequate systems of mass transportation, water supply, sewage disposal and other essential facilities and services." Further, "Open lands such as major recreation parks, golf courses, cemeteries, agricultural and large lot residential areas will be the predominant land uses in the spaces between the development corridors." (**16**) According to the concept, the most significant form of mass transportation in suburban areas is the commuter rail service which has been long established and helped shape the form of suburban areas. While other public services and facilities can be extended to any part of the region, commuter rail service is virtually fixed according to the present pattern of rail lines. For this reason, the existing rail system has taken on a special significance in defining the location of future development corridors along which both municipalities and industry would grow. Since sewer access is considered to be a critical factor in the regions developmental process, it follows that extensions of public sewer systems should generally be confined to those lands which have convenient access to existing or potential commuter rail service. Figure A-III-1 shows the existing public transportation system.

The methodology for development of the Corps projections, and the inherent resolution of projection differences between agencies, is presented below.

BASIS FOR POPULATION PROJECTIONS

The population was projected by decade for the 86 townships and the city of Chicago in the seven county study area (see Table A-III-1). Available projection data was revised as necessary to reflect more current information and to reconcile projections prepared by several agencies. Three projection regions were used for the city of Chicago. The boundaries conform to the 76 community areas developed for the Chicago community inventory by the University of Chicago (Figure A-III-2). County projections by the State of Indiana were accepted in their entirety for Lake, Porter, and LaPorte Counties, and then disaggregated to the township level, as explained below. Illinois county projections for Lake, Cook, DuPage, and Will Counties were provided by NIPC and slightly adjusted.

In adjusting the NIPC forecasts, the projection methodology developed by NIPC was utilized. NIPC projected population by decade for the four Illinois counties by township by decade from 1975 through 1995. The methodology entailed first forecasting the regional population and employment, and then

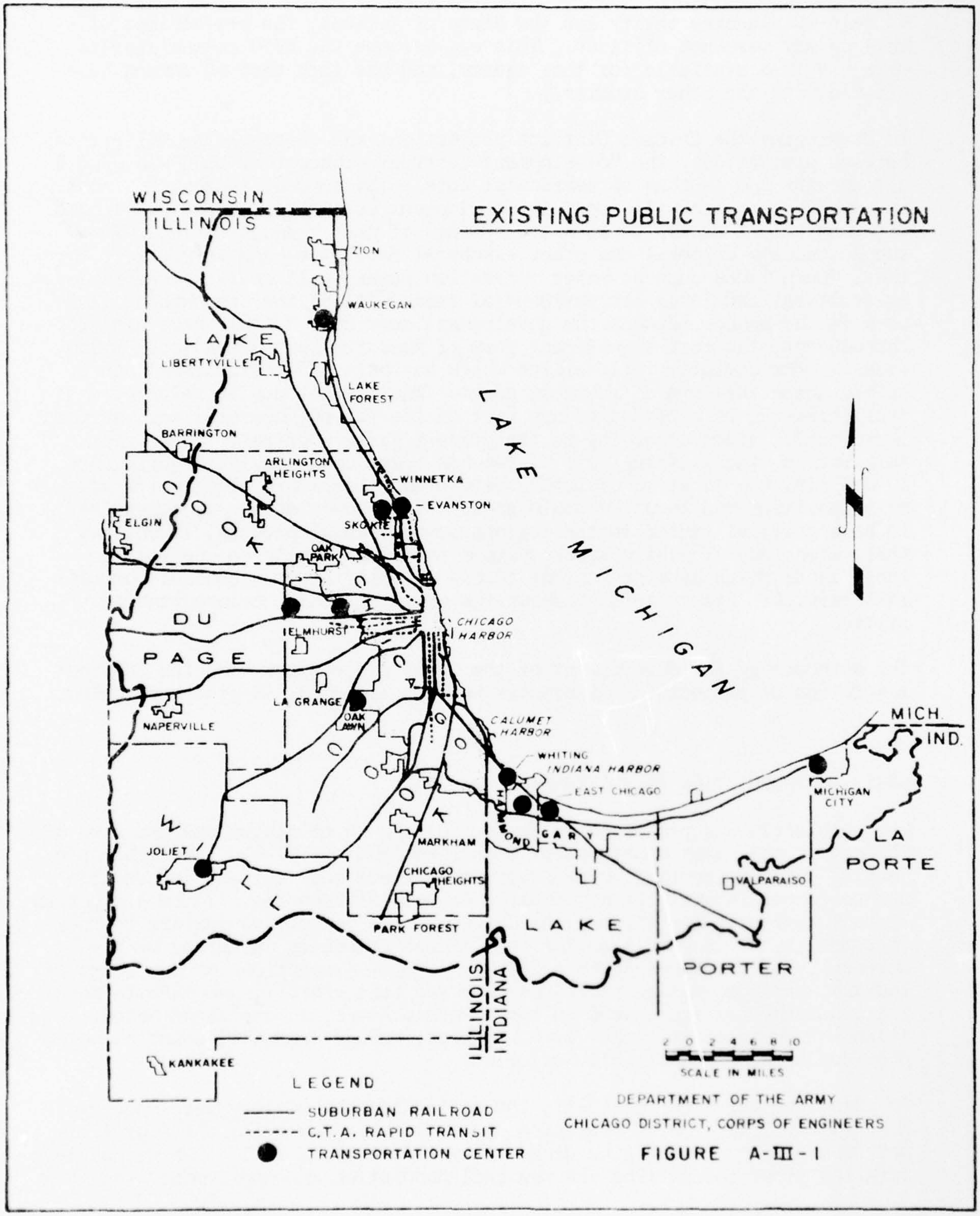
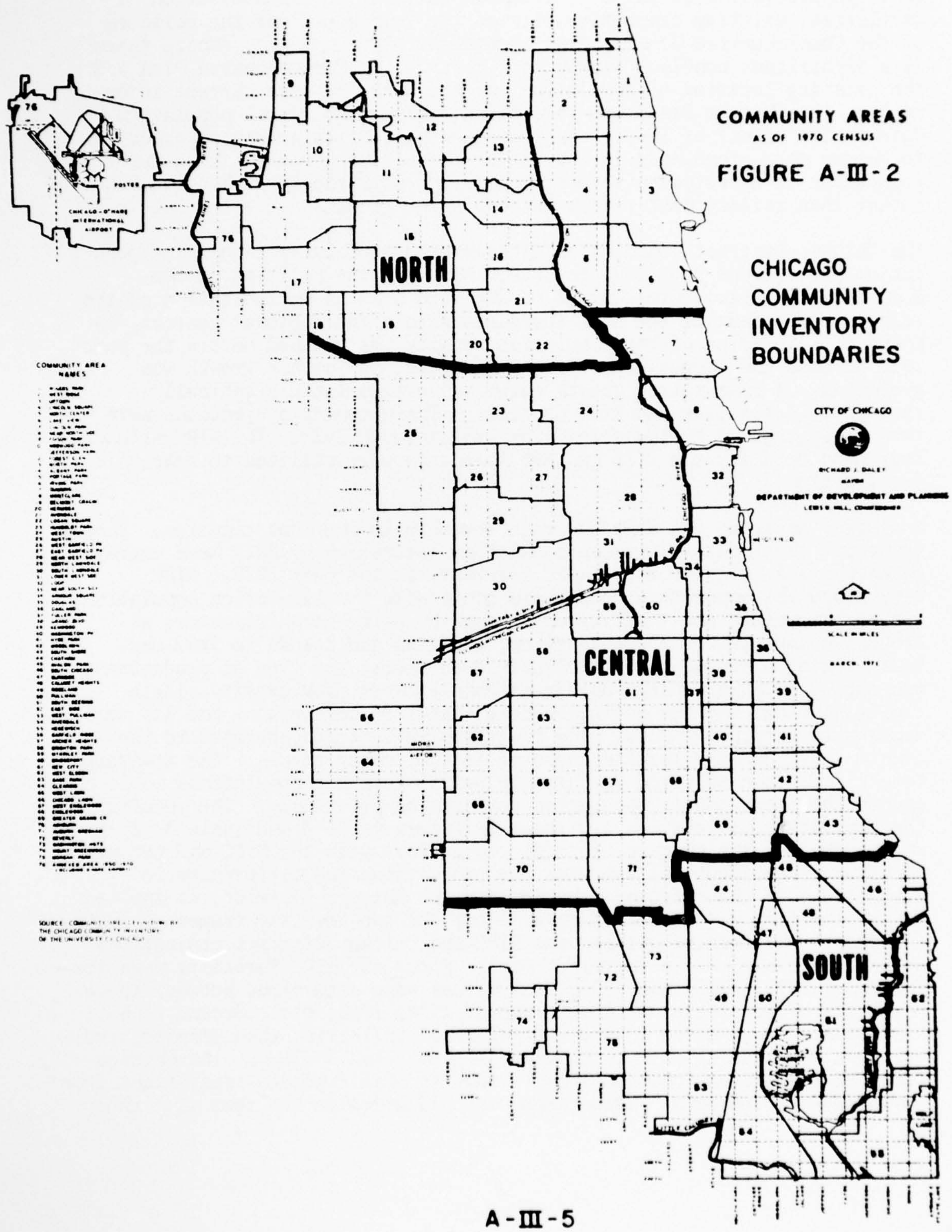


FIGURE A-III-1


COMMUNITY AREAS
AS OF 1970 CENSUS
FIGURE A-III-2
CHICAGO
COMMUNITY
INVENTORY
BOUNDARIES
CITY OF CHICAGO
NORTH
CENTRAL
SOUTH
COMMUNITY AREA NAMES
CHICAGO - O'HARE INTERNATIONAL AIRPORT
MIDWAY AIRPORT

allocating to townships on the basis of the interrelationships of employment, population, availability of land, proximity to transportation facilities, existing characteristics of the townships, and the policies of the Comprehensive General Plan adopted by NIPC in 1967. (Where there is a significant conflict between policies of the Comprehensive Plan and the existing location of population as determined by more current information, the Chicago District projections reflect the actual population data.) The effect of land use policies on population growth is expected to become more pronounced in the latter projection periods. Thus future population is expected to be more consistent with the Comprehensive Plan, rather than reflect past trends in population growth.

The Chicago District coordinated closely with NIPC in extrapolating population projections from 1995 to 2020, following the policies of the Comprehensive Plan. Projections of OBE were used as an indication of the relative agreement of the NIPC forecasts within the regional context. A point of saturation of the population density was reached before the year 2020 in Cook and DuPage Counties. Thereafter, no further growth was projected. A generalized growth curve was extrapolated graphically through 2020 for Lake and Will Counties. These county projections were then disaggregated to townships from 1980 through 2020. The NIPC methodology developed for the 1975 to 1995 forecasts were utilized to make this distribution.

A similar analysis was done for each township in the four counties. Those townships that would not reach population saturation by 2020 were extrapolated graphically from the NIPC forecasts to the year 2020. NIPC determined the population, and where applicable the saturation population, for each township and the city of Chicago by using such indicators as trends in immigration and emigration; existing and trends in land use, local zoning ordinances and available open space; the type of predominant housing, e.g. high density apartment complexes vs. low density single family housing; and the socio-economic status of communities and its residents within each township. The townships were then aggregated to the county level and the results compared to the county totals. The township totals were then adjusted so that the sum of township populations would not exceed the total county population established previously. The results of the population projections are shown in Figure A-III-3 and Table A-III-1 which compares the Chicago District projections with the NIPC and OBE projections. The figure illustrates the projections and differences in projections of the selected agencies and the Chicago District, as applied to the counties within the study area for the two key time frames of 1990 and 2020. Differences between the NIPC and Chicago District projections are attributable to two factors. First, since the NIPC forecasts were for the years 1975, 1985, and 1995, mean values were determined between these years to reflect the study time frame of 1980, 1990, etc. Second, the NIPC forecasts resulted in several points of inflection when graphed, indicating a fluctuating rate of population growth and decline. The Chicago District projections changed these values to obtain smooth transitions from one decade to the next. This "smoothing" illustrates the fact that the

FIGURE A-III-3

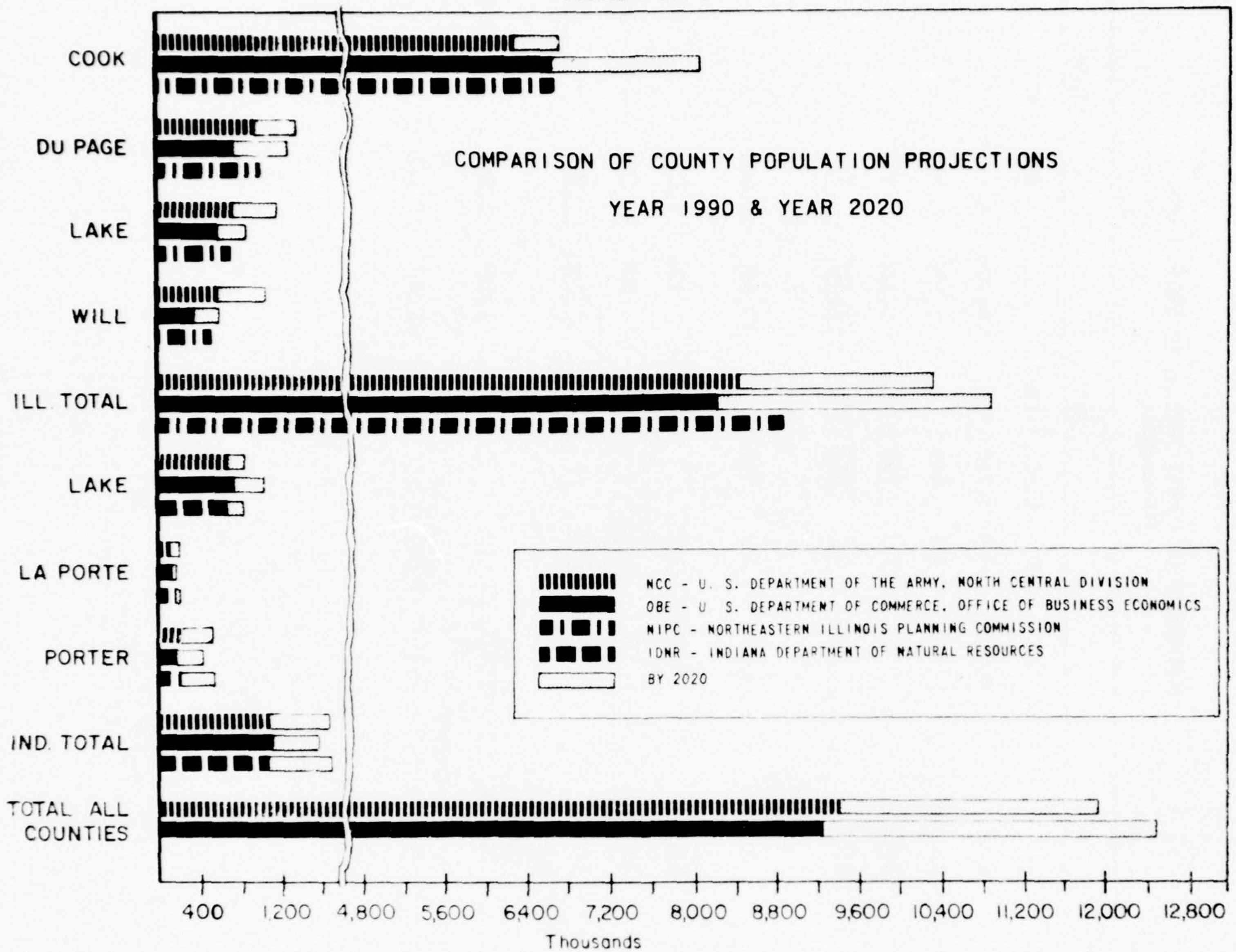


TABLE A-III-1

COMPARISON OF COUNTY POPULATION PROJECTIONS
(thousands)

	1990				2020			
	NCC	OBE	NIPC	IND	NCC	OBE	NIPC	IND
Cook	6,281	6,563	6,718	-	6,768	8,151	-	-
DuPage	925	731	945	-	1,374	1,254	-	-
Lake	709	573	705	-	1,132	940	-	-
Will	520	379	513	-	1,047	575	-	-
Subtotal, Illinois Portion	8,435	8,246	8,881	-	10,321	10,920	-	-
Lake	688	732	-	688	920	1,003	-	920
LaPorte	132	135	-	142	196	176	-	196
Porter	201	183	-	201	530	402	-	530
Subtotal Indiana Portion	1,021	1,050	-	1,031	1,646	1,581	-	1,646
Total 7 County Area	9,456	9,296	-	-	11,967	12,501	-	-

N/A - Not Available

accuracy of population projections decreases dramatically with increasing years. Hence peaks and valleys would indicate a level of accuracy inconsistent with the actual degree of accuracy. Thus a rounding off was performed to develop a smooth curve indicative of general trends in population growth but not of exact numbers.

The IDNR projected population by county by decade to the year 2020 as part of their water resources program (11). For the preliminary analysis, the Department relied on a 1966 study by the Bureau of Business Research at Indiana University (15). Due to the relatively lower out-migration estimates for Indiana prepared subsequent to the Indiana University study by the Indiana State Board of Health and the Bureau of Census, the forecast by Indiana University was modified by the IDNR. The IDNR first prepared a state projection which was disaggregated to nine economic subareas for water resource planning. Each subarea was comprised of several counties. The method of disaggregation used entailed weighing the 1930 share of the subarea and the 1960 share to obtain the 1990 share according to the formula $b^2/a=c$, where a, b, and c are the percent of State population in the subarea in the years 1930, 1960, and 1990, respectively. The same methodology was then used to extrapolate to 2020, weighing the 1990 share more heavily than the 1960 share. The projections were originally completed in 1968 and then adjusted to reflect the results of the 1970 census by modifying the State totals by the ratio of the 1970 census to the 1970 projections. The projections for the nine subareas were then recomputed, using the relative shares of 1930 and 1970 as base years. The subsequent disaggregation of population from subareas to counties thus reflect the 1970 census.

The disaggregation from the county to its townships for Lake and Porter counties was accomplished by using data developed by LPCRTPC (5). The Commission projected population by townships for 1975, 1985, and 1995. The township projections were extrapolated graphically to 2020 by assuming that trends during the 1975 to 1995 decades would continue. The relative share of the county for each township was then calculated for each decade. These percentages were then applied to the total county population figures developed by the IDNR to obtain the figures shown in Table A-III-2. The Commission analysis considered birth rates, death rates, and migration estimates for each township. However, the results of the 1970 census were unavailable at that time. The Commission's county distribution to townships were considered the best available, whereas the State's county projections were more realistic since the figures reflected the 1970 census results.

HISTORICAL TRENDS AND GROWTH PROJECTIONS

The apex of activity and the economic pacesetter in the metropolitan Chicago area is the city proper. Since its chartering in 1837, the city has experienced astounding physical as well as economic growth. Chicago's population increased from 30,000 in 1850 to 300,000 in 1870, a 1,000 percent increase. By the turn of the century the city's population had passed 1,000,000 and was over the 3,000,000 mark by 1930.

TABLE A-III-2

Cook County, Illinois

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Berwyn-Cicero-Oak Park	182	184	182	185	185	185	185	185
Bloom	41	71	95	117	140	154	161	165
Bremen	25	55	94	134	190	226	237	240
Calumet	12	19	24	26	28	31	33	35
Chicago City North	1019	1024	1014	1014	1014	1022	1030	1038
Chicago City Central	2251	2131	1921	1835	1835	1843	1851	1859
Chicago City South	352	397	431	451	451	460	469	478
Elk Grove	6	28	80	105	112	117	122	127
Evanston	74	79	80	82	84	86	88	90
Lemont	5	7	8	15	28	40	43	46
Leyden-Norwood Park	64	112	131	124 31 155	146 31 177	161 31 192	168 31 199	173 31 204
Lyons	52	82	101	125	135	143	147	149
Maine	39	95	140	178	186	194	199	201
New Trier	42	60	65	66	66	66	66	66
Niles	25	96	111	130	135	135	135	135
Northfield	17	44	66	96	117	120	120	120
Orland	2	7	15	36	72	88	96	99

TABLE A-III-2 (Cont'd)

Cook County, Illinois (Cont.)

(1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Palatine	8	31	55	81	109	133	133	133
Palos	6	18	33	49	57	62	64	66
Proviso-River Forest-Riverside	123	191	205	205	205	205	205	205
Rich	9	35	45	68	97	116	116	116
Schaumberg	1	11	51	76	106	124	124	124
Stickney	11	31	42	54	64	72	75	77
Thornton	77	138	188	215	250	250	250	250
Wheeling	17	59	119	147	159	166	173	176
Worth	42	108	156	172	186	196	202	204
C-SELM Total	4502	5113	5452	5817	6183	6426	6523	6588
Barrington	4	5	8	11	17	25	28	30
Hanover	4	11	34	50	76	112	141	150
County Total	4510	5129	5494	5878	6281	6563	6692	6768

TABLE A-III-2 (Cont'd)

DuPage County, Illinois

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Addison	18	42	72	120	158	183	195	200
Bloomingdale	4	15	37	59	86	113	132	140
Downers Grove	36	67	93	122	137	144	150	154
Lisle	11	21	49	75	100	126	142	150
Milton	26	51	76	103	150	181	195	200
Naperville (part)	5	8	10	20	35	60	80	90
Wayne (part)	2	3	4	12	20	40	61	65
Winfield	10	16	23	34	52	72	100	115
York	43	90	125	161	165	165	165	165
C-SELM Total	155	313	489	706	903	1084	1220	1279
Naperville (part)	0	0	3	8	15	29	47	65
Wayne (part)	0	0	1	2	7	12	23	30
County Total	155	313	493	716	925	1125	1290	1374

TABLE A-III-2 (Cont'd)

Lake County, Illinois

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Antioch (part)	1	3	4	5	7	10	11	12
Avon (part)	4	7	8	12	15	22	31	40
Benton-Zion	15	22	31	43	53	65	76	88
Deerfield-West Deerfield	29	50	64	93	125	140	150	150
Ela (part)	2	4	6	9	13	19	25	31
Fremont (part)	1	3	4	6	9	13	17	22
Lake Villa (part)	2	4	6	7	8	11	16	22
Libertyville	10	19	26	40	72	102	119	129
Newport	2	2	3	5	9	11	15	20
Shields	29	41	55	68	80	85	85	85
Vernon	3	7	13	22	39	51	57	60
Warren	4	10	16	25	35	44	52	56
Waukegan	51	70	77	99	115	120	125	125
C-SELM Total	153	242	313	434	580	693	779	840
Antioch (part)	4	6	8	9	10	10	12	13
Avon (part)	5	10	12	16	22	29	39	55
Cuba	4	6	9	14	23	33	42	49
Ela (part)	2	4	6	9	13	18	24	30
Fremont (part)	2	5	8	12	17	24	33	42

TABLE A-III-2 (Cont'd)

Lake County, Illinois (Cont.)

(1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Grant	5	9	11	16	21	30	43	60
Lake Villa (part)	1	4	6	7	8	11	15	21
Wauconda	3	7	10	13	15	18	20	22
County Total	179	293	383	530	709	866	1007	1132

TABLE A-III-2 (Cont'd)

Will County, Illinois

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Channahon	1	2	3	4	5	6	7	9
Crete (part)	4	10	13	17	22	28	34	40
DuPage	1	5	20	33	48	62	77	92
Frankfort	3	6	9	18	32	46	55	62
Green Garden (part)	0	0	0	0	1	1	2	3
Homer	1	4	7	15	28	46	67	90
Jackson (part)	1	1	2	2	3	4	6	8
Joliet	77	94	96	107	130	157	176	190
Lockport	17	27	33	40	58	74	89	104
Manhattan (part)	0	0	0	1	2	3	3	4
Monee (part)	1	3	4	35	45	60	73	85
New Lenox	3	6	10	16	26	40	55	70
Plainfield	4	7	11	16	24	38	50	60
Troy	1	3	12	19	31	45	62	80
Wheatfield	1	1	2	5	11	17	25	35
C-SELM Total	115	173	227	328	466	627	781	932
Crete (part)	2	2	2	2	2	2	1	1
Florence	1	1	1	2	3	4	5	6
Green Garden (part)	1	1	1	2	4	5	10	12
Jackson (part)	0	0	0	1	1	2	2	2

TABLE A-III-2 (Cont'd)

Will County, Illinois (Cont.)

(1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Manhattan (part)	1	2	2	2	3	4	6	7
Monee	1	2	3	5	7	8	11	15
Peotone	2	2	3	4	6	10	15	20
Reed	2	2	3	4	5	6	7	8
Washington	2	2	3	4	5	6	9	12
Wesley-Custer	1	2	3	4	5	6	7	8
Will	1	1	1	2	3	4	5	6
Willmington	4	5	5	6	7	9	10	12
Wilton	1	1	1	2	3	4	5	6
County Total	134	192	250	368	520	697	874	1047

TABLE A-III-2 (Cont'd)

Lake County, Indiana

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Calumet	150	211	216	220	226	236	245	256
Center (part)	10	15	19	30	35	45	51	60
Hobart	22	39	41	52	64	72	81	90
North	162	204	203	206	209	214	219	226
Ross	7	15	29	41	57	72	87	100
St. John (part)	5	10	15	26	38	50	62	75
Winfield (part)	1	1	1	2	3	4	7	8
C-SELM Total	357	495	524	577	632	693	752	815
Cedar Creek	4	5	6	11	14	18	21	24
Center (part)	1	2	3	4	8	7	9	11
Eagle Creek	1	1	1	2	4	7	10	12
Hanover	3	6	7	12	17	24	29	35
St. John (part)	1	2	2	2	3	3	3	3
West Creek	2	2	3	5	7	9	11	14
Winfield (part)	0	0	0	1	3	4	5	6
County Total	369	513	546	614	688	765	840	920

TABLE A-III-2 (Cont'd)

LaPorte County, Indiana

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Center (part)	11	13	13	15	17	20	22	25
Cool Spring	3	5	11	17	23	28	34	40
Michigan	32	39	40	41	42	43	44	45
New Durham (part)	1	2	1	2	3	3	4	5
Springfield (part)	1	2	2	3	4	5	6	7
C-SELM Total	48	61	67	78	89	99	110	122
Cass	1	1	1	1	1	2	2	2
Center (part)	11	11	11	11	11	11	11	10
Clinton	1	1	1	1	1	2	2	2
Dewey	1	1	1	1	1	2	2	2
Galena	1	1	1	1	2	3	4	5
Hanna	1	1	1	1	1	2	2	2
Hudson	1	2	2	2	3	4	5	6
Johnson	*	*	*	*	*	1	1	1
Kankakee	2	2	3	3	3	4	5	6
Lincoln	1	1	2	2	2	3	3	4
New Durham (part)	1	3	3	4	5	6	7	8
Noble	1	1	1	1	1	2	2	2
Pleasant	1	2	2	2	2	3	3	4
Prairie	*	*	*	*	*	1	1	1

TABLE A-III-2 (Cont'd)

LaPorte County, Indiana (Cont.)

(1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Scripo	1	2	2	2	2	3	3	4
Springfield (part)	1	1	2	3	4	5	6	7
Union	2	2	2	2	2	3	3	4
Washington	1	1	1	1	1	2	2	2
Wills	1	1	1	1	1	2	2	2
County	77	95	104	117	132	160	176	196

TABLE A-III-2 (Cont'd)

Porter County, Indiana

Population (1000's)

Townships	1950	1960	1970	1980	1990	2000	2010	2020
Center	15	19	25	30	37	46	58	77
Jackson (part)	1	1	1	2	4	7	10	15
Liberty (part)	2	2	2	7	12	20	30	40
Pine	2	3	3	8	12	17	25	34
Portage	6	14	28	44	64	90	121	164
Union (part)	1	2	2	3	6	11	17	24
Westchester	7	11	14	22	32	44	59	80
C-SELM Total	34	52	75	116	167	235	320	434
Boone	2	2	3	4	5	7	11	14
Jackson (part)	0	0	1	1	2	2	3	5
Liberty (part)	0	0	1	1	2	1	1	2
Morgan	1	1	1	3	6	9	13	17
Pleasant	2	2	2	3	5	7	11	14
Porter	1	2	2	5	8	12	17	23
Union (part)	0	0	0	0	0	1	1	2
Washington	1	1	1	3	6	10	15	19
County Total	41	60	86	136	201	284	392	530

A new phenomenon has become established since World War II in the county and in the Metropolitan Chicago area, that of suburbanization. Although the city has steadily lost population after reaching a peak in 1950 with 3,620,000 people, the metropolitan area population has continued to increase. Chicago's 1970 population sustained a further loss to 3,367,000 while the total metropolitan area population increased. The C-SELM study area had a 1970 population of some 7 million people. The population of the C-SELM area is expected to grow to 11.0 million in 2020 (see Figure A-III-4).

Cook County

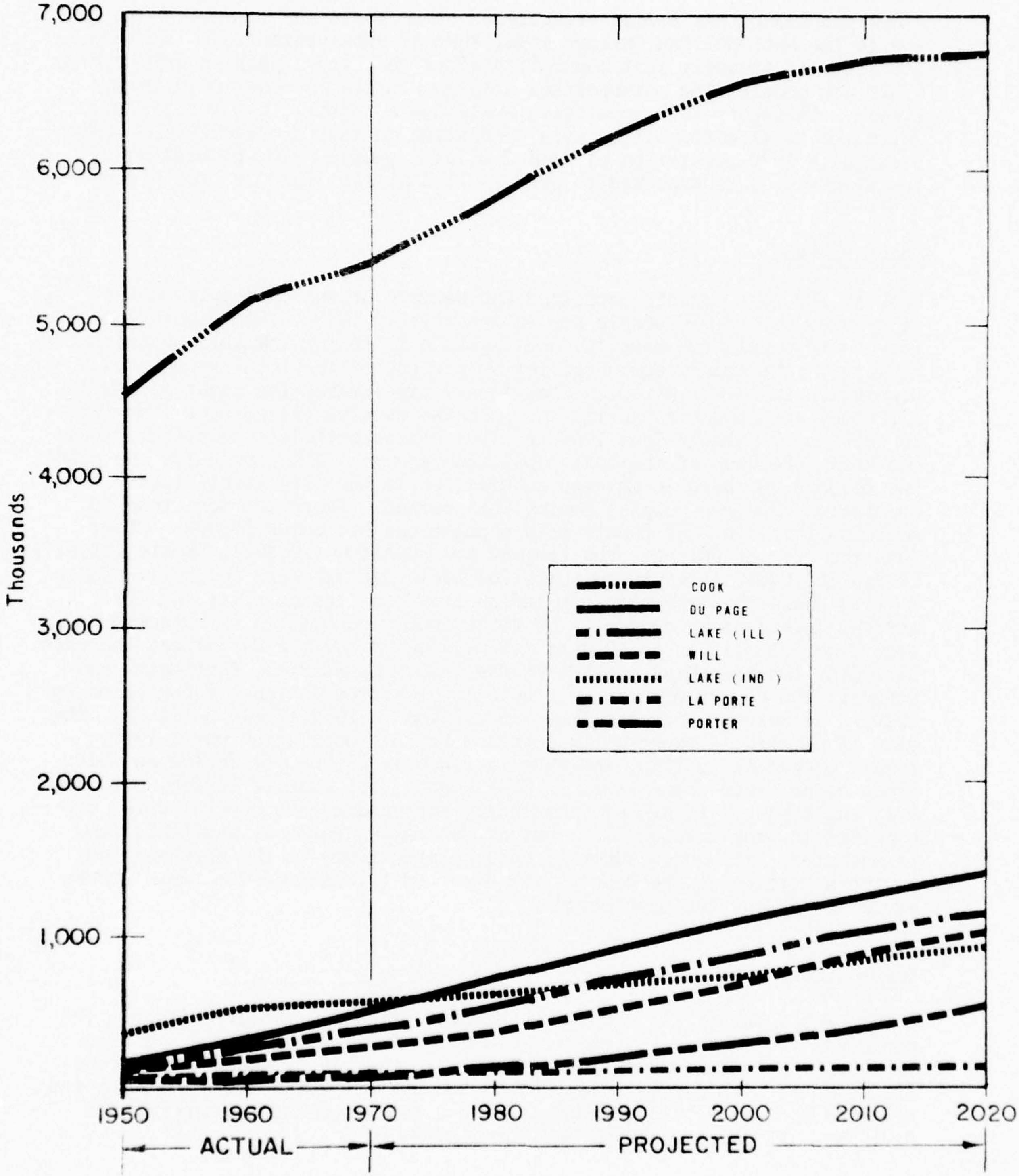
Cook is the most densely populated and heavily urbanized county in the study area with 5,757 people per square mile in 1970. (See Figure A-III-5 for county population density, and Figure A-III-6 for township population density.) The county accounted for 90 percent of the total study area population in 1970. Although Cook County experienced the least growth of all study area counties during the past two decades (14 percent from 1950 to 1960 and 7 percent from 1960 to 1970), it nevertheless contributed over one half (984,000) of the real population growth. All growth for the past two decades has been in Chicago suburbs, while the city itself lost population (250,000 people) during this period. There are more than 65 municipalities in Cook County with populations exceeding 10,000. Other than the city of Chicago, the largest are Evanston (79,808), Skokie (68,627), Cicero (67,058), Arlington Heights (64,884), and Oak Park (62,511). Table A-III-3 shows the trends in population growth of the counties and the percent increases by decade. The total county population is expected to grow from 5.5 million in 1970 to 6.8 million in 2020, a 24 percent increase. Excluding two townships outside of the C-SELM boundaries, Barrington and Hanover, the county population growth is projected to reach 6.6 million in 2020, a 21 percent increase from 5.5 million in 1970 (Table A-III-2). The city of Chicago is expected to continue to lose population until 1980, remain unchanged to 1990, and then increase at 25,000 per decade to 2020. Older established communities in Cook County, for example Leyden, Norwood Park and Evanston townships immediately surrounding the central city, are expected to grow through 2020, but at decreasing rates as available land is exausted. The outer suburbs, particularly those in the northern and southern portion of the county, are expected to continue the rapid growth exhibited during the past decade.

DuPage County

Before World War II the county was devoted primarily to agriculture. The municipalities then existing were either part of a farm economy or were small rail commuter suburbs. The post-war suburban expansion of metropolitan areas, with single-family homes and private automobiles becoming the new standard way of life, made possible a scattered intermixing of subdivisions, shopping centers, and farm lands.

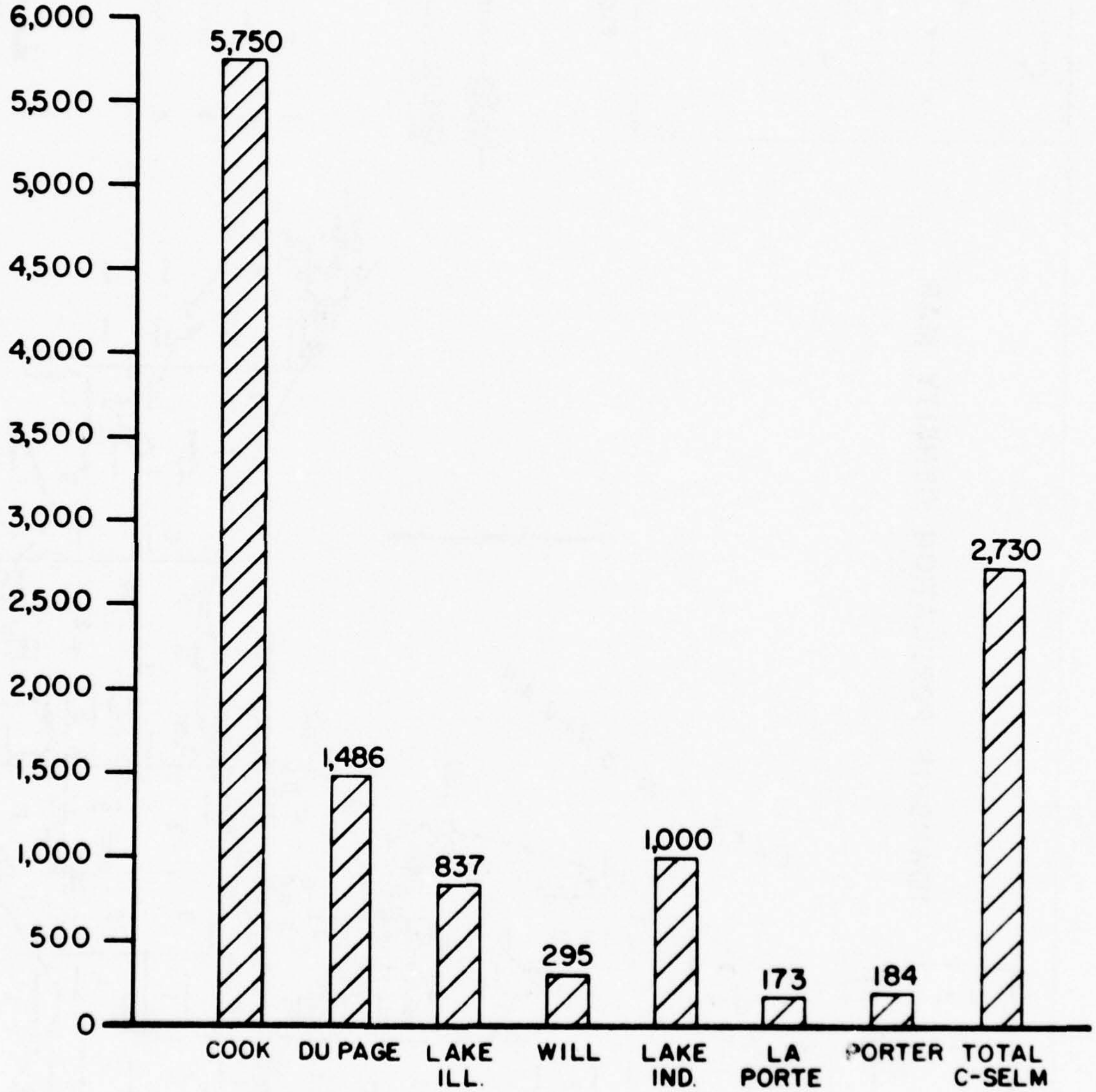
PAST AND PROJECTED POPULATION GROWTH

FIGURE A-111-4



POPULATION DENSITY (1970)
COUNTIES IN C-SELM STUDY AREA

FIGURE A-III-5



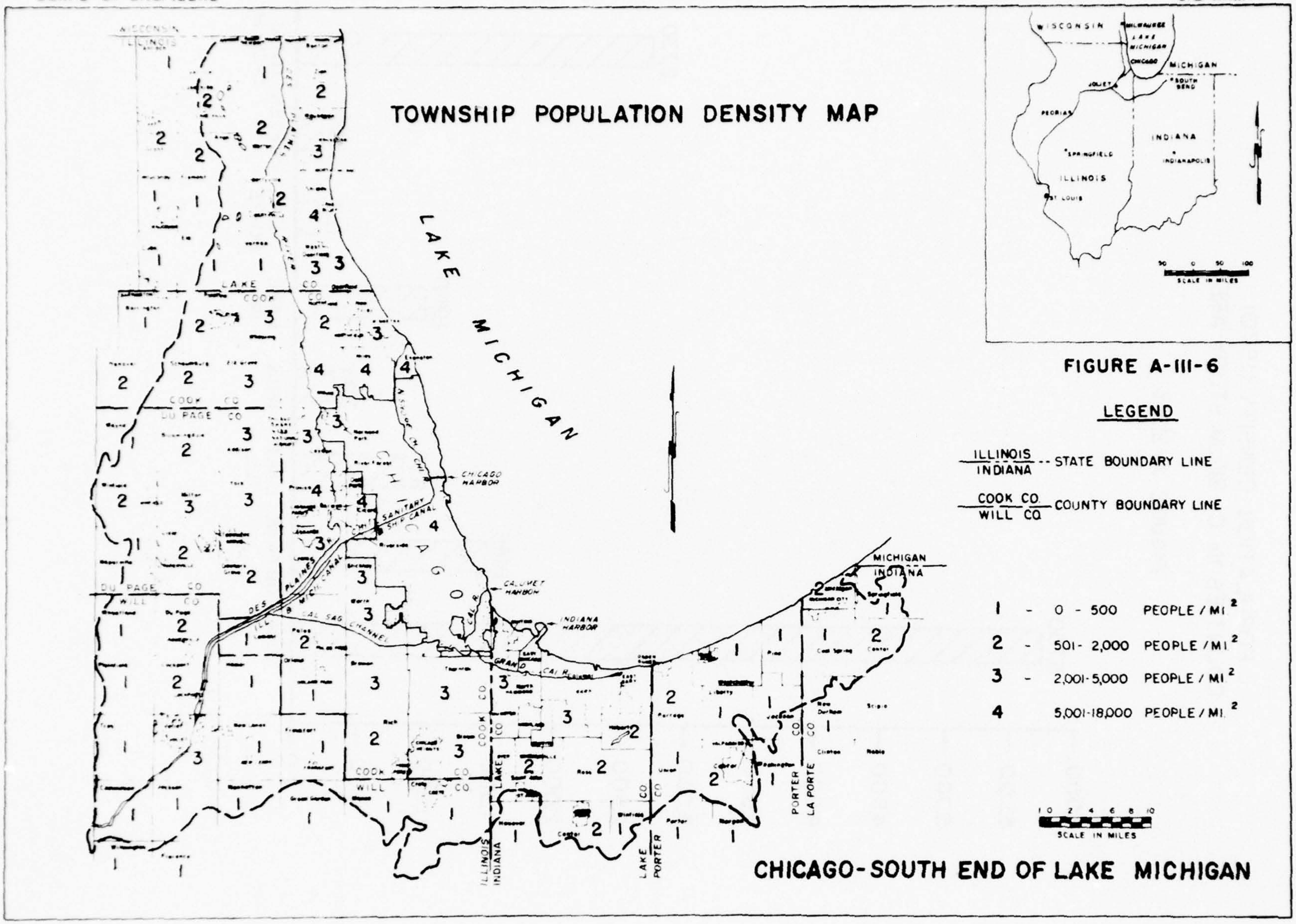

TOWNSHIP POPULATION DENSITY MAP
LAKE MICHIGAN
CHICAGO
CHICAGO HARBOR
CALUMET HARBOR
INDIANA HARBOR
SANITARY SHIP CANAL
CAL SAG CHANNEL
DES PLAINES
GRAND CAL R.
LAKE CO
COOK CO
DU PAGE CO
WILL CO
PORTER CO
LA PORTE CO
ILLINOIS
INDIANA
MICHIGAN
WISCONSIN
JOLIET
PEORIA
SPRINGFIELD
ST LOUIS
INDIANAPOLIS
SOUTH BEND
MILWAUKEE
SCALE IN MILES
FIGURE A-III-6
LEGEND
ILLINOIS / INDIANA - - STATE BOUNDARY LINE
COOK CO / WILL CO COUNTY BOUNDARY LINE
1 - 0 - 500 PEOPLE / MI 2
2 - 501 - 2,000 PEOPLE / MI 2
3 - 2,001 - 5,000 PEOPLE / MI 2
4 5,001 - 18,000 PEOPLE / MI 2
CHICAGO-SOUTH END OF LAKE MICHIGAN

TABLE A-III-3

TREND IN POPULATION GROWTH

County Populations for Study Area*

Counties	Population 1950	1960	1970	Percent Increase by Decade 1950-1960 percent	1960-1970 percent
ILLINOIS					
Cook	4,510	5,129	5,494	14	7
DuPage	155	313	493	50	57
Lake	179	293	383	64	30
Will	135	192	250	42	30
INDIANA					
Lake	369	513	546	39	6
LaPorte	77	95	104	23	11
Porter	41	60	86	46	45
TOTAL ALL COUNTIES	5,466	6,595	7,356	21	12

*Population is for entire county.

With a 50 percent population increase from 1950 to 1960 (155,000 to 313,000), and a 57 percent increase in population from 1960 to 1970 (313,000 to 493,000), DuPage continues to be the fastest growing county in the State of Illinois. The availability of inexpensive agricultural land, the growth in job opportunities and the existing transportation network (three commuter rails cross the county) enabled the county to increase at this phenonomenal rate.

Ten communities had a population greater than 10,000 in 1970. The largest are Elmhurst (50,547), Lombard (35,977), and Downers Grove (32,751). Population density was 1,486 people per square mile, with much of the land still classified as agricultural or vacant.

Population growth in DuPage County is forecast to grow from 493,000 in 1970 to 1,374,000 by 2020, a 179 percent increase. The portion of the county within the C-SELM area during this period will grow by 162 percent from 489,000 to 1,279,000 (Table A-III-1). Most of the growth is expected to take place in townships which have sufficient undeveloped lands, good access to the transportation networks servicing the county and/or are experiencing expansion in their industrial base.

Lake County, Illinois

Lake County also experienced substantial population growth, more than doubling from 179,000 to 383,000 from 1950 to 1970. The growth amounted to 64 percent from 1950 to 1960 and 30 percent from 1960 to 1970. Waukegan (65,269), the major city in the county, accounted for over 16 percent of the total county population in 1970. The other major concentrations of population are the cities of North Chicago (47,275) and Highland Park (32,263). Population density for this entire county was 837 people per square mile in 1970. Large portions of vacant land, primarily agricultural, remain.

The C-SELM portion of Lake County is forecast to grow from 313,000 in 1970 to 840,000 by 2020. The entire county is expected to grow from 383,000 in 1970 to 1,132,000 by 2020. Four townships (Deerfield, West Deerfield, Shields and Waukegan) are expected to reach population saturation before 2020. These townships have excellent transportation facilities and are adjacent to Lake Michigan. Although much land is available in the northern part of the county, the transportation service (Figure A-III-1) is inadequate; therefore the northern townships are not expected to experience rates of growth as high as the southern area.

Will County

Will, although the least populous of the four Illinois counties in the study area, is the seventh largest county in Illinois. Will County nearly doubled in population from 1950 to 1970, increasing from 135,000 to 250,000. This resulted from a 42 percent increase from 1950 to 1960 and a 30 percent increase from 1960 to 1970. As one of the largest and most rural of the C-SELM counties, much of the land remains vacant. The principal city of Joliet (80,328) accounted for over 32 percent of the total population in 1970. Population density for the county was 295 people per square mile in 1970.

The portion of Will County within the study area is expected to quadruple in population from 1970 to 2020, increasing from 227,000 to 932,000. The county as a whole is expected to grow to 1,047,000 by 2020 from 250,000 in 1970. This rural county will continue to be dominated albeit much less by Joliet Township with a population of 96,000 in 1970 and 190,000 by 2020. The tier of townships adjacent to Cook County and those with commuter service to Chicago will grow most rapidly. The distance from Chicago and the lack of transportation facilities will restrain the growth in the remaining townships.

Lake County, Indiana

Lake County's population increased from 369,000 in 1950 to 546,000 in 1970. The increase of 39 percent from 1950 to 1960 fell to 6 percent from 1960 to 1970. The population is concentrated in the northern portion of the county in the cities of Gary (175,415), Hammond (107,790), and East Chicago (46,982). Together these cities account for over 60 percent of the total population of the county. Although the density exceeded 1,000 per square mile in 1970, this figure is misleadingly low since almost all of the population is concentrated along the lake shore in the northern portion of the county. This leaves most of the vacant land in the southern portion of the county which is outside the study area.

Historically, the most rapid expansion has been along the shore of Lake Michigan. In recent years, however, the industrial and residential growth has spread south and east. Ninety-eight percent of the county's population is included in the study area. The C-SELM portion of Lake County is projected to increase from 524,000 people in 1970 to 815,000 by 2020. The entire county's population is only expected to grow from 546,000 to 920,000 during this same period. The extensive steel and petro-chemical complexes in the northern part of the county support a large population. The concentration of industry together with the scarcity of land for residential development has slowed this area's growth. Therefore, the northern townships are expected to grow only moderately throughout the projection period. The townships of Hobart, Ross and St. John, due south of the northern densely populated townships, will receive the spillover from the north growing at a slightly higher rate than the remaining townships.

LaPorte County

LaPorte County's population grew from 77,000 in 1950 to 104,000 in 1970. The increase of 23 percent from 1950 to 1960 had declined to 11 percent from 1960 to 1970. The two major cities of LaPorte (22,140) and Michigan

City (39,369) accounted for slightly less than 60 percent of the county's 1970 population. Most of the population is concentrated in the northern section of the county. The northwestern portion of the county has the greatest population density. The population density of 173 people per square mile in 1970, however, is the lowest of all the counties in the study area.

The portions of the five LaPorte County townships within the study area are expected to grow in population from 67,000 in 1970 to 122,000 by 2020, an 82 percent increase. The entire county during this same period is projected to increase by 92,000 people from 104,000 in 1970 to 196,000 in 2020. The population in the study area portion of the county in 1970 (78 percent) will fall to 62 percent by 2020 as the most populous township, Michigan, approaches saturation since limited land is available for development.

Porter County

Porter County doubled in population from 41,000 in 1950 to 86,000 in 1970. The decade growth rates are almost uniform at 46 percent from 1950 to 1960 to 45 percent from 1960 to 1970. Valparaiso (20,020), Portage (19,127) and Chesterton (6,177) are the largest communities in the county. Density for the entire county is quite low--184 people per square mile in 1970. However, the highest densities occur in the northern portion of the county, within the study area.

Parts of seven townships comprise the C-SELM area within Porter County. This area is projected to increase by 579 percent during the next five decades growing from 75,000 people in 1970 to 434,000 in 2020. The rapidly developing industrial complex along with the Indiana Dunes National Lakeshore in the townships adjacent to Lake Michigan (Pine, Portage and Westchester) are expected to attract the largest portion of the county's future population.

While much of the growth is expected in the northern part of the county, centrally located Valparaiso will continue to grow. Two opposing forces in the northern part of the county are in evidence. The Indiana Dunes National Lakeshore will take substantial land out of potential residential use. However, the steel mills established in the northern part of the county will contribute to the projected population expansion in this area. Growth along the shore of Lake Michigan in Portage Township, east of Gary, is expected to be substantial, responding to growth in the local Portage steel industry. The remaining parts of the county are expected to have a moderate rate of growth.

MUNICIPAL FLOW PROJECTIONS

Four basic assumptions were utilized in developing the municipal flow projections. It was assumed that:

(1) Areas with a projected population density greater than 2,000 persons/sq. mi. were assumed to be completely served by public sewers. For those townships with a density less than 2,000 persons/sq. mi., a serviced population was based on land use and development trends within each particular township.

(2) The total per capita daily domestic flow (including commercial usage and infiltration) for the city of Chicago and other established central cities would increase at the rate of 0.5 gallons per year from the base year 1990 through 2020.

(3) The total per capita daily domestic flow (including commercial usage and infiltration) for the remaining suburban townships would increase at the rate of 0.8 gallons per year during the study period.

(4) The maintenance and repair of collection systems in both areas would ensure that the present infiltration (including combined sewer flows) unit flow rate gallons/capita/day (gpcd) would remain constant throughout the study period.

METHODOLOGY

Using the total populations discussed above, an estimate of population served by public sewers was made for each township in the C-SELM area for the years 1980, 1990, 2000 and 2020. The criterion chosen for serving a population was a population density of 2,000 persons/sq. mi. or greater as used in the NIPC Wastewater Study (8) and which approximates U. S. Public Health Service "rule of thumb" criteria for environmental planning. The densities for each township in 1980, 1990, 2000, 2020 were then calculated. Populations projected to be served by public sewers in 1980, 1990, 2000 and 2020 are shown for each township in Table A-III-4. Table A-III-5 presents this same information by management watershed, the format used in designing facilities. Figure A-III-7 illustrates these serviced areas.

Domestic wastewater flows (including commercial usage and infiltration) for each township in the C-SELM area were computed for the years 1980, 1990, 2000 and 2020 using unit flow projection curves shown in Figure A-III-8. The unit flows are expressed in units of gpcd which when multiplied by the served populations in Table A-III-6 yield the daily domestic flows in gallons/day which are then converted to million gallons per day (MGD).

TABLE A-III-4

C-SELM WASTEWATER FLOWS 1980-2020
BY TOWNSHIPS

Township	Management Watersheds	Total Population (1,000's) 1980	1990	2000	2020	Population Served (1,000's) 1980	1990	2000	2020	Domestic Flow (MGD) 1980	1990	2000	2020
COOK, ILL.		5,817	6,188	6,426	6,588	5,803	6,188	6,426	6,588	803.1	887.0	958.6	1065.1
Chicago	4	3,300	3,300	3,325	3,375	3,300	3,300	3,325	3,375	[illegible]	[illegible]	[illegible]	[illegible]
Berwyn[1]	4	185	185	185	185	185	185	185	185	27.8	28.7	29.6	31.5
Bloom	16	117	140	154	165	117	140	154	165	17.6	21.7	24.6	28.1
Bremen	13, 14, 16	134	190	226	240	134	190	226	240	15.8	23.9	30.3	36.0
Calumet	4	26	28	31	35	26	28	31	35	3.1	3.5	4.2	5.3
Elk Grove	4, 5, 6	105	112	117	127	105	112	117	127	12.4	14.1	15.7	19.1
Evanston	4	82	84	86	90	82	84	86	90	12.3	13.0	13.8	15.3
Lemont	11, 12	15	28	40	46	15	28	40	46	1.8	3.5	5.4	6.9
Leyden[2]	4, 5	155	177	192	204	155	177	192	204	18.3	22.3	25.7	30.6
Lyons	4, 5, 10	125	135	143	149	125	135	143	149	14.8	[illegible]	19.2	22.4
Maine	3, 4, 5	178	186	194	201	178	186	194	201	21.0	23.4	26.0	30.2
New Trier	1, 2	66	66	66	66	66	66	66	66	7.8	8.3	8.8	9.9
Niles	4	130	135	135	135	130	135	135	135	15.3	17.0	18.1	20.3
Northfield	2, 3	96	117	120	120	96	117	120	120	11.3	14.7	16.3	18.0
Orland	12, 13, 14	36	72	88	99	25	72	88	99	3.0	9.1	11.8	14.9
Palatine	3, 6	81	109	133	133	81	109	133	133	[illegible]	[illegible]	17.8	20.0
Palos	11, 12	49	57	62	66	49	57	62	66	5.8	7.2	8.3	9.0
Proviso[3]	4, 5, 6	205	205	205	205	205	205	205	205	24.2	25.8	27.5	30.8
Rich	14, 16	68	97	116	116	65	97	116	116	[illegible]	12.2	15.5	17.4
Shaumburg	6, 8	76	106	124	124	76	106	124	124	9.0	13.4	16.6	18.6
Stickney	4, 11	54	64	72	77	54	64	72	77	6.4	[illegible]	9.6	11.6
Thornton	4, 16	215	250	250	250	215	250	250	250	25.4	[illegible]	33.5	37.5
Wheeling	3, 4	147	159	166	176	147	159	166	176	17.4	20.0	22.2	26.4
Worth	4, 11, 13	172	186	196	204	172	186	196	204	20.3	23.4	26.3	30.6
DU PAGE, ILL.		706	903	1,084	1,279	675	894	1,084	1,279	79.9	112.7	145.2	192.0
Addison	5, 6	120	158	183	200	120	158	183	200	14.2	19.9	24.5	30.0
Bloomingdale	6, 7, 8	59	86	113	140	45	86	113	140	5.3	10.5	15.1	21.0
Downers Grove	6, 7, 10	122	137	144	154	122	137	144	154	14.4	17.3	19.3	23.1
Lisle	7, 8	75	100	126	150	75	100	126	150	[illegible]	12.8	16.9	22.5
Milton	7, 8	103	150	181	200	103	150	181	200	12.2	16.9	24.3	30.0
Naperville (part)	8, 9	20	35	60	90	15	35	60	90	1.8	4.4	8.0	13.5
Wayne (part)	8	12	20	40	65	9	18	40	65	1.1	2.3	5.4	9.8
Winfield	8	34	52	72	115	25	45	72	115	3.0	5.7	9.6	17.3
York	5, 6, 7	161	165	165	165	161	165	165	165	19.0	20.8	22.1	24.8
LAKE, ILL.		434	580	693	840	388	540	656	807	49.2	71.5	91.1	123.8
Antioch (part)	3	5	7	10	12	0	0	0	2	0	0	0	0.3
Avon (part)	3	12	15	22	40	10	15	22	40	1.2	1.9	2.9	6.0
Benton-Zion	1, 3	43	53	65	88	35	50	65	88	4.1	6.3	8.7	13.2
Deerfield-W. Deerfield	1, 2	93	125	140	150	93	125	140	150	11.0	15.8	18.8	22.5
Ela (part)	3	9	13	19	31	3	5	12	25	0.4	0.6	1.6	3.8
Fremont (part)	3	6	9	13	22	3	6	11	22	0.4	0.8	1.5	3.3
Lake Villa (part)	3	7	8	11	22	5	7	9	22	0.6	0.9	1.2	3.3
Libertyville	2, 3	40	72	102	129	37	72	102	129	4.4	9.1	13.7	19.4
Newport	3	5	9	11	20	0	0	2	5	0	0	0.3	0.8
Shields	1, 2	68	80	85	85	68	80	85	85	8.0	10.1	11.4	12.8
Vernon	3	22	39	51	60	15	35	48	58	1.8	4.4	6.4	8.7
Warren	3	25	35	44	56	20	30	40	56	2.4	[illegible]	5.4	8.4
Waukegan	1, 2, 3	99	115	120	125	99	115	120	125	14.9	17.8	19.2	21.3
WILL, ILL.		328	466	627	932	261	393	567	896	34.3	53.2	80.1	138.3
Channahon	9, 15	4	5	6	9	0	0	0	0	0	0	0	0
Crete (part)	16, 17	17	22	28	40	10	17	24	37	1.2	2.1	3.2	5.6
DuPage	7, 9, 10, 12	33	48	62	92	21	35	55	92	2.5	4.4	7.4	13.8
Frankfort	14, 15	18	32	46	62	11	20	42	60	1.3	2.5	5.6	9.0
Green Garden (part)	14, 15	0	1	1	3	0	0	0	0	0	0	0	0
Homer	12, 14	15	28	46	90	10	24	41	90	1.2	3.0	5.5	13.5
Jackson (part)	15	2	3	4	8	0	0	0	0	0	0	0	0
Joliet	10, 14, 15	107	130	157	190	107	130	157	190	16.1	20.2	25.1	32.3
Lockport	9, 10, 12	40	58	74	104	35	55	74	104	4.1	6.9	9.9	15.6
Manhattan (part)	15	1	2	3	4	0	0	0	0	0	0	0	0
Monee (part)	14, 16	35	45	60	85	35	45	60	85	4.1	5.7	8.0	12.8
New Lenox	14, 15	16	26	40	70	12	23	37	70	1.4	2.9	5.0	10.5
Plainfield	9	16	24	38	60	10	20	34	60	1.2	2.5	4.6	9.0
Troy	9, 10	19	31	45	80	10	24	38	80	1.2	3.0	5.1	12.0
Wheatland	9	5	11	17	35	0	0	5	28	0	0	0.7	4.2
ILLINOIS TOTALS		7,285	8,137	8,830	9,639	7,127	8,015	8,733	9,570	966.5	1124.4	1275.0	1519.2

Township	Domestic Flow Class[4]	Industrial Output ($ millions) 1980	1990	2000	2020	Industrial Flow (MGD) 1980	1990	2000	2020	Total Domestic & Industrial Flow (MGD) 1980	1990	2000	2020
COOK, ILL.		19,488.5	24,764.5	30,460.7	43,043.4	969.5	871.3	881.6	904.7	1712.6	1758.3	1840.2	1969.8
Chicago	-A-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	584.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Berwyn[1]	-A-	880.7	1,122.0	1,364.4	1,964.8	[illegible]	29.6	30.8	[illegible]	55.5	58.3	60.4	63.2
Bloom	-A-	494.1	665.3	866.8	1,230.2	23.4	22.2	23.5	24.6	41.0	43.9	48.1	52.7
Bremen	-A-	44.9	64.5	79.6	113.0	2.9	3.3	3.3	3.3	18.7	27.2	33.6	39.3
Calumet	-B-	117.2	153.9	189.9	269.5	3.7	4.1	4.2	4.4	6.8	7.6	8.4	9.7
Elk Grove	-B-	335.9	464.2	603.4	856.4	10.6	12.3	13.5	13.9	23.0	26.4	29.2	33.0
Evanston	-A-	115.2	146.5	180.7	256.5	3.6	3.9	4.1	4.2	15.9	16.9	17.9	19.5
Lemont	-B-	23.4	34.8	42.9	60.9	12.2	12.5	12.0	11.9	14.0	16.0	17.4	18.8
Leyden[2]	-B-	1,312.4	1,675.6	2,067.4	2,934.2	[illegible]	45.3	[illegible]	[illegible]	61.3	67.6	72.6	79.1
Lyons	-B-	462.8	603.2	754.6	1,074.0	[illegible]	17.6	16.3	[illegible]	[illegible]	34.8	37.5	41.3
Maine	-B-	326.1	419.5	517.8	734.8	10.8	11.5	11.5	12.1	[illegible]	34.9	37.5	42.3
New Trier	-B-	39.1	49.7	61.3	86.9	1.2	1.3	1.4	1.4	9.0	9.6	10.2	11.3
Niles	-B-	1,287.0	1,643.4	2,042.9	2,899.4	42.5	44.6	46.6	48.1	57.8	61.6	64.7	68.4
Northfield	-B-	169.9	223.4	275.7	391.2	5.3	5.9	6.2	6.5	16.6	20.6	22.5	24.3
Orland	-B-	37.1	54.6	67.4	95.6	1.2	1.4	1.5	1.5	4.2	10.5	13.3	16.4
Palatine	-B-	[illegible]	81.4	[illegible]	[illegible]	[illegible]	2.2	2.3	2.4	[illegible]	[illegible]	20.1	22.4
Palos	-B-	39.1	57.1	70.4	100.0	1.2	1.5	1.6	1.8	7.0	8.7	9.9	11.5
Proviso[3]	-A-	595.6	762.1	940.3	1,334.5	19.4	20.6	21.4	22.0	43.6	46.4	48.9	52.8
Rich	-B-	70.3	104.3	128.6	182.6	2.2	2.7	2.8	3.0	9.9	14.9	18.3	20.4
Shaumburg	-B-	78.1	111.7	163.7	369.5	2.5	2.9	4.1	6.0	11.5	16.3	20.7	24.6
Stickney	-B-	324.6	414.6	511.5	725.4	10.3	11.0	11.4	11.9	16.7	19.1	21.0	23.4
Thornton	-B-	435.5	558.6	689.1	978.1	15.3	15.7	16.1	[illegible]	40.7	47.2	49.6	54.2
Wheeling	-B-	156.2	220.9	318.5	560.8	4.9	5.8	7.1	9.0	22.3	25.8	29.3	35.4
Worth	-B-	160.1	213.5	294.0	417.3	5.7	6.0	7.0	7.2	26.0	29.4	33.3	37.8
DU PAGE, ILL.		995.2	1,895.2	[illegible]	5,149.2	10.6	14.0	17.0	20.1	90.5	126.7	162.2	212.1
Addison	-B-	331.2	603.0	801.6	1,334.8	3.5	4.5	5.1	6.0	[illegible]	24.4	29.6	36.0
Bloomingdale	-B-	26.6	66.4	110.6	212.4	0.3	0.5	0.7	0.8	5.6	11.3	15.8	21.8
Downers Grove	-B-	96.5	185.4	262.8	504.4	1.0	1.4	1.7	2.0	15.4	18.7	21.0	25.1
Lisle	-B-	82.1	160.0	232.2	440.0	0.9	1.2	1.5	1.7	6.8	13.8	18.4	24.2
Milton	-B-	132.1	255.7	367.6	706.2	1.4	1.9	2.3	2.8	13.6	20.8	26.6	32.8
Naperville (part)	-B-	29.5	60.9	90.7	174.2	0.3	0.4	0.6	0.7	2.1	4.8	8.6	14.2
Wayne (part)	-B-	44.7	87.6	127.8	245.5	0.5	0.6	0.8	1.0	1.6	2.9	6.2	10.8
Winfield	-B-	54.4	113.2	176.9	334.8	0.8	0.8	1.1	1.3	3.8	6.5	10.7	18.6
York	-B-	195.9	363.0	506.6	976.9	2.1	2.7	3.2	3.8	21.1	23.5	25.3	28.6
LAKE, ILL.		1,194.3	1,776.3	2,474.7	4,744.9	14.4	14.3	15.1	16.6	63.6	85.8	106.2	140.4
Antioch (part)	-B-	5.1	8.3	11.5	22.1	0	0.1	0.1	0.1	0	0.1	0.1	0.4
Avon (part)	-B-	10.2	15.9	23.3	44.6	0.1	0.1	0.1	0.1	1.3	2.0	3.0	6.1
Benton-Zion	-B-	74.2	131.1	211.0	431.2	0.4	0.6	0.9	1.2	4.5	6.9	9.6	14.4
Deerfield-W. Deerfield	-B-	185.5	265.6	371.7	712.6	1.0	1.3	1.5	1.9	12.0	17.1	20.3	24.4
Ela (part)	-B-	16.6	28.1	40.7	78.1	0.1	0.1	0.2	0.2	0.5	0.7	1.8	4.0
Fremont (part)	-B-	4.4	7.9	12.0	23.0	0	0	0	0.1	0.4	0.8	1.5	3.4
Lake Villa (part)	-B-	1.7	2.4	3.3	6.4	0	0	0	0	0.6	0.9	1.2	3.3
Libertyville	-B-	140.5	207.5	290.2	556.5	0.7	1.0	1.2	1.5	5.1	10.1	14.9	20.9
Newport	-B-	1.2	3.4	7.5	14.3	0	0	0	0	0	0	0.3	0.8
Shields	-B-	140.5	209.3	292.7	561.2	0.7	1.0	1.2	1.5	8.7	11.1	12.6	14.3
Vernon	-B-	20.9	43.8	71.2	163.0	0.1	0.2	0.3	0.4	1.9	4.6	6.7	9.1
Warren	-B-	12.2	32.7	87.2	220.4	0.1	0.2	0.4	0.6	2.5	4.0	5.8	9.0
Waukegan	-A-	581.9	819.1	1,052.4	1,911.5	11.2	9.7	9.2	9.0	26.1	27.5	28.4	30.3
WILL, ILL.		846.3	1,236.5	1,736.1	2,971.6	42.4	29.4	27.1	27.5	76.7	82.6	107.2	165.8
Channahon	-B-	37.2	54.5	76.9	132.5	13.0	9.9	8.4	7.0	13.0	9.9	8.4	7.0
Crete (part)	-B-	1.4	4.2	9.7	23.0	0	0	0.1	0.1	1.2	2.1	3.3	5.7
DuPage	-B-	17.3	33.0	55.9	112.3	0.1	0.2	0.3	0.5	2.6	4.6	7.7	14.3
Frankfort	-B-	56.5	96.7	155.2	299.2	0.3	0.5	0.8	1.4	1.6	3.0	6.4	10.4
Green Garden (part)	-B-	0.3	0.8	1.1	1.9	0	0	0	0	0	0	0	0
Homer	-B-	6.0	16.6	32.7	72.3	0	0.1	0.2	0.3	1.2	3.1	5.7	13.8
Jackson (part)	-B-	29.8	45.2	63.8	109.8	0.1	0.2	0.3	0.5	0.1	0.2	0.3	0.5
Joliet	-A-	526.8	717.5	939.0	1,488.8	13.0	8.1	9.1	11.0	29.1	28.3	34.2	43.3
Lockport	-B-	108.7	155.1	209.8	345.2	15.6	9.9	7.0	4.8	19.7	16.8	16.9	20.4
Manhattan (part)	-B-	0.7	2.2	3.1	5.3	0	0	0	0	0	0	0	0
Monee (part)	-B-	9.6	19.6	41.7	95.8	0	0.1	0.2	0.5	4.1	5.8	8.2	13.3
New Lenox	-B-	4.5	12.9	27.5	63.4	0	0.1	0.1	0.3	1.4	3.0	5.1	10.8
Plainfield	-B-	8.9	15.7	22.1	38.1	0.1	0.1	0.1	0.2	1.3	2.6	4.7	9.2
Troy	-B-	16.3	26.6	42.2	80.6	0.1	0.1	0.2	0.4	1.3	3.1	5.3	12.4
Wheatland	-B-	22.3	35.9	55.4	103.4	0.1	0.1	0.3	0.5	0.1	0.1	1.0	4.7
ILLINOIS TOTALS		22,524.3	27,776.3	37,370.1	55,905.1	976.9	929.0	940.8	968.9	1943.4	2053.4	2215.8	2488.1

TABLE A-III-4 (Continued)

Township	Management Watersheds	Total Population (1,000's) 1980	1990	2020	2020	Population Served (1,000's) 1980	1990	2000	2020	Domestic Flow (MGL) 1980	1990	2000	2020	Domestic[4] Flow Class	Industrial Output ($ millions) 1980	1990	2020	2020	Industrial Flow (MGD) 1980	1990	2000	2020	Total M & I Flow (MGD) 1980	1990	2000	2020
LAKE, IND.		577	672	693	815	543	604	672	807	77.8	88.7	101.6	130.7		2,191.9	2,355.2	2,546.0	3,030.8	439.2	271.8	207.9	176.1	517.0	360.5	309.5	306.8
Calumet	18	220	226	236	256	220	226	236	256	33.0	35.0	37.8	43.5	-A-	687.0	747.9	817.8	997.0	124.0	79.8	76.4	71.8	157.6	114.8	108.2	115.3
Center (part)	19	30	35	45	60	25	30	45	60	3.0	3.8	6.0	9.0	-B-	8.8	14.3	20.6	33.7	0	0.1	0.1	0.1	3.0	3.9	6.1	9.1
Hobart	18, 19	52	64	72	90	52	64	72	90	6.1	8.1	9.6	13.5	-B-	8.8	17.8	25.7	49.1	0	0.1	0.1	0.2	6.1	8.2	9.7	13.7
North	17-1, 18	206	209	214	226	206	209	214	226	30.9	32.4	34.2	38.4	-A-	1,470.8	1,545.6	1,635.6	1,865.1	314.6	191.7	137.1	103.6	345.5	224.1	171.3	142.0
Ross	19	41	59	72	100	20	40	60	100	2.4	5.0	8.0	15.0	-B-	5.5	8.3	12.9	24.5	0	0	0.1	0.1	2.4	5.0	8.1	15.1
St. John (part)	17-1, 19	26	38	50	75	20	35	45	75	2.4	4.4	6.0	11.3	-B-	11.0	21.3	33.4	61.4	0	0.1	0.1	0.3	2.4	4.5	6.1	13.7
Winfield (part)	19	2	3	4	8	0	0	0	0	0	0	0	0	-B-	0	0	0	0	0	0	0	0	0	0	0	0
LA PORTE, IND.		78	89	99	122	46	57	66	91	6.8	8.4	10.0	14.6		285.8	399.7	526.8	829.2	1.6	1.7	2.0	3.2	8.4	10.1	12.0	17.8
Center (part)	22	15	17	20	25	0	0	3	10	0	0	0.4	1.5	-B-	0	0	0	0	0	0	0	0	0	0	0.4	1.5
Cool Spring	20, 21, 22	17	23	28	40	5	15	20	36	0.6	1.9	2.7	5.4	-B-	42.0	56.7	71.8	108.4	0.1	0.1	0.1	0.2	0.7	2.0	2.8	5.6
Michigan	21	41	42	43	45	41	42	43	45	6.2	6.5	6.9	7.7	-A-	239.6	331.1	431.0	669.8	1.5	1.6	1.9	2.9	7.7	8.1	8.8	10.6
New Durham (part)	20	2	3	3	5	0	0	0	0	0	0	0	0	-B-	0	0	0	0	0	0	0	0	0	0	0	0
Springfield (part)	21, 22	3	4	5	7	0	0	0	0	0	0	0	0	-B-	4.2	11.9	24.0	51.0	0	0	0	0.1	0	0	0	0.1
PORTER, IND.		116	167	235	434	60	107	182	378	7.2	13.6	24.4	56.8	-	401.4	671.2	996.2	1,809.6	51.9	36.8	39.3	57.2	59.1	50.4	63.7	114.0
Center	20	30	37	46	77	25	33	42	77	3.0	4.2	5.6	11.6	-B-	55.0	85.0	120.8	207.3	0.1	0.2	0.4	0.7	3.1	4.4	6.0	14.7
Jackson (part)	20	2	4	7	15	0	0	0	0	0	0	0	0	-B-	0	0	0	0	0	0	0	0	0	0	0	0
Liberty (part)	20	7	12	20	40	0	2	10	30	0	0.3	1.3	4.5	-B-	3.8	4.9	8.3	16.6	0	0	0	0	0	0.3	1.3	4.5
Pine	20, 21	8	12	17	34	0	2	5	20	0	0.3	0.7	3.0	-B-	2.5	7.3	12.3	24.3	0	0	0	0.1	0	0.3	0.7	3.1
Portage	18, 20	44	64	90	164	25	50	90	164	3.0	6.3	12.1	24.6	-B-	103.7	225.0	376.8	797.4	12.9	11.5	14.1	24.7	15.9	17.8	26.2	49.3
Union (part)	19, 20	3	6	11	24	0	0	0	7	0	0	0	1.1	-B-	0	0	0	0	0	0	0	0	0	0	0	1.1
Westchester	20, 21	22	32	44	80	10	20	35	80	1.2	2.5	4.7	12.0	-B-	236.4	349.0	478.0	763.8	38.9	25.1	24.8	31.7	40.1	27.6	29.5	43.7
INDIANA TOTALS		771	888	1,027	1,371	649	768	920	1,276	91.8	110.7	136.0	202.1		2,879.1	3,426.1	4,069.0	5,669.6	492.7	310.3	249.2	236.5	584.5	421.0	385.2	438.6
GRAND TOTALS		8,056	9,025	9,857	11,010	7,776	8,783	9,653	10,846	1,058.3	1,235.1	1,411.0	1,721.3		25,403.4	31,202.4	41,439.1	61,574.7	1,469.6	1,239.3	1,190.0	1,205.4	2,527.9	2,474.4	2,601.0	2,926.7

Notes

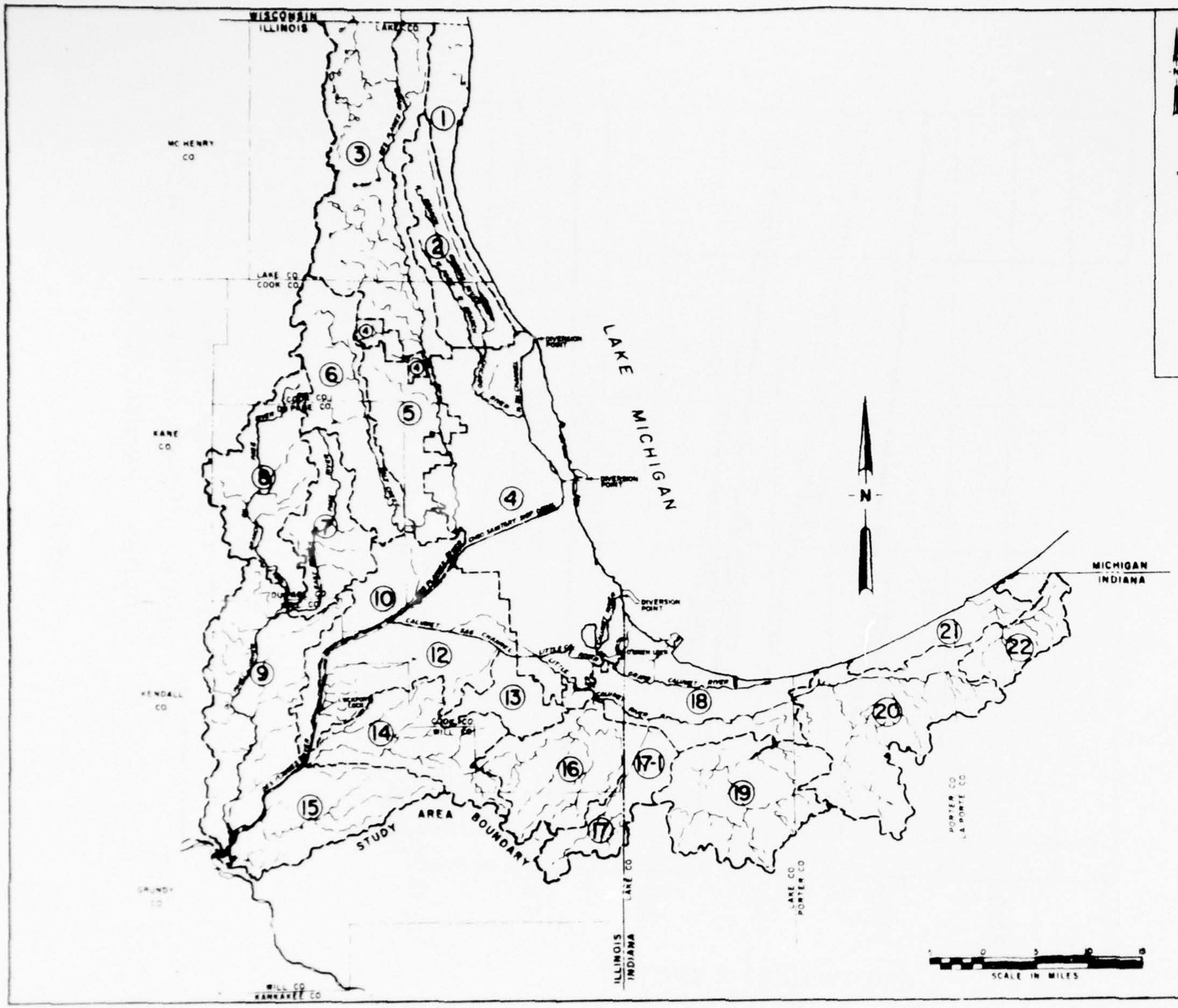
1 Includes Cicero and Oak Park
2 Includes Norwood Park
3 Includes River Forest and Riverside (wastewater flows calculated at "B" projection)
4 A-City of Chicago, Other Inner City
B-Suburbs

TABLE A-III-5 C-SELM WASTEWATER FLOWS 1980-2020
BY MANAGEMENT WATERSHEDS

Management Watershed	Total Population (1,000's)				Population Served (1,000's)				Municipal Flow (MGD)				Industrial Flow (MGD)				Total M & I Flow (MGD)			
	1980	1990	2000	2020	1980	1990	2000	2020	1980	1990	2000	2020	1980	1990	2000	2020	1980	1990	2000	2020
1. Lake Michigan - North	157.2	187.4	205.5	229.9	150.8	185.0	205.5	229.9	20.7	25.7	29.7	36.3	8.8	8.1	8.1	8.4	29.5	33.8	37.8	44.7
2. North Branch Chicago River	238.5	286.0	304.7	314.4	238.5	286.0	304.7	314.4	28.6	36.6	41.3	47.6	6.6	7.2	7.7	8.2	35.2	43.8	49.0	55.8
3. DesPlaines River - North	350.0	456.9	549.1	670.0	310.6	419.3	512.1	637.0	37.4	53.4	69.1	96.2	13.9	12.4	14.1	16.1	[illegible]	65.8	83.2	112.3
4. Chicago Tributary	4174.7	4219.1	4266.1	4341.1	4174.7	4219.1	4266.1	4341.1	604.7	632.7	662.8	722.0	767.2	720.9	723.4	738.4	1371.9	1353.6	1386.2	1460.4
5. DesPlaines - Middle	352.0	385.9	410.6	430.9	352.0	385.9	410.6	430.9	43.7	50.9	57.5	67.5	45.2	48.3	50.1	52.2	88.9	99.2	107.6	119.7
6. Salt Creek	368.0	443.6	495.6	515.5	364.9	443.6	495.6	515.5	43.2	55.9	66.4	77.4	12.0	14.5	16.7	19.9	55.2	70.4	83.1	97.3
7. East Branch DuPage River	207.6	267.7	317.4	364.3	199.7	264.5	315.7	364.3	23.6	33.3	42.4	54.7	2.3	3.1	3.8	4.5	25.9	36.4	46.2	59.2
8. West Branch DuPage River	180.9	267.5	361.4	473.4	159.4	258.5	361.4	473.4	18.9	32.7	48.5	71.1	3.1	4.1	5.4	6.9	22.0	36.8	53.9	78.0
9. Main Stem DuPage River	78.1	123.2	180.1	290.3	47.8	93.0	152.0	278.8	5.7	11.7	20.5	41.8	12.5	8.9	7.7	6.8	18.2	20.6	28.2	48.6
10. San-Ship Canal - North	245.9	283.8	315.2	361.1	239.8	278.5	312.4	361.1	29.5	36.4	43.3	55.5	23.6	21.2	21.4	21.9	53.1	57.6	64.7	77.4
11. Cal-Sag Channel - North	178.8	200.1	215.4	226.6	178.8	200.1	215.4	226.6	21.1	25.2	28.9	34.0	12.0	12.8	13.7	14.1	33.1	38.0	42.6	48.1
12. San-Ship Canal - South	64.6	98.3	128.5	170.1	58.4	94.8	125.7	170.1	6.9	11.9	16.9	25.5	16.4	15.3	14.1	13.3	23.3	27.2	31.0	38.8
13. Cal-Sag Channel - South	79.0	108.6	126.0	134.6	76.3	108.6	126.0	134.6	9.0	13.7	16.9	20.2	2.3	2.3	2.5	2.5	11.3	16.0	19.4	22.7
14. Hickory - Spring Creeks	162.0	244.2	312.5	395.4	144.6	230.6	304.8	392.3	18.4	30.3	42.2	60.2	6.8	6.0	6.8	8.2	25.2	36.3	49.0	68.4
15. Jackson Creek	51.9	70.3	91.5	128.1	45.5	59.9	80.2	109.7	6.5	8.6	11.9	17.7	11.0	8.0	7.7	8.1	17.5	16.6	19.6	25.8
16. Thorn-Deer Creeks	387.5	483.2	535.9	573.7	381.1	480.2	533.5	571.9	48.8	64.5	75.4	89.3	36.2	35.9	37.6	39.4	85.0	100.4	113.0	128.7
17. Little Calumet - West[1]	6.8	8.8	11.2	16.0	4.0	6.8	9.6	14.8	0.5	0.9	1.3	2.2	0	0	0	0	0.5	0.9	1.3	2.2
ILLINOIS TOTAL[3]	7285	8137	8827	9639	7127	8015	8733	9570	966.5	1124.4	1275.0	1519.2	976.9	929.0	940.8	968.9	1943.4	2053.4	2215.8	2488.1
17.1 Little Calumet - West[2]	48.3	56.9	65.6	84.2	44.3	54.9	62.3	84.2	6.2	7.8	9.2	13.3	47.2	28.8	20.6	15.7	53.4	36.6	29.8	29.0
18. Indiana Harbor	433.9	451.7	474.6	526.7	430.1	449.6	474.6	526.7	63.4	68.4	74.4	86.9	393.9	244.5	189.1	163.7	457.3	312.9	263.5	250.6
19. Little Calumet - Middle	103.9	136.1	171.8	204.8	72.4	107.2	148.7	224.3	8.6	13.5	19.8	35.8	0	0.2	0.3	0.4	8.6	13.7	20.1	36.2
20. Little Calumet - East	98.3	140.0	194.1	353.4	52.2	91.5	152.5	303.6	6.3	11.6	20.4	45.1	30.5	22.5	24.8	37.6	36.8	34.1	45.2	82.7
21. Indiana Dunes	58.5	67.3	77.6	107.8	46.5	54.5	65.0	98.6	6.9	8.1	9.9	15.7	21.0	14.2	14.3	18.9	27.9	22.3	24.2	34.6
22. Trail Creek	29.2	36.1	43.4	58.3	3.5	10.5	17.0	35.2	0.4	1.3	2.3	5.3	0.1	0.1	0.1	0.2	0.5	1.4	2.4	5.4
INDIANA TOTALS[3]	771	888	1027	1371	649	768	920	1276	91.8	110.7	136.0	202.1	492.7	310.3	249.2	236.5	584.5	421.0	385.2	438.6
C-SELM TOTALS[3]	8056	9025	9854	11010	7776	8783	9653	10846	1058.3	1235.1	1411.0	1721.3	1469.6	1239.3	1190.0	1205.4	2527.9	2474.4	2601.0	2926.7

Notes

1 Illinois portion
2 Indiana portion
3 Totals adjusted slightly to conform to Table 5.1 totals.



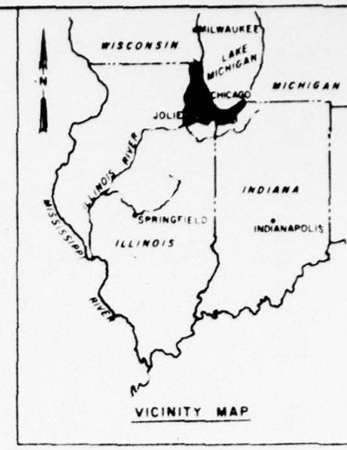


FIGURE A - III - 7

CORPS OF ENGINEERS, U.S. ARMY
CHICAGO DISTRICT

C-SELM WASTEWATER MANAGEMENT SURVEY STUDY

WASTE WATER MANAGEMENT
WATERSHEDS

BAUER ENGINEERING, INC — CHICAGO, ILLINOIS

SHEET OF

FIGURE A-III-8

C-SELM DOMESTIC UNIT FLOW PROJECTIONS 1970-2020

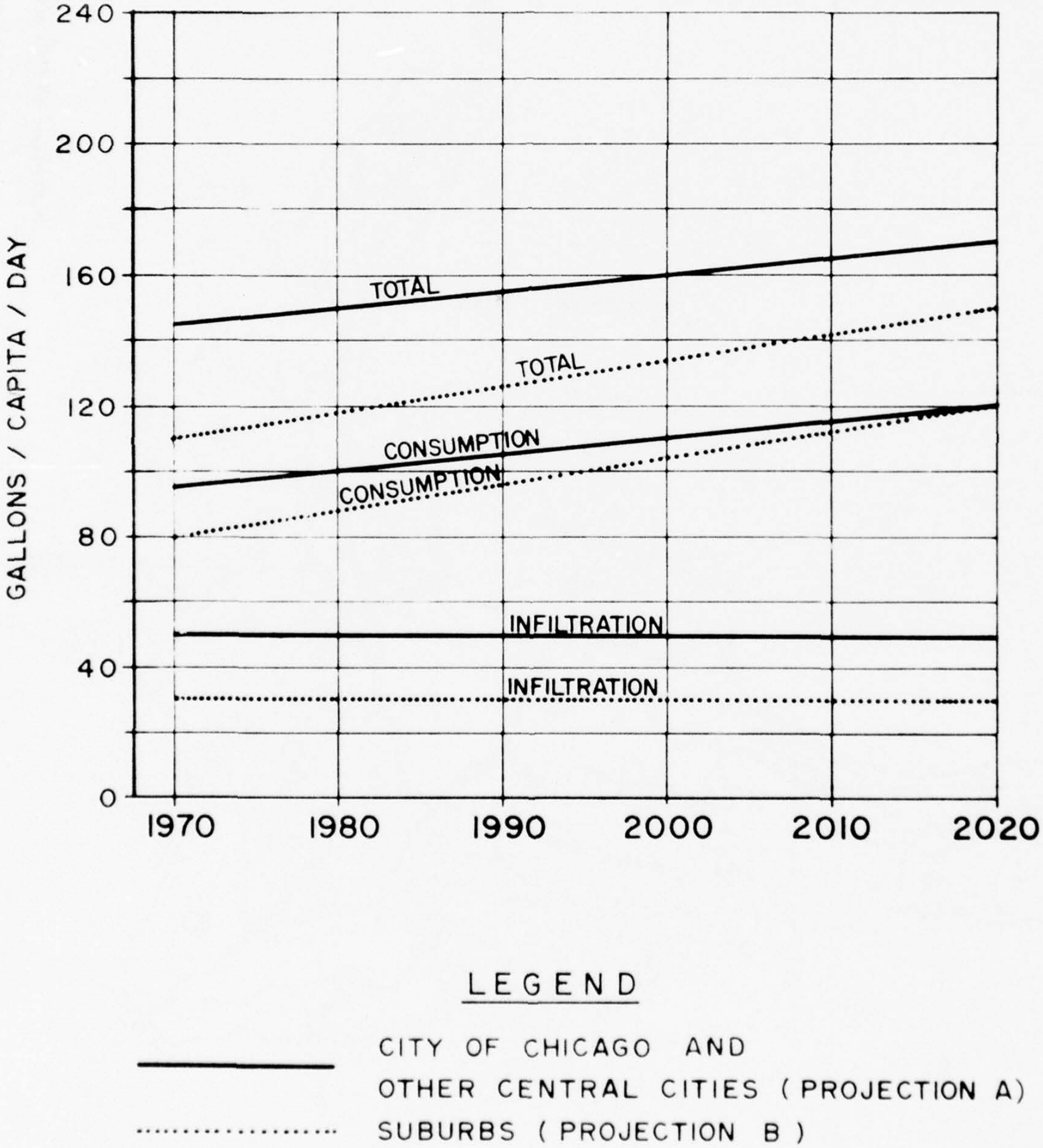


TABLE A-III-6

Industrial Output (Value Added) for
Chicago-Northwest Indiana Standard Consolidated Areas

Standard Industrial Classification (SIC)	Year	VALUE ADDED ($1,000,000)		
		1958	1963	1967
20		1191.7	1424.3	1681.3
22		48.9	43.8	37.5
23		206.3	212.6	228.0
24		D	52.9	69.3
25		161.6	196.3	246.4
26		222.0	303.9	431.5
27		821.1	1058.1	1416.1
28		731.4	1044.9	1308.8
29		190.1	233.3	345.2
30		154.1	265.7	352.0
31		60.6	59.5	74.1
32		243.5	268.2	311.7
33		1395.4	1793.9	2146.4
34		997.1	1266.0	1583.2
35		947.0	1227.6	1760.7
36		1193.0	1407.9	1926.0
37		462.3	404.3	685.5
38		250.2	387.4	539.5
39		240.0	269.7	345.2

1/ Census of Manufacturers', 1967, 1963; 1958 Chicago-Northwest Indiana Standard Consolidated Area

In the development of the unit flow projection curves, two different projection situations were assumed based on experience and an elevation of present available flow data.

Projection A was made for the cities of Chicago, Evanston, Oak Park, Berwyn, Cicero, Waukegan and Joliet; and North (Hammond), Calumet (Gary) and Michigan (Michigan City) townships. This projection recognizes the older development of these areas. The domestic per capita daily consumption rate increase of 0.5 gallons per year reflects an increasing utilization of water-using facilities in the urban areas due in large part to future urban renewal projects. The domestic consumption of 95 gpcd for 1970 was determined utilizing data from the Metropolitan Sanitary District of Greater Chicago (MSDGC), which was in agreement with the municipal sewage treatment plant inventory presented in Section VII. Further data from MSDGC indicated that infiltration (including combined sewer discharges to treatment plants) in 1970 was approximately 50 gpcd. It was assumed (assumption 4) that maintenance of the collector systems for these areas would keep the infiltration constant for the design period.

Projection B was made for the remaining suburban townships. The 1970 total domestic consumption was assumed to be 110 gpcd, which is representative for these areas as presented in the municipal sewage treatment plant inventory. This unit flow was then broken down into a domestic consumption of 80 gpcd and infiltration of 30 gpcd, which is representative of newer separate sewer systems. The domestic per capita daily consumption is assumed to be increasing at the rate of 0.8 gallons per year reflecting increasing water demands in suburban areas due in a large part to increasing commercial growth in these areas. It was also assumed that maintenance of the collector systems would keep the infiltration constant. As shown in Figure A-III-8, the townships included in Projection B converge toward Projection A over the fifty year design period, reflecting the outlook that these areas will become less distinct from the central city areas as time goes by.

Specific total unit flows (including consumption and infiltration) shown on Figure A-III-8 are shown below for the years 1970, 1980, 1990, 2000 and 2020; these are the unit flows utilized in the domestic flow calculations for the respective years.

	Total Unit Flow (gal/capita/day)				
Projection	1970	1980	1990	2000	2020
A - City of Chicago and Other Central Cities	145	150	155	160	170
B - Suburbs	110	118	126	134	150

The unit flow curve used for each particular township is indicated in the appropriate column of Table A-III-3 by the letter A or B. Figures A-III-9 and 10 graphically illustrate the waste flows for the study area. The reduction in industrial flows from the present to 2020 (Figure A-III-10) is expected because of an increasing amount of industrial recycle. Many industries generate wastewater perfectly adequate for recycling for further industrial use. Sometimes minimal pretreatment is required for recycling. Recycling accomplishes two goals: first, it minimizes demands on an often over-taxed water resource; second, it minimizes the quantity of wastewater that will ultimately be rejected or blowndown for treatment prior to discharge to a receiving water. Flow estimates are based on established trends.

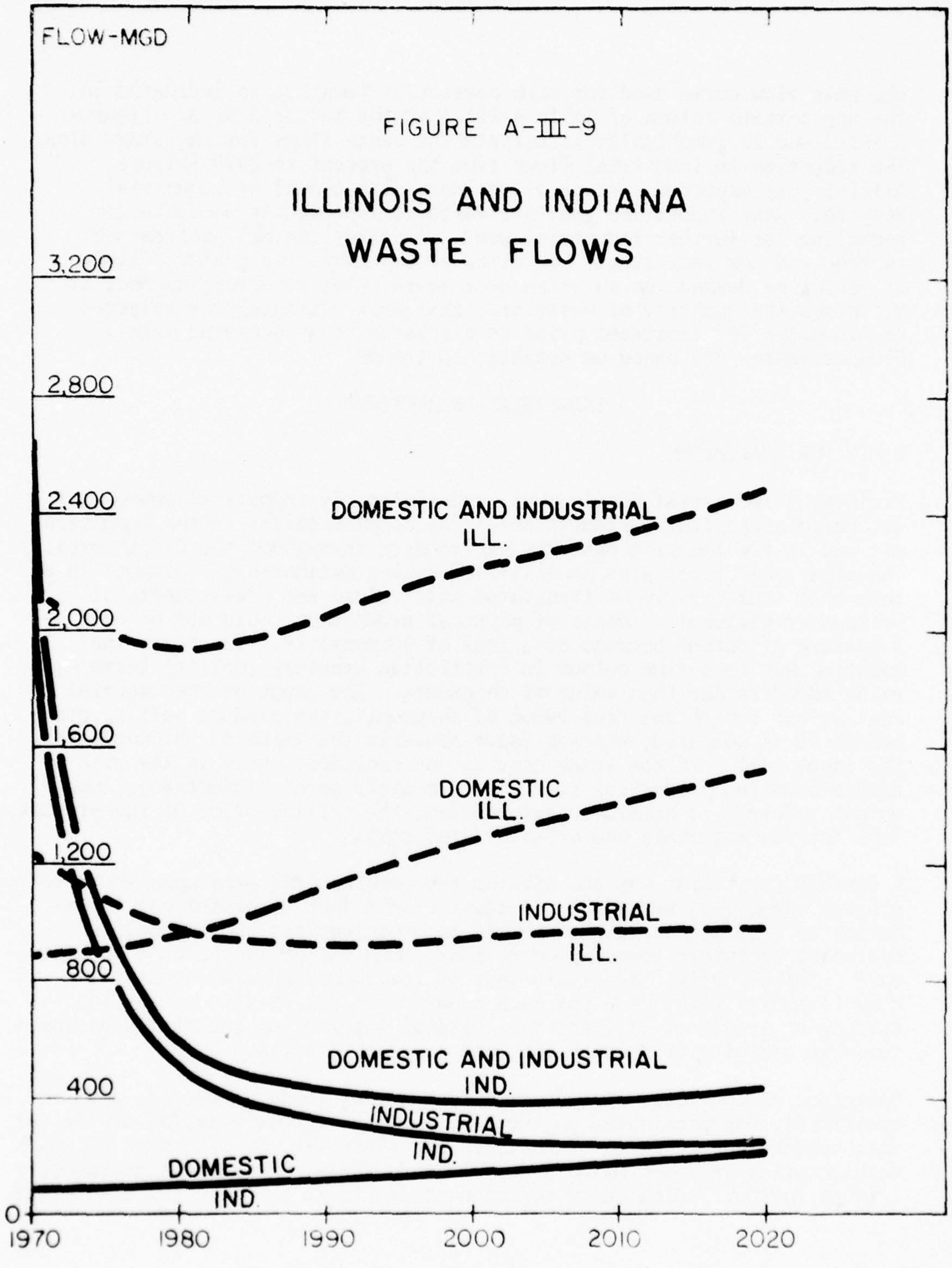
INDUSTRIAL PROJECTIONS

BASIS FOR EVALUATION

Projecting industrial development, and implicitly industrial wastewater discharge necessitated prediction of the complex shifts in the industrial mix and in the location patterns of industry throughout the C-SELM area. The study objectives also necessitated making estimates of "output" in a form that could easily be translated into volume and constituents of wastewater effluents. Units of physical production could not be used as a measure of output because of a lack of commonality. Therefore the solution was to define output in restrictive monetary (dollar) terms -- value added rather than value of shipments. The input or raw material cost is not subtracted from Value of Shipments, the product selling price before it is computed; whereas Value Added is the Value of Shipments less the input cost. If the input cost is not excluded, there is the risk of double-counting production (i.e., intermediate goods production). Hence output referred to herein is Value Added, the selling price of the product less the raw materials and other related costs.

A further constraint was the size of the geographical area upon which to project industrial expansion. Because of the lack of historical information to establish township and zip zone projections and incomplete estimates of future township conditions, data was projected on the county base. Susbsequntly, the growth indices for each Standard Industrial Classification (SIC) code for each county were utilized to assist in estimating growth of at least the critical water using industries on the township and city of Chicago Zip Zone geographic units.

Selection of the level of industrial refinement to be projected, a third constraint, was predicated on the availability of base year and historical data for the county base. Industries are classified by SIC codes of which manufacturing includes major groups 19 through 39. Refinement of industry type is further indicated by addition of digits to the base two digit code.


FLOW-MGD
FIGURE A-III-9
ILLINOIS AND INDIANA
WASTE FLOWS
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
DOMESTIC AND INDUSTRIAL
ILL.
DOMESTIC
ILL.
INDUSTRIAL
ILL.
DOMESTIC AND INDUSTRIAL
IND.
INDUSTRIAL
IND.
DOMESTIC
IND.
1970
1980
1990
2000
2010
2020

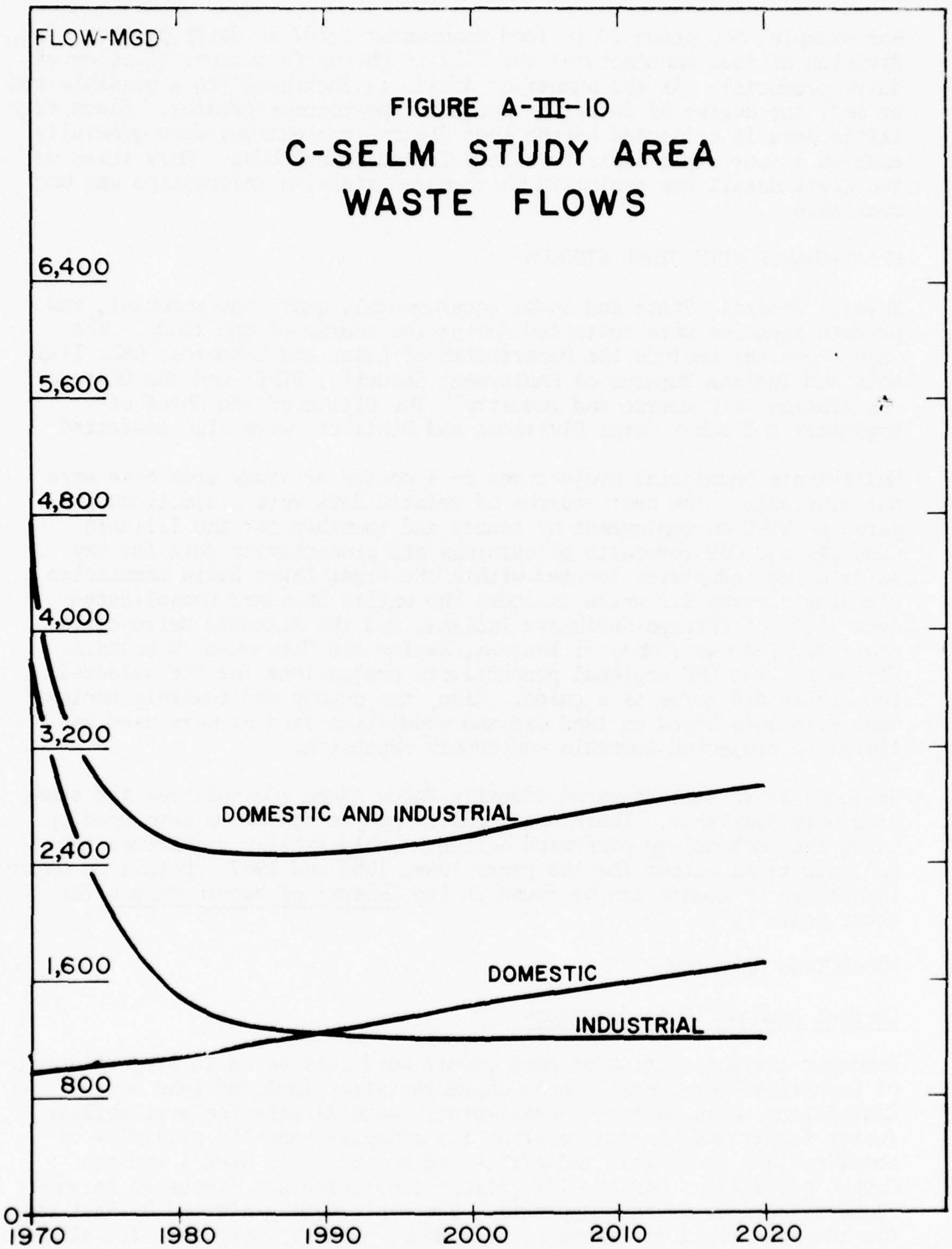


FIGURE A-III-10
C-SELM STUDY AREA
WASTE FLOWS

For example, SIC group 20 is food manufacture; 202 is dairy products (a division of food manufacture) and 2022 is cheese (a further division of dairy products). As the number of digits is increased (to a possible ten or so), the degree of detail of product type becomes greater. Since very little data is collected beyond four digits, projections were generally made on a four digit basis for the selected county base. Only three or two digit detail was projected where more extensive information was unavailable.

RELATIONSHIP WITH OTHER STUDIES

Several Federal, State and local governmental, quasi-governmental, and private agencies were contacted during the course of the study. The major agencies include the Departments of Labor and Commerce; OBE; Illinois and Indiana Bureaus of Employment Security; NIPC; and the Chicago Association of Commerce and Industry. The Office of the Chief of Engineers and other Corps Divisions and Districts were also contacted.

Multi-state industrial projections on a county or study area base were not available. The best sources of related data were projections prepared by NIPC on employment by county and township for the Illinois Counties and OBE forecasts of earnings and productivity data for key water using industries located within the Great Lakes Basin Commission Planning Subarea 2.2 which includes the entire Standard Consolidated Area (SCA) of Chicago-Northwest Indiana, and the Standard Metropolitan Statistical Areas (SMSA) of Kenosha, Racine and Milwaukee, Wisconsin. Ultimately the OBE regional productivity projections for the selected industries did serve as a guide. Also, the county and township employment forecasts based on land use and population studies were used as limits to projected township and county expansion.

No comparative statistics on industry Value Added (Output) for the study area were available. Therefore industry projections were developed by using the methodology presented herein. Table A-III-6 summarizes the SCA industrial output for the years 1958, 1963 and 1967. Detail on major industries by county can be found in the Census' of Manufacturers for these years (17).

PROJECTION APPROACH

Current Economic Considerations

Economic characteristics of each county were considered in projections of industrial forecasts. These characteristics included land use limitations, transportation constraints, natural resource availability (water supply and mineral reserves for example), and the proximity of complementary or similar industries and businesses. NIPC's and the Corps' projections and the limitations considered are discussed in subsequent sections of this appendix. The employment projected by NIPC on the township level for example, provided a primary constraint for allocating industrial growth by township within Illinois.

The industrial projections were the product of county historical trend analysis for individual industry groups. The application of the county trends to the industry group on the township and city of Chicago Zip Zone levels required adjustment within the county total projection to account for predicted land use availability. The total possible employment per township based on land use plans prepared by NIPC were considered. Comparable land use projections information was not available for the Indiana counties.

County projections for both population and industry through 1990 both closely reflect the historical trend of the past decade. Thus the correlation of population and industrial expansion over the past decade are reflected in the 1990 projections.

Development of Projection Model

An approach to determining values was developed by analyzing work of similar nature pursued by the aforementioned sources. This involved linear regression of two or more variables. The principle of linear regression is an attempt to postulate, or make a best estimate, of a straight line relationship between two sets of variables. Adequate historical data was first obtained to determine a trend. It was then assumed that past trends determined from historical data will continue into the future. Implicit in these trends are the current rates of technological change, demand patterns, employment patterns, and the assumption of a relatively stable economy (i.e. lack of dramatic upsurges or recessions). A difficulty in using linear regression (least squares) methods develops if the dependent variable decreases monotonically over time. Under such conditions, projections can be negative. A further problem arises when the dependent variable has increased rapidly over recent years. This results in unrealistically high projections. These difficulties did exist and required some modifications which are discussed below.

Data for the two variables selected for use in the projection model, employment and value added, were acquired from three sources. The Bureaus of Employment Security supplied county industry employment information by three (Illinois) and four (Indiana) digit SIC codes for 1960, 1963, 1967, 1970 and 1971 (18). Similarly, the Census of Manufacturers provided county information for both employment and value added for each SIC code up to four digits for 1958, 1963 and 1967 (17). Supplemental information in the form of detailed employment data for each manufacturing plant, in each county of the study area was also used. This data, prepared by McGraw Hill, identified industrial employment on a six digit SIC code. The McGraw Hill plant information was the only complete data of its type for a geographical unit smaller than the county and it was available for only the year 1970. Prior to processing the Census of Manufacturers value added data all values were converted to 1970 price levels to eliminate price change effects.

Application of Linear Regression Model

A problem in projecting the value added data by county for three and four digit SIC code levels of detail developed because of the minimum amount of input data. Too often the results of industrial projection extended from the latest year available, 1967, often did not correlate with the McGraw Hill information for 1970.

The unsatisfactory results from projecting Census of Manuracturers value added (VA) data led to development of an approach which would utilize the Bureau of Employment Security employment (N) data with complete information for more than three points in time and including the latest year, 1971. The drawback to this source was that the only data available was N. A method of translating this N into value added required the use of information drawn from the Census of Manufacturers. Detailed county value added projections developed from regressing Census VA data were not acceptable. However, the projection of the ratio of Census VA to employment E (productivity) was adequate when used with the detailed employment information projected from the Bureaus' data. The productivity data was derived from the Census, since it was the only consistent historical data source. The projections of both county productivity VA/E and employment N were independently regressed, on a four digit SIC base when possible. The projected ratio VA/E was then applied to the projected N to predict future value added. In each time period 1970 through 2020 the two values VA/E and N for each SIC group were multiplied producing the requisite future value added. The resultant value added projections do not necessarily approximate a straight line and as a result the projections were generally more realistic. Further, unlike the limitation imposed on value added when projected separately, from Census data, the VA/E could be applied to the employment base N to permit projection of all 1970, four digit industry groups.

To avoid the handicap posed by incomplete county Census VA data required in order to project VA/E, the following procedure was used. When possible the county VA/E was projected for the highest SIC level of detail possible. Further, the VA/E was projected for the four-digit level and all other levels for each code reported for three additional geographical bases--Chicago SMSA; Gary-Hammond SMSA; and the Northeastern Illinois-Northwestern Indiana Standard Consolidated Area. The result was VA/E projections for all SIC codes at the least on a two digit base for the entire study area. This information was applied for the appropriate year to the projected Bureau county employment data N for each matching four digit SIC code to produce county Value Added information. Following is an example of the procedure followed to consider the SIC code 2756 for a specific county for which employment N had been projected. The steps to develop the VA/E projection is:

(1) Search the Census VA/E for the county.

(2) Within the county search for SIC 2756. If VA/E figures exist for 2756, multiply them by N per year. If they do not, then:

(3) Within the county search for SIC 275. If VA/E exists for 275, multiply them by N per year. If they do not then:

(4) Search, within the county for SIC 27.

If the Census did not compile VA/E figures for the SIC in question at the county level, then the same process would be repeated at the appropriate SMSA level (Illinois Counties--Chicago SMSA: Indiana counties--Gary-Hammond SMSA). SIC 2756, SIC 275 and SIC 27 as required would then be searched in the SMSA VA/E Census compilations. If the Census did not compile the Value Added/Employment figures at the SMSA level, then the process would again be repeated at the Consolidated Area level, where, with few exceptions, a match would be found at least at the two digit level. The procedure stopped when a match was found. Thus, for each N SIC code, a match was searched for in the VA/E figures to multiply to yield the Value Added projections. This procedure of utilizing the VA/E at an available level of detail with N permitted the projection of county value added at a 3 to 4 digit level of detail. This was impossible when extrapolating from Census VA alone.

Although a few negative projections resulted from the procedure (usually associated with industries with declining employment), the straight line regression with slight modification usually yielded realistic products. Dr. Charlotte Boschan of the National Bureau of Economic Research indicated that ideally one type of regression should be used with growth industries, and another with stagnant and so forth. However, as an approximation the straight line, appropriately modified, gives as good a result as any. Therefore the straight line results for employment and VA/E were accepted, with necessary modifications. The OBE and other two-digit projections were used as controls to modify those output indices that were negative, too high, or too low. For those that were negative, the last positive projection was usually adopted for the future. For those that were too high, generally in counties that have little available land or experienced recent rapid growth, subjective judgement based on projections such as land use and population growth was used to reduce the growth rates. The opposite procedure was followed for those that were too low. The growth indices representing the county output projections for the major water using industries are presented in Table A-III-7 for the period 1960 through 2020. One general trend is observed in the growth indices. The developed counties such as Cook and Lake (Indiana), demonstrate generally low indices whereas the newly developing counties such as DuPage and Porter have the highest indices. Interpreting impacts of the varying indices must be carried out in view of the industrial output shown in Table A-III-6 for 1970. The Cook County index for the Primary Metal Industry in 2020 of 204 contrasts to that of Porter County of 993. Applying these to the county's 1970 bases of $1,096.5 million for Cook and $150.3 million for Porter, Cook will still retain its real lead in this industry, although it falls in relative importance within the Study Area.

TABLE A-III-7

INDUSTRIAL GROWTH INDEXES
OF MAJOR C-SELM
WATER USING INDUSTRIES
(1970=100)

COUNTY

C O O K (1)

STANDARD INDUSTRIAL CLASSIFICATION	1960	1970	1980	1990	2000	2010	2020
20 Food & Kindred Products	73	100	121	140	155	166	173
26 Paper & Allied Products	65	100	130	167	207	250	296
262 Paper Mills, exc. bldg.	02	100	209	374	581	830	1,122
263 Paperboard	173	100	--	--	--	--	--
28 Chemicals & Allied Products	61	100	149	204	266	336	413
281 Industrial Inorganic & Organic Chemicals	53	100	154	223	304	398	503
284 Soap, Detergents, etc.	57	100	143	196	257	325	400
29 Petroleum & Coal Products	38	100	170	277	408	565	747
2911 Petroleum Refining	24	100	202	367	579	839	1,147
32 Stone, Clay & Glass Products	77	100	115	129	141	152	160
3241 Cement, Hydraulic	--	--	--	--	--	--	--
33 Primary Metal Industries	72	100	122	146	167	186	204
3312 Blast Furnaces & Steel Mills	76	100	120	142	161	177	192

(1) Lake and LaPorte Counties, Indiana indices under 281 classifications are 2818 and 2819, respectively. Illinois County data on 4 diget line, i.e., 3312, refers to 3 diget SIC level only.

DUPAGE COUNTY							LAKE, IL. COUNTY (1)						
YEAR							YEAR						
1960	1970	1980	1990	2000	2010	2020	1960	1970	1980	1990	2000	2010	2020
19	100	242	442	700	1,018	1,393	35	100	170	247	329	416	508
01	100	256	474	750	1,085	1,479	33	100	194	311	456	627	826
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
34	100	204	339	507	707	941	41	100	184	293	428	587	772
69	100	119	123	114	95	64	--	--	--	--	--	--	--
13	100	239	432	677	972	1,319	146	100	53	53	53	53	53
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
64	100	160	244	344	460	592	87	100	109	120	130	138	145
--	--	--	--	--	--	--	--	--	--	--	--	--	--
17	100	210	365	560	794	1,068	67	100	104	94	94	94	94
--	--	--	--	--	--	--	93	100	79	79	79	79	79

WILL COUNTY (1) YEAR 1960	1970	1980	1990	2000	2010	2020	LAKE COUNTY, IND. (1) YEAR 1960	1970	1980	1990	2000	2010	2020
53	100	163	232	310	395	489	109	100	80	80	61	61	61
15	100	266	499	804	1,182	1,631	74	100	153	206	268	338	416
29	100	192	325	492	694	930	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
15	100	162	257	366	488	624	86	100	95	87	87	87	87
81	100	121	145	171	199	229	95	100	82	79	73	65	55
							64	100	117	149	184	223	266
36	100	175	266	369	485	614	104	100	93	79	38	38	38
65	100	146	189	232	273	314	74	100	100	100	100	100	100
--	--	--	--	--	--	--	--	--	--	--	--	--	--
95	100	66	66	66	66	66	144	100	47	47	47	47	47
--	--	--	--	--	--	--	176	100	77	77	77	77	77
83	100	112	115	109	109	109	89	100	112	126	140	154	169
81	100	116	121	118	108	89	90	100	114	128	143	158	173

LA PORTE COUNTY (1) YEAR							PORTER COUNTY YEAR						
1960	1970	1980	1990	2000	2010	2020	1960	1970	1980	1990	2000	2010	2020
17	100	171	265	367	471	596	89	100	139	177	218	262	310
19	100	174	281	422	583	768	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
72	100	104	118	130	140	148	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
126	100	81	60	35	35	35	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	100	226	338	466	609	769	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
56	100	100	123	140	157	176	456	100	161	161	161	161	161
--	--	--	--	--	--	--	--	--	--	--	--	--	--
27	100	205	353	541	769	1,037	03	100	219	371	551	758	993
--	--	--	--	--	--	--	02	100	221	377	561	774	1,015

Technical design requirements necessitated growth estimates of the critical water using industries on the township and city of Chicago Zip Zone geographical bases. Detail to realistically disaggregate county projections for each 3 to 4 digit SIC code to these units was well beyond the scope of this study. In order to satisfy the requirement of estimating the critical water using industries, however, the county VA growth indices developed for each SIC code were applied to the McGraw Hill employment data which had been grouped into the township and Chicago Zip Zone units and converted to VA by the application of appropriate county productivity indices VA/E. Since the projections for each SIC code by township could not be satisfactorily adjusted, only the critical water using industry projections by township and Zip Zone were checked for realism. These selected projections were used only as indicators to the expected distribution, concentration and growth of only the water using industries within the larger county unit.

COMPARISON OF CORPS OUTPUT WITH OTHER STUDIES

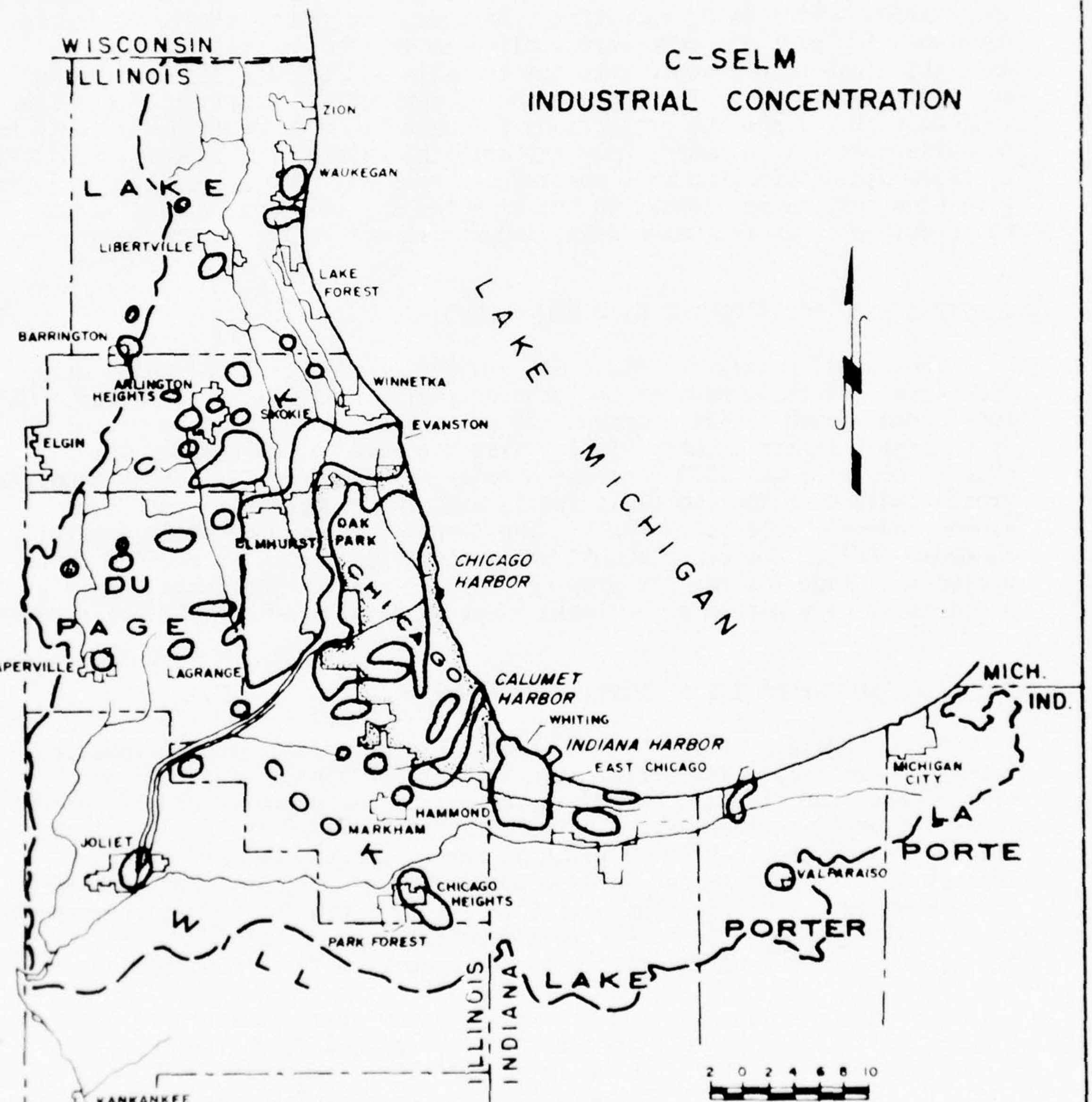
The Corps' county two-digit SIC projections for critical water using industries and those made by OBE (the only alternative source) differ. OBE considered a much larger geographical area as compared to those prepared by Chicago District (county base). Also the base period used by the Chicago District was 1970 contrasted to a 1967 base for OBE. Cook County's growth indices at the two digit level, with the exception of petroleum growth indices, fell below OBE's. The lesser developed counties generally exceeded OBE's. For example, OBE projections fell below or equaled those projections made for rapidly growing Du Page County. The Corps county growth projections vary within a realistic range on either side of OBE projections.

EXISTING AND TRENDS IN INDUSTRIAL DEVELOPMENT

The foundation of the C-SELM economy is the area's diverse industrial complex. Presently, industrial jobs account for approximately 40 percent of the wages and salaries earned in the area. The primary industry groups ranked by employment and value of output are displayed in Table A-III-6. The major industry, ranked by value of production, is primary metals. Primary metals ranks second in employment and in addition leads in volume of wastewater discharge. The next three highest ranking industry groups, Electrical Equipment, Non-electrical Machinery and Fabricated Metals, are all linked directly or indirectly to the primary metals industry.

The concentration of industry in the study area is displayed in Figure A-III-11. The two principal water users and dischargers are the steel (SIC 331) and Petroleum Refining (SIC 291) Industries. The steel industry is most heavily concentrated along Lake Michigan on the south side of the city of Chicago, northern Lake County, Indiana and in the city of Portage, Indiana. Petroleum refineries are clustered in Whiting and East Chicago, Indiana and situated on the Illinois Waterway near the cities of Lemont, Lockport and Joliet, Illinois.

C-SELM INDUSTRIAL CONCENTRATION



LEGEND

☐ CONCENTRATION OF INDUSTRIES

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS

FIGURE A-III-11

Industrial Growth Potential

Industrial growth in the Chicago metropolitan area is expected to continue at a rate above the national average impelled by the proximity to markets, easy access to land and water transportation, availability of highly skilled labor, and the existence of general agglomeration economies. The availability of land for industrial development in each county is a good indicator of where the greatest industrial growth will occur. The major industrial growth areas beyond the 1970 decade are expected in counties or sections thereof which have the greatest availability of vacant land. Identified as growth centers within the study area, by virtue of availability of land, convenience to major transportation routes, and/or abundance of water, are DuPage, Will, northwest Cook and Porter counties and the central and southwestern portions of Lake County, Illinois. Table A-III-6 shows the value added projections, of major water using industries by county in 1970.

City of Chicago. The central city, even with industrial land clearance projects, will be unable to create sufficient amounts of vacant land to accommodate those industries desiring city locations. In the inner sections of the city, the amount of available land zoned for manufacturing is minimal. The inner city seems to be best suited for three general groups of industries -- firms that require large numbers of semi-skilled and unskilled employees; small firms that are highly dependent upon their suppliers and/or markets; and closely related industrial types, e.g. printing and publishing industries. These industries will continue to expand, pprobably at the expense of other types of industries.

In response to industry's demand for land within the city of Chicago, property is being cleared throughout the city for redevelopment projects. In addition, undeveloped land along the Illinois Waterway and connecting channels, in the Lake Calumet region, and along vacated railroad terminals will provide additional sites for manufacturing in the future. In conjunction with these large-scale projects, the establishment of relatively small-sized industrial parks in Chicago should provide further industrial growth potential. Such parks would be ideal locations for embryonic industries which have a heavy reliance on certain agglomeration economies. The proximity to agglomeration economies coupled with the availability of modern single story facilities may serve to offset the higher land costs and make such parks highly desirable industrial sites, since land availability is still the chief obstacle to industrial parks in the city. Several future sources of land include the space occupied by vacant residential buildings, miles of unused commercially zoned property, and many vacant and obsolete multi-story buildings.

The Lake Calumet Region on the city's far south side will also play a key role in the city's future industrial expansion. This region has the greatest amount of vacant land in the city that is zoned for industry and commerce. Open space land is the area's principal asset. The area to date is known as a water-oriented heavy industrial zone. Primary steel plants requiring large-scale water transportation and low cost water supply constitute the industrial core in both lakefront and river sites. A parallel structure of water-oriented activities serves the grain industry at Calumet River sites. Substandard urban services on the east side of Lake Calumet presently constrain industrial development. The increasing demand for commercial and industrial sites within the city will most likely lead to significant future growth in the Lake Calumet Region. Of the 4,000 industrial acres zoned available in Chicago, over 3,000 acres are presently in the Lake Calumet area on the southeast side of the city.

Outside the City of Chicago. The suburbs within the study area which can be reasonably predicted as areas of future industrial expansion are those situated near the growth areas of the past decade. DuPage, and northwestern Cook counties have recently experienced the greatest industrial growth. DuPage, followed by northern Cook County, presently leads the study area in total acres within developed industrial districts available for industry. Considering the large acreage of vacant and agricultural land, they should continue to lead the study area in future industrial development.

Two additional factors contribute to the expectation of rapid growth in DuPage and northern Cook (particularly northwestern Cook) Counties. These are (1) the northern, northwestern, and western rail commuter service; and (2) the expressway system of the Edens Expressway, the Northern Illinois Toll Road, the Northwest and Kennedy Expressway systems, and the East/West Tollway. The greatest industrial development in recent years has centered around O'Hare Airport in Northwest Cook County. Due to the characteristics of DuPage and northern Cook Counties, light industry which has been dominating the local industrial growth, is expected to continue to develop there.

Will County possesses valuable water assets which are expected to continue to attract industry. The Illinois Waterway, which flows diagonally through the county, provides shallow draft water transportation connecting to the Great Lakes and the Gulf. In addition to the waterway transportation available, several railroads also crisscross Will County. Water-using chemical, petroleum and metals industries have recently been concentrating in the County, particularly along the Illinois Waterway.

Lake County is expected to experience its greatest industrial expansion in the light industries group and in industries requiring a ready pool of skilled and semi-skilled labor. In particular, the chemical and food industries are expected to show the greatest real growth. Large acreages of undeveloped vacant and agricultural land are available for expansion.

Lake County, Indiana's heavy industry will continue to be dominant although the county's rate of future expansion in all water demanding industries (consumptive or for transportation) is expected to be below the average for the study area. The largest heavy industry group, Blast Furnaces and Steel Mills (SIC 3312), is expected to increase production by only 73 percent from 1970 to 2020. The general limit on all expansions is due primarily to the limited availability of sites accessible to water.

Porter County industry is expected to grow at a rapid pace in the future. Its new deep water port, in combination with the existing rail and highway networks and available open land, is expected to stimulate industrial growth. Expansion by the county's two major steel companies will substantially add to the county's growth. Metal-using industries are also expected to contribute heavily to the future growth.

LaPorte County's industrial center is within the C-SELM portion of the county. The county's principal industries are expected to continue to be metal related. The area's growth as compared with that of the entire study area is expected to be relatively greater because of its availability of undeveloped land coupled with its established industry.

FLOW PROJECTION METHODOLOGY

Five basic assumptions were utilized in developing the industrial flow projections. These were:

(1) For the critical (large water using) industries discharging to surface waters, it was assumed that recycling would reduce the flows in future years as follows:

	Proportion of 1970 Unit Flow				
Critical Industry	1970	1980	1990	2000	2020
Petroleum	1.00	.45	.25	.15	.075
Steel	1.00	.2	.1	.08	.075

(2) Critical industry flows to surface waters were assumed to equal the value added component of a particular township contributed by the specific critical industry times the unit flow factor for that industry times the recycling reduction factor as presented in Assumption 1.

(3) The other industrial flows to surface waters were assumed to be reduced in the future by the following recycling-reduction factor:

	1970	1980	1990	2000	2020
Non-critical Industry	1.0	0.4	0.3	0.25	0.2

(4) Flow projections for those industries that are presently discharging to municipal wastewater treatment systems were assumed to be proportional to the population served by the municipal system. The present industrial per capita unit flow for municipal systems in Cook County was assumed to equal the MSDGC industrial flow data of 105.6 gpcd. The present industrial per capita unit flow for municipal systems in the remaining counties was assumed to equal 15.7 gpcd. It was also assumed that these unit flows would remain constant throughout the design period.

(5) The industrial flows to municipal systems for each county were allocated among the townships according to the proportion of value added within each township.

In reviewing present industrial flows, it was found that the Steel and Refineries industries generated 90 percent of the industrial flow. Thus these key industries were designated critical industries and given particular attention in the evaluation and projection. In addition several other industries were found to be presently generating large flows. Among them were Union Carbide, the Joliet Munitions Plant, and Abbott Laboratories.

For the critical industries (petroleum and steel), it was necessary to determine that component of value added at the township level attributable to them. This was done by taking township value added projections for all industries and identifying the value added figures from SIC groups corresponding to these critical industries for the years 1980, 1990, 2000 and 2020. These critical industry value added figures were then used in the calculation of critical industry flows at the township level by multiplying them by the time adjusted flow factor of these industries as derived below.

Recycle Potential - Steel Industry

The water needs of the steel industry per unit production have increased slightly in recent years reflecting new, high-volume production technology. In the present and foreseeable future, the water requirements of advanced-technology, integrated steel mills will be approximately 40,000 gallons per ton of production, of which 26,000 gallons per ton, or 65 percent is required for cooling and 14,000 gallons per ton, or 35 percent is required for process use.

Steel mills without coke plants can be expected to require 32,000 gallons per ton of production, or 80 percent of the integrated mill requirement. The water requirements are proportioned similarly between the cooling and process uses in steel mills without coke plants, i.e., approximately two-thirds to cooling and one-third to process use.

The distribution of the water needs among the varied sub-processes within advanced-technology steel mills is presented below, together with an indication of the type of pollutant resulting from each of the sub-processes . The waste streams and the pollutants therein from each of the sub-processes have different degrees of recycle potential. The degree of overall recycle possible is evident from the following examples:

(a) Kaiser Steel Corporation's Fontana, California, integrated plant, where 1,600 gallons per ton of production is the total water make-up requirement (71).

(b) Wisconsin Steel Division of International Harvester Company's Cook County, Illinois, integrated plant, where a one-time water intake of 120 MGD has been reduced to 70 MGD and is destined to be reduced to an estimated 5 MGD, or four percent of the original water requirement.

(c) United States Steel Corporation's South Works in Cook County, Illinois, which announced in January, 1971, a recycling program encompassing five years that will accomplish the reduction of wastewater to a small quantity to be processed by the Metropolitan Sanitary District of Greater Chicago.

A generalized maximum recycle strategy for the integrated steel industry is as follows:

(a) All cooling flows and the sinter plant, steelmaking processes, and hot and cold rolling mill process flows are reclaimed and recycled repeatedly until the total dissolved solids concentration approaches inhibitory levels.

(b) Blowdown from the recycling flow, described above, is successively used for the by-product coke plant cooling and process requirement followed by the blast furnace process requirement.

(c) A final suspended solids reclamation is performed on the enriched blowdown flow prior to its admixture to local or remote primary, secondary and, as required, advanced waste treatment.

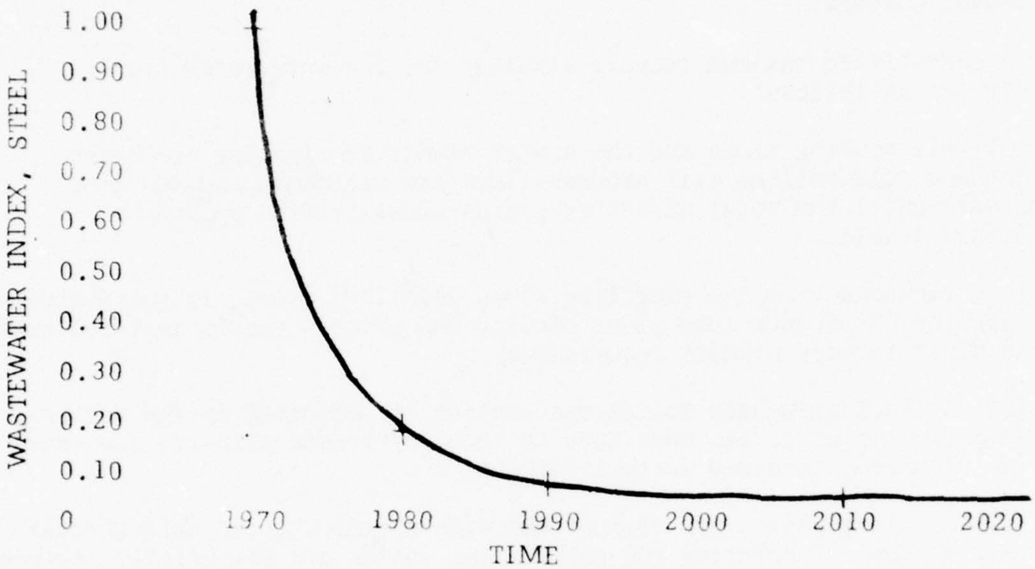
(d) Pickling wastes are regenerated with a hydrochloric acid-thermal-recovery system. Tinplating and galvanizing wastes are essentially stripped of their heavy metal contents by absorption recovery systems and recycled with a required blowdown admixture to local or remote primary, secondary and, as required, advanced waste treatment.

(e) Reclaimed iron solids are recycled to either blast furnaces or steelmaking processes via sintering, as required; reclaimed oil is classified and reused or sold for further reclaiming; recovered zinc, tin and chromium are selectively reclaimed as economically feasible and reused.

(f) Sanitary flows are transmitted to local or remote primary, secondary and, as required, advanced waste treatment.

This example of maximum recycle strategy for the integrated steel industry leads ultimately to a total water requirement per ton of production of approximately 3,000 gallons, or seven and one-half percent of the estimated water requirement without recycle. The graph below has been prepared to serve as an example of how such a strategy could develop with time. The wastewater index defined in this exhibit is the fraction of the original wastewater volume requiring treatment (40,000 gallons per ton) that accompanied modern technology steel manufacture prior to wastewater recycle.

THE EFFECT OF WASTEWATER RECYCLE IN THE STEEL INDUSTRY ON TREATMENT VOLUME REQUIREMENTS



Recycle Potential - Petroleum Indistry

In the past fifteen years, the total water requirement for crude oil for both processing and cooling has decreased from 200 to 50 gallons per barrel. This has been possible largely through recycle of cooling water. Further reduction in wastewater production per barrel of crude oil is still possible (72).

The waste characteristics of the various sub-processes encountered in the petroleum industry are illustrated in Table A-III-8. Each of the wastewater parameters is compatible with conventional primary, secondary and advanced waste treatment, as required. Pretreatment for oils and sulfides is frequently required.

A review of large (greater than 5 MGD wastewater discharges) petroleum refiners in the C-SELM Study Area reveals that recycle of cooling water is not intensively practiced. With an ultimate recycle strategy in the petroleum industry within the C-SELM Area, it is possible to hypothesize a 75 percent reduction in petroleum industry wastewater requiring treatment.

TABLE A-III-8

WASTEWATER CHARACTERISTICS IN THE VARIOUS SUB-PROCESSES OF THE PETROLEUM INDUSTRY

Fundamental Processes	Flow	BOD	COD	Phenols	Sulfide	Oil	Emulsified Oil	pH	Temp.	Ammonia	Chlorides	Acidity	Alkalinity	Susp. Solids
Crude Oil and Product Storage	X	X	X			X	X							X
Crude Oil Desalting	X	X	X	X	X	X	X	X	X	X	X		X	X
Crude Oil Distillation	X	X	X	X	X	X	X	X	X	X	X		X	X
Thermal Cracking	X	X	X	X	X	X		X	X	X	X		X	X
Catalytic Cracking	X	X	X	X	X	X	X	X	X	X			X	X
Hydrocracking	X				X				X					
Reforming	X			X	X	X			X	X				
Polymerization	X	X	X		X	X		X	X	X	X	X		X
Alkylation	X	X	X		X	X		X	X	X	X	X		X
Isomerization	X													
Solvent Refining	X		X	X			X	X					X	
Dewaxing	X	X	X	X		X								
Hydrotreating	X	X	X		X			X					X	
Drying and Sweetening	X	X	X	X		X		X		X		X	X	X

X - indicates presence of flow constituents
Blank indicates absence of constituent

Derivation of Unit Flow Factors for Critical Industries

Industrial unit flow factors (expressed in units of gallons/day/dollar value added) are presented in Table A-III-9 for 1970.

Unit flows within the two critical industries are envisioned to be reduced over the fifty year period to reflect the effect of recycling process and cooling waters. The reduced flow in later years is shown as a proportion of the 1970 unit flow in the table below.

Critical Industry Classification	Proportion of 1970 Unit Flow 1970	1980	1990	2000	2020
291	1.00	.450	.250	.150	.075
331	1.00	.200	.100	.080	.075

The time adjusted flow factors for the critical industries thus becomes:

Critical Industry SIC Classification	Flow Factor (gal/day/dollar output) 1970	1980	1990	2000	2020
291	1.400	.630	.350	.210	.105
331	0.970	.192	.097	.078	.073

The critical industry flows are the product of the township value added for the particular critical industry and the time adjusted unit flow factor.

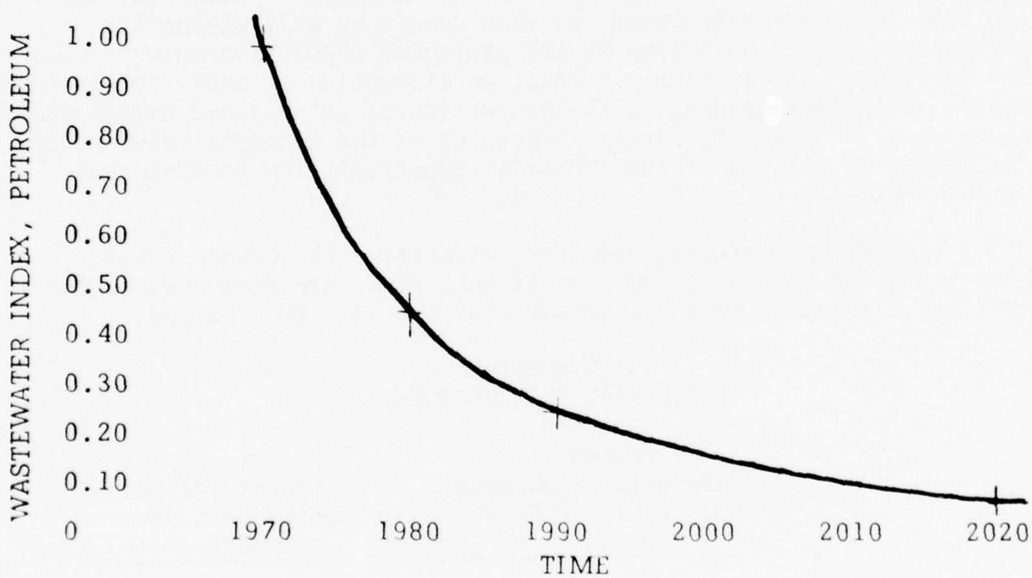
Estimation of Other Flows to Surface Streams

In addition to discharge from the two critical industries, approximately 350 MGD of wastewater was discharged to surface streams in 1970. The dispersion of these industries among SIC categories did not render this group of industries readily amenable to flow projection methodology used for the critical industries; therefore, a more workable, procedure was used.

A recycling effort within these industries was estimated to result in the reduction of the 350 MGD flow to that proportion shown in the following graph. Thus, by 2020, the flow from this group of industries would be (0.20) (350 MGD) = 70 MGD.

The following graph illustrates how such a recycle strategy could be achieved over time. The wastewater index in the graph below is the fraction of original wastewater requiring treatment (200 gallons per barrel) before significant recycle occurred.

THE EFFECT OF WASTEWATER RECYCLE IN THE PETROLEUM INDUSTRY ON TREATMENT VOLUME REQUIREMENT



The total flow was allocated among those townships in which it was actually located in proportion to the 1970 flow in the given township. (i.e., in 2020 approximately 70 MGD would be the control total to be allocated among those townships in which this type of industry was located). Flows so allocated are shown on the calculation sheets in Table A-III-10 under the heading "Non-Critical to Surface (MGD)".

Projection of Industrial Flows That Are Presently Discharging to Municipal Systems

This component of industrial flow is attributable to non-critical industries which presently discharge to municipal sewers and therefore tend to have relatively low flows. Present experience in the C-SELM area shows this flow to be 0-50 percent of the total flow to municipal systems. Based on the municipal sewage treatment plant inventory, a representative proportion of the total municipal flow by county is assumed to be industrial. An industrial per capita unit flow was obtained by dividing this industrial flow to municipal systems by the present population served. It was assumed that industrial flows to municipal systems will be proportional to the population served. Thus industrial flows to municipal systems for the period 1980-2020 were calculated for each county by multiplying the industrial per capita unit flow by the projected population served. Subsequent to the derivation of the county totals, an allocation of these totals among townships was made according to the proportion of value added within each township (i.e., a township having 10 percent of the county's value added was allocated 10 percent of the county's industrial flow to municipal treatment systems).

The specific proportions used for calculating the county total, together with the industrial per capita unit flow, are shown below (these figures are assumed to remain constant over the 1970-2020 period).

TABLE A-III-9
INDUSTRIAL FLOW FACTORS

County	Present Industrial Flow/Total Municipal STP Flow Percent	Industrial per Capita Unit Flow (gpcd)
Cook	42.5	105.6
DuPage	10	15.7
Lake, Ill.	10	15.7
Will	10	15.7
Lake, Ind.	10	15.7
Porter	10	15.7
LaPorte	10	15.7

The flows allocated as described above are shown in the calculation sheets of Table A-III-10.

Total Wastewater Flows

The total industrial flow is the sum of the critical industry flows, industrial flows to surface streams, and industrial flows that are presently discharging to municipal systems. Total flows were calculated as the sum of domestic flows and industrial flows as shown in Table A-III-10. The total flows are shown by township for the years 1980, 1990, 2000, and 2020. Total flows are illustrated in Figures A-III-9 and 10.

INDUSTRIAL FLOW CALCULATIONS

	1980					1990					2000					2020				
	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal S wers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)
COOK COUNTY																				
Township																				
Chicago	375.2	93.9	104.9	67.9	641.9	393.9	88.3	59.9	45.3	587.4	401.2	88.5	54.6	37.7	584.0	408.3	93.8	61.0	30.9	594.0
Berwyn	27.7	0	0	0	27.7	29.6	0	0	0	29.6	30.8	0	0	0	30.8	31.7	0	0	0	31.7
Bloom	15.6	0	7.8	0	23.4	17.6	0	4.6	0	22.2	19.3	0	4.2	0	23.5	19.9	0	4.7	0	24.6
Bremen	1.4	1.4	0.1	0	2.9	1.7	1.5	0.1	0	3.3	1.8	1.4	0.1	0	3.3	1.8	1.4	0.1	0	3.3
Calumet	3.7	0	0	0	3.7	4.1	0	0	0	4.1	4.2	0	0	0	4.2	4.4	0	0	0	4.4
Elk Grove	10.5	0	0.1	0	10.6	12.2	0	0.1	0	12.3	13.4	0	0.1	0	13.5	13.8	0	0.1	0	13.9
Evanston	3.6	0	0	0	3.6	3.9	0	0	0	3.9	4.1	0	0	0	4.1	4.2	0	0	0	4.2
Lemont	0.7	11.5	0	0	12.2	0.9	11.6	0	0	12.5	1.0	11.0	0	0	12.0	1.0	10.9	0	0	11.9
Leyden	41.3	0	1.7	0	43.0	44.3	0	1.0	0	45.3	46.0	0	0.9	0	46.9	47.5	0	1.0	0	48.5
Lyons	14.5	0.9	0.9	0	16.3	16.0	1.0	0.6	0	17.6	16.9	0.9	0.5	0	18.3	17.4	0.9	0.6	0	18.9
Maine	10.2	0	0.6	0	10.8	11.1	0	0.4	0	11.5	11.5	0	0	0	11.5	11.9	0	0.4	0	12.3
New Trier	1.2	0	0	0	1.2	1.3	0	0	0	1.3	1.4	0	0	0	1.4	1.4	0	0	0	1.4
Niles	40.5	0	2.0	0	42.5	43.4	0	1.2	0	44.6	45.5	0	1.1	0	46.6	46.9	0	1.2	0	48.1
Northfield	5.3	0	0	0	5.3	5.9	0	0	0	5.9	6.2	0	0	0	6.2	6.3	0	0	0	6.3
Orland	1.2	0	0	0	1.2	1.4	0	0	0	1.4	1.5	0	0	0	1.5	1.5	0	0	0	1.5
Palatine	1.7	0	0	0	1.7	2.2	0	0	0	2.2	2.3	0	0	0	2.3	2.4	0	0	0	2.4
Palos	1.2	0	0	0	1.2	1.5	0	0	0	1.5	1.6	0	0	0	1.6	1.6	0	0	0	1.6
Proviso	18.8	0	0.6	0	19.4	20.2	0	0.4	0	20.6	21.0	0	0.4	0	21.4	21.8	0	0.4	0	22.2
Rich	2.2	0	0	0	2.2	2.7	0	0	0	2.7	2.8	0	0	0	2.8	3.0	0	0	0	3.0
Shaumburg	2.5	0	0	0	2.5	2.9	0	0	0	2.9	4.1	0	0	0	4.1	6.0	0	0	0	6.0
Stickney	10.3	0	0	0	10.3	11.0	0	0	0	11.0	11.4	0	0	0	11.4	11.8	0	0	0	11.8
Thornton	13.8	0	1.5	0	15.3	14.8	0	0.9	0	15.7	15.3	0	0.8	0	16.1	15.8	0	0.9	0	16.7
Wheelin_	4.9	0	0	0	4.9	5.8	0	0	0	5.8	7.1	0	0	0	7.1	9.0	0	0	0	9.0
Worth	5.0	0	0.7	0	5.7	5.6	0	0.4	0	6.0	6.6	0	0.4	0	7.0	6.8	0	0.4	0	7.2
TOTAL	613.0	107.7	120.9	67.9	909.5	654.0	102.4	69.6	45.3	871.3	679.0	101.8	63.1	37.7	881.6	696.0	107.0	70.8	30.9	904.7
DU PAGE COUNTY																				
Township																				
Addison	3.5	0	0	0	3.5	4.5	0	0	0	4.5	5.1	0	0	0	5.1	6.0	0	0	0	6.0
Bloomingdale	0.3	0	0	0	0.3	0.5	0	0	0	0.5	0.7	0	0	0	0.7	0.8	0	0	0	0.8
Downers Grove	1.0	0	0	0	1.0	1.4	0	0	0	1.4	1.7	0	0	0	1.7	2.0	0	0	0	2.0
Lisle	0.9	0	0	0	0.9	1.2	0	0	0	1.2	1.5	0	0	0	1.5	1.7	0	0	0	1.7
Milton	1.4	0	0	0	1.4	1.9	0	0	0	1.9	2.3	0	0	0	2.3	2.6	0	0	0	2.6
Naperville (P)	0.3	0	0	0	0.3	0.4	0	0	0	0.4	0.6	0	0	0	0.6	0.7	0	0	0	0.7
Wayne (P)	0.5	0	0	0	0.5	0.6	0	0	0	0.6	0.8	0	0	0	0.8	1.0	0	0	0	1.0
Winfield	0.6	0	0	0	0.6	0.8	0	0	0	0.8	1.1	0	0	0	1.1	1.3	0	0	0	1.3
York	2.1	0	0	0	2.1	2.7	0	0	0	2.7	3.2	0	0	0	3.2	3.8	0	0	0	3.8
TOTAL	10.6	0	0	0	10.6	14.0	0	0	0	14.0	17.0	0	0	0	17.0	20.1	0	0	0	20.1
LAKE COUNTY																				
Township																				
Antioch	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.1	0	0	0	0.1
Avon	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.1	0.1	0	0	0	0.1
Benton-Zion	0.4	0	0	0	0.4	0.6	0	0	0	0.6	0.9	0	0	0	0.9	1.2	0	0	0	1.2
Deerfield	1.0	0	0	0	1.0	1.3	0	0	0	1.3	1.5	0	0	0	1.5	1.9	0	0	0	1.9
Ela	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.2	0	0	0	0.2
Fremont	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
Lake Villa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Libertyville	0.7	0	0	0	0.7	1.0	0	0	0	1.0	1.2	0	0	0	1.2	1.5	0	0	0	1.5
Newport	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shields	0.7	0	0	0	0.7	1.0	0	0	0	1.0	1.2	0	0	0	1.2	1.5	0	0	0	1.5
Vernon	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.3	0	0	0	0.3	0.4	0	0	0	0.4
Warren	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.4	0	0	0	0.4	0.8	0	0	0	0.8
Waukegan	2.9	0	1.9	6.4	11.2	3.9	0	1.0	4.8	9.7	4.4	0	0.8	4.0	9.2	5.1	0	0.7	3.2	9.0
TOTAL	6.1	0	1.9	6.4	14.4	8.5	0	1.0	4.8	14.3	10.3	0	0.8	4.0	15.1	12.7	0	0.7	3.2	16.6
WILL COUNTY																				
Township																				
Channahon	0.2	0	0	12.8	13.0	0.3	0	0	9.6	9.9	0.4	0	0	8.0	8.4	0.6	0	0	6.4	7.0
Crete	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1
DuPage	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.3	0	0	0	0.3	0.5	0	0	0	0.5
Frankfort	0.3	0	0	0	0.3	0.5	0	0	0	0.5	0.8	0	0	0	0.8	1.4	0	0	0	1.4
Green Garden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homer	0	0	0	0	0	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.3	0	0	0	0.3
Jackson	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.3	0	0	0	0.3	0.5	0	0	0	0.5
Joliet	2.6	0	10.4	0	13.0	3.6	0	4.5	0	8.1	4.8	0	4.3	0	9.1	7.2	0	3.8	0	11.0
Lockport	0.5	15.1	0	0	15.6	0.8	9.1	0	0	9.9	1.1	5.9	0	0	7.0	1.6	3.2	0	0	4.8
Manhattan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monee	0	0	0	0	0	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.5	0	0	0	0.5
New Lenox	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.3	0	0	0	0.3
Plainfield	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.2
Troy	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.4	0	0	0	0.4
Wheatland	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.3	0	0	0	0.3	0.5	0	0	0	0.5
TOTAL	4.1	15.1	10.4	12.8	42.4	6.2	9.1	4.5	9.8	29.4	8.3	5.9	4.3	8.0	27.1	14.1	3.2	3.8	6.4	27.5

TABLE A-III-10

INDUSTRIAL FLOW CALCULATIONS (Cont.)

	1980					1990					2000					2020				
	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)	Ind. Flow to Municipal Sewers (MGD)	Critical Ind. SIC 291 (MGD)	to Surface SIC 331 (MGD)	Non-Critical to Surface (MGD)	Total Ind. Flow (MGD)
LAKE, INDIANA																				
Township																				
Calumet	2.7	0	81.9	40.0	124.6	3.0	0	46.8	30.0	79.8	3.4	0	42.0	25.0	70.4	4.2	0	47.6	20.0	71.8
Center	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.1	0	0	0	0.1
Hobart	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.2
North	5.8	220.5	69.3	19.0	314.6	6.2	126.0	45.2	14.3	191.7	6.8	77.7	40.7	11.9	137.1	7.8	39.9	46.4	9.5	103.6
Ross	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1
St. Johns	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.3	0	0	0	0.3
Winfield	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	8.5	220.5	151.2	59.0	439.2	9.5	126.0	92.0	44.3	271.6	10.6	77.7	82.7	36.9	207.9	12.7	39.9	94.0	29.5	176.1
PORTER, INDIANA																				
Township																				
Center	0.1	0	0	0	0.1	0.2	0	0	0	0.2	0.4	0	0	0	0.4	0.7	0	0	0	0.7
Jackson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
Portage	0.2	0	12.7	0	12.9	0.6	0	10.9	0	11.5	1.1	0	13.0	0	14.1	2.6	0	22.1	0	24.7
Union	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westchester	0.5	0	38.4	0	38.9	0.9	0	24.2	0	25.1	1.4	0	23.4	0	24.8	2.5	0	29.2	0	31.7
TOTAL	0.8	0	51.1	0	51.9	1.7	0	35.1	0	36.8	2.9	0	36.4	0	39.3	5.9	0	51.3	0	57.2
LA PORTE, INDIANA																				
Township																				
Center	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cool Spring	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.1	0	0	0	0.1	0.2	0	0	0	0.2
Michigan	0.6	0	0.9	0	1.5	0.8	0	0.8	0	1.6	0.9	0	1.0	0	1.9	1.1	0	1.9	0	2.9
New Durham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Springfield	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
TOTAL	0.7	0	0.9	0	1.6	0.9	0	0.8	0	1.7	1.0	0	1.0	0	2.0	1.4	0	1.9	0	3.2

TABLE A-III-10

SECTION IV: WATER MANAGEMENT NEEDS

GENERAL

Effective water management in the C-SELM area involves many considerations; of concern is the quantity and quality of water as related to the various uses of the water and its adjoining land resources. The planning objectives for the region are largely a reflection of water management needs, such as the following: flood control, maintenance of minimum hydrologic flows, water supply, open space, improved water quality, recreational development, fish and wildlife restoration and conservation, navigation, and electric power. The water management needs are discussed in detail in the following paragraphs.

FLOOD CONTROL

Current land use practices and inadequate capacity in the area's storm water collector and conveyance systems are the two basic factors contributing to the present flood problem.

The high density of development and urban type ground cover converts any rainfall into sheet runoff which if not quickly removed will tend to pond and flood the area. Failure to provide sufficient open-space where the runoff can be held until it can be safely released into the streams is just one part of the problem.

The major streams and tributaries are the basic conveyance systems for removing storm water runoff from the area. Portions of these streams, particularly in the headwaters or upper reaches, do not have the carrying capacity to contain sufficient volumes of runoff without overtopping the banks. Consequently the urban growth in the headwater areas has not only helped cause the flooding but also suffers from it. Only limited attempts have been made to either zone or prohibit development in and adjacent to the floodway or offset the growth effects by increasing the stream's capacity. Furthermore some of the pipeline systems which collect and transport the runoff from the suburban area to the stream have been inadequately designed with respect to today's requirement. Heavy rains within a short time of concentration create severe runoff which becomes more than the system can handle. A water back-up occurs and the runoff which cannot flow away, ponds and creates a local flood problem.

Storm runoff is also a significant and heretofore neglected (with respect to treatment of wastewaters) source of pollutants. Data availability, especially with respect to quality characteristics, is very limited both historically and nationwide.

APPROACH

Storm runoff was inventoried as to urban, suburban and rural watercourses and service areas for the present, for 1980, 1990, 2000, and 2020 urbanization. The information was developed for up to a 7 inch, 72 hour rainfall with 4 inches of runoff (100-year storm). Insofar as feasible, the desired storm retention volumes both in terms of water quality and flood relief, were defined.

The primary sources of information for this storm water inventory are data on stream events, USGS flood hazard maps (27), results of "deep tunnel conferences" (28) and other pertinent information available from other sources.

The results are presented in a suitable format, such as: a graph showing runoff and required storage as a function of historical storm events for each of the USGS gaging station watersheds for 1970, 1990, and 2020; as maps of watershed areas (Figure A-III-7); and in tabular format.

ASSUMPTIONS

The assumptions used in developing information were as follows:

(a) Definition of land-use classification criteria for the C-SELM area was assumed to be: Urban Area - 10,000 or more, suburban area - 4,000, and rural area - 500 or less persons per square mile.

(b) Storm runoff data from the following quantity models were assumed to be representative for the entire C-SELM study area as classified by assumption (a): Urban model - derived from a 375 square mile area served by combined sewers in the Greater Chicago Metropolitan Area; Suburban and rural model - derived from Salt Creek, Thorn Creek, Des Plaines River and Hickory Creek watersheds.

(c) The following quality parameters and concentrations, in mg/l, were utilized in the projection of pollutant loadings from storm runoff to the waterways in the C-SELM area. The concentrations considered as representative of runoff from the various land-classification areas are presented in Table A-IV-1.

TABLE A-IV-1

Pollutant Loadings from Storm water Runoff

Area	Served By	Soluble Phosphorus	BOD	Suspended Solids
Urban	Combined sewers	1.0	10	130
Suburban	Separate sewers	0.25	20	500
Rural	Partial storm sewers	1.0	10	550

(d) Collection systems were designed to accept 0.5 cfs per acre of drainage area.

FINDINGS

It was concluded that a pronounced discontinuity exists in the relationship between the volume of storm runoff and the number of times that this volume was equalled or exceeded during the 21-year period of record studied. There is little doubt concerning the need to provide sufficient storage to reach the point of discontinuity located at 2.5 inches of storage. Provisions to capture less than this amount would result in too frequent discharges of polluted water into the waterways.

This is obvious by inspection of the generalized curve developed and shown on Figure A-IV-1. From the curve, the amount of total spills was estimated to be 4.5 inches. By applying the set of water quality parameters shown under item (c) above, the amount of pollutants in terms of soluble phosphorus, BOD, and suspended solids was computed. The results of the computation are presented in Table A-IV-2.

For comparison, the estimated amount of pollutants contained in the treated domestic, commercial and industrial wastewaters have been computed assuming that advanced treatment plant or land treatment methods were employed. These estimates, together with those derived from Table A-IV-2 are listed in Table A-IV-3, permitting some comparison of the relative degree of impact on the waterways.

MINIMUM HYDROLOGIC FLOWS

The worst environmental conditions in natural streams are generally associated with low flows. They are significant also because of the many undesirable effects associated with lack of availability of adequate water supply.

APPROACH

The first engineering task was then to identify the minimum seven-day ten-year hydrologic flows for all significant watercourses in the study area. The task identifies these flows at each USGS gaging station and (in the form of synthesized data) at locations considered important for adequate definition of low flows within the entire C-SELM study area.

The primary source for flow information was the USGS flood hazard quad sheets (27), for stream location and mile reach of stream: other flow information was taken from available references, such as federal and state geological survey and other water resources data publications.

The results are presented in a tabular format with appropriate grouping consistent with other types of data.

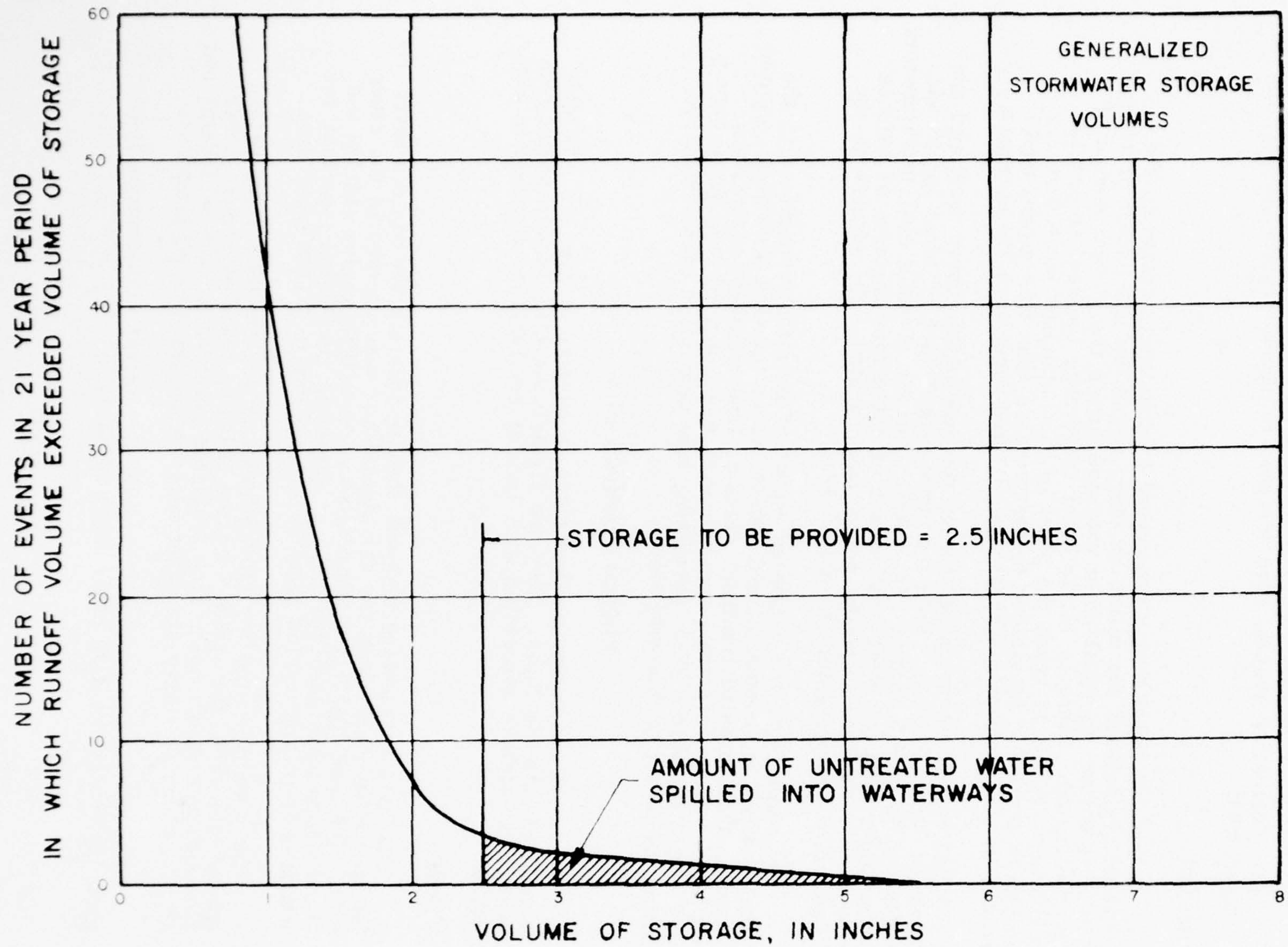

GENERALIZED
STORMWATER STORAGE
VOLUMES
NUMBER OF EVENTS IN 21 YEAR PERIOD
IN WHICH RUNOFF VOLUME EXCEEDED VOLUME OF STORAGE
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
STORAGE TO BE PROVIDED = 2.5 INCHES
AMOUNT OF UNTREATED WATER
SPILLED INTO WATERWAYS
VOLUME OF STORAGE, IN INCHES

FIGURE A-IV-1

TABLE A-IV-2 SUMMARY OF PRELIMINARY INVENTORY

WATERSHED NUMBER	DESCRIPTION	DRAINAGE AREA (SQ MILES)	REQUIRED STORAGE (AC / FT)	1970 CONDITION: LAND USE % URBAN	1970 LAND USE % SUBURBAN	1970 LAND USE % RURAL	1970 AMOUNT OF POLLUTANTS SPILLED INTO WATERWAYS (LBS / DAY): PHOSPHORUS	1970 BOD	1970 SS	1980 PROJECTION: LAND USE % URBAN	1980 LAND USE % SUBURBAN	1980 LAND USE % RURAL	1980 AMOUNT OF POLLUTANTS SPILLED INTO WATERWAYS (LBS / DAY): PHOSPHORUS	1980 BOD	1980 SS
1	LAKE MICHIGAN - NORTH	59	7,875	3.4	35.6	61.0	3.7	68.0	2,611	3.4	52.6	44.0	3.0	76.6	2,567
2	NORTH BRANCH CHICAGO RIVER	92	12,280	2.2	38.0	59.8	5.6	107.9	4,102	2.2	53.8	44.0	4.7	120.5	4,032
3	DESPLAINES RIVER NORTH	249	33,300	1.0	16.5	82.5	18.5	246.4	11,440	1.0	23.2	75.8	17.4	260.7	11,388
4	CHICAGO METRO. AREA	375	50,000	100	—	—	31.9	319.0	4,150	100	—	—	31.9	319.0	4,150
5	DESPLAINES - MIDDLE	82	10,930	19.5	39.0	41.5	4.9	96.9	3,137	19.5	55.5	25.0	4.1	108.4	3,075
6	SALT CREEK	119	15,900	8.4	25.4	66.2	8.2	126.9	5,106	11.8	42.2	46.0	6.9	144.0	4,875
7	EAST BRANCH DUPAGE RIVER	83	11,080	—	36.4	63.6	5.1	96.3	3,770	—	57.2	42.8	4.0	111.1	3,690
8	WEST BRANCH DUPAGE RIVER	124	16,550	—	13.5	86.5	9.5	119.7	5,763	—	27.2	72.8	8.4	134.2	5,685
9	MAIN STEM DUPAGE RIVER	181	24,200	—	—	100	15.4	153.9	8,520	—	—	100	15.4	154.0	8,540
10	SAN-SHIP CANAL - NORTH	76	10,140	2.0	54.0	44.0	3.9	99.5	3,332	2.0	72.6	25.4	2.9	111.7	3,274
11	CAL-SAG CHANNEL-NORTH	51	6,810	4.9	57.4	37.7	2.5	68.2	2,168	4.9	72.5	22.6	2.0	74.9	2,141
12	SAN-SHIP CANAL - SOUTH	100	13,340	—	—	100	8.5	85.0	4,710	—	4.0	96.0	8.2	88.4	4,690
13	CAL-SAG CHANNEL - SOUTH	43	5,740	—	24.4	75.6	3.0	45.5	1,979	—	38.4	61.6	2.6	50.7	1,952
14	HICKORY - SPRING CREEKS	117	15,620	1.7	8.5	89.8	9.3	107.9	5,443	2.6	19.7	77.7	8.0	119.0	5,302
15	JACKSON CREEK	108	14,200	—	—	100	9.2	91.8	5,090	—	—	100	9.2	91.8	5,090
16	THORN - DEER CREEKS	111	14,820	10.8	33.2	36.0	7.1	125.7	4,628	11.8	44.1	44.1	6.3	136.0	4,534
17	LITTLE CALUMET - WEST[1]	31	4,140	—	—	100	2.6	26.4	1,460	—	—	100	2.6	26.4	1,460
17.1	LITTLE CALUMET - WEST[2]	32	4,270	—	23.4	76.6	8.2	33.6	1,473	—	28.8	71.2	2.1	35.0	1,464
18	INDIANA HARBOR	140	18,700	20.0	16.6	63.4	10.4	138.7	5,468	20.7	18.0	61.3	10.3	140.6	5,432
19	LITTLE CALUMET MIDDLE	143	19,100	—	3.5	96.5	11.8	125.7	6,713	—	5.5	94.5	11.7	128.6	6,700
20	LITTLE CALUMET - EAST	173	23,100	—	—	100	14.7	147.0	8,160	—	—	100	14.7	147.0	8,160
21	INDIANA DUNES	46	6,140	—	—	100	3.9	39.1	2,160	—	—	100	3.9	39.1	2,160
22	TRAIL CREEK	49	6,550	—	—	100	4.2	41.7	2,310	—	—	100	4.2	41.7	2,310
	TOTAL	2584	344,785				196.0	2510.8	103,693				184.6	2659.3	102,671

TABLE A-IV-2 SUMMARY OF PRELIMINARY INVENTORY

				1990 PROJECTION						2020 PROJECTION					
WATERSHED NUMBER	DESCRIPTION	DRAINAGE AREA (SQ MILES)	REQUIRED STORAGE (AC / FT)	LAND USE			AMOUNT OF POLLUTANTS SPILLED INTO WATERWAYS (LBS / DAY)			LAND USE			AMOUNT OF POLLUTANTS SPILLED INTO WATERWAYS (LBS / DAY)		
				% URBAN	% SUBURBAN	% RURAL	PHOSPHORUS	BOD	SS	% URBAN	% SUBURBAN	% RURAL	PHOSPHORUS	BOD	SS
1	LAKE MICHIGAN - NORTH	59	7,875	5.1	62.7	32.2	2.6	81.7	2,501	8.5	73.7	17.8	2.2	86.1	2,370
2	NORTH BRANCH CHICAGO RIVER	92	12,280	2.2	68.4	29.4	3.8	131.6	3,973	3.3	74.4	22.3	3.4	123.9	3,845
3	DESPLAINES RIVER - NORTH	249	33,300	1.0	35.4	63.6	15.6	286.9	11,238	5.0	49.0	46.0	13.4	313.7	10,688
4	CHICAGO METRO AREA	375	50,000	100	—	—	31.9	319.0	4,140	100	—	—	31.9	319.0	4,150
5	DESPLAINES - MIDDLE	82	10,930	19.5	67.1	13.4	3.4	116.7	3,036	21.0	79.0	—	2.8	124.1	2,929
6	SALT CREEK	119	15,900	16.0	48.9	35.1	6.4	150.9	4,658	18.5	59.5	22.0	5.6	159.8	4,454
7	EAST BRANCH DUPAGE RIVER	83	11,080	—	77.7	22.3	2.9	125.7	3,613	12.0	78.5	9.5	2.9	124.9	3,228
8	WEST BRANCH DUPAGE RIVER	124	16,550	—	47.4	52.6	6.8	155.5	5,580	8.0	73.0	19.0	4.7	180.5	5,021
9	MAIN STEM DUPAGE RIVER	181	24,200	—	5.0	95.0	14.7	161.7	8,484	4.4	19.6	76.0	13.1	183.8	8,079
10	SAN. SHIP CANAL - NORTH	76	10,140	2.0	86.8	11.2	2.2	120.6	3,218	12.5	87.5	—	2.2	120.1	2,905
11	CAL-SAG CHANNEL - NORTH	51	6,810	4.9	84.4	10.7	1.6	80.0	2,117	10.8	83.5	5.7	1.6	78.5	1,985
12	SAN. SHIP CANAL - SOUTH	100	13,340	—	14.0	86.0	7.6	96.9	4,655	—	34.2	65.8	6.3	113.5	4,540
13	CAL-SAG CHANNEL - SOUTH	43	5,740	—	57.0	43.0	2.1	57.4	1,914	—	75.0	25.0	1.6	63.6	1,870
14	HICKORY - SPRING CREEKS	117	15,620	4.2	33.8	62.0	7.4	133.0	5,155	8.5	59.4	32.1	5.5	167.6	4,811
15	JACKSON CREEK	108	14,200	—	4.0	96.0	8.9	95.7	5,061	1.8	14.6	83.6	8.2	104.8	4,942
16	THORN - DEER CREEKS	111	14,820	12.6	49.1	38.3	5.9	140.7	4,475	21.6	74.8	3.6	4.1	163.8	3,954
17	LITTLE CALUMET - WEST[1]	31	4,140	—	—	100	2.6	26.4	1,460	—	—	100	2.6	26.4	1,460
17.1	LITTLE CALUMET - WEST[2]	32	4,270	3.1	28.1	68.8	2.1	34.9	1,429	6.3	43.7	50.0	1.8	38.4	1,351
18	INDIANA HARBOR	140	18,700	22.8	38.2	39.0	8.5	164.6	5,204	23.6	40.0	36.4	8.3	165.9	5,129
19	LITTLE CALUMET - MIDDLE	143	19,100	2.1	7.3	90.6	11.5	130.4	6,579	3.5	17.1	79.4	10.6	142.4	6,446
20	LITTLE CALUMET - EAST	173	23,100	—	8.6	91.4	13.7	159.6	8,088	5.8	28.2	66.0	11.6	188.0	7,551
21	INDIANA DUNES	46	6,140	—	27.2	72.8	3.1	49.7	2,111	4.3	40.7	55.0	2.7	54.4	1,992
22	TRAIL CREEK	49	6,550	—	7.0	93.0	3.9	44.7	2,289	—	19.8	80.2	3.5	50.2	2,270
	TOTAL	2584	344,785				169.2	2864.3	100,978				150.8	3093.4	95,970

ASSUMPTIONS

Different assumptions were used to determine the low-flow conditions of streams and rivers in the C-SELM area depending upon the availability of stream flow data:

(a) Where sufficient flow data was available, the results of statistical analyses were used to obtain the seven-day, ten-year low flow. Two sources of such statistical analysis results were available for the State of Illinois: "Low-Flow Frequencies of Illinois Streams" (U. S. Geological Survey, 1970) (29), and the "Statistical Summaries of Illinois Streamflow Data" (U.S.G.S., Water Resources Division, 1969) (30). The first reference, which gives a complete statistical analysis, was used as the primary source of low-flow data, and the second reference was used as an auxiliary source. The low flow data for the State of Indiana were obtained from "Low-Flow Characteristics of Indiana Streams" (U.S.G.S. and State of Indiana, 1962) (31).

(b) Where flow data for only a few years were available, the minimum recorded seven-day low flow was used.

(c) Where no flow data were available, the estimated minimum flow was based on upstream sewage treatment plant effluent flows, ground water flows, and where applicable, Lake Michigan diversions. Two-thirds of the sewage treatment plant design average flow was used in determining the minimum flow, reflecting diurnal and daily variations.

For comparison, the estimated amount of pollutants contained in the treated domestic, commercial and industrial wastewaters have been computed assuming that advanced treatment plant or land treatment methods were employed. These estimates, together with those derived from Table A-IV-2 are listed in Table A-IV-3, permitting some comparison of the relative degree of impact on the waterways.

FINDINGS

The seven-day ten-year low flow was determined for 60 locations in the 22 watersheds identified in Figure A-III-7. Forty-three of the points are gaging stations established by the U.S.G.S., some of which have been abandoned, and seventeen other locations were chosen at points where low flow data may be required during the study. The sixty locations are shown on Figure A-IV-2.

The tabulated results for these locations, showing distance from river mouth, in miles, drainage area, in square miles, unit flow, in cfs/sq. mi., and discharge, in cfs, indicate that the seven-day ten-year low flow is

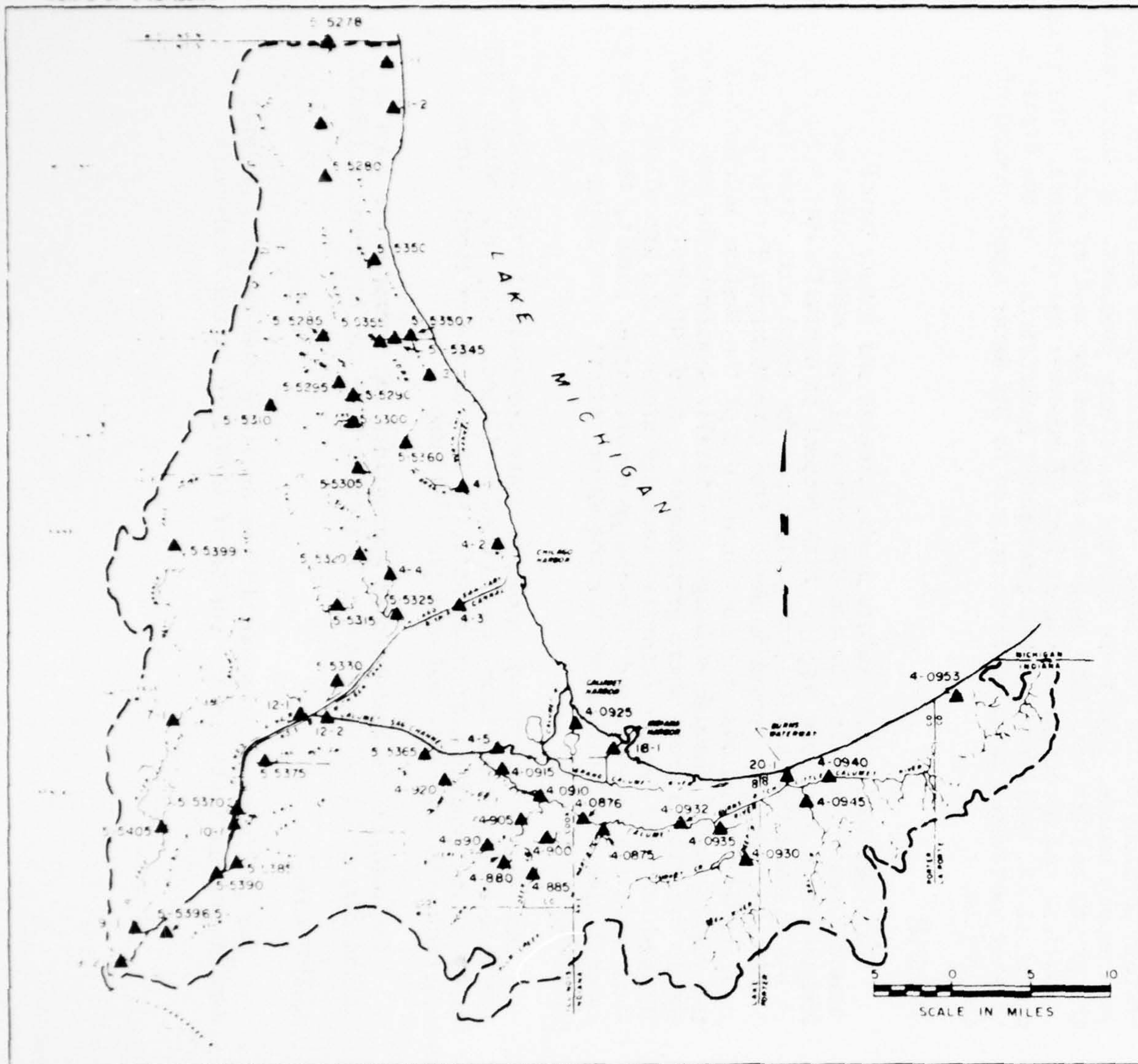
TABLE A-IV-3

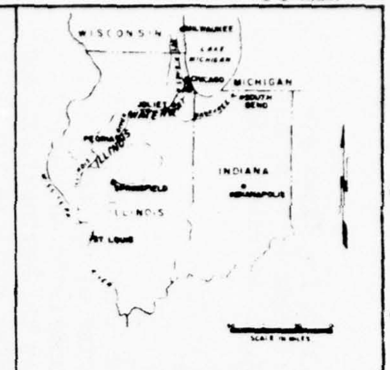
COMPARISON OF AMOUNT OF POLLUTANTS DISCHARGED INTO WATERWAYS

SOURCE OF POLLUTANTS	1970			1980			1990			2020		
	SOL. PHOS.	BOD	SUS. SOLIDS	SOL PHOS.	BOD	SUS. SOLIDS	SOL. PHOS.	BOD	SUS. SOLIDS	SOL. PHOS.	BOD	SUS. SOLIDS
STORMWATER RUNOFF	196	2510	103,693	185	2659	102,671	169	2864	100,978	151	3093	95,970
EFFLUENT FROM TREATMENT PLANT METHOD *	—	—	—	3,900	96,000	58,000	3600	91,000	54,000	4000	100,000	60,000
EFFLUENT FROM LAND TREATMENT METHOD *	—	—	—	190	3900	0	180	36,000	0	200	40,000	0

NOTE: ALL FIGURES ARE IN lbs./day

* Assuming the most advanced method for either treatment plant method or land treatment method





VICINITY MAP

FIGURE A-IV-2

LEGEND

▲ GAGING POINT

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C-SELM WASTEWATER MANAGEMENT SURVEY STUDY

GAGING POINTS FOR
STORM WATER RUNOFF

BAUER ENGINEERING INC CHICAGO, ILLINOIS

near zero at most of the sixty locations. Where larger low flows are encountered, these are almost without exception attributable to either sewage treatment plant effluent flows or Lake Michigan diversions (for actual values see following Table A-IV-4).

WATER SUPPLY

The water supply deficiences, both present and future reflect the capability of the current supply source. That portion of the area presently supplied from Lake Michigan should not experience any supply deficiences within the next 50 years. It is only in the northwestern and western portions of the study area, where ground water aquifers are utilized as a supply source, that there are any deficiency problems. In these areas, the growth and its resultant usage has exceeded the aquifer recharge capability and an actual mining or loss of reserves has occurred. The reuse potential (to safisfy projected groundwater deficiencies) of the highly treated wastewater is directly correlated to the water supply demand of the region.

APPROACH

In order to identify future needs, present and future water supply demands were inventoried for the watersheds of each watercourse and compared with available supply. With respect to overall water balance it was assumed that a 3 billion gallons per day total wastewater flow, 3,200 cubic feet per second diversion from Lake Michigan for Illinois and as required for Indiana, the sustained yield of the shallow aquifer plus the yearly runoff through recharge, are totally available for use. Water supply deficit in areas where groundwater is used for supply are defined in terms of 2020 needs. Potential recharge areas in and around the study area are located, and if recharge opportunities permit, the recharge capabilities are distributed over the water deficit areas using some preliminary strategy.

The primary sources of information are professional experience of the engineering consultant supplemented by Illinois (32) and Indiana (33) Water Survey reports concerning deficits in groundwater supply areas, together with soil (34) and geologic (35) maps.

The results are presented in appropriate map format where such is called for, and in other formats consistent with the information tabulated.

ASSUMPTIONS

The following are the assumptions utilized when projecting water demands and deficits for the period of 1980-2020 in the study area.

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Dischge. in cfs	USGS Quad Sheet No.
LAKE MICHIGAN - NORTH					SUB-BASIN 1	
1-1	Kellogg Ravine at Camp Logan, Illinois	0.0	6.5	-	0.1[(4)]	B-1-1
1-2	Dead River at Illinois Beach	0.0	10.7	-	0[(4)]	B-1-1
NORTH BRANCH-CHICAGO RIVER					SUB-BASIN 2	
5-5345	North Branch Chicago R. at Deerfield, Illinois	28.6	20.7	-	0[(3)]	B-2-1
5-5350	Skokie River at Lake Forest, Illinois	36.0	12.8	-	0.45[(3)]	B-2-1
5-5350.7	Skokie River near Highland Park, Illinois	30.2	21.0	-	3.6[(5)]	B-2-1
5-5355	West Fork, North Branch Chicago R. at Northbrook	27.2	11.5	-	0.1[(3)]	B-2-1
2-1	Skokie River at Wilmette, Illinois	25.0	28.7	-	7.1[(4)]	B-2-4
DES PLAINES RIVER - NORTH					SUB-BASIN 3	
5-5278	Des Plaines River at Russell, Illinois	109.14	124.0	-	0.8[(5)]	B-1-2
5-5280	Des Plaines River near Gurnee, Illinois	94.2	230.0	0.00002[(1)]	0.0046	B-1-3

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Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Discharge in cfs	USGS Quad Sheet No.
DES PLAINES RIVER - NORTH (cont'd)					SUB-BASIN 3	
5-5285	Buffalo Creek near Wheeling, Illinois	4.98	19.4	-	0 (3)	B-2-2
5-5290	Des Plaines River near Des Plaines, Illinois	69.25	359.0	0.00058 (1)	0.208	B-2-3
5-5295	McDonald Creek near Mt. Prospect, Illinois	2.0	7.52	-	0.001 (3)	B-2-3
3-1	Mill Creek at Newport, Illinois	0.3	62.4	-	1.45 (4)	B-1-2
CHICAGO METROPOLITAN AREA					SUB-BASIN 4	
4-0915	Little Calumet River at Harvey, Illinois	17.5	570.0	0.022 (1)	12.54	A-4-2
5-5300	Weller Creek at Des Plaines, Illinois	3.0	13.1	0.085 (2)	1.11	B-2-3
5-5325	Des Plaines River at Riverside, Illinois	44.3	635.0	0.005 (1)	3.175	B-3-4
5-5360	North Branch Chicago River at Niles, Illinois	15.6	102.0	0.0095 (1)	0.969	C-2-4
4-1	North Shore Channel at Lincolnwood, Illinois	0.5	-	-	538.0 (4)	A-3-1

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi²	Discharge in cfs	USGS Quad Sheet No.
CHICAGO METROPOLITAN AREA (Cont'd)					SUB-BASIN 4	
4-2	Chicago River at Oak Park, Illinois	1.0	-	-	546.0 (4)	A-3-2
4-3	Chicago San. & Ship Canal near Stickney	30.0	-	-	1430.0 (4)	A-3-3
4-4	Des Plaines River near Forest Park, Illinois	49.2	470	-	7.0 (4)	B-3-4
4-5	Grand Calumet River near Blue Island	13.5	-	-	426.0 (4)	A-4-2
DES PLAINES RIVER - MIDDLE					SUB BASIN 5	
5-5305	Willow Creek near Park Ridge, Illinois	1.3	19.6	0.0015 (1)	0.029	B-3-1
5-5320	Addison Creek at Bellwood, Illinois	3.2	18.2	-	0.09 (3)	B-3-2
SALT CREEK					SUB-BASIN 6	
5-5310	Salt Creek near Arlington Heights, Illinois	34.7	32.5	0.0043 (1)	.140	C-2-4
5-5315	Salt Creek at Western Springs, Illinois	8.8	114.0	0.015 (1)	1.710	B-3-3

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station
(cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Discharge in cfs	USGS Quad Sheet No.
EAST BRANCH-DUPAGE RIVER						SUB-BASIN 7
7-1	East Branch DuPage R. South of Lisle, Illinois	29.7	81.2	-	15.9(4)	C-4-2
WEST BRANCH-DUPAGE RIVER						SUB-BASIN 8
5-5399	West Branch DuPage R. near West Chicago	49.14	27.5	-	.15(2)	C-3-2
MAIN STREAM-DUPAGE RIVER						SUB-BASIN 9
5-5405	DuPage River at Shorewood, Illinois	10.6	325.0	0.052(1)	16.9	C-4-3
9-1	DuPage River at Channahon	1.1	372.0	-	32.3(4)	C-5-2
9-2	Des Plaines River at Channahon	5.2	-	-	2460.0(4)	C-5-2
SAN-SHIP CANAL - NORTH						SUB-BASIN 10
5-5330	Flag Creek near Willow Springs, Illinois	2.25	16.2	-	1.30(3)	B-4-2
5-5370	Chicago San. & Ship Canal at Lockport, Ill.	1.0	-	-	1922.0(4)	C-4-4
10-1	Des Plaines River at Lockport, Illinois	19.0	706.	-	36.05(4)	C-4-4

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Dischge. in cfs	USGS Quad Sheet No.
CAL-SAG CHANNEL - NORTH						SUB-BASIN 11
None						
SAN-SHIP CANAL - SOUTH						SUB-BASIN 12
5-5365	Tinley Creek near Palos Heights, Illinois	1.9	11.3	-	0	B-4-1
5-5375	Long Run Creek near Lemont, Illinois	5.4	20.8	-	0	C-4-1
12-1	Chicago San. & Ship Canal near Lemont	14.0	-	-	1922.0(4)	B-4-2
12-2	Cal-Sag Channel near Lemont, Illinois	0.0	-	-	449.0(4)	B-4-2
CAL-SAG CHANNEL - SOUTH						SUB-BASIN 13
4-0920	Midlothian Creek at Oak Forest, Illinois	5.8	12.6	0.0025(1)	0.0315	A-4-3
HICKORY - SPRING CREEKS						SUB-BASIN 14
5-5385	Spring Creek at Joliet, Illinois	2.8	19.7	0.08	1.576	C-4-4
5-5390	Hickory Creek at Joliet, Illinois	2.0	107.0	0.027	2.889	C-4-4

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Dischge. in cfs	USGS Quad Sheet No.
JACKSON CREEK						SUB-BASIN 15
5-5396.5	Jackson Creek near Arsenal, Illinois	0.8	52.2	-	3.86	C-5-2
THORN - DEER CREEKS						SUB-BASIN 16
4-0880	Thorn Creek at Glenwood, Illinois	17.9	24.6	0.34(1)	8.36	A-4-4
4-0885	Deer Creek near Chicago Heights, Illinois	19.6	23.2	0.0035(1)	.081	A-4-4
4-0890	Butterfield Creek at Flossmoor, Illinois	1.75	23.4	0.0028(1)	.066	A-4-4
4-0895	Lansing Ditch near Lansing, Illinois	2.5	8.7	0.0056(1)	.0487	A-4-4
4-0900	North Creek near Lansing, Illinois	18.8	16.7	0.0018(1)	.030	A-4-4
4-0905	Thorn Creek at Thornton, Illinois	12.9	104.0	0.074(1)	7.696	A-4-4
LITTLE CALUMET - WEST						SUB-BASIN 17
4-0875	Hart Ditch at Munster, Indiana	0.4	69.2	-	3.2(2)	L-4-3

Table A-IV-4 Seven-day Ten-year L Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Dischge. in cfs	USGS Quad Sheet No.
LITTLE CALUMET - WEST (cont'd)						SUB-BASIN 18
4-0876	Little Calumet River at Munster, Indiana	26.8	indeterminate	-	0.6 (4)	A-4-4
4-0910	Little Calumet River at South Holland, Illinois	21.6	indeterminate	-	21.8 (4)	A-4-4
4-0925	Wolf Lake at Chicago, Illinois	outlet	-	-	1.54 (5)	A-4-1
4-0932	Little Calumet River at Gary, Indiana	40.0	indeterminate	-	0.0 (2)(5)	L-4-4
4-0935	Burns Ditch at Gary, Indiana	28.35	160.0	-	5.6 (2)	L-4-4
18-1	Indiana Harbor Canal	0.0	no information available			L-4-2
LITTLE CALUMET - MIDDLE						SUB-BASIN 19
4-0930	Deep River, Lake George outlet at Hobart, Ind.	7.5	125.0	-	4.9 (2)	L-4-4
LITTLE CALUMET - EAST						SUB-BASIN 20
4-0940	Little Calumet River at Porter, Indiana	52.0	62.9	-	19.0 (2)	K-4-4
4-0945	Salt Creek near McCool, Indiana	1.5	78.7	-	21.0 (2)	K-4-3

Table A-IV-4 Seven-day Ten-year Low Flow for each Gaging Station (cont'd)

Station No.	Name	Mi. from River Mouth	Drainage Area sq.mi.	Unit Flow cfs/mi^2	Dischge. in cfs	USGS Quad Sheet No.
LITTLE CALUMET - EAST (cont'd)						SUB-BASIN 20
20-1	Burns Ditch at River mouth	0.0	316	-	45.6	K-4-3
INDIANA DUNES						SUB-BASIN 21
4-0953	Trail Creek near Yacht Basin at Michigan City	4.2	54.1	-	23.0(5)	J-4-2
TRAIL CREEK						SUB-BASIN 22
None						

Notes:

(1) Data from "Low-Flow Frequencies of Illinois Streams", U. S. Geological Survey, 1970.

(2) Data from "Low-Flow Characteristics of Indiana Streams", U.S.G.S. and State of Indiana, 1962.

(3) Data from "Statistical Summaries of Illinois Streamflow Data", U.S.G.S., Water Resources Division, 1969

(4) Low-flow based on sewage treatment plant flows, groundwater flows, and where applicable, Lake Michigan diversions.

(5) Minimum 7-day low-flow recorded; 10-year records not available.

(a) It was assumed that the area and the population served by the public water supply system are identical, respectively, with the area and the population served by the wastewater management system, and the future industrial water demand is identical with the industrial flow.

(b) The per capita domestic and commercial water consumption for populations served by public water systems was assumed to equal the per capita domestic and commercial wastewater unit flows. For populations not served by public water supply systems, the per capita consumption is assumed to equal 80 gallons per day.

(c) Projected water demands for agricultural and livestock uses are assumed to be nominal, approximately 0.07 - 0.15 inches per year over the area, and are dependent upon soil characteristics and land uses.

(d) The portion of the study area analyzed for projecting groundwater deficits is assumed to equal that portion of the C-SELM area that is not presently supplied by Lake Michigan waters.

(e) The projected groundwater available in 2020 from natural recharge and mining is assumed to equal the Illinois State Water Survey projections, on a township basis. The water deficit for this analysis is then assumed to equal the projected water demands minus the groundwater available from recharge and mining as discussed above.

FINDINGS

The water consumptions in gallons per capita per day were estimated according to the degree of development for: (1) The City of Chicago; (2) Inner suburbs; (3) Outer suburbs; and (4) Rural areas. The results are shown on Figure A-IV-3. The estimated water demands were developed by counties, and townships, and watershed management areas. The results of the latter are shown in Table A-IV-5.

Groundwater supply needs were identified for each of the seven counties, then water supply deficiencies in each township within the study area have been estimated by comparing the water demand projections and the potential yield of the shallow aquifers plus the practical sustained yield of the deep aquifers. The resulting groundwater deficits for the townships in the year 2020 are shown on Figure A-IV-4.

The Illinois State Water Survey investigated the possibility of mining the deep sandstone aquifer and concluded that proper mining management allows more water taken from groundwater storage. Figure A-IV-5 shows estimated deficits. Based on a mathematical model study, using the shallow aquifer production, the sustained yield of the deep aquifer, and mining of the deep aquifer.

FIGURE A-IV-3

PER CAPITA DOMESTIC WATER DEMAND PROJECTION 1970 - 2020

(INCLUDED COMMERCIAL)

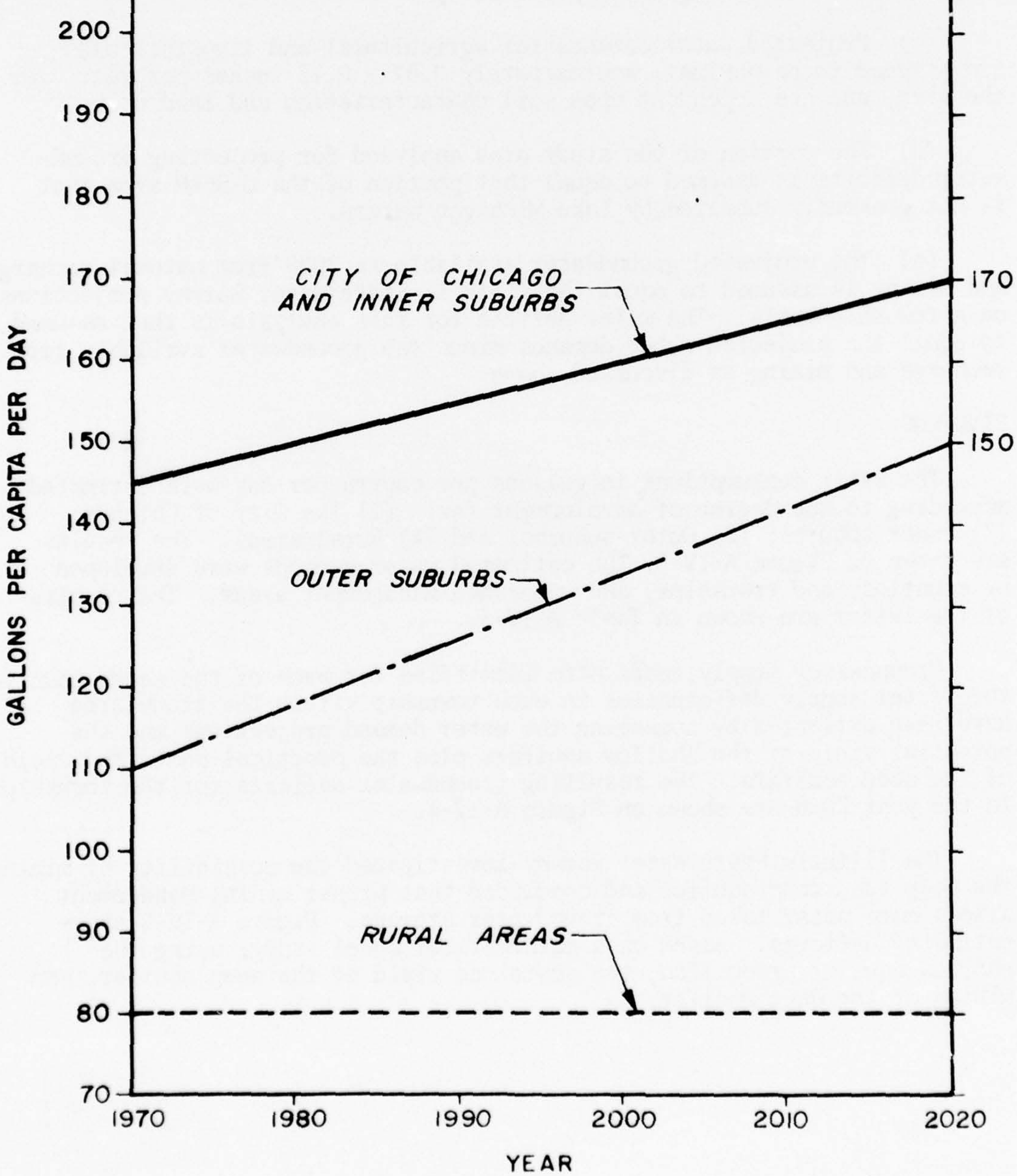


TABLE A-IV-5 C-SELM WATER DEMANDS 1980-2020
BY MANAGEMENT WATERSHEDS
(UNIT IN MGD)

	DOMESTIC & COMMERCIAL WATER DEMAND				INDUSTRIAL WATER DEMAND				AGRICULTURAL WATER DEMAND				TOTAL WATER DEMAND			
Management Watersheds	1980	1990	2000	2020	1980	1990	2000	2020	1980	1990	2000	2020	1980	1990	2000	2020
Lake Michigan - North	20.5	26.0	29.7	36.3	8.8	8.1	8.1	8.4	0.5	0.5	0.6	0.7	29.8	34.6	38.4	45.4
North Branch Chicago River	28.6	36.6	41.3	47.6	6.6	7.2	7.7	8.2	0.5	0.5	0.8	0.9	35.7	44.3	49.8	56.7
Des Plaines River - North	40.6	56.4	72.1	98.8	10.9	12.4	14.1	16.1	1.8	1.9	3.0	3.7	53.3	70.7	89.2	118.6
Chicago Tributary	604.7	632.7	662.8	722.0	767.2	720.9	723.4	738.4	0	0	0	0	1371.9	1353.6	1386.2	1460.4
Des Plaines - Middle	43.7	50.9	57.5	67.5	45.2	48.3	50.1	52.2	0.2	0.1	0	0	89.1	99.3	107.6	119.7
Salt Creek	43.4	55.9	66.4	77.4	12.0	14.5	16.7	19.9	0.8	0.9	1.5	1.9	56.2	71.3	84.6	99.2
East Branch DuPage River	24.2	33.6	42.5	54.7	2.3	3.1	3.8	4.5	0.4	0.4	0.8	1.0	26.9	37.1	47.1	60.2
West Branch DuPage River	20.6	33.3	48.5	71.1	3.1	4.1	5.4	6.9	0.8	0.8	1.2	1.5	24.5	38.2	55.1	79.5
Main Stem DuPage River	8.1	14.1	22.8	42.7	12.5	8.9	7.7	6.8	1.0	1.0	1.7	2.3	21.6	24.0	32.2	51.8
San-Ship Canal - North	30.0	36.8	43.5	55.5	23.6	21.2	21.4	21.9	0.3	0.3	0	0	53.9	58.3	64.9	77.4
Cal-Sag Channel - North	21.1	25.2	28.9	34.0	12.0	12.8	13.7	14.1	0.1	0.1	0.1	0.1	33.2	38.1	42.7	48.2
San-Ship Canal - South	7.4	12.2	17.1	25.5	16.4	15.3	14.1	13.3	0.7	0.7	0.8	1.1	24.5	28.2	32.0	39.9
Cal-Sag Channel - South	9.2	13.7	16.9	20.2	2.3	2.3	2.5	2.5	0.2	0.2	0.3	0.4	11.7	16.2	19.7	23.1
Hickory - Spring Creeks	19.8	31.5	42.8	60.4	6.8	6.0	6.8	8.2	0.5	0.5	0.7	1.0	27.1	38.0	50.3	69.6
Jackson Creek	7.3	9.4	12.8	19.3	11.0	8.0	7.7	8.1	0.5	0.5	0.9	1.0	18.8	17.9	21.4	28.4
Thorn-Deer Creeks	49.3	64.7	75.6	89.4	36.2	35.9	37.6	39.4	0.6	0.6	0.9	1.2	86.1	101.2	114.1	130.0
Little Calumet - West[1]	0.7	1.1	1.4	2.3	0	0	0	0	0.1	0.1	0.2	0.2	0.8	1.2	1.6	2.5
ILLINOIS TOTAL	979.2	1134.1	1282.6	1524.7	976.9	929.0	940.8	968.9	9.0	9.1	13.5	17.0	1965.1	2072.2	2236.9	2510.6
Little Calumet - West[2]	6.5	8.0	9.5	13.3	47.2	28.8	20.6	15.7	0.1	0.1	0.2	0.2	53.8	36.9	30.3	29.2
Indiana Harbor	63.7	68.6	74.4	86.9	393.9	244.5	189.1	163.7	0	0	0	0	457.6	313.1	263.5	250.6
Little Calumet - Middle	11.0	15.8	21.7	38.4	0	0.2	0.3	0.4	0.6	0.6	0.7	0.8	11.6	16.6	22.7	39.6
Little Calumet - East	10.0	15.4	23.6	49.1	30.5	22.5	24.8	37.6	0	0	0	0	40.5	37.9	48.4	86.7
Indiana Dunes	7.9	9.1	10.9	16.4	21.0	14.2	14.3	18.9	0.3	0.4	0.4	0.5	29.2	23.7	25.6	35.8
Trail Creek	2.5	3.4	4.4	5.6	0.1	0.1	0.1	0.2	0.9	1.1	1.3	1.7	3.5	4.6	5.8	7.5
INDIANA TOTALS	101.6	120.3	144.5	209.7	492.7	310.3	249.2	236.5	1.9	2.2	2.6	3.2	596.2	432.8	396.3	449.4
C-SELM TOTALS	1080.8	1254.4	1427.1	1734.4	1469.6	1239.3	1190.0	1205.4	10.9	11.3	16.1	20.2	2561.3	2505.0	2633.2	2960.0

[1] Illinois Portion

[2] Indiana Portion

PROJECTED WATER DEFICIENCIES IN 2020

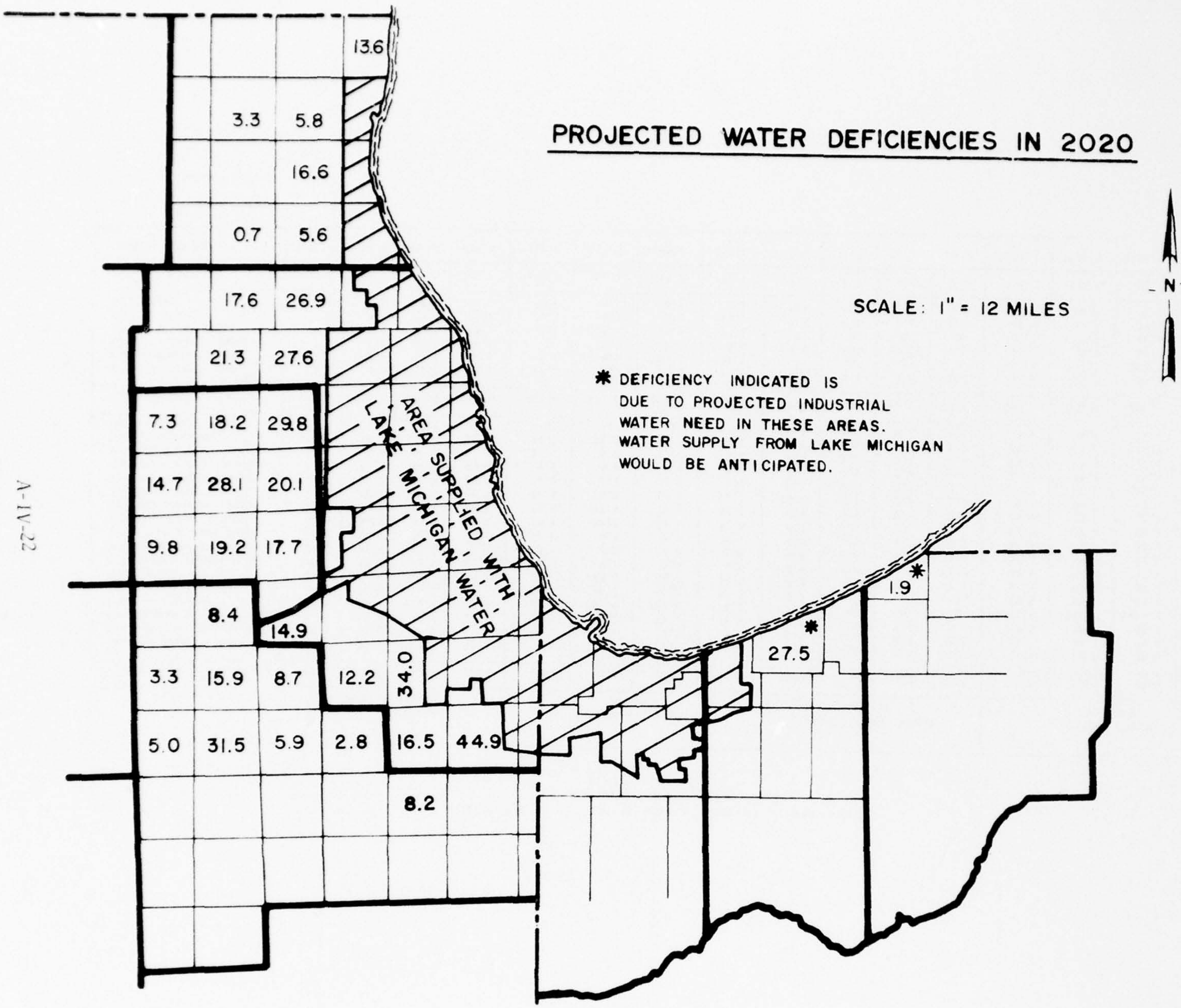
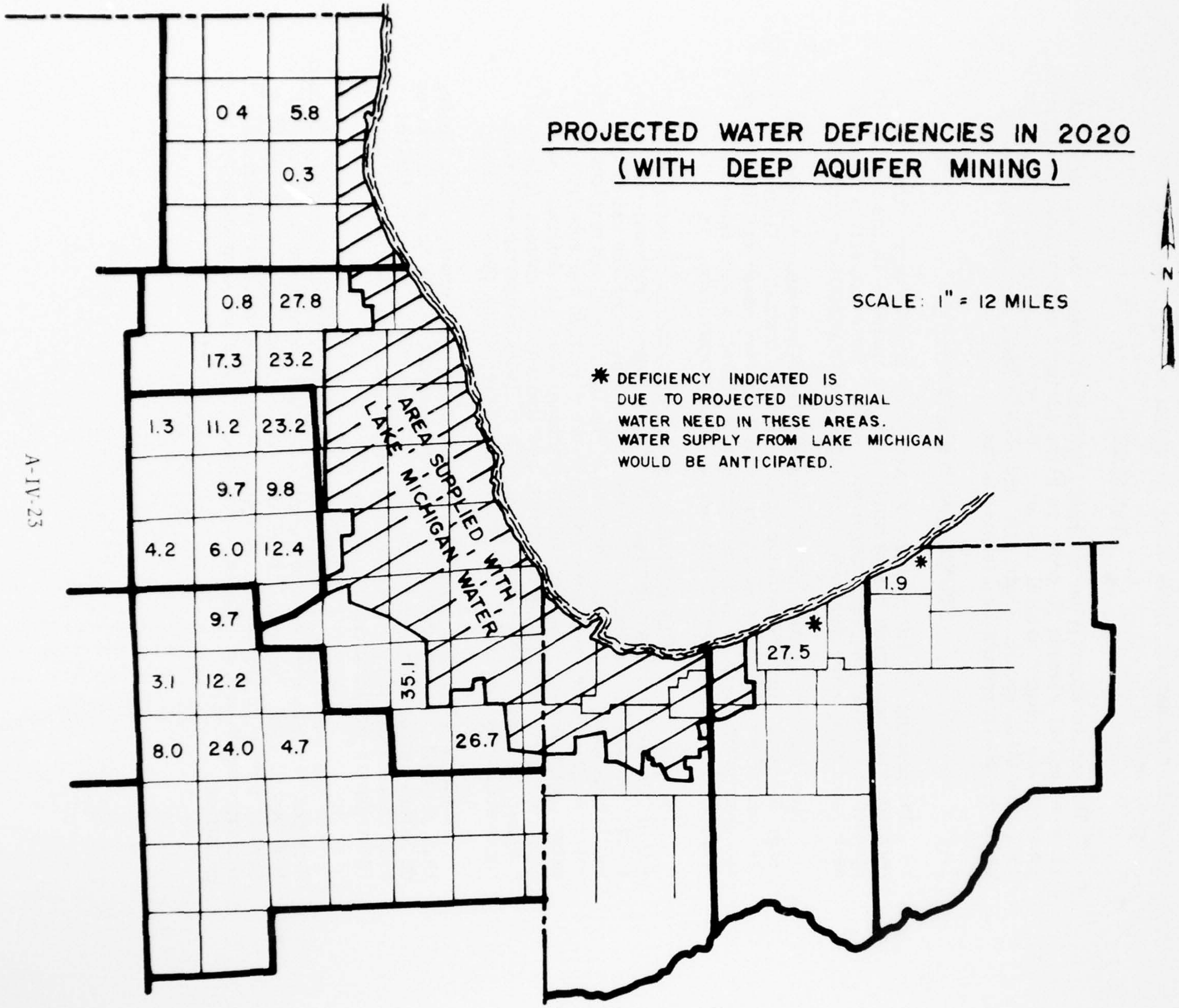


FIGURE A-IV-4

PROJECTED WATER DEFICIENCIES IN 2020
(WITH DEEP AQUIFER MINING)

SCALE: 1" = 12 MILES



* DEFICIENCY INDICATED IS DUE TO PROJECTED INDUSTRIAL WATER NEED IN THESE AREAS. WATER SUPPLY FROM LAKE MICHIGAN WOULD BE ANTICIPATED.

FIGURE A-IV-5

Study of the feasibility of artificial groundwater recharge indicated that recharge pit method would be a preferred technique. Preliminary investigations have identified 1[illegible] sites within and near the C-SELM area in Illinois which appear to satisfy the criteria for artificial groundwater recharge. These areas are shown on Figure A-IV-6.

OPEN SPACE

The public acquisition or zoning control of open space within C-SELM is an essential element in order to allow adequate recreational opportunity, preserve and enhance natural resources, and make planning effective relative to future urban growth. Both NIPC and LPCRTPC have regional open space plans for their respective planning areas.

RECREATIONAL DEVELOPMENT

The demands for in-close and a variety of general recreational opportunities have grown concurrently with the increase in the country's standard of living and the shorter work week. Those activities normally associated with water and open-space lands are in particular demand.

Over time the quality of the area's streams have been degraded and usage for most forms of water-related recreation including fishing, is limited. The lack of public access which precludes effective usage and the fact that the quantities of flows are insufficient to sustain a wide range of activities during the recreation season are also problems.

The problem of water pollution affects all aspects of water usage. Two of the most critical problems are the shortage of recreational facilities and the diminution or loss of utilization of the existing facilities due to pollution. Because of this shortage, recreational water usage is even more sensitive to water pollution and subsequent water contamination. Two general recreational uses are defined: whole body contact (swimming, water skiing) and limited body contact (pleasure boating, fishing). The latter group also includes aesthetic enjoyment, such as driving or hiking, picnicking or cycling along the shoreline.

Whole body contact activities require high quality water, paralleling that of public water supply (according to a report of the Select Committee on Natural Water Resources of the U. S. Senate) (37). However, limited body contact activities are also adversely affected by low quality water (decrease in aesthetic value, etc.).

Of the ten largest metropolitan areas in the United States, the Chicago Metropolitan Area has the least amount of public open space - 13.5 acres/1000 capita (38). Compared to 57 acres/1000 in the State of Illinois (lowest of the fifty states), it can be seen that C-SELM has a serious recreation problem, originating from lack of space and compounded by pollution.

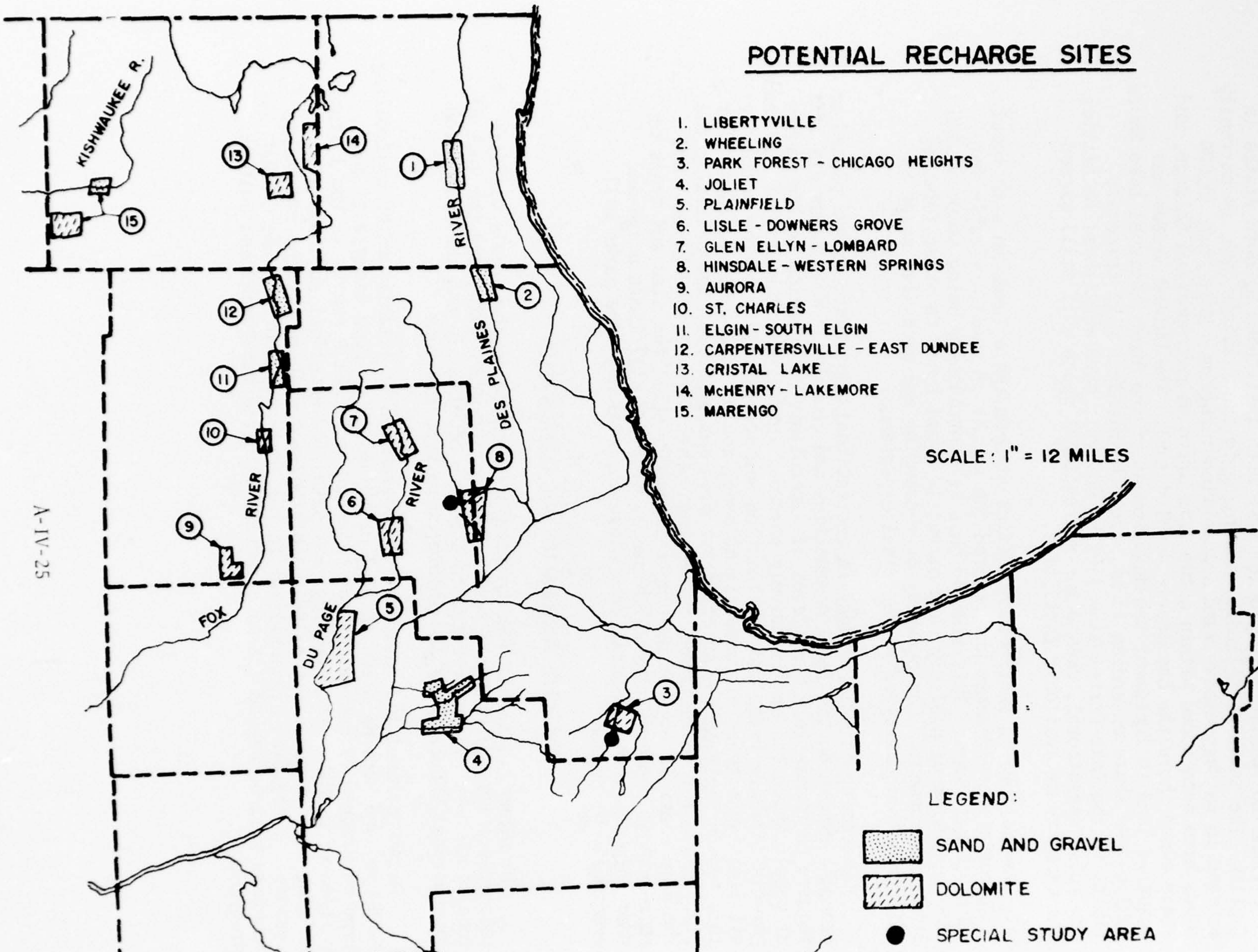

POTENTIAL RECHARGE SITES
1. LIBERTYVILLE
2. WHEELING
3. PARK FOREST - CHICAGO HEIGHTS
4. JOLIET
5. PLAINFIELD
6. LISLE - DOWNERS GROVE
7. GLEN ELLYN - LOMBARD
8. HINSDALE - WESTERN SPRINGS
9. AURORA
10. ST. CHARLES
11. ELGIN - SOUTH ELGIN
12. CARPENTERSVILLE - EAST DUNDEE
13. CRISTAL LAKE
14. McHENRY - LAKEMORE
15. MARENGO
SCALE: 1" = 12 MILES
LEGEND:
SAND AND GRAVEL
DOLOMITE
SPECIAL STUDY AREA
KISHWAUKEE R.
DES PLAINES RIVER
DU PAGE RIVER
FOX RIVER

FIGURE A-IV-6

Plans to resolve this problem have been instituted by both states in C-SELM. The State of Illinois, according to the Illinois EPA, is currently engaged in an "aggressive land acquisition" program. More than 20,000 acres have been added within a two mile drive of metropolitan Chicago, and state owned shoreline has nearly doubled (39). The United States has acquired land to implement the development of the Dunes National Lake Shore; public lake shore extending 13 mi. from the Michigan City Corporate limits to the Lake-Porter Line (40). However, even when these facilities are fully operational, demand for recreational space will still exceed the capacity of available facilities.

The failure to incorporate sufficient open-space lands in with local residential developments has reduced the amount of lands available for recreational usage. This limited base is continuously being reduced with the conversion of publicly and privately-owned lands to other forms of urban development. Consequently over-crowding and excessive usage is affecting the quality of recreational experience.

Overcoming this deficiency in recreational opportunities has placed an economic burden on the local communities and counties. What lands are left require an excessively high level of expenditure in relation to the number of people which can be effectively served. Furthermore the size of the land parcels that are left, and the location and accessibility by the community all limit what types of recreational usage can or should be provided. For this reason implementing an effective open-space program and utilizing the flood plain for recreational rather than other forms of development are the only feasible ways of meeting this need. Still the size and types of recreational opportunities which can be provided will limit usage and some form of large, comparatively close-in, regional-type parks will eventually be needed.

WILDLIFE RESTORATION AND CONSERVATION

The urban growth has been particularly severe on the area's wildlife resources. Loss of habitat, pollution from the urban area, and the lack of food plots have all contributed to the loss of wildlife and the associated recreational, educational and interpretive type programs.

An educational and interpretive program can be established by controlling land-use, and setting aside natural preserves. One good example of this type of program is operational at Palos Hills Forest Preserve in the Illinois portion of C-SELM. Establishing rest areas for waterfowl and separate hunting areas requires large tracts of land for both management and safety reasons. Therefore, areas similar to regional parks outside the C-SELM boundary will be needed for an effective wildlife management and hunting program.

NAVIGATION

The economic growth enjoyed by the Chicago metropolitan area is in part attributable to its being the center of a large inter-model transportation network. The commercial advantages offered by waterborne navigation are particularly significant, especially the commodity interchange between the Inland System (Mississippi and Ohio Rivers) and the Great Lakes traffic. The low-flow, slack water system on the Illinois River is maintained by a series of locks and dams. As traffic grows, so does the need to provide sufficient low-flow augmentation for the required through lockages. To meet this need sufficient flows can be provided from either Lake Michigan diversion and/or discharge flows from the Metropolitan Sanitary District of Greater Chicago plants.

The present Illinois Waterway provides through navigation from the Mississippi River to Lake Michigan with a minimum channel depth of 9 ft. and a minimum channel width of 160 ft. Congestion on the Waterway is a major problem, resulting ultimately in higher transportation costs and slower deliveries. Operation of locks downstream from the Port of Chicago depends upon water diverted from Lake Michigan; however, diversion by the State of Illinois is limited to a 5-year average annual rate of 3,200 cfs by U. S. Supreme Court Order. (This includes all withdrawal uses; hence increases in diversion for navigation would result in a proportional decrease in municipal and industrial use of Lake Michigan as a source of water supply.) Water quality is directly affected by this interrelation of water uses, since water is now used for sewage dilution. The greater the dilution (i.e., volumes of water vs. sewage), the more effective the water is to (1) assimilate the waste and (2) undergo natural purification.

ELECTRIC POWER

In designing wastewater management systems energy forecasts are essential both in terms of the energy requirements of the system itself and in terms of possible synergisms between waste treatment and energy production.

APPROACH

Existing and projected power generation requirements, together with the waste heat dissipation requirements are defined for the study area. Graphical projections of the future energy requirements, evaporative cooling requirements, and anticipated wastewater flows are evaluated for the C-SELM area through the year 2020. Attention is called to the degree of balance between wastewater flows and evaporative cooling requirements of this projected period. The interrelationship between power generation and heat rejection as applied to present and anticipated power generation technology is discussed in the Design Appendix, together with the relationship to evaporative cooling, and the advantages of cooling reservoirs over cooling towers.

The primary sources of information are professional experience supplemented with technical literature (41) and specific inputs from area electric utilities.

ASSUMPTIONS

The following are a list of assumptions utilized in the formulation of energy projections:

(a) The large increases in energy needed in the next 50 years will substantially be provided by generation of electrical power, and this will be accompanied by a large increase in demand for water for cooling purposes.

(b) The minimum energy demands will require a doubling of installed capacity every 10 years for the next 30 years. These are the Federal Power Commission's (FPC) assumptions based on a projection of the energy demands experienced over the past 20 years, including an allowance for decreasing population growth rates.

(c) The minimum commitment of power companies, estimated for the purposes of this study, to install generating facilities on wastewater land-treatment sites would be 65,000 MW by the year 2020, or about 7 times the present level of power production. This compares to 12 times the present levels as estimated by local power companies.

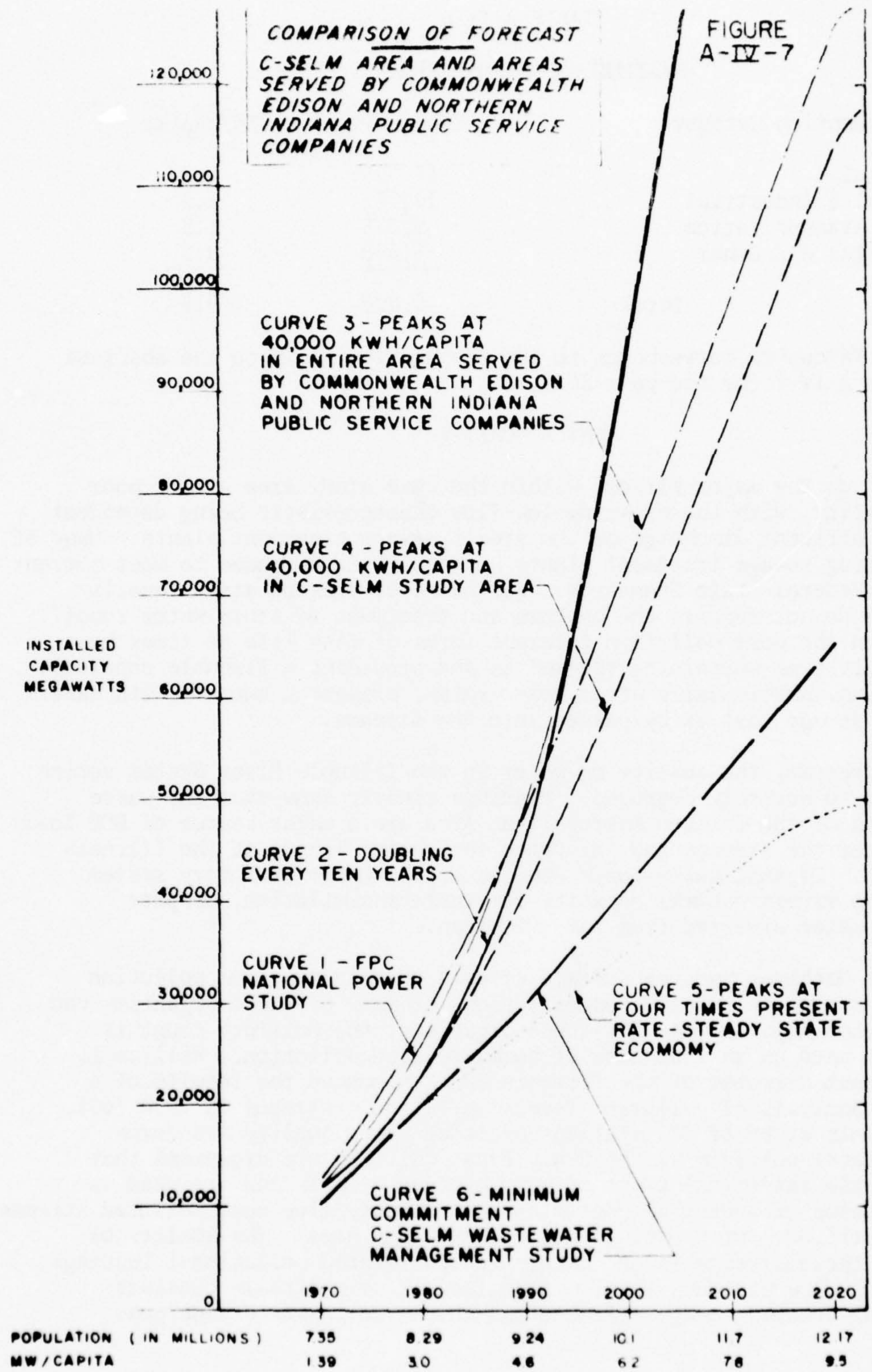
(d) The unit cost of the capital cost of wastewater management system was assumed at $1.00 per gallon per day of capacity. The unit cost of payment by the power companies to the wastewater management system for site and cooling water was assumed at $50 per kilowatt to be paid after an assumed allocation of electrical power generation capacity of 5 KW per capita (associated with 60 gallons per day of water required for evaporation).

FINDINGS

Projected power requirements curves were developed in terms of megawatts installed capacity and per capita power consumption, shown as curves 1, 2, 3, and 4 on Figure A-IV-7, for the study area. As contrast to these curves, curve 5 depicts an extreme projection made by Professor Cook of Texas A & M University. For this curve to be realistic unprecedented public policy changes, calling for an arbitrary limitation of consumption of resources, would be required.

These curves indicate that the minimum commitment of power production facilities to be situated at wastewater land-treatment sites, and shown as curve 6, is a conservative estimate to be used for computing synergistic benefits.

The following Table A-IV-6 is the summary of the maximum likely energy use per person per year:



COMPARISON OF FORECAST
C-SELM AREA AND AREAS SERVED BY COMMONWEALTH EDISON AND NORTHERN INDIANA PUBLIC SERVICE COMPANIES
FIGURE A-IV-7
INSTALLED CAPACITY MEGAWATTS
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
CURVE 3 - PEAKS AT 40,000 KWH/CAPITA IN ENTIRE AREA SERVED BY COMMONWEALTH EDISON AND NORTHERN INDIANA PUBLIC SERVICE COMPANIES
CURVE 4 - PEAKS AT 40,000 KWH/CAPITA IN C-SELM STUDY AREA
CURVE 2 - DOUBLING EVERY TEN YEARS
CURVE 1 - FPC NATIONAL POWER STUDY
CURVE 5-PEAKS AT FOUR TIMES PRESENT RATE-STEADY STATE ECOMOMY
CURVE 6 - MINIMUM COMMITMENT C-SELM WASTEWATER MANAGEMENT STUDY
1970
1980
1990
2000
2010
2020
POPULATION (IN MILLIONS) 7.35 8.29 9.24 10.1 11.7 12.17
MW/CAPITA 1.39 3.0 4.6 6.2 7.6 9.5

TABLE A-IV-6

MAXIMUM ENERGY USE PROJECTED

Consumption Category	KWh/capita	KW/capita
Residential	17,000	4.9
Commercial & Industrial	10,135	2.3
Electric Transportation	9,375	1.8
Governmental and Other	3,490	0.5
Total	40,000	9.5

This 9.5 KW/capita corresponds to the consumption shown on the abscissa of Figure A-IV-7 for the year 2020.

WATER QUALITY

Most of the major streams within the base study area are of poor water quality, with the existing low-flow characteristic being dependent upon the effluent discharge of the area's sewage treatment plants. Many of the existing sewage treatment plants have not been upgraded to meet current State or Federal-State Standards. Furthermore, present stream quality standards do not require the capture and treatment of storm water runoff. Thus, even the most pollution tolerant forms of fish life at times have a difficult time sustaining themselves and providing a fishable population. The streams, particularly after heavy rains, present a human health hazard from the sewage that is by-passed into the streams.

At present, the quality of water in the Illinois River System varies from good to severely degraded. Findings clearly show that the waste discharges of the Chicago Metropolitan Area are a major source of BOD loads which enter the streams and influence the entire length of the Illinois River (1). Organic waste loads imposed on the upper tributary system exceed the rivers natural capacity for waste assimilation, despite dilution water diverted from Lake Michigan.

Lake Michigan and the surface streams contain numerous pollution tolerant organisms. Daily concentrations of many of these organisms can and do reach high levels. Of these organisms, the coliform count is generally used as an indicator of human-related pollution. William L. Blaser, past director of the Illinois EPA, announced the results of a computer analysis of pollution levels in Illinois streams in 1970 (60). Measurements at 89 of 218 stations exceeded water quality standards set for fecal coliform by the EPA. Fecal coliform are organisms that breed in the intestinal tract of warm-blooded animals and are used as an indication of bacterial contamination. Twenty-five most polluted streams were identified. Of these, 20 are in the study area. The quality of water in these streams is due mainly to man-related pollutional loadings; during low flow periods, total system flow in some streams consists chiefly of treated sewage effluent and industrial waste discharges.

Identification of existing wastewater flows, their character and spatial and temporal distribution, is essential for definition of base water quality conditions. Also, treatment and water conservation practices and trends in industry have great influence and significance on and for any wastewater management scheme.

APPROACH

In order to achieve higher water qualities, existing municipal treatment plants by type, collection systems, flow, quality of effluent and service area were inventoried for each of the watercourses within the C-SELM area. Future sewage treatment plant loadings were derived from this inventory. Typical effluent qualities are identified for all sanitary treatment plants (STP's), including any reuse features. Significant industrial components of municipal facilities were identified with respect to quantity and quality.

An inventory of significant existing industrial and other discharges to surface water by type, flow, and quality characteristics for each watercourse from Federal, State, and local sanitary district records, was combined with the inventory of municipal plants.

The primary source of information was state records of Illinois and Indiana (61), data developed in the C-SELM feasibility study (21) and the Corps' *discharge permit application program* (62).

The results are presented in a tabular format with appropriate grouping and breakdown consistent with other types of data.

ASSUMPTIONS

A number of assumptions were utilized in developing the inventory of municipal and industrial flows in the study area:

(a) The inventory of municipal wastewater systems only included plants whose average flow was 10,000 gallons per day or greater; industrial wastewater treatment discharges to surface waters were considered significant if the total average flow exceeded 5 MGD; miscellaneous treatment systems for schools, motels, restaurants, etc., were not included in the inventory. It was extremely difficult to get effluent data from smaller industries, hence the 5 MGD cutoff. Additional study would be necessary after selection of a wastewater management system for implementation.

(b) Municipal waste loadings, with the exception of the three main Metropolitan Sanitary District of Greater Chicago (MSDGC) plants, were based on average concentrations of secondary effluents considered typical of treatment performances existing in the study area. These concentrations are: Total dissolved solids, 400 mg/1; Suspended Solids, 25 mg/1; Chemical Oxygen Demand, 60 mg/1; 5-day Biochemical Oxygen Demand, 20 mg/1; Total Nitrogen, 20 mg/1; Total Phosphorus, 8 mg/1; Fecal Coliform Bacteria, 400 MNP/100 ml. The large MSDGC plants were not considered typical due to their large proportion of industrial flow (42%), and loadings for these plants were obtained from data presented in the 1970 MSDGC Maintenance and Operation Department Annual Report.

(c) The maximum concentrations of other critical pollutants parameters used to estimate maximum possible loadings were based on performance capabilities of existing systems. These concentrations are: Color, 0 Platinum - Color Unit; Max. heat discharge, 18°F winter increment; Oils and greases, 10 mg/l; Phenols, 0.2 mg/l; Boron, 1 mg/l; Arsenic, 0.3 mg/l; Cyanide, 0 mg/l; Trace Metals, 3 mg/l. Trace metals were considered to include aluminum, cadmium, chromium, copper, iron, lead, manganese, and mercury.

(d) Information reflecting waste solids management and municipal effluent reuse potential were assumed to be consistent with the following references: "Report of the Committee on Water Quality Criteria" (FWPCA, 1968) (63), and "Theories and Practices of Industrial Waste Treatment," by Nelson L. Nemeron (Addison-Wesley Publishing Co., Inc., Reading, Massachusetts, 1963) (64).

FINDINGS

The information for wastewater facilities, classified by 22 C-SELM watersheds, is summarized in Table A-IV-7 for existing municipal wastewater treatment facilities, and in Table A-IV-8 for industrial surface wastewater discharges. For tabulated results of individual facilities consult Tables 2-1, and 4-1 of the Phase I report. That report also presents tabulated information on current waste solids management (Table 4-3), and on industrial reuse potential of municipal effluent.

BOTTOM DEPOSITS

Bottom deposits are the results of natural processes and the activities of man. In many of the study area's streams large accumulations of bottom deposits exist. These deposits may be potential sources of pollution for some time to come, even after sewage effleunts become highly purified and non-polluting. Without adequate knowledge concerning the extent and nature of these deposits it is not possible to estimate their pollutional effect or to develop a management scheme, should such be required, to eliminate them as potential sources of pollution.

The accumulated bottom deposits capable of sustaining significant pollution were inventoried for each C-SELM watercourse. The location, length, breadth, depth, estimated wet weight, and volatile solids content of the deposits are defined below.

The primary sources of information are field data and representative sampling. Sample sites were selected on the basis of proximity to sewage

TABLE A-IV-7

SUMMARY OF EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Watershed Number	Description	Drainage Area (Sq. Mi.)	Total Population (1000's)	Total Population Served[1] (1000's)	Estimated Present Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	ESTIMATED WASTE LOADINGS: Total Dissolved Solids lb/day	Suspended Solids lb/day	COD lb/day	BOD lb/day	NH_3-N lb/day	Organic N lb/day	NO_3-N lb/day	P lb/day	Fecal Coliform Bacteria (MPN/100ml)	ESTIMATED MAXIMUM POSSIBLE WASTE LOADINGS: Color Pt-Co Units	Heat Million BTU/day	Oils & Greases lb/day	Phenols lb/day	Trace Metals lb/day	Boron lb/day	Arsenic lb/day	Cyanide lb/day
1	Lake Michigan - North	59	121.5	138.6	18.76	19.83	62,583	6,644	20,160	6,720	2,858	690	120	1,288	400	0	2,814	1,556	31	469	156	47	0
2	North Branch Chicago River	92	187.1	60.1	7.51	9.05	25,053	1,565	3,758	1,253	1,135	125	63	501	400	0	1,127	626	13	188	63	19	0
3	DesPlaines River - North	249	292.7	49.58	5.15	7.73	17,180	1,074	2,577	859	730	86	43	344	400	0	773	430	9	129	43	13	0
4	Chicago Tributary	375	4143.0	5424.0	1369.0	1920	4,566,984	238,415	536,625	178,876	120,329	31,251	11,241	43,165	400	0	205,350	114,175	2,283	34,252	11,418	3,425	0
5	DesPlaines - Middle	82	304.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Salt Creek	119	260.9	143.8	17.20	20.51	[illegible]	3,543	8,517	2,839	[illegible]	284	142	1,135	400	0	2,553	1,419	28	426	142	43	0
7	East Branch DuPage River	83	147.2	117.20	12.62	15.66	42,101	2,631	6,314	2,105	1,789	211	107	842	400	0	1,893	1,053	21	316	105	32	0
8	West Branch DuPage River	124	120.1	108.20	14.68	13.45	48,972	2,996	7,195	2,399	2,083	247	123	980	400	0	2,202	1,224	24	367	122	37	0
9	Main Stem DuPage River	181	51.8	6.6	0.66	0.99	2,203	137	330	111	93	12	5	45	400	0	99	55	1	17	6	2	0
10	Sani & Ship Canal - North	76	196.2	58.03	6.05	8.03	20,182	844	2,064	689	857	101	50	404	400	0	906	505	10	151	51	15	0
11	Cal-Sag Channel North	51	151.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Sani & Ship Canal - South	100	40.3	25.4	2.64	3.21	9,741	1,179	3,713	1,238	455	129	17	203	400	0	396	220	4	66	22	[illegible]	0
13	Cal-Sag Channel - South	43	58.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Hickory & Spring Creeks	117	102.6	93.4	19.14	23.67	63,850	3,991	9,577	3,192	2,714	320	160	1,276	400	0	2,871	1,596	32	479	160	48	0
15	Jackson Creek	108	44.8	1.6	0.16	0.23	534	33	80	26	26	2	1	10	400	0	24	13	1	4	1	1	0
16	Thorn & Deer Creeks	111	299.2	157.4	17.71	22.71	59,081	3,475	8,360	2,787	2,511	295	149	1,180	400	0	266	1,477	30	443	148	44	0
17	Little Calumet - West[1]	31	6.0	0.8	N.A.	N.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17.1	Little Calumet - West[2]	32	41.8	7.55	0.73	N.A.	2,434	152	365	122	103	12	6	49	400	0	110	61	1	18	6	2	0
18	Indiana Harbor	140	417.30	475.0	88.40	120.6	294,902	18,431	44,235	14,745	12,536	1,476	738	5,284	400	0	13,260	7,373	147	2,212	737	221	0
19	Little Calumet - Middle	143	75.0	11.0	1.8	1.8	6,005	375	901	300	255	30	15	120	400	0	270	150	3	45	15	5	0
20	Little Calumet - East	173	69.5	24.7	3.8	4.5	12,677	792	1,901	634	539	64	32	254	400	0	570	317	6	95	32	10	0
21	Indiana Dunes	46	50.6	63.0	8.3	N.A.	27,689	1,731	4,153	1,384	1,177	139	69	554	400	0	1,245	692	14	208	69	21	0
22	Trail Creek	49	34.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL	2,584	7,217.0	6,965.96	1,594.13	2,191.97	5,318,949	288,014	660,825	220,279	152,603	35,474	13,081	57,634	400	0	236,731	132,942	2,657	39,885	13,296	[illegible]	0

[1] The total population served by a STP in a particular watershed may be greater than the population residing in that watershed since the service area of the STP may encompass more than one watershed.

TABLE A-IV-8 SUMMARY OF INDUSTRIAL SURFACE WASTEWATER DISCHARGES[1]

Watershed Number	Description	Wastewater Flow (MGD)	Fecal Coliform Bacteria (MPN/100ml)		Pollutant Loadings (1000 lbs/day)																									
					Total Dissolved Solids		Suspended Solids		BOD_5		NO_3-N		NH_3-N		Organic N		P		Oils & Greases		Phenols		Toxic Substances					
																							Arsenic		Boron		Cyanide	
			I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D
1	Lake Michigan - North	3,139.72	0	0	4,386.0	4,450.1	377.7	380.5	65.9	68.5	202.7	209.6	2.1	2.6	940.0	947.2	5.0	5.2	0.4	0.1	0	0.1	0.6	0.6	9.9	18.3	0	0
4	Chicago Tributary	2,298.67	0	0	4,889.9	5,034.3	433.7	285.4	129.8	162.9	524.6	580.4	81.3	88.0	8.3	7.2	37.6	37.5	41.1	23.3	0.1	0.1	0.4	0.4	19.9	18.4	0.1	0
5	DesPlaines - Middle	20.8	0	0	BL	BL	BL	BL	BL	BL	BL	BL	NA	NA	NA	NA	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
10	San-Ship Canal - North	1,144.78	434,000	74,470	4,752.2	4,783.2	137.7	136.1	67.4	67.2	316.2	316.6	71.2	69.6	6.0	5.6	10.0	10.1	0	0.9	BL	BL	0.5	0.6	18.6	22.3	BL	BL
12	San-Ship Canal - South	1,700.63	0	0	6,721.4	6,742.3	267.6	280.0	90.1	90.4	511.2	517.1	92.2	92.5	5.0	4.6	6.3	6.5	3.0	1.7	BL	BL	0.6	0.6	10.3	9.2	BL	BL
15	Jackson Creek	30.21	21,400	26,800	101.5	164.7	5.0	11.9	0.9	1.7	4.35	8.2	0	79.1	0.2	0.2	0.3	0.3	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
18	Indiana Harbor	3,480.82	76	0	5,024.4	5,912.3	259.2	466.8	62.2	109.9	202.6	364.5	6.0	12.6	6.8	11.4	1.8	2.6	28.2	66.8	0	1.1	0.3	0.3	3.8	3.8	1.7	0
20	Little Calumet - East	277.04	283	241	260.5	336.6	36.4	50.9	2.3	3.4	17.7	28.2	3.2	2.9	2.1	1.1	0.3	0.6	5.8	7.7	BL	BL	0.5	0.5	BL	BL	BL	BL
21	Indiana Dunes	734.0	0	0	1,112.0	1,112.0	103.9	103.9	18.4	18.4	BL	BL	BL	0	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
	TOTAL	12,826.67			27,247.8	28,535.3	1,621.2	1,715.7	437.2	522.4	1,779.3	2,024.6	256.0	268.3	968.5	977.7	61.3	62.7	78.5	100.5	0.2	1.4	3.0	3.0	62.5	71.9	1.8	0.1

Pollutant Loadings (1000 lbs/day)

Watershed Number	Description	Trace Metals																			
		Al		Cd		Cr		Cu		Fe		Pb		Mn		Hg		Ni		Zn	
		I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I	D
1	Lake Michigan - North	1.2	1.8	0	0	0.4	0.4	0.4	0.6	14.7	15.5	0.2	0.2	1.3	1.3	0	0	1.2	1.3	2.3	2.4
4	Chicago Tributary	1.7	2.0	0	0	0.6	0.5	1.7	0.9	23.0	21.8	0.9	0.8	0.5	0.5	0.3	0.1	1.3	1.3	2.2	1.9
5	DesPlaines - Middle	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
10	San-Ship Canal - North	2.7	3.1	0	0	0.2	0.2	0.7	0.8	6.3	6.7	0.2	0.2	0.2	0.2	0	0	0.6	0.6	0.8	0.9
12	San-Ship Canal - South	3.7	4.3	0	0	0.6	0.2	0.9	1.0	9.5	14.0	0.7	1.1	1.5	1.6	0	0	1.3	1.0	0.9	1.2
15	Jackson Creek	0.3	0.2	BL	BL	0	0	BL	BL	0.2	0.3	BL	BL	0	0	BL	BL	BL	BL	BL	BL
18	Indiana Harbor	1.9	2.5	0	0	0.1	13.3	0.7	0.7	7.1	36.0	0.2	0.4	0	0.2	1.4	1.1	0.7	0.3	0.5	2.2
20	Little Calumet - East	BL	BL	BL	BL	BL	BL	0.1	0.1	1.8	1.7	0.1	0.1	BL	BL	BL	BL	BL	0.1	0.1	0.1
21	Indiana Dunes	0.8	1.1	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
	TOTAL	12.2	15.0	0.2	0.2	1.9	14.6	4.5	4.1	62.6	95.5	2.3	2.9	3.6	3.8	1.7	1.2	5.1	4.6	6.8	8.7

[1] For legend see Table 4-1.

I = Intake

D = Discharge

treatment plants, and the samples were submitted to a competent laboratory in plastic or comparable bags which would assure retention of their properties for volatile solids determination.

The results are presented in an appropriate tabular format accompanied by a suitable map showing sample locations.

ASSUMPTIONS

The following are the assumptions utilized in formulating data.

(a) It was assumed that, with regard to the estimation of bottom deposit volumes in the water courses, the depth obtained from one sample in the middle of the stream would be uniform across the width of the stream.

(b) The volume between two sampling points was assumed to equal the average depth of each sample times the average width of the stream times the length between sampling points.

FINDINGS

As a general summary of the aesthetic and physical appearance of the area sampled, the Northshore area yielded heavy organic sludge deposits accompanied by septic odors. The central area, or basically Will and DuPage Counties in Illinois, showed significant bottom deposits but with diminished odor problems. The bottom deposits in Lake, Porter, and LaPorte Counties in Indiana were generally very significant in extent and appeared to have a pronounced oily appearance consistent with a heavily industrialized area.

These characterizations are based on the results of a field sampling program during which a total of 72 samples were collected. Analyses of the samples appears in Table A-IV-9. The sampling locations are shown on Figure A-IV-8. The volume of bottom deposits in the areas sampled was estimated at 520,000 cubic yards. The samples were analyzed for volatile solids content and the analysis was supplemented by description of the sampling locations as well as visual observations of sample appearance and estimations of depth, length and width of bottom deposits. No supplemental biological survey information was available.

CRITICAL POLLUTANT LOADINGS

In order to assess or otherwise measure the environmental effect of pollutants on surface and groundwater adequate knowledge of pollutant loadings and concentrations is essential.

APPROACH

Therefore, critical pollutant loadings and concentrations, originating from sewage treatment plant effluents, are identified for key reference points on each watercourse for the present and future. These loadings and concentrations are developed for each of three different treatment postures: existing treatment, existing effluent standards, and ultimate treatment with present technology.

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
		*A	*B	*C						
1	Mundelein Sewage Treatment Plant @ 6.7 mi. Hawthorn Drainage Ditch	3'	1'	0	--	-	Recent San. Sewer Const. at T.P. rerouting discharge channel	as recd. Dry Ash	sediment in clay matrix, pebbles, putrid odor Brown color - otherwise unchanged Unchanged from dry condition	4.1
2	100' S. Mundelein T.P. @Soo Line R.R. Bridge & 6.7 mi. Hawthorn Drainage Ditch	8'	0.5'	0.1'	-	-	Small deposits in ditch bed Large gravel & tan sand	as recd. Dry Ash	Plant debri, sandy sediment, putrid odor, worms Brown color - otherwise unchanged Unchanged	5.6
3	1000' S. Libertyville T.P. @Elgin-Joliet & Eastern R.R. Bridge & 84.8 mi. Des Plaines River	50'	3'	N.A.	-	-	River bed frozen. Found soft spot of sand and gravel	as recd. Dry Ash	Mostly pebbles in clay matrix, sandy, putrid odor Unchanged Unchanged	3.6
4	500' S. Elgin-Joliet & Eastern R.R. Bridge & 84.7 mi. Des Plaines River	30'	2.5'	N.A.	-	-	River bed frozen, mostly sand & large gravel	as recd. Dry Ash	Sandy sediment, plant debri, small worms, putrid odor Brown color - otherwise unchanged Unchanged	1.7
5	2000' S. Great Lakes Naval Sta. @ Rockland Rd. Bridge & 39.6 mi. Skokie River	10'	1'	2'	-	-	Deposits black soft with Organic matter	as recd. Dry Ash	Black mud, oily odor, worms, euximic Unchanged Brown color of ashed clay sand mixture	10.7
6	1000' S. Rockland Road Bridge @39.4 mi. Skokie River	7'	1.5'	2'	1000' 3000'	2,700	Deposits depth varies from 1' to 3' probed bed to approx. 38.8 mi. mark. Depth 2'	as recd. Dry Ash	Plant debri, oily odor, sandy-clay and pebbles, worms in sediment Unchanged Brown color	8.1
7	2000' S. Deerfield T.P. @ County Line Rd. Bridge & 28.5 mi. W. Branch Chicago River	7'	1.5'	2.5'	-	-	Very soft dark black, and organic	as recd. Dry Ash	Very dark sandy-pebble sediment With cracking similar to dried sludge Brown color	2.2

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
		*A	*B	*C						
8	1000' ± N. U.S. 94 Bridge @28.2 mi. W. Branch Chicago River	12'	2'	1.5'	1500'	1,100	Same as Sample #7	as recd. Dry Ash	Sandy with clay matrix, small pebbles Unchanged Brown color	6.8
9	1100' S. Clavey Rd. T.P. @County Line Rd. & 29.6 mi. Skokie River	15'	1'	0.1'	-	-	Small pockets of deposits stream bed mostly gravel	as recd. Dry Ash	Sandy sediment odor of sewage, plant debri, worms Unchanged Unchanged	4.0
10	50' S. County Line Rd. Bridge @Intake of 48" ø Diversion Pipe 29.6 mi. Skokie River Botamic Gardens	10'	0.5'	0.5'	150'	-	Stream bed sand, gravel and pockets of deposits	as recd. Dry Ash	Plant debri, mostly grass, dark, oily odor, euximic Unchanged Brown color	9.4
11	150' S. 48" ø Intake Pipe in Botamic Gardens Lagoon	varies	4	N.A.	-	-	Lagoon bottom clay w/ traces of large gravel 8" ice	as recd. Dry Ash	Light brown mud, euximic condition beginning, grassy odor Sandy appearance Brown color	5.8
12	29.4 mi. Skokie River Botamic Gardens	8'	1.25'	N.A.	-	-	3" Ice bottom frozen, used hand auger sampler	as recd. Dry Ash	Light brown mud, septic odor, euximic Sandy appearance Brown color	8.1
13	29.4 mi. Botamic Gardens Lagoon	varies	12'	9'	-	-	Soft brownish deposits 10" ice	as recd. Dry Ash	Muddy clay, septic odor Unchanged Brown color	6.3
14	28.7 mi. Botamic Gardens Lagoon	varies	16'	1'	-	-	Same as sample 13 12" ice	as recd. Dry Ash	Oily black mud - euximic Grey color Brown color	6.5

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width *A	Depth Water *B	Depth Deposit *C	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
15	28.7 mi. Skokie River Botanic Gardens	17'	2'	0.25'	-	-	Ground frozen after 0.25' 12" ice	as recd. Dry Ash	Brown, sandy-pebble mixture-euximic Unchanged Brown color	3.0
16	Dundee Rd. Bridge @ 28.5 mi. Skokie River	45'	1'	1'-2'	--	-	Deposits varies, possibly hitting boulders	as recd. Dry Ash	Black mud, putrid odor, euximic Grayish green Brown color	12.4
17	150' S. Dundee Rd. Bridge 28.5 Skokie Lagoon #7	45'	2.25'	1'	-	-	Deposits same as sample 16	as recd. Dry Ash	Black mud, plant debri, putrid odor, euximic Grayish green Brown color	14.8
18	27.5 mi. W. Branch Skokie Lagoon #6	varies	3'	1.75'	-	-	Black organic deposit some fresh vegetation	as recd. Dry Ash	Black mud mixture, putrid, euximic Grayish green Brown color	7.3
19	27.5 mi. N. End Skokie Lagoon #6	100'	3.25'	2.5'	-	-	Same as sample #18 4" ice	as recd. Dry Ash	Black mud-sand mixture, live organisms (lavae, copepods) euximic Grayish green Brown color	7.4
20	27.2 mi. Skokie Lagoon #5 S. of Voltz Dam	varies	7.5	2'	-	-	Same as sample #18	as recd. Dry Ash	Black mud-sand mixture, putrid, euximic Grayish green Brown color	5.5
21	26.7 mi. Skokie Lagoon #4 N. Tower Rd.	120'	3.5'	2.5'	--	-	Probed to 2.5 refusal	as recd. Dry Ash	Black and brown mud mixture, plant debri, live organism, putrid, euximic Grayish green Brown color	7.5

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS	
		Width *A	Depth Water *B	Depth Deposit *C	Length Deposit	Volume Deposit C.Y.		COMMENTS	Volatile Solids %
22	2640' N. Tower R. @ 26.9 mi. W. Branch Skokie River, Skokie Lagoons	50'	3.5'	3.0'	-	-	Black, Heavy odor, very soft	as recd. Black mud mixture, copepods, sludge worms, putrid euximic Dry Grey Ash Brown color	9.6
23	Tower Rd. Bridge @26.2 mi. Skokie Lagoon #3	65'	4.7'	1.5'	-	-	Black organic deposit	as recd. Black mud mixture, blood worms, lavae, putrid euximic Dry Grey Ash Brown color	8.6
24	25.5 mi. Skokie Lagoon #2 50' N. Pine St. Dam	50'	3'	1.25'	-	-	Same as sample #23	as recd. Black brown mud-sand mixture, putrid, plant debri, euximic Dry Grey Ash Brown color	7.3
25	24.8 mi. Skokie Lagoon #1 100' N. Dam No. 1	70'	8'	3'	4.8 mi.	199,500	Very soft, black, and organic. 10" ice	as recd. Black mud mixture, copepods, putrid, euximic Dry Grey Ash Brown color	11.9
26	Fisher Rd. Bridge @56.6 mi. W. Branch DuPage River	8'	2'	0.75'	-	-	Gravel in middle of River	as recd. Oily skim on water layer, dark brown mud-sand mixture, putrid, euximic Dry Grey with oil spot Ash Brown color	8.1
27	Lake St(U.S. 20) Bridge @57.0 mi. W. Branch Du Page River	9'	1.25'	2'	2000	900	Very soft black deposit	as recd. Brown sand, light offensive odor Dry Brown Ash Brown color	8.5

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width *A	Depth Water *B	Depth Deposit *C	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
28	Lake St.(U.S. 20)@25.0 Mile Salt Creek Trib.	10'	0.5'	N.A.	-	-	Bottom frozen, used power auger for sample	as recd. Dry Ash	Large rocks, sand, putrid, euximic water Oil spot - grey Brown color	8.8
29	S. Lake St.(U.S.20)Bridge E-Pumping Sta. @23.5 mi. Salt Creek	20'	1.5'	N.A.	-	-	Bottom frozen, used hand auger sampler	as recd. Dry Ash	Brown, sand-mud mixture, stagnant odor Grey Brown color	5.0
30	North Ave.(U.S.64)Bridge @21.7 mi. Salt Creek	30'	2.25'	1'	-	-	Partly frozen	as recd. Dry Ash	Black, sand-mud mixture, putrid, large stones Black Brown color	4.3
31	North Ave.(U.S. 64) Bridge @48.7 mi. E. Branch DuPage River	11'	0.25'	2'	-	-	Very soft, organic, muck	as recd. Dry Ash	Black mud, pebbles, plant debri, putrid Black Brown color	7.1
32	Butterfield Rd. Bridge @42.6 mi. E. Branch DuPage River	16'	2.5'	1.75'	6.1 mi.	31,300	Probed to 1.75 ground firm with gravel	as recd. Dry Ash	Black, clay-mud mixture, euximic Black Brown color	6.4
33	Roosevelt Rd (U.S. 38) Bridge Frontage Rd (N) @17.2 mi. Salt Creek	60'	4.0'	3.0'	4.5 mi.	39,600	Large amount deposit by piers, depth varies	as recd. Dry Ash	Black mud, plant debri, sulfide odor, euximic Black Brown color	12.2
34	York Rd. Bridge @11.8 mi. Salt Creek	45'	3.0'	2.0'	5.4 mi.	132,000	Ice very thin deposit same as sample 33	as recd. Dry Ash	Black mud, small pebbles, sulfide odor, euximic Black Brown color	9.2

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
		*A	*B	*C						
35	42.6 mi. W. Branch Du Page River, between Gary-Roosevelt Rd.	75'	2'	N.A.	-	-	Sample frozen USD Hand Auger Sampler	as recd. Dry Ash	Sandy, pebbles, plant debri Brown Brown	2.1
36	Naperville Rd. Bridge @29.6 mi. E. Branch Du Page River	40'	2'	0.75'	-	-	Soft Black organic deposit	as recd. Dry Ash	Black mud, plant debri - euximic Black Brown	4.6
37	2.0 mi. Sawmill Creek Trib. @Eastwood Dr.	5'	0.5'	N.A.	-	-	Creek bed frozen	as recd. Dry Ash	Sand, gravel, putrid water layer, euximic Brown Brown	2.8
38	S. Frontage Rd. E. Cass Ave. @4.0 mi. Sawmill Creek Trib.	7'	1.25'	1'	-	-	Dark, soft deposit	as recd. Dry Ash	Sand, pebbles, putrid Brown Brown	4.6
39	S. Frontage Rd. E. Cass Ave. @4.5 mi. Sawmill Creek	8'	1.5'	N.A.	-	-	Creek bed frozen, mostly gravel	as recd. Dry Ash	Mud-clay mixture, plant debri, putrid Black Brown	3.4
40	Naperville Rd. Bridge @29.4 mi. W. Branch Du Page River	50'	8'	N.A.	-	-	River bottom frozen, large gravel, chopped 4 holes before getting sample @ Gage Station	as recd. Dry Ash	Sand, gravel, plant debri, putrid Black Brown	4.6
41	Plainfield Rd. @26.0 mi. Du Page River	75'	3'	N.A.	-	-	Creek bed frozen gravel	as recd. Dry Ash	Gravel, putrid water layer (Black) Black Brown	7.2
42	Black Rd. Bridge @12.0 mi. Du Page River	50'	2.5'	N.A.	-	-	Same as sample 41	as recd. Dry Ash	Gravel (pebbles) plant debri, putrid, little sediment Black Brown	6.3

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS	
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.		COMMENTS	Volatile Solids %
		*A	*B	*C					
43	Bramdon Rd. Bridge @13.1 mi. Des Plaines River	200'	4'	3'	-	-	Bottom varies	as recd. Black mud, gravel, putrid, plant debri, euximic Dry Black Ash Brown	13.6
44	Cass Ave. Bridge @4.5 mi. Hickory Creek	10'	0.5'	N.A.	-	-	Creek bed gravel and sand	as recd. Brown, clay-mud mixture, putrid Dry Grey Ash Brown	3.5
45	MSDGC North Side T.P. Howard St. @12.0 mi. North Shore Channel	35'	3'	2.5'	-	-	Very dark soft, strong odor	as recd. Grey-brown mud - putrid Dry Grey Ash Brown	6.1
46	Pratt Rd @11.0 mi. North Shore Channel	40'	5'	2'	1 mi.	16,500	Same as sample 45	as recd. Grey mud, plant debris, putrid, euximic Dry Grey Ash Brown	4.1
47	2600' S.W. of Stickney T.P. @24.0 mi. Chicago San. Ship Canal	150'+	25'	N.A.	-	-	To deep to probe. Large gravel	as recd. Highly putrid odor, gravelly sand, euximic Dry Black Ash Brown	6.0
48	Harlem Ave. @23.4 mi. Chicago San. Ship Canal	150'+	25'	N.A.	-	-	To deep to probe. Sample oily	as recd. Sandy mud mixture, plant debris, sulfide odor, euximic Dry Black Ash Brown	4.8
49	U.S. 12 & 20 @19.0 mi. Chicago San. Ship Canal	150'+	25'	N.A.	-	-	Same as sample 48 Oily smell	as recd. Large rocks, euximic water layer Dry Black Ash Brown	23.5

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA Width *A	Depth Water *B	Depth Deposit *C	Length Deposit	Volume Deposit C.Y.	FIELD OBSERVATION	LABORATORY ANALYSIS COMMENTS		Volatile Solids %
50	106th St. @2.5 mi. Calumet River	125' +	30'	N.A.	-	-	To deep to probe. Sample dark & oily	as recd. Dry Ash	Sand-mud mixture, putrid, euximic Black Brown	9.2
51	Thorrence Rd. @ 5.3 mi. Calumet River	125'+	30'±	N.A.	-	-	Same as sample #50 middle of River has clay & gravel sample taken 40' from east bank	as recd. Dry Ash	Sand, putrid, euximic Brown Brown	3.5
52	Chicago Rd. @19.6 mi. mouths of Thorn-Trib. Creeks	12'	2'	0	-	-	Sand and gravel	as recd. Dry Ash	Sand, putrid, euximic Brown Brown	2.6
53	Halsted (U.S.-1)@19.6 Thorn Creek Trib.	7'	1'	0	-	-	Creek bed frozen	as recd. Dry Ash	Gravel and sand, putrid, euximic Dark grey Brown	7.1
54	Halsted St. (U.S.-1)@0.9 mi. Butterfield Creek	13'	0.5'	0	-	-	Muck Deposits with gravel	as recd. Dry Ash	Black mud, putrid, plant debris euximic Dark grey Brown	2.2
55	U.S. 83 @14.4 mi. Thorn Creek N. of Glenwood	25'	2'	1.5'	-	-	Deposits in spots, large rocks and gravel	as recd. Dry Ash	Black mud-sand mixture, putrid, euximic Grey Brown	3.6
56	Cottage Grove Ave @ 14.0 mi. Third Creek-Deer Creek mouths	9'	0.66'	0.5'	-	-	Deposits in pockets, depth from 0.25' to 0.75' partially frozen	as recd. Dry Ash	Black mud-sand mixture, putrid, euximic Grey Brown	2.7

BOTTOM DEPOSITS & AQUATIC SURVEY

TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
		*A	*B	*C						
57	Joe-Orr Rd. @19.6 mi. Deer Creek	11'	2'	2'	-	-	Same as sample 56	as recd. Dry Ash	Black mud-sand mixture, putrid, plant debris euximic Grey Brown	9.7
58	Columbia Ave @11.8 mi. Grand Calumet W. Hammond Ind. T.P.	30'	3'	3'	-	-	Very soft, strong odor	as recd. Dry Ash	Black mud-sand mixture, putrid, euximic conditions beginning to appear Black Brown	8.7
59	U.S. 20 @13.1 mi. Grand Calumet, W. - East Chicago T.P.	40'	7'	3'	-	-	Depth deposits varies	as recd. Dry Ash	Black sediment composed of plant debri, mud, sand and sludge, putrid oily odor Black Brown	31.1
60	Ind. 912 @16.2 mi. Grand Calumet River	50'	14'	2'	4.4 mi.	91,800	Same as sample 59	as recd. Dry Ash	Sludge, mud, plant debri, highly putrid odor euximic Black Brown	17.1
61	U.S. 12 @18.3 mi. Grand Calumet River 2.5 mi. W. Gary T.P. Ind.	40'	3'	0.75'	-	-	Probe hit hard red cynders see sample analysis	as recd. Dry Ash	Black mud, sand mixture, some appearance of sludge, euximic Black Brown	6.9
62	State 249-Burns Harbor @35.1 mi. Little Calumet River	55'	9'	0	-	-	Sand and gravel (new bridge construction	as recd.	Sand, putrid	1.6

BOTTOM DEPOSITS & AQUATIC SURVEY

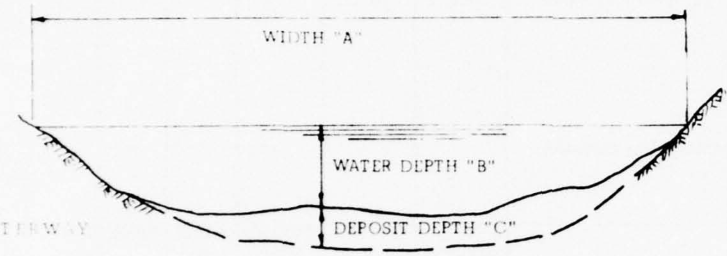
TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width *A	Depth Water *B	Depth Deposit *C	Length Deposit	Volume Deposit C.Y.			COMMENTS	Volatile Solids %
63	Madison St. @27.4 mi. Beaver Dam Ditch	9'	1.5'	0.75'	-	-	Depth of Deposits vary	as recd. Dry Ash	Appearance of undigested sludge, gases giving off scum on water layer Black Brown	12.7
64	Indiana St. @28.5 mi. Beaver Dam Ditch 1/4 mi. E. Crown Point T.P.	12'	1'	0.5'	1.1 mi.	1,400	Same as sample 63	as recd. Dry Ash	Mud, plant debri, gases given off, scum on water layer, putrid, euximic Grey Brown	4.4
65	Central Ave. @28.4 mi. Little Calumet River 1 mi. West - East Gary T.P.	30'	2'	N.A.	-	-	River bed frozen	as recd. Dry Ash	Clay-mud mixture plus small pebbles no distinctive odor Grey Brown	3.4
66	Ripley St. @4.2 mi. Deep River	60'	2.5'	0.5'	-	-	River bed frozen after 0.5' probe	as recd. Dry Ash	Black mud, sand mixture, putrid, euximic Grayish black Brown	2.2
67	37th St. @6.2 mi. Deep River	75'	2'	0.75'	-	-	River bed frozen in spots	as recd. Dry Ash	Clay-mud mixture, putrid, euximic Grey Brown	2.1
68	250 West St. @13.9 mi. Salt Creek, West Valparaiso	12'	1'	0.2'	-	-	Gravel and Clay in stream bed	as recd. Dry Ash	Plant-debri, scum, small pebbles, putrid Grey Brown	6.0
69	Joliet Rd. @16.1 mi. Salt Creek 1000' W. S.T.P. Valparaiso	10'	2'	0.2'	-	-	Rocky bottom	as recd. Dry Ash	Plant debri, scum, gases given off, putrid Grey Brown	2.9

BOTTOM DEPOSITS & AQUATIC SURVEY

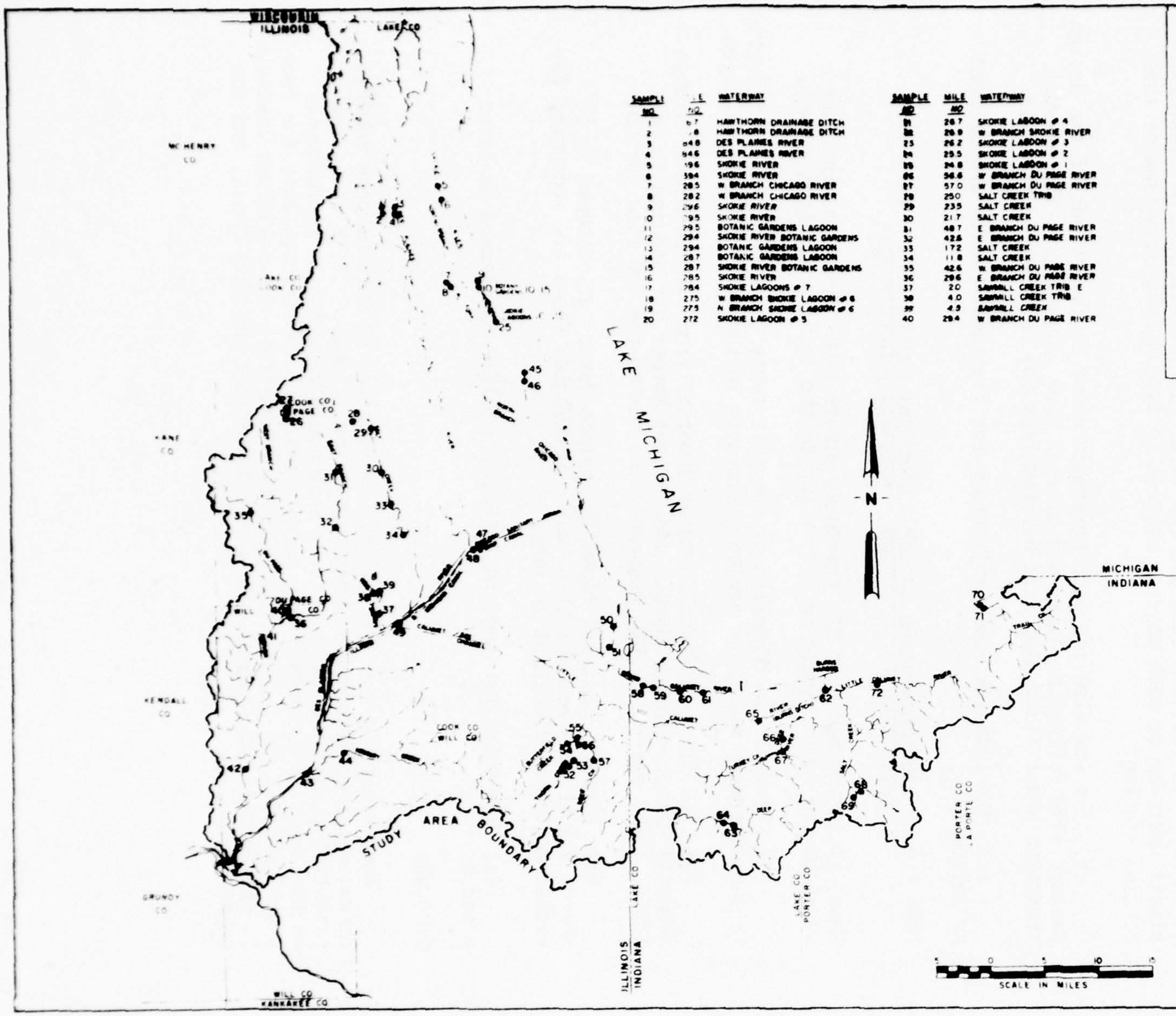
TABLE A-IV-9

Sample No.	LOCATION	WATERWAY DATA					FIELD OBSERVATION	LABORATORY ANALYSIS		
		Width	Depth Water	Depth Deposit	Length Deposit	Volume Deposit C.Y.				Volatile Solids %
		*A	*B	*C						
70	U.S. 12 @0.8 mi. Trail Creek 1 mi. North Michigan City T.P.	60'	12'	2.25'	-	-	Very soft yellow muck	as recd. Dry Ash	Appearance of sludge, gases given off, putrid euximic Grey Brown	14.2
71	6th St. @1.0 mi. Trail Creek 1/2 mi. West T.P.	30'	3'	1'	1056'	2,900	Muck w sand frozen	as recd. Dry Ash	Mud-clay mixture, putrid, euximic Black Brown	15.1
72	U.S. 20 @38.5 mi. Little Calumet River 1.2 mi. W. T.P.	27'	2.5'	1.5'	-	-	Clay and sand	as recd. Dry Ash	Mud-clay mixture, putrid, euximic Black Brown	5.8



TYPICAL WATERWAY

ESTIMATED TOTAL VOLUME DEPOSITS IN AREAS SAMPLED 520,000 C.Y.



SAMPLE NO	MILE NO	WATERWAY
1	6.7	HAWTHORN DRAINAGE DITCH
2	[illegible]	HAWTHORN DRAINAGE DITCH
3	64.8	DES PLAINES RIVER
4	64.6	DES PLAINES RIVER
5	19.6	SKOKIE RIVER
6	39.4	SKOKIE RIVER
7	28.5	W BRANCH CHICAGO RIVER
8	28.2	W BRANCH CHICAGO RIVER
9	29.6	SKOKIE RIVER
10	29.5	SKOKIE RIVER
11	29.5	BOTANIC GARDENS LAGOON
12	29.4	SKOKIE RIVER BOTANIC GARDENS
13	29.4	BOTANIC GARDENS LAGOON
14	28.7	BOTANIC GARDENS LAGOON
15	28.7	SKOKIE RIVER BOTANIC GARDENS
16	28.5	SKOKIE RIVER
17	28.4	SKOKIE LAGOONS # 7
18	27.5	W BRANCH SKOKIE LAGOON # 6
19	27.5	N BRANCH SKOKIE LAGOON # 6
20	27.2	SKOKIE LAGOON # 5

SAMPLE NO	MILE NO	WATERWAY
21	26.7	SKOKIE LAGOON # 4
22	26.9	W BRANCH SKOKIE RIVER
23	26.2	SKOKIE LAGOON # 3
24	25.5	SKOKIE LAGOON # 2
25	24.8	SKOKIE LAGOON # 1
26	56.6	W BRANCH DU PAGE RIVER
27	57.0	W BRANCH DU PAGE RIVER
28	25.0	SALT CREEK TRIB
29	23.5	SALT CREEK
30	21.7	SALT CREEK
31	40.7	E BRANCH DU PAGE RIVER
32	42.6	E BRANCH DU PAGE RIVER
33	17.2	SALT CREEK
34	11.8	SALT CREEK
35	42.6	W BRANCH DU PAGE RIVER
36	29.6	E BRANCH DU PAGE RIVER
37	2.0	SAWMILL CREEK TRIB E
38	4.0	SAWMILL CREEK TRIB
39	4.9	SAWMILL CREEK
40	29.4	W BRANCH DU PAGE RIVER

VICINITY MAP

FIGURE A-IV-8

SAMPLE NO	MILE NO	WATERWAY
41	26.0	DU PAGE RIVER
42	12.0	DU PAGE RIVER
43	13.1	DES PLAINES RIVER
44	4.5	HICKORY CREEK
45	12.0	NORTH SHORE CHANNEL
46	11.0	NORTH SHORE CHANNEL
47	24.0	CHICAGO SAN. & SHIP CANAL
48	23.4	CHICAGO SAN. & SHIP CANAL
49	19.0	CHICAGO SAN & SHIP CANAL
50	2.5	CALUMET RIVER
51	5.3	CALUMET RIVER
52	20.1	THORN CREEK
53	19.6	THORN CREEK
54	0.9	BUTTERFIELD CREEK
55	14.4	THORN CREEK
56	14.0	THORN CREEK & DEER CREEK
57	19.6	DEER CREEK
58	11.8	GRAND CALUMET RIVER
59	13.1	GRAND CALUMET RIVER
60	16.2	GRAND CALUMET RIVER
61	18.3	GRAND CALUMET RIVER
62	35.1	LITTLE CALUMET RIVER
63	27.4	BEAVER DAM DITCH
64	28.5	BEAVER DAM DITCH
65	28.4	LITTLE CALUMET RIVER
66	4.2	DEEP RIVER
67	6.2	DEEP RIVER
68	13.9	SALT CREEK
69	16.1	SALT CREEK
70	0.8	TRAIL CREEK
71	1.0	TRAIL CREEK
72	38.5	LITTLE CALUMET RIVER

CORPS OF ENGINEERS U.S. ARMY
CHICAGO DISTRICT

C-SELM WASTEWATER MANAGEMENT SURVEY STUDY

SAMPLE LOCATION MAP
BOTTOM DEPOSITS

BAUER ENGINEERING INC. CHICAGO, ILLINOIS

SHEET OF

(a) The base flow (that flow which does not have a treatment plant as its source) is zero at low flow conditions in Illinois. This assumption stems from the findings of the Minimum Hydrologic Flow inventory. The seven-day, ten-year low flow analyses are based on data taken some time ago. Since that time the base flow has decreased markedly. Increased mining of ground water, which is the major source of base flow, has caused the decrease.

There has been no obvious change in the base flow at low flow conditions in the State of Indiana. Thus the low flows identified were judged to be adequate for Indiana waterways, and the difference between the observed seven-day, ten-year low flow and the total flow contributed by treatment plants upstream of each control station is used as the base flow of that control station.

(b) The low flow for each treatment plant is two-thirds of the design average flow reflecting daily and diurnal flow variations. The average treatment plant flows used were derived from the inventoried STP data.

(c) The 1990 low flow projections for treatment plants are derived as follows:

$$\text{1990 flow} = \frac{\text{1990 population in TWP}}{\text{1970 population in TWP}} \times \frac{\text{1990 per capita flow}}{\text{1970 per capita flow}} \times \text{1970 flow}$$

Thus, it is assumed that all treatment plants would remain at the same location and would expand in proportion to the local population growth.

(d) There is no reduction of the pollutants due to natural purification in the waterways and there are no pollutants introduced from Lake Michigan.

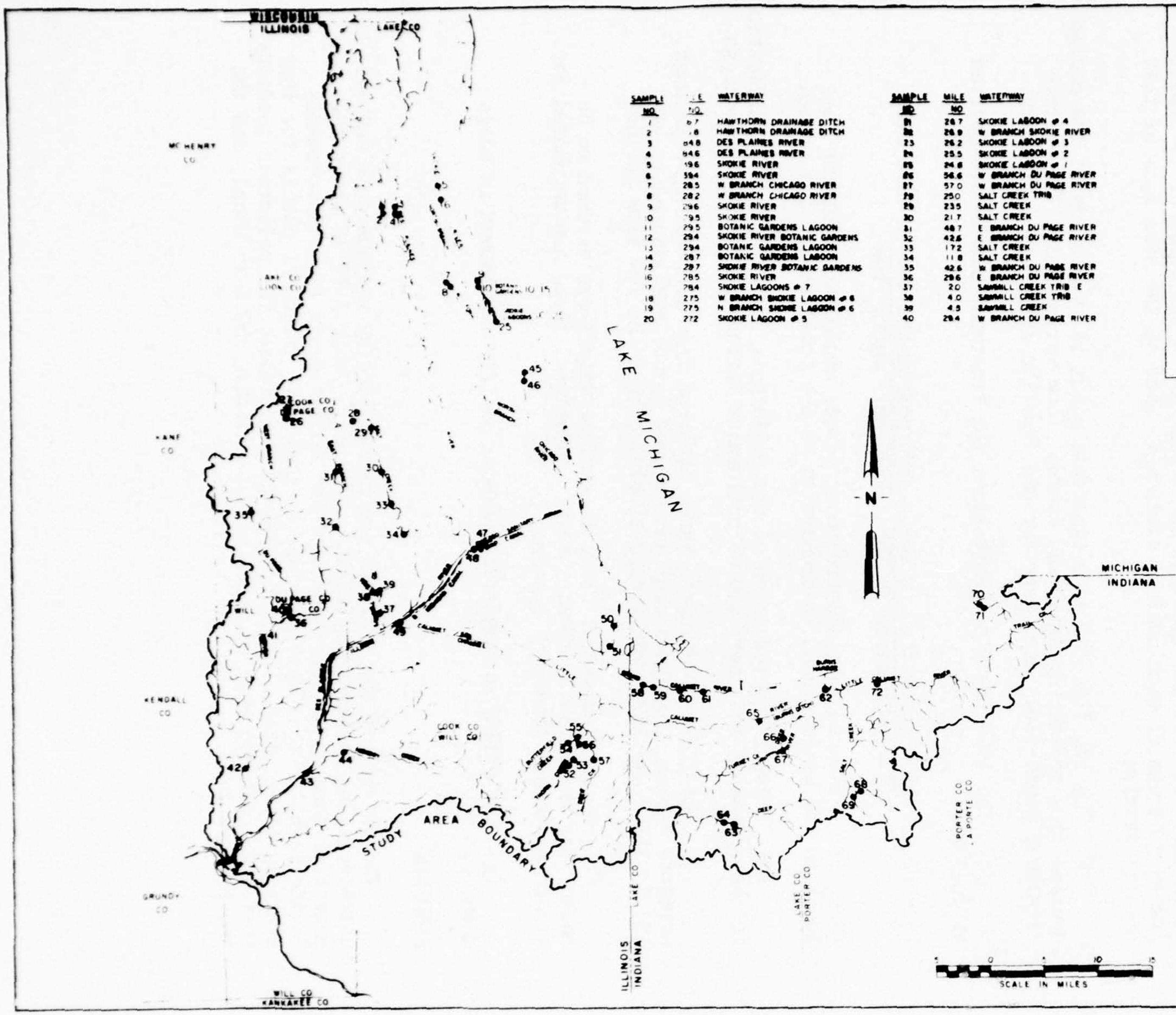
(e) The flows of dilution water diverted from Lake Michigan through Wilmette Harbor, Chicago Harbor and Calumet Harbor are assumed to be 137.3, 315.0 and 133.0 MGD, respectively, during the low flow period.

(f) Direct industrial flows to surface waters are assumed to be absent for the purposes of this task. Industrial flows are accounted for within municipal treatment systems.

(g) The existing standards effluent quality is assumed in cases a and c.

FINDINGS

The results of the analysis are categorized by various case numbers characterizing different effluent qualities. Table A-IV-10 shows the potential changes in water quality that would result from improvements in the level of treatment provided at municipal treatment plants for four stations (12-1, 12-2, 10-1, and 9-2) to demonstrate the pollutant loadings in the Calumet-Sag Channel, the Chicago Sanitary and Ship Canal, and the DesPlaines River.



SAMPLE NO	MILE NO	WATERWAY
1	6.7	HAWTHORN DRAINAGE DITCH
2	.8	HAWTHORN DRAINAGE DITCH
3	84.8	DES PLAINES RIVER
4	84.6	DES PLAINES RIVER
5	19.6	SKOKIE RIVER
6	39.4	SKOKIE RIVER
7	28.5	W BRANCH CHICAGO RIVER
8	28.2	W BRANCH CHICAGO RIVER
9	29.6	SKOKIE RIVER
10	29.5	SKOKIE RIVER
11	29.5	BOTANIC GARDENS LAGOON
12	29.4	SKOKIE RIVER BOTANIC GARDENS
13	29.4	BOTANIC GARDENS LAGOON
14	28.7	BOTANIC GARDENS LAGOON
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19	27.5	N BRANCH SKOKIE LAGOON # 6
20	27.2	SKOKIE LAGOON # 5

SAMPLE NO	MILE NO	WATERWAY
21	26.7	SKOKIE LAGOON # 4
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23	26.2	SKOKIE LAGOON # 3
24	25.5	SKOKIE LAGOON # 2
25	24.8	SKOKIE LAGOON # 1
26	56.6	W BRANCH DU PAGE RIVER
27	57.0	W BRANCH DU PAGE RIVER
28	25.0	SALT CREEK TRIB
29	23.5	SALT CREEK
30	21.7	SALT CREEK
31	48.7	E BRANCH DU PAGE RIVER
32	42.6	E BRANCH DU PAGE RIVER
33	17.2	SALT CREEK
34	11.8	SALT CREEK
35	42.6	W BRANCH DU PAGE RIVER
36	29.6	E BRANCH DU PAGE RIVER
37	2.0	SAWMILL CREEK TRIB E
38	4.0	SAWMILL CREEK TRIB
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VICINITY MAP

FIGURE A-IV-8

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51	5.3	CALUMET RIVER
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53	19.6	THORN CREEK
54	0.9	BUTTERFIELD CREEK
55	14.4	THORN CREEK
56	14.0	THORN CREEK & DEER CREEK
57	19.6	DEER CREEK
58	11.8	GRAND CALUMET RIVER
59	13.1	GRAND CALUMET RIVER
60	16.2	GRAND CALUMET RIVER
61	18.3	GRAND CALUMET RIVER
62	35.1	LITTLE CALUMET RIVER
63	27.4	BEAVER DAM DITCH
64	28.5	BEAVER DAM DITCH
65	28.4	LITTLE CALUMET RIVER
66	4.2	DEEP RIVER
67	6.2	DEEP RIVER
68	13.9	SALT CREEK
69	16.1	SALT CREEK
70	0.8	TRAIL CREEK
71	1.0	TRAIL CREEK
72	30.5	LITTLE CALUMET RIVER

CORPS OF ENGINEERS U.S. ARMY
CHICAGO DISTRICT

C-SELM WASTEWATER MANAGEMENT SURVEY STUDY

SAMPLE LOCATION MAP
BOTTOM DEPOSITS

BAUER ENGINEERING INC. — CHICAGO, ILLINOIS

SHEET OF

(a) The base flow (that flow which does not have a treatment plant as its source) is zero at low flow conditions in Illinois. This assumption stems from the findings of the Minimum Hydrologic Flow inventory. The seven-day, ten-year low flow analyses are based on data taken some time ago. Since that time the base flow has decreased markedly. Increased mining of ground water, which is the major source of base flow, has caused the decrease.

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(b) The low flow for each treatment plant is two-thirds of the design average flow reflecting daily and diurnal flow variations. The average treatment plant flows used were derived from the inventoried STP data.

(c) The 1990 low flow projections for treatment plants are derived as follows:

$$\text{1990 flow} = \frac{\text{1990 population in TWP}}{\text{1970 population in TWP}} \times \frac{\text{1990 per capita flow}}{\text{1970 per capita flow}} \times \text{1970 flow}$$

Thus, it is assumed that all treatment plants would remain at the same location and would expand in proportion to the local population growth.

(d) There is no reduction of the pollutants due to natural purification in the waterways and there are no pollutants introduced from Lake Michigan.

(e) The flows of dilution water diverted from Lake Michigan through Wilmette Harbor, Chicago Harbor and Calumet Harbor are assumed to be 137.3, 315.0 and 133.0 MGD, respectively, during the low flow period.

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FINDINGS

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TABLE A-IV-10 POLLUTANT LOADING FOR 1970 & 1990

Gaging Station	Basin	Year	Flow (cfs) Comp.	Flow (cfs) Obs.	BOD_5 (mg/1) case 1 / 4	BOD_5 case 2 / 5	BOD_5 case 3 / 6	NH_3-N (mg/1) Obs.	NH_3-N case 1 / 4	NH_3-N case 2 / 5	NH_3-N case 3 / 6	NO_3-N (mg/1) Obs.	NO_3-N case 1 / 4	NO_3-N case 2 / 5	NO_3-N case 3 / 6	PO_4-P (mg/1) Obs.	PO_4-P case 1 / 4	PO_4-P case 2 / 5	PO_4-P case 3 / 6
12-1	C.S.S.C.	1970	2368.92	7	14.1	2.5	2.1	17.0	12.0	12.0	0	0.7	0.7	0.7	1.4	5.5	5.6	5.6	0.007
		1990	2441.6		14.3	2.8	2.1		12.1	13.8	0		0.7	0.7	1.4		5.7	5.7	0.007
12-2	C.S.C.	1970	592.70	33	13.0	6.0	2.0	20.0	11.1	11.1	0	7.2	0.7	0.7	1.3	19.9	5.2	5.2	0.007
		1990	701.13		10.9	2.9	2.1		12.0	12.4	0		0.7	0.7	1.4		5.6	5.6	0.007
10-1	DP.R	1970	39.51	13	20.0	9.4	3.0	5.0	17.0	17.0	0	4.5	1.0	1.0	2.0	4.1	8.0	8.0	0.01
		1990	82.5	--	20.0	7.9	3.0	--	17.0	17.0	0	--	1	1.0	2.0	--	8.0	8.0	0.01
9-2	DP.R.	1970	3062.53	--	14.1	3.4	2.1	--	12.0	12.0	0	--	0.7	0.7	1.4	--	5.6	5.6	0.007
		1990	3343.4		14.6	3.1	2.2		12.4	12.8	0		0.7	0.7	1.5		5.8	5.8	0.007

NOTES

Assumptions used in each case

CASE NO	FLOW AT	Effluent pollutant loading (mg/1) BOD	NH_3-N	NO_3-N	PO_4-P	ASSUMPTIONS
1	1970	20	17	1	8	Typical secondary effluent quality is assumed.
2	1970	See Note 1	NA	NA	NA	Effluent quality equal to the existing standard is assumed.
3	1970	3	0	2	0.01	The best available treatment is assumed.
4	1990	20	17	1	8	Typical secondary effluent quality is assumed.
5	1990	See Note 1	See Note 2	NA	NA	Effluent quality equal to the existing standard is assumed.
6	1990	3	0	2	0.01	The best available treatment is assumed.

1. BOD -4, $DF < 1$ 10, $1 \leq DF \leq 2$ 20, $DF \geq 2$

2. Generally there are no standards applicable, except after 1977 effluent which discharges to the Chicago River System or the Calumet River System shall contain no more than 2.5 mg/1 of ammonia as N.

3. NA - No standards are applicable. Concentration typical of secondary effluent is assumed.

Abbreviations used are as follows:

C.S.C. ..... Cal-Sag Channel
C.S.S.C. ... Chicago Sanitary and Ship Canal
DP.R. ...... Des Plaines River

The observed pollutant concentrations are the maximum value ever observed.

The sources of water quality data are from "1970 Water Quality Network" by EPA, State of Ill. and from "Indiana Water Quality" by State Board of Health.

The source of low flow data is from the results of Task No. 1

These stations, shown on Figure A-IV-9, were added to the important gaging stations where low flow data are available (locations of these are also shown in the figure), and used as controlling stations.

ULTIMATE WATER QUALITY

Desirable water quality is relative and beyond constituent levels non-harmful to the environment the desirable characteristics depend to a great extent upon the ultimate use of the water.

APPROACH

The expanding and changing nature of our understanding of what comprises desirable water quality is discussed and ultimate water quality is characterized in terms of the best scientific evidence presently available (as required by various uses). Among the uses the following are discussed: healthy aquatic ecosystem, recreation, domestic and municipal water supply, agriculture, and industrial water use quality requirements, including cooling water.

The primary sources of information are professional experience supplemented with selected literature (42).

The results are presented in appropriate format consistent with the task description.

FINDINGS

Table A-IV-11 contains a summary of ultimate water quality goals in terms of the parameters defined for the C-SELM study as critical pollutants. For each of the parameters, the critical or controlling water use is given, as well as the source of the information.

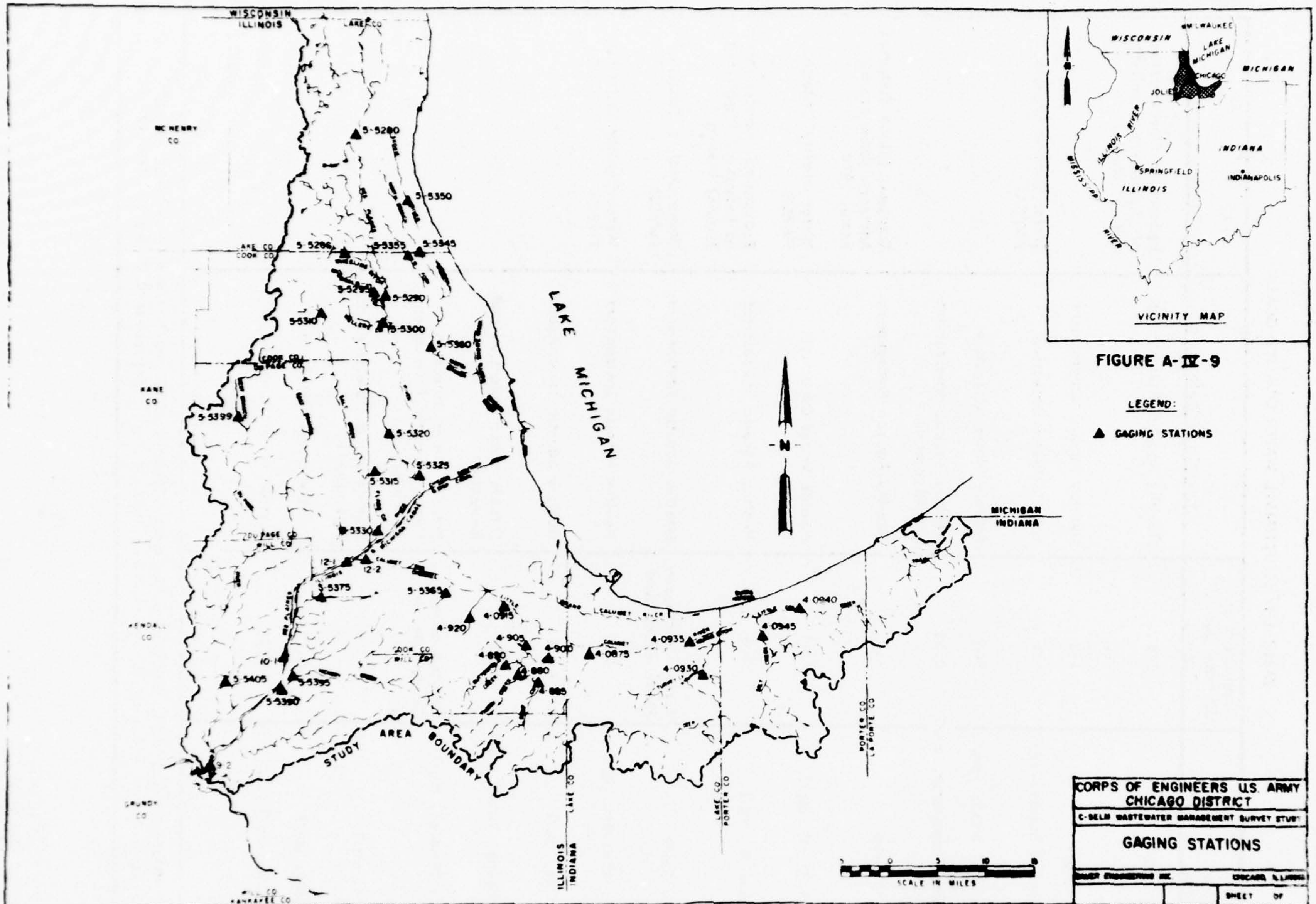

FIGURE A-IV-9

LEGEND:

▲ GAGING STATIONS

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C-SELM WASTEWATER MANAGEMENT SURVEY STUDY

GAGING STATIONS

SHEET OF

TABLE A-IV-11 ULTIMATE WATER QUALITY GOALS

Critical Pollutant	Controlling and Ultimate Quality Criteria	Controlling Water Use	Reference Source
COD, mg/l	3-6	Healthy Aquatic Environment	Background Concentration of Relatively Unpolluted Natural Waters
BOD, mg/l	1-2	Healthy Aquatic Environment	"
Suspended Solids, mg/l	NO	Potable Water Objective	Water Quality Criteria, FWPCA
Dissolved Solids, mg/l	500	Potable Water Objective	"
Soluble Phosphorus, mg/l	0.01	Healthy Aquatic Environment and Recreation	"
NH_3-N, mg/l	<1	Healthy Aquatic Environment	European Inland Fisheries Advisory Commission, Rome, 1970
NO_3+NO_2-N, mg/l	10	Potable Water Objective	Water Quality Criteria, FWPCA
Organic N, mg/l	<0.3	Healthy Aquatic Environment	Background Concentration of Relatively Unpolluted Natural Waters
Heat, Temp. °F	3 to 5°F Increase Above Background	Healthy Aquatic Environment	Water Quality Criteria, FWPCA
Oils, Greases, mg/l	<0.3	Healthy Aquatic Environment	Water Quality Criteria, FWPCA
Phenols, mg/l	<0.1	Healthy Aquatic Environment	"
Pathogens, Virus, mg/l	<0	Potable Water Objective and Recreation	"
Trace Metals*, mg/l	See Individual Criteria Below	Potable Water Objective, Healthy Aquatic Environment, Agricultural	"
Boron, mg/l	0.5-1.0	Potable Water Objective and Agricultural	"
Arsenic, mg/l	0.05	Potable Water Objective	"
Cyanide, mg/l	0.02	Potable Water Objective	"

*Aluminum-1.0 mg/l, Cadmium-0.005 mg/l, Chromium-0.02 mg/l, Copper-<1.0 mg/l, Lead-0.05 mg/l, Nickel -<0.1 mg/l, Zinc-4 mg/l, Iron-0.3 mg/l, Manganese-0.05 mg/l, Mercury-<0.

SECTION V: PLANNING OBJECTIVES

REGIONAL STUDY I

The Upper Mississippi River Comprehensive Basin Study completed in June, 1972, is a regional framework study applicable to the C-SELM area and is intended to guide the development of water and related land resources within the entire Upper Mississippi River Basin. The study provides a broad-brush analysis of water and related land resource problems and offers solutions to the problems. These solutions are the planning guidelines for achieving the "objectives" (22).

PLANNING OBJECTIVES

Various regional needs and problems were considered prior to identification of the particular problems applicable to specific subregions within the Upper Mississippi River Basin. Water Supply and Water Quality Management considerations included: water quality management, sustained streamflow, municipal water supply, industrial water supply, agricultural water supply, thermal power cooling water, hydroelectric power water supply. Other need considerations were: Navigation, Recreation (water-oriented and land-oriented), Fish and Wildlife, Aesthetic and Cultural Areas, Land Use, Related Land Resource Problems (flood and sediment damage, watershed protection and management), and various Health Aspects (public water supply systems, sewage treatment plant irrigation water quality, shellfish growing and harvesting waters, recreation area development, vector control, solid waste management, radiological health, and air pollution).

OBJECTIVES FOR THE CHICAGO METROPOLITAN AREA

The Chicago Metropolitan Area was concluded to be the worst problem area, or subregion, within the Upper Mississippi River Basin. Certain action programs were recommended for the area, including: assuring an adequate water supply (particularly in sections relying on groundwater), improving water quality, providing flood and sediment damage reduction, providing additional recreational opportunity, improving commercial navigation routes, and preserving the environment.

REGIONAL STUDY II

The Great Lakes Basin Commission's principal responsibility is, in the words of the Water Resources Planning Act of 1965, to:

> "Prepare and keep up to date...a comprehensive, coordinated, joint plan for Federal, State, interstate, local and non-governmental development of water and related resources: Provided, that the plan shall include an evaluation of all reasonable alternatives...and may be prepared in stages."

The study orientation is very similar to that of the Upper Mississippi River Comprehensive Basin Study, which is to identify developments to satisfy needs and solve problems by defining planning goals or objectives within a specified region. The study will be completed in February 1974. The Chicago Metropolitan Area is a subregion included within the study area.

The background information phase of the study is about completed; the plan formulation appendix, which will require some additional time, will be the final segment of the report. Some specific planning objectives for the Chicago Metropolitan Area have been tentatively agreed upon (23). The objectives for the Chicago Metropolitan Area include, but are not limited to: providing additional recreational opportunity, assuring adequate groundwater supply, improving water quality, providing flood reduction, and preserving the environment.

PLANNING OBJECTIVES DEFINED BY REGIONAL COMMISSIONS

The incorporation of development policies established by the Northeastern Illinois Planning Commission (NIPC) and the Lake-Porter County Regional Transportation and Planning Commission (LPCRTPC) will guarantee a reasonable pattern of development for the C-SELM study area. Both planning commissions encourage growth within land development corridors with convenient access to adequate transportation, public and private services, and other facilities and services. The spaces between the corridors would be predominantly in open space uses, such as recreation parks, golf courses, cemetaries, agriculture or the like.

THE COMPREHENSIVE GENERAL PLAN OF NIPC (24)

(a) <u>Residential Policies</u>

1. Housing suitable for all family sizes and income levels should be available to meet consumer demands within each developing sector of the six-county area.

2. Intensive residential developments including apartments, townhouses, and small homes should be located within development corridors close to mass transportation and business centers.

3. The possible role of "new cities" should be analyzed in terms of their potential for relieving growth pressures on existing suburban communities, their impact on the central city and other advantages and disadvantages.

4. The housing market in all parts of the area should operate without discrimination due to national origin, race or religion.

5. Every effort should be made to improve the quality of existing housing and to maintain a high standard for new construction.

(b) Open Space Policies

1. Large permanent areas of open space should be maintained between each of the several development corridors.

2. Major open spaces and especially regional parks (including State parks and county forest preserves) should be located where the several benefits of conserving plant, animal, water, air, mineral, esthetic and historical resources may be realized in combination.

3. Lands unsuited for intensive development due to flooding, unstable soil conditions, or where the provision of essential public services and facilities is difficult, should be maintained in suitable open space use.

4. Future development along the Lake Michigan shorelines, and other lakes, rivers and streams should make provision for the maximum use of these areas for public recreation.

(c) Transportation Policies

1. The construction of regional transportation facilities should be used as an important means of shaping the entire land development pattern of the area.

2. Provision for shared expressway and rail facilities or closely parallel rail and expressway routes should be continued so that within the development corridors there will be a choice of travel mode.

3. More opportunities for interchange should be established within the rail network and between rail and road facilities.

(d) Policies for Regional Centers

1. New regional shopping centers should be located within development corridors with direct pedestrian access to public transportation facilities.

2. New major centers of employment should be located on sites within development corridors.

3. New, intensively used public and private institutions and centers for health, education, recreation, or cultural activities should be located within development corridors on sites convenient to mass transportation facilities.

4. Sites meeting the above location criteria but currently occupied by obsolete, vacant or dilapidated structures should be rehabilitated or redeveloped.

(e) Natural Resource Policies

1. Urban development should not exceed the capabilities of the natural resources. Such factors as water supply, drainage, stability of soils, and the capacity of the land, air, and water to absorb waste materials safely should be given prime consideration in development decisions.

2. Intensive urban development should be directed so as to avoid flood plains, protect ground water deposits, and preserve lands particularly suited for multi-purpose resources management programs.

3. Land specially suited for valley or upground reservoir use should be set aside for such use. Certain streams and other water areas should be preserved in a natural state, even protected from treated waste disposal use.

4. Special steps should be taken to protect areas containing valuable sand, gravel and limestone deposits from intensive urban development until the deposits have been fully exploited. The appropriate reuse of such lands after the resource has been depleted should be planned in advance.

5. Immediate steps should be taken to reserve suitable lands for present and future refuse disposal needs and to plan the ultimate reuse of these lands.

6. All available means should be used to conserve water resources and to improve and maintain the quality of the region's air and water resources.

COMPREHENSIVE PLAN FOR THE LAKE-PORTER REGION, INDIANA (7)

(a) Residential Policies

1. Housing suitable for all family sizes and income levels should be available to meet consumer demands within each sub-region of the eight-county area.

2. Intensive residential developments including apartment and townhouses should be located close to mass transportation and business centers.

3. The possible role of "new cities" should be analyzed in terms of their potential for relieving growth pressures on existing suburban communities, their impact on the central city, and other advantages and disadvantages.

4. The housing market in all parts of the urban area should operate without discrimination due to national origin, race or religion.

5. Every effort should be made to improve the quality of existing housing and to maintain a high standard for new construction.

(b) Open Space Policies

1. Large permanent areas of open space should be maintained between intensive development areas.

2. Major open spaces and especially regional parks (including state parks and county forest preserves) should be located where the several benefits of conserving plant, animal, water, air, mineral, aesthetic and historical resources may be realized in combination.

3. Lands unsuited for intensive development due to flooding, unstable soils conditions, or where the provision of essential public services and facilities is difficult, should be maintained in suitable open space use.

4. Future development along the Lake Michigan shoreline, and other lakes, rivers and streams should make provision for the maximum use of these areas for public recreation.

(c) Regional Centers Policies

1. New regional shopping centers should be located within intensive development areas with direct pedestrian access to public transportation facilities.

2. New major centers of employment should be located on sites within intensive-development areas.

3. New, intensively-used public and private institutions and centers for health, education, recreation, or cultural activities should be located within intensive-development areas on sites convenient to mass-transportation facilities.

4. Sites meeting the above location criteria, but currently occupied by obsolete, vacant or dilapidated structures, should be rehabilitated or redeveloped.

(d) Transportation Policies

1. The construction of regional transportation facilities should be used as an important means of shaping the entire land-development pattern of the region.

2. Provision for shared expressway and rail facilities or closely parallel rail and expressway routes should be continued so that within intensive-development areas there will be a choice of travel mode.

3. More opportunities for transfer should be established within the rail network and between rail and road facilities.

(e) Natural Resource Policies

1. Urban development should not exceed the capabilities of the natural resources. Such factors as water supply, drainage, stability of soils, and the capacity of the land, air and water to absorb waste materials safely should be given prime consideration in development decisions.

2. Intensive urban development should be directed so as to avoid flood plains, protect ground water deposits, and preserve lands particularly suited for multi-purpose resources-management programs.

3. Land specially suited for valley or up-ground reservoir use should be set aside for such use. Certain streams and other water areas should be preserved in a natural state, even protected from treated waste disposal use.

4. Special steps should be taken to protect areas containing valuable sand, gravel and limestone deposits from intensive urban development until the deposits have been fully developed. The appropriate reuse of such lands after the resource has been depleted should be planned in advance.

5. Immediate steps should be taken to reserve suitable lands for present and future refuse disposal needs and to plan the ultimate reuse of these lands.

6. All available means should be used to conserve water resources and to improve and maintain the quality of the region's air and water resources.

PLANNING OBJECTIVES - POTENTIAL LAND TREATMENT AREAS (BY COUNTY)

Some of the alternative wastewater management strategies will rely on the land treatment or "living filter" technology. A soils data survey was conducted by our technical contractor to determine what areas nearby or within the C-SELM area would be suitable for incorporation into the land treatment system. Several counties adjacent or near to C-SELM have the type of soils required. These counties include: McHenry, Kendall, Grundy, Kankakee, Will and Iroquois Counties in Illinois, and Newton, Pulaski, Starke, and Jasper Counties in Indiana. Since the land treatment system will effect land-use in the area if incorporated, some attention must be directed toward the plans for the counties; in particular, any available land-use forecasts and planning objectives. Unfortunately, land use forecasts for areas exogenous to the C-SELM area are general. The following paragraphs identify available information. A more detailed analysis of these areas would be necessary should a land treatment system be recommended for implementation. Available data sources have been referenced; additional non-referenced data represent conclusions drawn from formal and informal contacts with appropriate planning agencies in the area.

INDIANA COUNTIES (NEWTON, STARKE, PULASKI, JASPER)

Since all of the counties which may be involved in the land treatment system fall within Indiana Planning Region No. 1, planning objectives established by the Lake-Porter County Regional Transportation and Planning Commission (LPCRTPC) will be extrapolated to include these counties. The LPCRTPC has not broadened its geographic jurisdiction to include the five additional counties in the Northwestern Indiana planning area. However, LPCRTPC has been under pressure to broaden its geographic jurisdiction and may do so.

ILLINOIS COUNTIES (McHENRY, KENDALL, GRUNDY, KANKAKEE, WILL AND IROQUOIS)

McHenry County

Membership in the Northeastern Illinois Planning Commission (NIPC) usually implies that the planning objectives established by NIPC are accepted as representative of each member county. However, recent meetings with McHenry County Planning Commission personnel have brought out differences in planning philosophy at the working level. Although the general planning objectives of NIPC are not regarded as invalid, there are particular aspects within each county which are undoubtedly unique. For example, the development philosophy of NIPC indicates a strong relationship of growth to transportation corridors. It is interesting to note that urban-related growth in McHenry County should occur in areas already slated for urban development; (e.g. those areas with sewers, streets, communication lines). This growth policy has been adopted by the McHenry County Planning Commission.

Iroquois County

The Iroquois County Regional Planning Commission will identify goals and policies for at least the following items: housing, business, natural resources, and aesthetics of the region. Iroquois County completed a planning study in 1972 which defined housing and solid waste disposal planning objectives (25). Existing and projected demand for housing should not require an intensive home building program at this time. However, the County should take appropriate steps to satisfy at least the existing demand as soon as possible. Identification of a specific set of housing goals should be accomplished in 1973; the information is not available to date.

Solid waste disposal methods involve collection and transport to a volume reduction process or to a landfill area. The landfill method is the recommended method of disposal.

Kendall County

The Kendall County Regional Planning Commission prepared an Interim Report in February, 1972 (26). The report recommended a development plan for the County consisting of four elements: land use plan, transportation plan, community facilities plan, open space and recreation plan. The regional land use plan is oriented toward the year 2000. Three basic planning objectives are highlighted: regulation of land use, protection for structural safety and against fire hazards, and protection of public health. The following criteria are used:

Residential Areas

1. Residential uses should be located in neighborhood environments, free from noise, odor, dirt, and heavy traffic.

2. Zoning for residential use should recognize that a healthy living environment requires protection from commercial and industrial uses.

3. Land overcrowding should be avoided in order to maintain stable neighborhoods, prevent problems of congestion, preserve a desirable degree of openness and attractiveness, and to discourage the blighting influence of over-used property. Multiple family use should be permitted where adequate open space and facilities can be provided.

Central Commercial

1. The development of attractive, efficient and functional business areas will be accomplished by establishing adequate but limited areas for the business uses, encouraging diversification of available goods and services, discouraging scattering of appropriate central district functions, and encouraging the maximum use of older, stable areas through the rebuilding of obsolete structures.

2. Relationships between residential, commercial and industrial uses should be improved, by prohibition of conflicting land uses and by elimination of nuisance characteristics.

3. New business uses will provide adequate parking and loading facilities for their operations, including employee parking. Existing business areas should jointly develop off-street parking facilities to provide greater attractiveness to reduce traffic congestion.

Outlying and General Commercial

1. Strip-type commercial development will be discouraged but, where permitted, should be controlled with adequate off-street loading areas and combined street entrances.

2. Neighborhood shopping areas should be planned in growth areas. These centers can provide convenience goods for a limited segment of the population, catering to both walk-in and automotive traffic. These centers should be located with careful consideration of traffic patterns, surrounding land uses, and trade areas.

3. If and when growth demands, a larger shopping center might be developed. This center should have controlled access to a major traffic artery, with well-planned parking areas and circulation patterns.

Industrial Areas

1. Areas with good rail and highway access will be preserved for future industrial development.

2. Existing industries should be encouraged to consider their future expansion needs, perhaps making vacant lands available for new uses.

3. Establishment of industrial districts, providing sites and facilities, and possibly shell buildings should be encouraged through utility extension policies, zoning and subdivision controls, and local financing agencies.

4. Industries should provide adequate off-street parking and loading space for their operations. Circulation through minor residential streets should be avoided, with controlled access to major highways.

Open Space Standards

1. To provide adequate space for the enjoyment of recreation.

2. To enhance the living environment of our urban and suburban areas.

3. To provide a measure of the required land which should be provided to meet the needs of the present population.

4. To establish a goal for the people and the government to serve the future population.

5. To provide a quantity of needed land within given communities and areas of the county as a basis for programming the acquisition and development of needed open space and recreational facilities.

SECTION VI: PLANNING RESTRICTIONS FOR WATER MANAGEMENT

Certain institutional restrictions on water management in the C-SELM area are of interest to long-range water resource management planners. Of particular concern is the restricted diversion of water from Lake Michigan in the Illinois portion of the study area.

RESTRICTIONS PLACED ON USE OF LAKE MICHIGAN WATERS

Indiana must return all waters diverted from Lake Michigan for its domestic usage; quality restrictions are applied to the returned waters. Illinois diverts water from Lake Michigan down the Illinois Waterway; the amount of this diversion is restricted to 3,200 cfs. According to the U. S. Supreme Court Decision of 12 June 1967 (43), (in the case of Wisconsin et al vs. Illinois et al.; Michigan vs. Illinois et al,; New York vs. Illinois et al; and Illinois vs. Michigan et al): "It is ordered, adjudged, and decreed that:

> The State of Illinois and its municipalities, political subdivisions, agencies, and instrumentalities, including among others, the cities of Chicago, Evanston, Highland Park, Highwood and Lake Forest, the villages of Wilmette, Kenilworth, Winnetka, and Glenco, the Elmhurst-Villa Park-Lombard Water Commission, the Chicago Park District and the Metropolitan Sanitary District of Greater Chicago, their employees and agents and all persons assuming to act under their authority, are hereby enjoined from diverting any of the waters of Lake Michigan or its watershed into the Illinois Waterway, whether by way of domestic pumpage from the lake the sewage effluent derived from which reaches the Illinois Waterway, or by way of storm runoff from the Lake Michigan watershed which is diverted into the Sanitary and Ship Canal, or by way of direct diversion from the lake into the canal, in excess of an average for all of them combined of 3,200 cubic feet per second..."

THE MULTI-GOVERNMENT STRUCTURE

The major obstacles to institutional modification within the C-SELM area are the complexity of the governmental structure which exists within the area and the public attitude towards regionalism.

ILLINOIS

Illinois has more local government units than any other state and the number of these political units is greatest in the state's six northeastern counties. The sheer number of counties, townships, municipalities and special districts makes any attempt at institutional modification complex and difficult from a political standpoint.

Furthermore, there is a new movement towards home rule within Illinois. A new Constitution approved in 1970 institutes the home rule concept in Illinois and grants local governments wide authority to exercise power and perform functions relating to local affairs. Although there is legislation in Illinois which allows planning and wastewater management at the regional level, the new Constitution demonstrates that there is a strong support for home rule. This belief could make implementation of a regional plan difficult.

Another critical factor which must be faced if existing institutional arrangements are to be modified, is the public attitude towards regional institutions. An example of this attitude is the opposition towards NIPC from those who envision the commission as a possible super government threatening local autonomy. Although NIPC is limited to an advisory role, an organization (Save the Suburbs) dedicated to fighting NIPC has sprung up in the suburbs in the North Shore area. Furthermore, bills aimed at abolishing NIPC are introduced at almost every session of the Illinois legislature.

Opposition to regional government or regional planning is not restricted to the C-SELM Area alone, however. In February 1972, the Central Illinois Mayors' Association adopted a resolution asking the General Assembly to take away the Illinois Pollution Control Board's power to levy fines and issue cease and desist orders. The Association believes that these powers should be given to the circuit courts, presumably because the courts are more in tune to local needs and interests.

INDIANA

Although Indiana law provides for as many types of local governments as does Illinois law, the number of local governments is not as great in Indiana. Furthermore, Indiana is not a home-rule state and therefore local governments in Indiana are not as independent as is the case in Illinois.

Also of significance is the fact that until recently, LPCRTPC has not been involved in studying the regional wastewater problems of Northwestern Indiana. At the same time, LPCRTPC has not broadened its geographic jurisdiction to include the five additional counties in Northwestern Indiana which are within the State Planning and Development Region 1. However, LPCRTPC has been under pressure to broaden its geographic jurisdiction.

INTERSTATE

There are two critical factors which stand as obstacles to institutional modification and which are a result of the interstate nature of the

C-SELM area. The first critical factor results from the fact that the C-SELM study area comprises portions of two states and therefore may require the creation of a bi-state regional agency.

Because Indiana and Illinois have separate political, governmental and economic systems there could be problems in forming an institution with authority to act in both states.

The second critical factor is of a legal nature and involves the compact clause of the U.S. Constitution. The compact clause (Article I, section 10, clause 3) provides that "No state shall without the consent of Congress.... enter into any agreement with another State or with a foreign power" (65). The compact clause does not apply to a matter which is of local concern only. For example, an interstate agreement to engage in comprehensive planning would probably not require Congressional approval as long as the agreement did not attempt to make plans binding upon the participating members or the federal government. On the other hand, consent probably would be required in the case of an agreement to implement an interstate wastewater treatment plan because of the Federal interest in pollution control. Evidence that such an agreement would require the approval of Congress is furnished by Title 33 USC Section 1154 (b), which reads as follows (66):

> "The consent of the Congress is hereby given to two or more States to negotiate and enter into agreements or compacts, not in conflict with any law or treaty of the United States, for (1) cooperative effort and mutual assistance for the prevention and control of water pollution and the enforcement of their respective laws relating thereto, and (2) the establishment of such agencies, joint or otherwise, as they may deem desirable for making effective such agreements and compacts. No such agreement or compact shall be binding or obligatory upon any State a party thereto unless and until it has been approved by the Congress."

FRAGMENTATION OF MANAGEMENT ACTIONS (PLANNING VS. IMPLEMENTATION)

At present, there are several regional institutions in the C-SELM area, but none has sufficient authority and jurisdiction to effectively control the operation of a wastewater management system for the entire area. At the interstate level, the Interstate Planning Committee is authorized to consider all planning and development problems affecting the Chicago-Gary area but has no regulatory or enforcement authority. At the regional level, the Northeastern Illinois Planning Commission (NIPC) and the Lake Porter County Regional Transportation Commission (LPCRTPC) have comprehensive planning authority but no power to implement plans. Both Illinois and Indiana have regulatory agencies at the state level. In Illinois, the Illinois Pollution Control Board and the Environmental Protection Agency regulate treatment facilities and promulgate water quality standards. The Indiana Stream Pollution Control Board and Environmental Management Board perform similar functions in that state.

In order for these regional planning institutions to fulfill the requirements of regionalization several modifications would be necessary. First, there is a need to develop uniform objectives for wastewater management in the Illinois and Indiana portions of the C-SELM area and to coordinate enforcement of these standards. This could be accomplished by an interstate agreement between state regulatory agencies. Second, regional planning agencies need authority to implement regional water and land resource plans or to coordinate the implementation of plans by local institutions. If local agencies cannot be required to coordinate the planning, construction and operation of their facilities at the regional level, then implementation of any technical alternative will be difficult.

SECTION VII: CURRENT AND PLANNED WATER MANAGEMENT ACTIVITIES

CURRENT POLLUTION ABATEMENT OPERATIONS

The existing municipal wastewater treatment plant operating data are presented in Table A-VII-1. Treatment of municipal waste is secondary in almost all cases, typically resulting in a 85-90% reduction of the biochemical oxygen demanding (BOD) waste and suspended solids (SS) entering the system. The Table is based on a compilation of data from several sources including treatment plant operating reports on file with the Indiana State Board of Health (44), 1970 annual operating reports for the Metropolitan Sanitary District of Greater Chicago (MSDGC) (45) and Bloom Township Sanitary District, the Northeastern Illinois Commission wastewater plans, State of Illinois Sanitary Water Board's 1970 data book on wastewater treatment works (46) and private correspondence with treatment plant officials. Table A-IV-7 summarized existing municipal wastewater treatment facilities.

POLLUTANT SOURCES

Outfalls in the study area are of three types: Storm water, municipal sewage, and industrial waste. Although the current trend is towards separation of storm and sanitary sewers, most of the storm water and sanitary sewers in the study area are combined with sanitary waste sewers. Indicative of the magnitude of the problem caused by the combined sewers is the vast number of overflow points. For example, there are over 400 overflow points from the 300 sq. mi. area of combined sewers in the MSDGC system (1). The combined sewers spill their contents whenever the combined flow of waste and storm water exceed the capacity of the sewer. The flow in excess of sewer capacity is released untreated to the lake and streams, accounting for at least 50 percent of the pollutant load to the Waterway (MSDGC estimate).

The October flood of 1954 is an extreme example of the pollution that can result from combining storm water and sanitary sewers. In 47 hours, seven inches of rainfall caused many of the local streams to overflow their banks. Flow at Lockport averaged 24,000 cfs for 43 consecutive hours. Threats of additional flooding and consequential damage in downtown Chicago necessitated opening the locks to Lake Michigan to relieve the swollen Chicago River. A sewage-rainfall-runoff flow of 8,000 cfs for 4 hours was released to Lake Michigan.

Although present policy is to release overflows at Lockport, release of polluted waters to the Lake has occurred on seven occasions since the 1954 flood. This purposeful release is necessitated whenever the hydraulically overtaxed Rivers and Canals begin to swell out of their banks and spill into adjacent communities. A typical combined sewer area is

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	ESTIMATED WASTE LOADINGS (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria (MPN/100 ml)	Comments
DES PLAINES RIVER DRAINAGE BASIN																					
Grayslake	Mi 15	X			X		[illegible]	1.6	0.45	0.09	0.7	1501	94	225	75	64	8	4	30	< 400	
Grandwood Park U.C.	Mi 8.5	X			X		[illegible]	NA	0.12	NA	0.2	400	25	60	20	17	2	1	8	< 400	
Lindenhurst Water Co.	N. Mi 5.6, Des 102	X			X		3.0	2.2	0.3	0	0.25*	1000	63	150	50	43	5	3	20	< 400	Expending plant to 0.5 MGD Capacity
Gages [illegible]	[illegible]	X			X		4.[illegible]	[illegible]	[illegible]	0	0.6	1368	85	205	68	58	7	3	27	< 400	
Vickory Manor Serv.	Dt, Bul 1, Des 91.4	X			X		[illegible]	NA	0.02	NA	0.1	67	4	10	3	3	<1	<1	1	< 400	
LCPWD Countryside Manor	Des 90	X			X		[illegible]	[illegible]	0.1	0	[illegible]	334	21	50	17	14	2	1	7	< 400	
Libertyville, S.	Des 84.5	X			X		[illegible]	14.0	1.0	0.1	2.0	3336	209	500	167	142	17	8	67	< 400	*
LCPWD - Sylvan Lake	In 10.9	X			X		0.6	0.3	0.06	0	0.1	200	13	30	10	9	1	1	4	< 400	
Mundelein	Haw 7.4	X			X		[illegible]	[illegible]	1.44	0.2	2.2	4804	300	721	240	204	24	12	96	< 400	
LCPWD - Vernon Hills	Haw 4, In 3, Des 79.6	X			X		[illegible]	[illegible]	0.07	0	0.12	233	15	35	12	10	1	1	5	< 400	
Lincolnshire	Des 79	X			X		2.0	2.0	0.2	0	0.26	667	42	100	33	28	3	2	13	< 400	
LCPWD - S.E. Sew. Wks.	Ap 0.4, Des 76.3	X			X		[illegible]	[illegible]	0.1	0.01	0.1*	334	21	50	17	14	2	1	7	< 400	Plans to increase capacity to 2.0 MGD
Chevy Chase S. & W. Co	Des 75.8	X			X		0.26	NA	0.03	NA	0.03	100	6	15	5	4	1	<1	2	< 400	
MSDGC - Barrington Woods	Bu 11.7	X			X		0.6	NA	0.06	NA	0.1	200	13	30	10	9	1	1	4	< 400	
Long Grove	Bu 9.	X			X		*	0.1	0.04	0	0.04	133	8	20	6	6		<1	3	< 400	Services Antique Business Dist., School, and a few homes
Buffalo Grove	Bu 5.3.	X			X		NA	NA	NA	NA	0.08										
Buffalo Grove U.C.	Bu 1, Des 72.5	X			X		6.0	3.0	0.75	0.1	0.75	2502	156	375	125	106	13	6	50	< 400	

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	Estimated Waste Loadings (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria (MPN/100 ml)	Comments
Subtotal For Des Plaines R prior to confluence with Salt Creek							49.58	32.7	5.15	0.5	7.73	17180	1074	2577	859	730	86	43	344	<400	
Salt Ck. Sub-drainage Basin																					
Roselle	Sp 6.5,	X			X		6.0	2.5	0.7	0.1	1.0	2335	146	350	117	99	12	6	47	<400	Plans to exp. 1.7 MGD Act sludge w/existing trickling filter
Bloomingdale	Sp 4.8	X			X		1.5	1.2	0.15	0	0.2	500	31	75	25	21	3	1	10	<400	
DCDPW - Nordic Park	Sp 2.5	X			X		0.28	NA	0.03	NA	0.1	100	6	15	5	4	1	<1	2	<400	
Itasca	Sp 0.5, Sa 28.2	X			X		5.0	8.0	0.5	0.13	0.6	1668	105	250	84	71	9	4	34	<400	
Wood Dale	Sa 27.6	X			X		4.5	2.8	0.45	0.02	1.0	1501	94	225	75	64	8	4	30	<400	
Bensenville	Ad 10.	X			X		11.2	6.5	1.1	0.2	2.0	3670	229	550	183	156	18	9	73	<400	
Citizens County	Ad 9.	X			X		NA	NA	NA	NA	0.09										
N. Elmhurst S.D.	Ad 8.6, Sa 24	X			X		2.4	0.8	0.24	0	0.3	801	50	120	40	34	4	2	16	<400	
Addison - North	Sa 23.5		X		X		25.0	2.7	1.58	0	2.0	5271	329	791	264	224	26	13	105	<400	
- South	Sa 22		X		X	X		3.3	2.48	0.5	2.1*	8273	517	1241	414	352	41	21	165	<400	Plans to include sludge dewatering & expansion of present tertiary (mixed mediafilters) equipment
Elmhurst	Sa 20	X			X		50.0	9.4	5.0	0	6.9*	16680	1043	2500	834	709	84	12	334	<400	To install Chemical precipitation equipment which will inc. plant cap 15%
Salt Ck Drainage Basin S.D.	Sa 19.6		X		X		26.0	4.5	3.6	0.2	2.8*	12010	751	1801	600	510	60	30	240	<400	Plans for expansion up to 12 MGD
Highland Hills S.D.	Su 3.5	X			X		1.1	NA	0.11	NA	0.25	387	23	55	16	16	2	1	7	<400	
York Center Coop.	Su 2.7, Sa 16.6	X			X		0.12	NA	0.01	NA	0.2	33	2	5	2	1	<1	<1	1	<400	

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	Estimated Waste Loadings (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria (MPN/100 ml)	Comments
Oakbrook Terrace	Sa 16.7	X			X		.7	NA	0.07	0	0.07	233	15	35	12	10	1	1	5	< 400	
Oakbrook U.C.	Sa 13.5, Des 45.2	X			X		10.0	NA	1.0	0.05	0.9	3,336	209	500	167	142	17	8	67	< 400	
Subtotal For Salt Creek prior to confluence with Des Plaines River							143.8	41.7	17.02	1.2	20.51	56,778	3,549	8,517	2,839	2,413	284	142	1,135		
Willowbrook Rd. Estates	Fl 4.8	X			X		0.13	NA	0.01	NA	0.02	33	2	5	2	1	< 1	< 1	1	< 400	
Hinsdale S.D.	Fl 4.5, Des 33.2	X	X			X	32.0	2.6	3.85	0	4.25*	12,844	385	963	321	546	64	32	257	< 400	Plans to expand to 9.6 MGD
DCDPW-Marion Br. Brookhaven	Saw 4.5, Des 30.6	X			X		17.0	NA	1.25	NA	1.25*	4,170	261	626	209	177	21	10	[illegible]	< 400	Expanding plant to 2.[illegible] MGD Cap.
DCDPW-Space Valley	Des 28	X			X		0.1	NA	0.01	NA	0.01	33	2	5	2	1	< 1	< 1	1	< 400	
Romeoville	Des 23.6	X			X		8.5	2.0	0.9	0	1.0	3,002	188	450	150	128	15	8	60	< 400	
Alexander UC	Des 23.6	X			X		0.3	NA	0.03	NA	1.5	100	[illegible]	15	5	4	1	< 1	2	< 400	
Subtotal Des Plaines River prior to the confluence with Chicago Sanitary and Ship Canal							251.41	79.0	28.22	1.7	36.27	94,140	5,467	13,158	4,387	4,000	[illegible]	235	[illegible]		
Chicago River Sub-drainage Basin																					
Great Lakes Naval Training Center Green Bay	Sk 40.5		X		X		12.0	[illegible]	[illegible]	0	2.2	4,003	250	600	200	170	20	10	[illegible]	< 400	
NSSD-Clavey Road	Sk 30.2, N. Br. Chi 22.9	X	X		X		30.0	NA	4.5	NA	4.5	15,012	938	2,252	751	709	75	38	300	< 400	
Riverwoods S&W Co.	W. Fr. N. Br. Chi 32	X			X		0.1	NA	0.01	NA	0.1	33	2	5	2	1	< 1	< 1	1	< 400	
Deerfield	W. Fr. N. Br. Chi 29, N. Br. Chi 19.3	X			X		18.0	5.8	1.8	0.3	2.25	6,005	375	901	300	255	30	15	120	< 400	
MSDGC-North Side	N. S. C. 3.3, N. Br. Chi 7.7, SSC 30.8	X	X		X		1424.0	145.0	327.0	96.9	410.0	1,090,872	46,362	114,540	38,181	16,636	6,545	8,182	16,363	< 400	
Subtotal Chicago River System prior to the Chicago Sanitary & Ship Canal							1484.10	151.5	334.51	97.2	419.05	1,115,925	47,927	118,298	39,434	17,771	6,570	8,245	16,363		
MSDGC-West Southwest	SSC 25	X	X		X		3300.0	270.0	844.0	418.0	1200.0	2,815,584	168,935	337,869	112,623	80,244	20,413	1,408	16,894	< 400	

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	Estimated Waste Loadings (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria MPN/100 ml	Comments
Little Calumet Drainage Basin discharging into Des Plaines River																					
Township U.C.	Pl 18.5	X			X		0.8	NA	NA	NA	NA										
Selym U.C.	Pl 16.8, Har	X					NA	NA	NA	NA	NA										
Schererville	Sc 2.5, Har 3.6	X			X		4.25	9.0	0.37	0	NA	1,234	77	185	62	52	6	3	25	< 400	
Dyer	Har 3.5, L. Cal 29.5		X		X		3.3	5.5	0.36	0	NA	1,200	75	180	60	51	6	3	24	< 400	
Lansing	L. Cal 25.2		X		X		21.0	5.0	2.1	0.1	2.5	7,006	438	1,051	350	298	35	18	140	< 400	
Bloom Township S.D.	Tho 32.3	X			X		80.0	14.2	9.9	3.0	12.1	33,026	2,064	4,954	1,651	1,404	103	83	[illegible]	< 400	
MSDGC-E. Chi. Hts.	De 20	X			X		26.0	0.9	2.6	0	2.4	8,674	542	1,301	434	369	43	22	173	< 400	
Steger	Thi, De 18	X			X		7.0	1.6	0.7	NA	1.0	2,335	146	350	117	99	12	6	47	< 400	
Wood Hill U.C.	De 14.6	X			X		1.0	NA	0.1	NA	0.25	334	21	50	17	14	2	1	7	< 400	
Crete	De 9.7	X			X		3.8	1.3	0.38	0	0.4	1,266	79	190	63	54	6	3	25	< 400	
Crete-Greenbiar	De 7.9	X			X		NA	1.5	NA	0	NA										
Crete-Swiss Valley	De 6.9, Tho 30.3	X			X		NA	1.5	NA	0	0.1										
Glenridge Subd.	But 11.3	X			X		0.4	NA	0.11	NA	0.16	367	23	55	18	16	2	1	7	< 400	
Richton Park	But Trib 2.5, But 8	X			X		1.5	3.0	0.15	NA	0.3	500	31	75	25	21	3	1	10	< 400	
Flossmoor	But 3.5	X			X		6.0	3.0	0.6	0	0.8	2,002	125	300	100	85	10	5	40	< 400	
Homewood	But 1.3, Tho 29.5	X				X	20.0	4.5	2.0	0	3.8	6,672	200	500	167	284	33	17	133	< 400	
Thornton	Tho 26.4, L. Cal 22.5		X		X		3.7	1.9	0.37	0	0.4	1,234	77	185	62	52	6	3	25	< 400	
MSDGC-Hazel Crest	Cal U 4.0, L. Cal 10.4, Cal. Sag 16	X			X		8.0	2.5	0.8	0	1.0	2,669	167	400	133	113	18	7	53	< 400	
MSDGC-Calumet	L. Cal 10.5, Cal-S 16	X	X		X		700.0	280.0	198.0	66.0	310.0	660,528	23,118	84,216	28,072	23,449	4,298	1,651*	9,908*	< 400	Assumed figures, actual data not available
Subtotal Little Calumet River prior to confluence with the Cal Sag Channel							886.75	335.6	218.54	69.1	338.21	729,049	27,183	93,992	31,331	26,361	4,633	1,824	11,277		
Perrway	Ti 8.7, Cal-S 10.5	X			X		1.9	NA	0.2	NA	0.2	667	42	100	33	28	3	2	13	< 400	
MSDGC-Orland Park	McG, MIS, Cal-S 5.2, SSC 13.1	X			X		7.5	4.0	0.75	0	0.8	2,508	156	375	125	106	13	6	50	< 400	

TABLE A-VII-2 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	ESTIMATED WASTE LOADINGS (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria (MPN/100 ml)	Comments
MSDGC-Lemont	SSC 10.2	X			X		5.0	20.6	0.69	0.2	0.7	2,302	144	345	115	98	12	6	46	< 400	
Lockport	DR 1.3, SSC 1.9, Des 16.9		X	X			8.5	4.0	0.9	0	1.0	3,002	758	2,703	901	169	94	< 1	68	< 400	
Subtotal Chicago Sanitary & Ship Canal prior to the confluence with Des Plaines River							5693.75	785.7	1399.59	584.5	1956.95	4,669,031	245,145	553,662	184,562	124,777	31,840	11,491	45,211		
Derby Meadows U.C.	Lo 11.2	X			X		NA	NA	NA	NA	0.05										
Chickasaw Hill U.C.	Lo 8.9	X			X		NA	NA	NA	NA	0.1										
Lockport Heights S.D.	Lo 6.8, IMC	X			X		[illegible]	NA	0.1	NA	0.11	334	21	50	17	14	2	1	7	< 400	
Bonnie Brae - Forest Manor S.D.	Ft 1.4, IMC, Des 15.8	X			X		2.8	NA	0.28	NA	0.25	934	58	140	47	40	5	2	19	< 400	
Hickory Creek Sub-drainage Basin																					
Prestwick U.C.	Hi 20	X			X		NA	NA	NA	NA	0.03										
Citizens-Arbury Hills	Hi 16.3	X			X		0.7	NA	0.07	NA	0.24	233	15	35	12	10	1	1	5	< 400	
Frankfort	Hi 13.9	X			X		1.7	NA	0.17	NA	0.35	567	35	85	28	24	3	1	11	< 400	
Mokena	E. Br. Ma 4.4, Hi 10.3	X			X		5.0	1.0	0.5	0.02	0.35	1,668	104	250	83	71	8	4	33	< 400	
New Lenox	Hi 8.5	X			X		1.8	NA	0.18	NA	0.25	600	38	90	30	26	3	2	12	< 400	
Oak Highlands-Ingalls Pk. S.D.	Hi 4.0	X			X		1.0	NA	0.1	NA	0.25	334	21	50	17	14	2	1	7	< 400	
Preston U.C.	Hi 1.0	X		X			1.2	NA	0.12	NA	0.2	400	25	60	20	17	2	1	8	< 400	
Joliet	Hi 0.1, Des 13.2		X		X		82.0	11.0	18.0	7.22	22.0	60,048	3,753	9,007	3,002	2,552	301	150	1,200	< 400	
Subtotal Hickory Creek prior to the confluence with the Des Plaines River							93.40	12.0	19.14	NA	23.67	63,850	3,991	9,577	3,192	2,714	320	160	1,276		
Ranch Oaks Serv. Assn.	Ja 16.2	X			X		0.2	NA	0.02	0	0.03	67	4	10	3	8	< 1	< 1	1	< 400	
Manhattan	Man 5.3, Ja 10.9, Des 6.4	X			X		1.4	0.8	0.14	593.42	0.2	467	29	70	23	23	2	1	9	< 400	
Subtotal Des Plaines River prior to the confluence with the DuPage River							6043.96	877.5	1447.49	593.42	2017.41	4,828,823	254,715	576,687	192,231	131,568	32,640	11,890	48,406		
DuPage River Sub-drainage Basin																					
MSDGC-Hanover	W. Br. Du 36.5	X			X	X	21.3	11.2	1.53 0.6	0	NA	5,104 2,002	319 60	766 150	255 50	217 85	26 10	13 5	102 40	< 400	

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	Estimated Waste Loadings (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria MPN/100 ml	Comments
MSDGC-Bartlett	W. Br. Du 53.7	X			X		4.6	8.0	0.46	0	NA	1,535	96	230	77	65	8	4	31	< 400	
Apple Orchard U.C.	W. Br. Du 52.9	X			X		0.4	NA	0.04	NA	0.26	133	8	20	7	6	1	< 1	3	< 400	
Maddox	W. Br. Du 49.4	X			X		NA	NA	NA	NA	0.01										Services drive-in & truck rental Co.
DCDPW-Cascade	W. Br. Du 49.0	X			X		*	0	NA	0	0.01										
Carol Stream	Kl 2.2, W. Br. Du 47	X			X		4.5	5.0	0.45	0.1	0.5	1,501	94	225	75	64	8	4	30	< 400	
Winfield	W. Br. Du 44	X			X		3.0	1.5	0.3	0	0.5	1,000	63	150	50	43	5	3	20	< 400	
West Chicago	W. Br. Du 43	X			X		11.0	6.0	1.5	0.1	3.0	5,004	313	751	250	213	25	13	100	< 400	
Wheaton S.D.	Sp 3.1, W. Br. Du 39.6		X		X		38.0	14.0	6.16	0	5.0*	20,330	[illegible]	[illegible]	[illegible]	[illegible]	165	[illegible]	411	< 400	Expanding to 5.3 including stormwater overflow lagoon
Utilities Inc., Westfield	Fe 4.7	X			X		NA	NA	NA	NA	0.06										
Utilities Inc., Scots Plains	Fe 0.2, W. Br. Du 36.8	X			X		.4	NA	0.04	NA	0.26	133	6	20	7	6	1	< 1	3		
Naperville-North	W. Br. Du 35.3	X			X			1.1	1.0	0.6	0.75	3,336	209	500	167	142	17	8	67	< 400	Presently expanding plant
-Central	W. Br. Du 32.4		\		X		23.0	3.4	2.0	0.04	2.5	6,672	417	1,001	334	284	33	17	133	< 400	
-South	W. Br. Du 30.5, Du 27.7	X			X			1.1	0.6	0	0.6	2,002	125	300	100	85	10	5	40	< 400	
Subtotal W. Branch DuPage River prior to the confluence with the E. Branch							108.20	31.4	14.68	0.3	13.45	48,972	2,996	7,195	2,394	2,063	247	323	980		
Glendale Heights	E. Br. Du 49.2	X			X		6.8	2	0.68	0	1.0	2,268	142	340	113	96	11	6	45	< 400	
DCDPW-Glen Ellyn Hts	E. Br. Du 47.7	X			X		1.0	NA	0.1	NA	0.2	334	21	50	17	14	2	1	[illegible]	< 400	
Lombard	E. Br. Du 46.6		X		X		33.0	5.0	3.7	0.03	4.4	12,343	771	1,851	617	525	62	31	247	< 400	
Glen Ellyn	E. Br. Du 43.7	X			X		21.0	7.5	2.1	0	2.3	7,006	438	1,051	350	298	35	18	140	< 400	
DCDPW-Butterfield	E. Br. Du 43.0	X			X		2.4	NA	0.24	NA	0.72	801	50	120	40	34	4	2	16	< 400	
Citizens-Valley View	E. Br. Du 41.0	X			X		2.4	NA	0.24	NA	0.24	801	50	120	40	34	4	2	16	< 400	
Downers Grove S.D.	St. J. 3.3, E. Br. Du 39.6	X	X	X	X		40.0	5.0	4.5	0.09	8.0* 5.5	15,012	938	2,252	751	638	75	38	300	< 400	*Plans to upgrade sec. to 6 MGD & also chem. precipitation
DCDPW-Lisle	E. Br. Du 38.5	X			X		7.0	2.5	0.7	0	0.9	2,335	146	350	117	99	12	6	47	< 400	
Woodridge S&W Co.	E. Br. Du 35.4, Du 27.7	X			X		3.6	1.9	0.36	0	0.4	1,201	75	180	60	51	6	3	24	< 400	
Subtotal E. Branch DuPage River prior to the confluence with the W. Branch							117.20	24.4	12.62	0.12	15.66	42,101	2,631	6,314	2,105	1,789	211	107	842		
Plainfield	Du 18.5	X			X		2.2	NA	0.22	NA	0.3	734	46	110	37	31	4	2	15	< 400	
Citizens-W. Suburban	Li 14.5, Du 14.4	X			X		0.7	NA	0.07	NA	0.24	236	15	35	12	10	1	1	5	< 400	
Will County Water Co.	Du 10	X			X		NA	NA	NA	NA	0.1										
Camelot U.C. Inc.	Du 7.2	X			X		0.1	NA	0.01	NA	0.04	33	2	5	2	1	< 1	< 1	1	< 400	
Crest Hill-East	Ro 10	X			X		0.3	NA	0.03	NA	0.05	100	6	15	5	4	1	< 1	2	< 400	
Crest Hill-Pars...ount	Ro 9.5	X			X		0.5	NA	0.05	NA	0.06	167	10	25	8	7	1	< 1	3	< 400	

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type		Present Treatment			Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	ESTIMATED WASTE LOADINGS (LBS/DAY)									Comments
		Sanitary	Combined	Primary	Secondary	Advanced						Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria MPN/100 ml	
Crest Hill-West	Ro 8.5	X			X		0.4	NA	0.04	NA	0.05	133	8	20	7	6	1	< 1	3	< 400	
Westfield	Ro 6.2, IMC Du 1.0, Des 3.8	X			X		0.4	NA	0.04	NA	0.12	133	8	20	7	6	1	< 1	3	< 400	
Subtotal DuPage River prior to the confluence with the Des Plaines River							230.0	75.7	27.76	0.42	30.07	92,609	5,722	13,734	4,582	3,937	467	233	1,854		
Total Des Plaines River out of Study Area							6273.96	953.2	1475.25	593.84	2047.48	4,921,432	260,437	590,426	196,813	135,505	33,107	12,123	50,260		
Rockdale	IMC		X		X		2.0	NA	0.2	NA	0.3	667	42	100	33	28	3	2	13	< 400	
LAKE MICHIGAN DRAINAGE BASIN																					
Camp Logan	Ke 0.3, LM 42°27'50", 87°47'50")				X		NA	NA	NA	NA	0.1										
NSSD-Waukegan	LM(42°22'30", 87°48'45")		X		X		65.0	NA	9.75*	NA	9.05	32,526	2,033	4,879	1,626	1,383	163	81	650	< 400	*Estimated @ 150 gpcd
NSSD-North Chicago	LM(42°19', 87°49'50")	X			X		20.5	NA	3.0*	NA	3.35	10,008	626	1,500	500	425	50	25	200	< 400	*Estimated @ 150 gpcd
Great Lakes Naval Training Center-Lake Front	LM(42° 18', 87° 50')		X		X		17.0	1.7	1.7	0	2.1	5,671	354	851	284	241	28	14	115	< 400	
NSSD-Lake Bluff	LM(42°16'30", 87°49'45")		X	X			3.5	NA	0.5	NA	0.28*	1,668	421	1,500	500	94	52	< 1	38	< 400	*Plans call for abandoning plant
NSSD-Lake Forest	LM(42°14'30", 87°49')	X		X			10.9	NA	1.1	NA	1.2*	3,670	[illegible]	3,300	[illegible]	206	115	< 1	[illegible]	< 400	*Plans call for abandoning plant
Fort Sheridan	LM(42°13', 87°48'15")		X	X			5.0	NA	0.5	NA	1.25	1,668	421	1,500	500	94	52	< 1	[illegible]	< 400	
NSSD-Park Ave.	LM(42°12', 87°47'45")	X		X			5.1	NA	0.51	NA	0.7*	1,701	430	1,530	510	96	53	< 1	38	< 400	*Plans call for abandoning plant
NSSD-Ravine Dr.	LM(42°10'50", 87°46'25")	X		X			4.5	NA	0.7*	NA	0.9	2,335	590	2,100	700	131	73	< 1	[illegible]	< 400	*Plans call for abandoning plant
NSSD-Cary Ave.	LM(42°10'10", 87° 47')	X		X			7.1	NA	1.0*	NA	0.9	3,336	842	3,000	1,000	188	104	< 1	75	< 400	*Plans call for abandoning plant
Grand Calumet River Drainage Basin																					
Hammond S.D.	Gr Cal 12.0, Cal 7.6, LM(41° 44', 87°31' 45")		X		X		180.0	47.5	35.9	NA	36.0*	119,762	7,485	17,964	5,988	5,091	600	299	2,395	< 400	Under construction 48 MGD Expansion
E. Chicago S.D.	Gr Cal 13.7, IHC 4.0		X		X		57.0	12.3	10.5	NA	20.0	35,028	2,189	5,254	1,751	1,489	175	88	88*	< 400	*Phosphorus removal by chemical precipitation
Gary	Gr Cal 18.5, IHC 4.0, LM(41°40', 87°26'30")		X		X		200.0	42.0	38.2	1.25	60.0	127,435	7,965	19,115	6,372	5,417	[illegible]	319	2,548	< 400	
Total Grand Calumet River discharging into Lake Michigan							437.00	101.8	84.6	1.25	116.0	282,225	17,639	42,333	14,111	11,997	1,413	706	[illegible]		

TABLE A-VII-1 EXISTING MUNICIPAL WASTEWATER TREATMENT FACILITIES

Sewage Treatment Plant Name	Location (Receiving Stream, Mile Designation point)	Sewer Type: Sanitary	Sewer Type: Combined	Present Treatment: Primary	Present Treatment: Secondary	Present Treatment: Advanced	Pop. Served (1000's)	Estimated Service Area (Square Miles)	Estimated Present Average Wastewater Flow (MGD)	Estimated Industrial Average Wastewater Flow (MGD)	Estimated Design Capacity Average (MGD)	Estimated Waste Loadings (LBS/DAY): Total Dissolved Solids	Suspended Solids	COD	BOD	NH_3-N	Organic N	NO_3-N	P	Fecal Coliform Bacteria (MPN/100 ml)	Comments
Little Calumet River Drainage Basin to Lake Michigan																					
Chesterton	L. Cal 53.5		X		X		4.7	10.8	0.7	0	1.5	2,335	146	350	117	99	12	6	47	< 400	Plans for phosphorus removal & detention pond
Valparaiso	Sa 16.2, L. Cal 49.8, Bu 1.3, LM(41°37'50" 87°10'35")		X		X		20.0	7.6	3.1	0.1	3.0	10,342	646	1,551	517	440	52	26	207	< 400	Installing phosphorus removal equipment & plant expansion to 6 MGD
Crown Point	BD 28.7, Deep 25.4		X		X		11.0*	7.0	1.8	0	1.8	6,005	375	901	300	255	30	15	120	< 400	*Population estimated
Hobart	Deep 7.5, L. Cal 41.6, Bu 1.3, LM(41°37'50", 87°10'35")	X			X		17.0*	12.0	1.7	0	2.1	5,671	354	851	284	241	28	14	113	< 400	*Population estimated
Total Little Calumet River discharging into Lake Michigan							59.7	37.4	7.3	0.1	8.4	24,353	1,521	3,653	1,218	1,035	122	61	487		
Michigan City	Tr 1.7, LM (42°13', 86°54'30")				X		63.0	16.0	8.3	0.9	NA	27,689	1,731	4,153	1,384	1,177	139	69	554	< 400	
Total Discharges into Lake Michigan							691.30	210.9*	118.96	4.55*	NA	396,850	27,535	70,299	23,433	17,067	2,364	956	7,360		*Includes the NSSD total service area 54 sq. miles and actual industrial flow = 2.3 MGD

Legend

BOD - Biochemical oxygen demand
COD - Chemical oxygen demand
Di - Ditch
E Br - East Branch
Fr - Fork
N - Nitrogen
NA - Not Available
N Br - North Branch
P - Phosphorus
S Br - South Branch
S. D. - Sanitary District
S&W - Sewer & Water
UC - Utility Company
W Br - West Branch
DCDPW - DuPage County Department of Public Works
LCPWD - Lake County Public Works Department
MSDGC - Metropolitan Sanitary District of Greater Chicago
NSSD - North Shore Sanitary District

Stream Legend

Stream Legend

Ad - Addison Creek
Ap - Aptakisic Creek
BD - Beaver Dam Ditch
Bu - Buffalo Creek
Bul - Bull Creek
But - Butterfield Creek
Cal-S - Calumet-Sag Channel
Cal-U - Calumet Union Drainage Ditch
Chi - Chicago River
DR - Deep Run
De - Deer Creek
Deep - Deep River
Des - Des Plaines River
Du - DuPage River
Fe - Ferry Creek
Fi - Fiddyment Creek
Fl - Flagg Creek
Gr Cal - Grand Calumet River
Har - Hart Ditch
Haw - Hawthorn Drainage Ditch
IMC - Illinois & Michigan Canal
In - Indian Creek
Ja - Jackson Creek
Ke - Kellog Ravine Ditch
Kl - Klein Creek
L.Cal - Little Calumet River
LM - Lake Michigan
Li - Lily Cache Creek
Lo - Long Run
Ma - Marley Creek
Man - Manhattan Creek
McD - McDonald Creek
McG - McGinnis Slough
Mi - Mill Creek
NSC - North Shore Channel
Pl - Plum Creek
Ro - Rock Run
SSC - Sanitary & Ship Canal
Sa - Salt Creek
Saw - Sawmill Creek
Sc - Schererville Ditch
Sk - Skokie River
Sp - Spring Brook
St. J - St. Joseph Creek
Su - Sugar Creek
Thi - Third Creek
Tho - Thorn Creek
Ti - Tinley Creek
Tr - Trail Creek

the area tributary to the MSDGC Calumet Plant on the south side of Chicago. The combined sewer system is designed to deliver dry weather flow to an interceptor sewer which conveys the flow to the treatment plant: but rainfalls of only 1-1/2 to 2 times dry weather flows, not an uncommon occurrence, may result in overflows to the waterways (47). A sanitary district computer model utilizing actual data for the area had the following results. For a year with a normal amount of precipitation, frequency of overflows was estimated at 35 occurrences, resulting in nearly 9 billion gallons of combined sewer overflow entering the streams. This overflow is estimated to have a BOD loading of 6.2 million lbs. and a SS loading of 31 million lbs. The area under discussion represents only 62 sq. mi. of the 300 sq. mi. combined sewer area. When the combined sewer overflows of the remainder of the 2,600 sq. mi. study area is added, together with the separate storm water reaching the streams untreated and with a high initial flush of BOD and SS, both the magnitude and significance of controlling overflows is apparent. Although both the States of Illinois and Indiana require elimination of storm sewer overflows, generally by mid-1977, this is quite a momentous task for the municipalities, requiring much research, design, and funding.

RELATED PROBLEMS

In addition to municipal and industrial waste loads, the presence of less noticeable forms of pollutant sources adds significantly to the complexity of the pollution problem. For example, indiscriminate use of septic tanks, cesspools, and individual sewage disposal systems have caused severe pollution in some areas, particularly when liquid wastes are added to the natural surface runoff prior to adequate assimilation. Oxidation lagoons, improperly managed refuse disposal sites, and landfills are sources of organic, chemical, and bacteriological pollution. Surface runoff from rainstorms adds great amounts of suspended solids, nutrients, animal manure, phenols, oils, and pesticides to the waters transforming what is often an asset on land to a liability in water. The effects of seepage of these wastes has caused a serious problem of water supply contamination in some areas, especially those areas using wells. Whatever the source of water supply, the threat of pollution is omnipresent.

ATTITUDE TOWARD VIOLATION OF WATER QUALITY STANDARDS

Recently acquired enforcement policies, the education of the public to the magnitude of the problem of environmental degradation, and subsequent "get tough" policies of enforcement agencies nationwide have resulted in numerous court actions and contempt citations against many of the major pollutors. Industry especially has felt the brunt of public concern and has become one of the most publicized targets of environmental groups, agencies, and state legislatures. In legislation and court action unprecedented in the history of pollution abatement policies, municipalities and industries are being told either to meet water quality standards or be subjected to ever-increasing penalties. Specific short-range dates for water quality standards are established, and violators are required by law to comply. Many who have failed to meet established criteria are being detected by the increased surveillance programs of effluent water quality.

REGIONAL WASTEWATER MANAGEMENT PLANS

Many plans have been proposed for areas within the study area but legal problems, political feasibility, and funding have precluded their implementation. Consequently, only a select few plans may attain realization. Studies completed by NIPC and LPCRTPC have indicated the utility of a regional wastewater management program with expansion and upgrading of some existing facilities. The Metropolitan Sanitary District of Greater Chicago is continuing its pioneering efforts in wastewater treatment and is currently improving its treatment facilities for more efficient operation, i.e., greater and more effective removal of pollutants.

Future expansion and upgrading of treatment facilities are planned for many of the sewage treatment facilities in the study area. Some facilities require expansion to keep ahead of increasing flows and population served. Recent expansion of urban area, added industries, and changes in processing methods has caused the volume of raw sewage to increase considerably and has changed the character of the pollutant load. Most treatment facilities also require upgrading to effectively remove pollutants. Several factors underscore this need: (1) new pollutant hazards, such as mercury and other heavy metals, are being identified, (2) State water quality standards have been established and must be met within a given time frame, and (3) past public apathy toward environmental pollution has shifted to public concern.

The proposed construction at many plants relates to the problems and objectives of a local area rather than being a component of a regionalized system. This results in only localized solutions to a regional problem.

(a) MSDGC. Service to eight service basins: expansion of the Hanover, North Side, Central, South Side, and Lemont Plants; construction of Poplar Creek, Salt Creek, and O'Hare Plants; detention of combined sewer overflow in holding ponds for subsequent treatment, tertiary and advanced waste treatment at Central, South Side, North Side, Lemont, and Hanover plants; Underflow - Deep Tunnel plan for retention and subsequent treatment of combined sewer overflows.

(b) NSSD. Service by three plants: Expansion of plants at Harvey Road and Waukegan; new plant at Gurnee; diversion of all flows from the Lake; all plants to be tertiary and advanced waste treatment (48).

(c) Joliet. New west side intercepting sewer systems and secondary wastewater treatment plant west of city.

(d) Gary Sanitary District. Deep tunnel system to convey combined sewer overflow to retention pond with storage in the tunnel-reservoir.

(e) East Chicago Sanitary District. Deep lagoon for retention of combined sewer overflow and possible use as supplement to secondary treatment during non-storm periods.

(f) Hebron, Indiana. Sewage treatment plant (new facility).

(g) Lake County, Illinois. Tertiary treatment plants at Barrington (plus advanced waste treatment), Deerfield, Fox Lake, Libertyville, and Mundelein.

(h) DuPage County, Illinois. Tertiary treatment plants at Addison, Downers Grove, Elmhurst, Glen Ellyn, Glendale Heights (plus advanced waste treatment), Hinsdale, Naperville, Salt Creek Drainage Basin Sanitary District, West Chicago, and Wheaton Sanitary District.

INDUSTRY

Pollution abatement programs are expected to continue. For many industries, plans for advanced waste treatment and recycle/reuse of wastewater will be implemented.

WATER SUPPLY ALLOCATIONS

The State of Illinois has had to abide by the Supreme Court Decision of June 1967 and restrict its total diversion of water from Lake Michigan to 3,200 cfs. However, future needs of Northeastern Illinois will necessitate an increased diversion allowance from Lake Michigan or some other water management method (such as recycling) to assure an adequate supply.

RECENT ACTIVITY IN ILLINOIS

As evidenced by numerous articles in Chicago newspapers (49, 50, 51), a good deal of public sentiment in Illinois supports the idea of increasing the diversion of water allowance from Lake Michigan. However, Canada would resist "pressure south of the border to allow Chicago to divert more water than the prescribed 3,200 cubic feet per second" (52).

The Department of Transportation, State of Illinois, recently (21 July 1972) received Administrative Order No. 1, Lake Michigan Diversion. Mr. John C. Guillou, Chief Waterway Engineer, State of Illinois, will take action to form a committee of the various public agencies involved in the diversion to assist in the development and implementation of a plan to measure and compute the allocations for the 3,200 cfs allotment from Lake Michigan (53). The allocation of Lake Michigan water according to this Administrative Order No. 1 is as follows.

There will be serious debates over these diversion allocations. For example, the North Shore Sanitary District (NSSD) wants all of the various allotments to east Lake County communities assigned to the district. The district is building a system design based on putting all treated sewage effluent into the Des Plaines or Chicago Rivers. If the district is barred from diverting lake water, then it must put the treated effluent back into Lake Michigan.

When Illinois' Administrative Order No. 1 was made public last fall, several of the proposed Lake Michigan water allocations received more publicity than others. The decision on the North Shore Sanitary District diversion allowance request (none allowed) is a subject of serious debate. Also of interest is the expanded use of Lake Michigan as a potable water supply for suburbs west of Chicago (e.g. Des Plaines, Arlington Heights, Mt. Prospect).

TABLE A-VII-2

ALLOCATION OF LAKE MICHIGAN WATER
(Cubic Feet Per Second)

Entity	1972 Allocation	1975 Anticipated	1980 Allocation
Department of the Navy - Great Lakes	10.0	11.2	13.2
North Shore Sanitary District	0.0	0.0[a]	0.0[a]
City of Chicago Heights	0.0	13.6	17.0
City of Lake Forest	4.5	5.8	6.8
City of North Chicago	37.0	40.7[b]	40.7[b]
Village of Lake Bluff	1.2	1.7	2.1
Elmhurst - Villa Park - Lombard Water Commission	0.0	56.0[c]	70.8[c]
Des Plaines - Mount Prospect Arlington Heights - Palatine Water Commission	0.0	34.8[c]	42.5[c]
Department of the Army - Fort Sheridan	1.0	1.2	1.4
City of Waukegan-	17.5	19.6	25.5
Village of Elk Grove	0.0	7.4	11.8
City of DesPlaines	0.0	0.0	0.0
Citizens Utilities Company of Illinois	0.0	12.1	23.0
Lake County Water District	3.0	4.8	16.6
Villages of Clarendon Hills, Downers Grove and Westmont	0.0	3.4	20.4
City of Evanston	20.0	21.3	23.0
Village of Skokie	22.0	24.0	26.0
Village of Glencoe	3.5	4.2	5.1
Village of Wood Dale	0.0	1.4	2.3
Village of Northbrook	5.6	10.2	17.0
Village of Winnetka and Northfield	6.3	6.8	9.9
Village of Wilmette and Glenview	11.9	15.3	17.1
Village of Kenilworth	0.8	0.9	1.1
Village of Oak Brook	0.0	7.7	7.7
City of Chicago	1600.0	1700.0	1735.0
Metropolitan Sanitary District of Greater Chicago	1425.0[d]	1100.0[d]	1000.0[d]
TOTAL	3169.3	3104.1	3136.0

a - Water of the indicated allocation, per letter of August 6, 1968 to August Cepon, are contained in special allocations to member communities

b - Predicted upon return of Abbott Laboratories cooling water to Lake Michigan

c - The indicated flow rate is allocated for 1975 and shall continue in full force and effect through the year 2015, unless use of the water is not developed, or there is abuse or misuse of the allocation, or there are violations of the rules and regulations developed in accord with the laws of the State of Illinois

d - Includes storm water runoff now measured at Lockport which will be separated from the allocation.

OPEN-SPACE PLANNING

Open-space planning is an extremely important consideration in effective water management planning. Open Space areas can hold water, whether permanently or on a seasonal basis. Acquisition of lowlands in the C-SELM area for preservation of green space and acquisition of flood plains near streams will give nature a chance to exert some control of storm water runoff. If there is no development in certain areas, water falling on the areas should not run off appreciably into other areas; during fairly mild rainfall periods (1" or less) the water will usually remain within the open space area. Keeping flood plains free of development will also give flood waters somewhere to go without incurring tremendous damages, including the loss of life and property.

NORTHEASTERN ILLINOIS PLANNING COMMISSION, (NIPC) REGIONAL OPEN SPACE PLAN

The following open space planning objectives were defined by NIPC in its Regional Open Space Plan, dated April, 1971 (54).

1. To preserve areas of regional open space adequate to meet the present and future recreational needs in Northeastern Illinois.

2. To preserve and promote the optimum use of the natural resources so that they may provide continued benefit to the people of Northeastern Illinois.

3. To guide the development of the region toward an efficient, attractive and viable form in accordance with the policies of the comprehensive general plan.

4. To optimize the benefits of the open space programs by preserving the sites capable of accommodating compatible multiple-uses.

5. To involve appropriate public agencies at all levels as well as private organizations in implementing the recommendations of this plan.

The feelings of NIPC can best be expressed in those three sentences taken from the foreward to the Regional Open Space Plan document, as signed by Commission President Lee M. Burkey:

> "Once lost, open space is exceedingly difficult, if not impossible, to reclaim. There can be no escaping the fact that now is the time - - the only and last time - - to prepare for future open space needs. The institutions for meeting those needs already exist."

NIPC's open space planning is supported by an inventory of open space need on a township basis, and a proposed open space acquisition map indicating suggested locations for acquisition and/or preservation.

LAKE-PORTER COUNTY REGIONAL TRANSPORTATION AND PLANNING COMMISSION (LPCRTPC)

On 7 December 1972 a Regional Open Space Plan Document was submitted to the Commissioners of the LPCRTPC for adoption. The document has been adopted by the commission as of this date (May 1973) (55). The planning document identifies the objectives and philosophies espoused by the commission. The following open space planning objectives are in the Regional Open Space Plan Document:

1. To preserve areas of regional open space adequate to meet the present and future recreation needs in the Lake-Porter region.

2. To preserve and promote the optimum use of the natural resources so that they may provide continued benefit to the people of the Lake-Porter region.

3. To guide the development of the region toward an efficient, attractive and viable form in accordance with the policies of the Comprehensive General Plan.

4. To optimize the benefits of the open space programs by preserving areas capable of accomodating the multiple open space objectives.

5. To involve appropriate public agencies at all levels as well as private organization in implementing the recommendations of this plan.

The objectives, as listed, are accepted by the LPCRTPC. Sections of the Plan Document, dealing with open space standards and determination of where open space acquisitions should be, are still under discussion.

FLOOD CONTROL

RECENT STUDIES

The Chicago Metropolitan Area Cooperative River Basin Study, involving the Metropolitan Sanitary District of Greater Chicago and the United States Department of Agriculture's (USDA) Soil Conservation Service (SCS), is a floodwater management study of the Des Plaines River drainage basin. The study is authorized by PL 566, The Watershed Protection and Flood Prevention Act of the USDA, and will be completed in 1976. The SCS has completed one segment of their study pertaining to the Upper Salt Creek watershed, located primarily in Northwestern Cook County (56). A second study segment pertaining to the North Branch of the Chicago River, will be completed in 1973. The objectives of the North Branch study include:

1. Identification of flood prone areas.

2. Projection of future urbanization in the drainage areas in order to determine projected increases in storm water runoff.

3. To reduce flood damages.

4. To reduce erosion and sediment damage.

5. Identify the needs for wastewater management.

6. To enhance fish and wildlife resources.

7. To improve environmental quality.

8. To identify water supply needs.

9. To develop model ordinances for flood plain zoning.

CHICAGO UNDERFLOW PLAN

The problem of combined sewer overflow in the Chicago Metropolitan Area has been restudied by the Flood Control Coordinating Committee, which was reactivated in November, 1970. The committee is composed of officials of the State of Illinois, County of Cook, Metropolitan Sanitary District of Greater Chicago, and the City of Chicago. Alternative solutions to the problem of mixed storm and sewage water spillage to the waterways were examined in order to identify the most economical solution. Water quality standards in metropolitan waterways as well as the prevention of backflow of waters into Lake Michigan were highlighted as design considerations. A Summary of Technical Reports identifying the alternative solutions was published by the Flood Control Coordinating Committee in August, 1972 (57). This report presents system designs and their associated costs.

The recommended plan is aptly described in the following paragraph, taken from the Summary of Technical Reports by the Flood Control Coordinating Committee:

> "The recommended Chicago Underflow Plan, a composite of the several Alternatives, would capture the runoff from all of the recorded storms of history, except the peak period of three or four of the most severe storms. It consists of 120 miles of conveyance tunnels intercepting 640 sewer overflow points in the 375 square mile area served by combined sewers. Most of the conveyance tunnels will be constructed in Silurian Dolomite rock formations 150 to 290 feet below the surface of waterways. In some areas, the smaller conveyance tunnels will be constructed in the clay overburden."

The benefits of the Chicago Underflow Plan will be estimated in order to illustrate the cost vs. benefits of the plan. A social-environmental impact evaluation will also be prepared. Federal funding is the key to eventual implementation of the plan and the expected impacts must be clearly spelled out.

Table A-VII-3 shows the major alternatives considered in the report. It should be noted that the total project cost as shown in the table includes the first investment cost only. The annual cost considers the "amortized project cost" and "operation, maintenance and equipment replacement cost" and roughly estimated benefits associated with the plan were subtracted from the costs.

FISH AND WILDLIFE ENHANCEMENT

ILLINOIS

Several meetings have been held with representatives of the Illinois Department of Conservation regarding development priorities for Northeastern Illinois. Lake Michigan is a resource planning focus for the area. The Department of Conservation would like to install salmon runs into the lake at three different locations. Two salmon runs would be located in Lake County and one in Cook County. The salmon would be imprinted at the salmon run locations with the hope that the fish will return for spawning. The increasing popularity of salmon or Coho fishing in Lake Michigan has significant bearing on fish and wildlife management planning in Northeastern Illinois.

The Department of Conservation is also interested in the implementation of an Urban Fishing Program into the ghetto areas of Chicago. They have approached the Chicago Park District regarding the use of lagoons in several city parks.

INDIANA

The Indiana Department of Natural Resources is also interested in a salmon "seeding" program into Lake Michigan. Natural streams would be relied on as feeder elements to the lake. The East Branch of the Little Calumet River and Trail Creek are the streams Indiana has used for Coho seeding operations.

Northwestern Indiana, when viewed as a seven-county regional planning area within the State, will experience the expansion of existing game management and preserve areas. These areas, according to plans, will be increased by 6,000 acres between 1970 and 1975 (58).

NAVIGATION

RELATION TO LAKE MICHIGAN DIVERSION

The basis and control of the C-SELM area's water balance must be resolved. Final decisions on the use of Lake Michigan and net withdrawal for the Illinois portion of the study area must be completed by the Illinois Department of Transportation, Division of Water Resource Management. The amount of flow to be maintained within the area's streams and the volume

TABLE A-VII-3

Summary of Major Alternative Plans

No.	Symbol	Description	Cost in Million Dollars								
			MODIFICATION 2			MODIFICATION 3			MODIFICATION 4		
			Proj. Cost	Pres. Worth	Ann. Cost	Proj. Cost	Pres. Worth	Ann. Cost	Proj. Cost	Pres. Worth	Ann. Cost
1	A	Original Deep Tunnel Plan w/Mined & Surface Stge.in the Calumet Area	3,774	2,815	239	2,174	1,621	148	2,418	1,804	150
2	Ap	As Above + Pumped Storage	4,206	3,137	223	2,624	1,957	139	Not Econ.	--	--
3	B	Deep Tunnel Plan w/ Mined & Surface Stge. in Calumet & Stickney Area	2,964	2,211	194	1,824	1,360	129	2,055	1,533	129
4	Bp	As Above + Pumped Storage	3,383	2,523	182	2,195	1,637	120	Not Econ.	--	--
5	C	Deep Tunnel w/Mined & Surface Stge. in Calumet, W-S-W & N. Side Treatment Plant	2,927	2,183	193	1,850	1,380	129	1,989	1,484	124
6	Cp	As Above + Pumped Storage	3,340	2,491	179	2,247	1,676	121	Not Econ.	--	--
7	D	State of Illinois Division of Waterways Plan	3,593	2,680	243	2,130	1,589	159	2,054	1,532	146
8	E	Composite Plan	2,776	2,071	183	1,878	1,401	129	1,971	1,470	122
9	F	Chicago Underflow Plan - Lockport	4,847	3,615	294	2,460	1,834	156	2,051	1,530	124
10	G	Chicago Underflow Plan - Single Quarry	2,583	1,923	162	1,344	1,002	90	1,846	1,377	115
11	H	Chicago Underflow Plan - Two Quarries	2,088	1,557	137	1,223	912	85	1,819	1,356	115
12	J	Chicago Underflow Plan - Three Quarries	2,084	1,554	138	1,235	921	86	1,831	1,366	116
13	Q	Four Storage Plan	2,080	1,551	138	1,359	1,014	97	1,833	1,367	118
14	Qp	As Above and Pumped Storage	2,124	1,583	133	1,435	1,070	93	Not Econ.	--	--
15	R	McCook, Calumet & O'Hare Storage Plan	2,119	1,580	149	1,395	1,040	103	1,827	1,363	120
16	Rp	As Above and Pumped Storage	2,540	1,894	157	1,600	1,195	103	Not Econ.	--	--
17	S	McCook & O'Hare Storage Plan	2,471	1,843	157	1,312	979	89	2,069	1,543	129

Costs in Millions of Dollars

allotted for other uses will be determined in relation to the recreational and other synergistic programs in the Design Appendix. Final decisions will be contingent upon the recommendation of those agencies having planning responsibilities in the various programs.

DUPLICATE LOCKS STUDY (CHICAGO DISTRICT)

The Duplicate Locks Project will involve the construction of supplemental 1200 ft x 110 ft. locks on the Illinois Waterway between Grafton, Illinois and the Cal-Sag Canal. This project will reduce existing lockage delay times and permit continued growth on the waterway. In 1985 the first supplemental lock will be completed and the projected project completion date is 1997. The flow requirements for the duplicate lock system are identified by alternative strategies in the following three Tables A-III-4, A-VII-5 and A-VII-6.

ELECTRIC POWER GENERATION

NEED MUST BE SATISFIED

Certain developmental patterns in the Chicago Metropolitan Area have been recently studied by the Federal Power Commission. Population, land-use, industrial, and standard-of-living projections all indicate a tremendous increased need for electric power. Mr. D. Bruce Mansfield, Chairman, Edison Electric Institute made a statement on June 6, 1971, pertaining to the role of electric energy in the solving of environmental problems (59). Some of the points he brought out:

1. So-called frivolous uses of electricity, such as small appliances like electric toothbrushes, hair dryers, vacuum cleaners, clocks, toasters, etc. in 1970 amounted to less than 4 percent of the total kilowatt hours used.

2. Residential customers use less than 1/3 of the total electricity, the remaining 2/3 being used for industrial and commercial application which relieve human drudgery in the home, on the farm and in industry and result in countless job opportunities, economic growth, and an environment of higher quality than would have been possible had air-polluting factory boilers continued to multiply.

3. Electric energy is fundamental to solving the environmental problems:
   - A recent sampling of 85 manufacturers showed they used annually 1.5 billion kwh exclusively for pollution control, which was 8.4 percent of their total use.

   - Expansion of sewage treatment facilities for water pollution reduction will require massive quantities of electric power for pumping, etc.

TABLE A-VII-4

ILLINOIS WATERWAY FLOW REQUIREMENTS

WATER REQUIREMENTS, CFS, FOR A 1200' X 110' LOCK AND A 600' X 110' LOCK AT THE EXISTING LOCKPORT LOCK SITE (PRESENT OPERATIONS)

	CFS	
	1990	2020
January	550	630
February	580	665
March	680	790
April	670	770
May	685	790
June	685	790
July	620	710
August	660	760
September	640	740
October	660	765
November	645	745
December	685	790
Total	7,660	8,950
Average	647	746

TABLE A-VII-5

ILLINOIS WATERWAY FLOW REQUIREMENTS

COMMERCIAL & RECREATIONAL LOCKAGES
AT LOCKPORT (LOW LIFT - PLAN 2)

	NUMBER OF LOCKAGES			
	1990		2020	
	Commercial	Recreation	Commercial	Recreation
January	513		592	
February	491		566	
March	634		731	
April	605	30	698	60
May	641	210	739	395
June	619	180	714	340
July	577	280	655	510
August	619	260	714	485
September	577	260	665	485
October	620	260	715	485
November	583	45	672	85
December	641		739	
TOTAL	7,120	1,515	8,200	2,845

TABLE A-VII-6

ILLINOIS WATERWAY FLOW REQUIREMENTS

WATER REQUIREMENTS, CFS, FOR A 1200' X 110' COMMERCIAL NAVIGATION LOCK AND A 200' X 40' RECREATIONAL LOCK, (HIGH LIFT - PLANS 3 & 4)

	1990			2020		
	1200' Lock	Rec. Lock	Total	1200' Lock	Rec. Lock	Total
January	1320		1320	1520		1520
February	1390		1390	1600		1600
March	1630		1630	1880		1880
April	1610	5	1615	1850	10	1860
May	1650	30	1680	1900	60	1960
June	1650	30	1680	1900	50	1950
July	1490	40	1530	1710	80	1790
August	1590	40	1630	1840	70	1910
September	1540	40	1580	1770	75	1845
October	1590	40	1630	1840	70	1910
November	1550	10	1660	1790	15	1805
December	1650		1650	1900		1900
TOTAL	18,660	235	18,895	21,500	430	21,930
AVERAGE	1,555	29	1,575	1,792	54	1,828

- Much electricity is required in the solid-waste recycling field for machines using as much as 10,000 horsepower.
- Large amounts of electricity are required by industries to meet the states' environmental standards.

4. Mr. Mansfield quoted Senator Jennings Randolph (D-W. Va.) as stating in the Congressional Record:

> "The quality of life and the use of energy are inextricably tied together. For one to improve, the other must increase."

TENDENCY TO LOCATE NEW PLANTS OUTSIDE C-SELM

Because of population concentrations, and public concern over heated water discharges and radioactive emissions from nuclear power plants, new electric power facilities will be located outside the C-SELM area; although the power generated will be used within C-SELM. The new Zion Nuclear Power Station of Commonwealth Edison will probably be the last electric power generating facility to be constructed within the C-SELM area.

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