

Report on Water Pollution in the

LAKE ERIE BASIN

SOUTHEASTERN MICHIGAN AREA

Immediate
Pollution Control Needs



UNITED STATES DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION

MARCH 1967

REPORT ON WATER POLLUTION

in the

LAKE ERIE BASIN

**SOUTHEASTERN MICHIGAN AREA
IMMEDIATE POLLUTION CONTROL NEEDS**

**U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Great Lakes-Illinois River Basins Project**

Grosse Ile, Michigan

March 1967

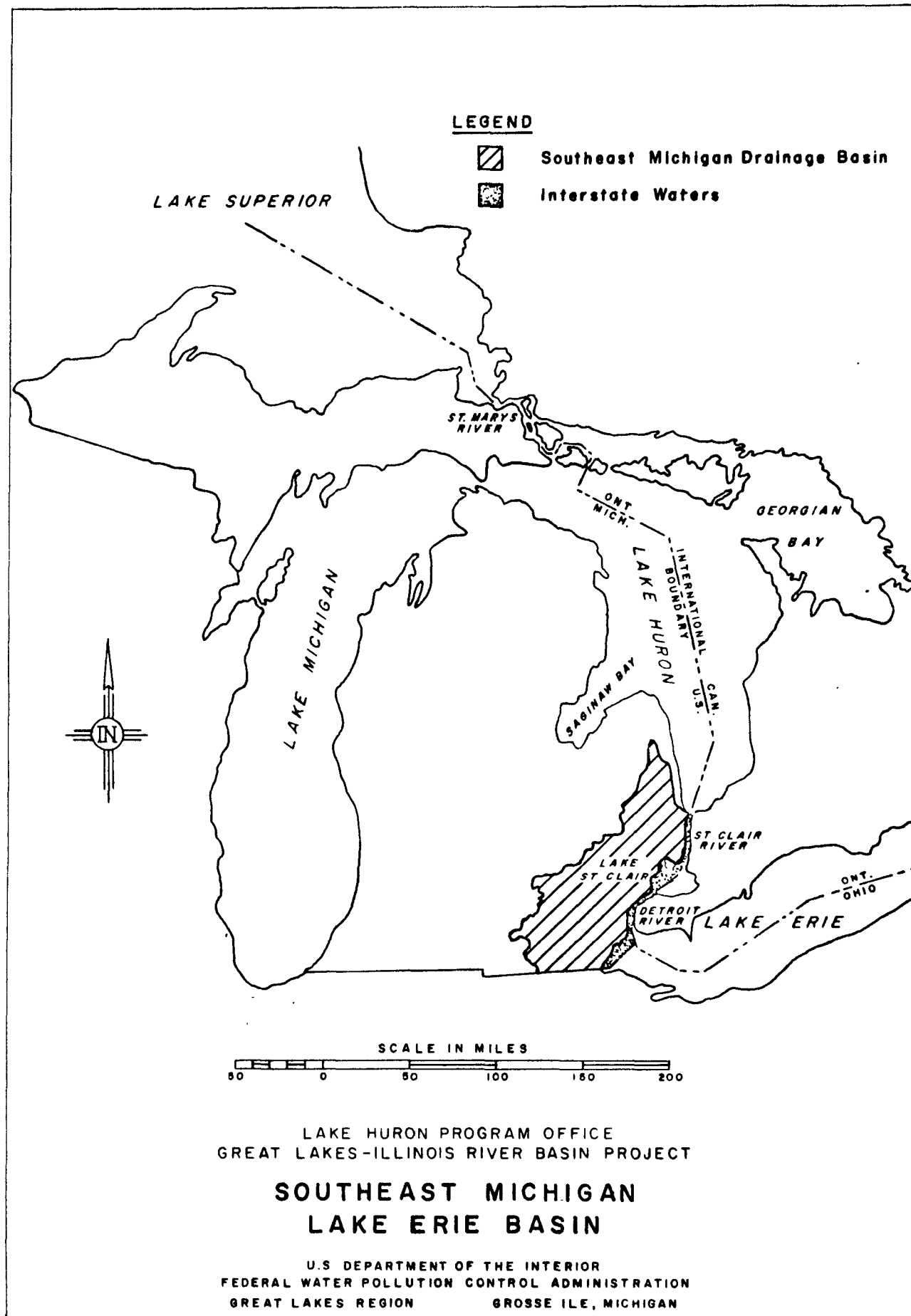
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I. INTRODUCTION

Purpose:

The purpose of this report is to define present water quality in the Southeastern Michigan Drainage Basin, including St. Clair River, Lake St. Clair, Detroit River, and the Michigan part of Lake Erie. Known sources of pollution and remedial measures of immediate importance are listed.

Scope:

The water quality control needs and costs are taken from field investigations by the Detroit River-Lake Erie Project, Lake Huron Program Office of the Great Lakes-Illinois River Basins Project, as well as from information obtained from the Michigan Water Resources Commission, Michigan Department of Public Health, and other sources.

The "Guidelines for Establishing Water Quality Standards for Interstate Waters" considers international waters as subject to interstate standards. The Detroit and St. Clair Rivers, Lakes St. Clair and Erie, fall within this definition. Those waste sources known to contribute to the interstate waters directly or through tributaries, thereto, are shown on Figures 2 through 9.

Canadian waste sources are not included in this report.

Authority:

The study of the Lake Erie Basin is a part of the Great Lakes-Illinois River Basins Project, a comprehensive water pollution study authorized by the Federal Water Pollution Control Act of 1956 as

amended (33 USC 466 et seq) Sec. 3a and 5f. The area also is under the jurisdiction of the Lake Erie Enforcement Conference (August 3-5, 1965) and Detroit River-Lake Erie Enforcement Conference (March 27 and 28, 1962), under provisions of Sec. 10 Federal Water Pollution Control Act (33 USC 466 et Seq).

II. Summary of Immediate Pollution Control Needs

The following table is a summary of immediate pollution control needs. The basis for these needs are documented elsewhere in this report. The priority is that assigned by this office after review of available information from various sources.

The priorities are as follows:

1. Area immediately affected is interstate waters.
2. Intrastate waters - major problem.
3. Intrastate waters - minor problem.
4. Intrastate waters - small community.

MUNICIPAL WASTE TREATMENT (by basin)

<u>Location</u>	<u>Needs</u>	<u>Priority</u>
ST. CLAIR RIVER BASIN		
<u>St. Clair River</u>		
Port Huron	Expand to secondary	1
Marysville	Expand to secondary	1
St. Clair	Expand to secondary	1
Marine City	Expand to secondary	1
Cottrelville T.	Collection system & secondary	1
Kimball T.	Collection system & secondary	1
St. Clair T.	Expand to secondary	1
Clay T.	Collection system & secondary	1
Algonac	Collection system & secondary	1
East China T.	Expand to secondary	1
<u>Black River</u>		
Deckerville	Collection system & lagoon	4
Yale	Lagoon modifications	3
Fort Gratiot T.	Collection system & secondary	2
Peck	Collection system & lagoon	4
<u>Pine River</u>		
Emmett	Collection system & lagoon	4
<u>Belle River</u>		
Imlay City	Improve collection system	3

MUNICIPAL WASTE TREATMENT (cont.)

<u>Location</u>	<u>Needs</u>	<u>Priority</u>
LAKE ST. CLAIR BASIN		
<u>Clinton River</u>		
Clinton T.	Connect to Detroit Metro	1
Mt. Clemens	Connect to Detroit Metro	1
Sterling T.	Connect to Detroit Metro	1
Utica	Connect to Detroit Metro	1
Warren	Connect to Detroit Metro	1
Pontiac	Connect to Detroit Metro	1
Rochester	Connect to Detroit Metro	2
Oxford Village	Collection system & secondary	3
Harrison T.	Connect to Detroit Metro	2
Fraser	Connect to Detroit Metro	2
Shelby T. (part)	Connect to Detroit Metro	2
Leonard	Collection system & lagoon	4
Washington	Collection system & secondary	3
LAKE ERIE BASIN		
<u>Lake Erie (minor tributaries)</u>		
Maybee	Collection system & lagoon	4
Bedford T.	Collection system & lagoon	2
Erie T.	Collection system & lagoon	1
<u>Huron River</u>		
Ann Arbor T.	Connect to Ann Arbor Metro	2
Ypsilanti T.	Connect to Ann Arbor Metro	2
Pittsfield T.	Connect to Ann Arbor Metro	2
Superior T.	Connect to Ann Arbor Metro	2
Dexter	Expand to secondary	2
Pinckney	Collection system & lagoon	4
South Lyon	Collection system & secondary	2
South Rockwood	Collection system & lagoon	1
Stockbridge	Collection system & lagoon	3
Wixom	Collection system & secondary	2
Flat Rock	Improve collection system; secondary	1
Rockwood	Improve collection system; secondary	1
Ann Arbor Metro	Collection system & expand secondary	2

MUNICIPAL WASTE TREATMENT (cont.)

<u>Location</u>	<u>Needs</u>	<u>Priority</u>
LAKE ERIE BASIN (cont.)		
<u>Raisin River</u>		
Blissfield	Expand to secondary	2
Britton	Collection system & lagoon	4
Brooklyn	Collection system & lagoon	3
Cement City	Collection system & lagoon	4
Clayton	Collection system & lagoon	4
Clinton	Expand to secondary	2
Deerfield	Collection system & lagoon	3
Dundee	Expand to secondary	2
Madison T.	Collection system & secondary	2
Ash T.	Connect to Monroe Metro	1
Onsted	Collection system & lagoon	4
Palmyra T.	Collection system & secondary	2
Petersburg	Collection system & lagoon	3
Tecumseh	Expand collection system & treatment	3
Monroe Metro	Expand to secondary & increase collection	1

Some communities in the Detroit River-Lake Erie Project Enforcement area are bound by the stipulations set forth by the Michigan Water Resources Commission in 1966.

The communities involved and their immediate treatment needs are listed below:

<u>Location</u>	<u>Needs</u>	<u>Priority</u>
Detroit Metro**	Expand collection; secondary (to serve 18 additional communities by 1970)	1
Grosse Ile	Improve collection; secondary	1
Riverview	Expand to secondary	1
Wayne County System*		
Wyandotte	Expand to secondary	1
Trenton	Expand to secondary	1
Trenton	Expand to secondary	1
Estral Beach	Collection system & secondary	1
Berlin T.	Collection system & secondary	1
Luna Pier	Collection system & secondary	1
Frenchtown T.	Connect to Monroe Metro	1
Monroe T.	Connect to Monroe Metro	1

* Wayne County System also serves Rockwood and Flat Rock.

** For list of communities in Detroit Metro service area, see next page.

The Detroit Metro System now serves 2,890,000 people living in the
53 communities listed below:

Macomb County

Centerline
East Detroit
Roseville
St. Clair Shores
Warren (small part)

Oakland County

Berkley
Beverly Hills
Birmingham
Bloomfield Hills
Bloomfield T. (part)
Clawson
Farmington
Farmington T. (part)
Ferndale
Hazel Park
Huntington Woods
Keego Harbor
Lathrup Village
Madison Heights
Northville
Oak Park
Pleasant Ridge
Pontiac T. (part)
Royal Oak
Royal Oak T.
Southfield
Sylvan Lake
Troy (part)
West Bloomfield)

Wayne County

Allen Park
Canton T.
Dearborn
Dearborn Heights
Detroit
Garden City
Grosse Pointe
Grosse Pointe Farms
Grosse Pointe Park
Grosse Pointe Shores
Grosse Pointe Woods
Hamtramck
Harper Woods
Highland Park
Inkster
Livonia
Melvindale
Northville T.
Plymouth
Plymouth T.
Redford T.
Romulus T.
Wayne
Westland (part)

By 1970, the Detroit Water Service plans to serve 3,490,000 people
by expanding its present service area to include the following communi-
ties and provide secondary treatment and maximum phosphate removal:

Macomb County

Clinton T.
Fraser
Harrison
Mt. Clemens
Shelby T.
Sterling T.

Oakland County

Avon T.	Novi
Bingham Farms	Orchard Lake
Franklin	Orion T.
Independence T.	Quakertown
Lake Angelus	Waterford T.
Lake Orion	Wood Creek Farms

INDUSTRIAL WASTE TREATMENT
(by basin)

ST. CLAIR RIVER BASIN

<u>Industry</u>	<u>Location</u>	<u>Needs</u>
<u>Black River</u>		
Michigan Milk Producers Assn.	Peck	Establish treatment needs
Port Huron Paper Co.	Port Huron	Establish adequacy of treatment
<u>Belle River</u>		
Michigan Milk Producers Assn.	Imlay City	Establish adequacy of treatment (irrigation)
Vlasic Food Products Co.	Imlay City	Establish adequacy of treatment (holding ponds)

LAKE ST. CLAIR BASIN

<u>Clinton River</u>		
Briggs Manufacturing Co.	Sterling T.	Establish adequacy of treatment (lagoon)
Chrysler Corp. Michigan Missile Plant	Sterling T.	Establish adequacy of treatment (lagoons)
Ford Motor Co. Chassis Parts	Sterling T.	Establish adequacy of treatment for oil and sanitary wastes
Thompson, Ramo, Woodbridge, Inc. Thompson Products, Mich. Div.	Sterling T.	Improve reliability of treatment of oil wastes Establish adequacy of treatment of sanitary wastes

LAKE ERIE BASIN

<u>Huron River</u>		
General Motors Corp. Fisher Body Div.	Willow Run	Establish adequacy of treatment (coagulation & lagoon)
Huron Valley Steel Corp.	Belleville	Improve treatment (solids in wastewater)
Longworth Plating Co.	Chelsea	Establish adequacy of treatment
Peninsular Paper Co.	Ypsilanti	Improve treatment

INDUSTRIAL WASTE TREATMENT (cont.)
(by basin)

LAKE ERIE BASIN (cont.)

<u>Industry</u>	<u>Location</u>	<u>Needs</u>
<u>River Raisin</u>		
Buckeye Products Corp.	Adrian	Establish adequacy of treatment
Dundee Cement Co.	Dundee	Improve treatment reliability
Simplex Paper Corp.	Palmyra	Establish adequacy of treatment

Industries in the Detroit River-Lake Erie Project Enforcement area are covered by stipulations set forth by the Michigan Water Resources Commission in 1966. These industries are listed in Section V, Recent Progress in Pollution Control.

Flow Regulation

Consideration should be given to flow augmentation in the Clinton River above Pontiac and the Huron River above Ann Arbor for quality control.

Other Pollution Control Practices

Provision should be made for onshore disposal of vessel wastes at major lake ports. Provision for control of waste disposal from all classes of vessels including pleasure craft should be instituted.

Institutional Practices

-- State of Michigan should adopt standards for both inter- and intrastate streams as currently scheduled by the Water Resources Commission.

-- The area system of waste collection and disposal should be investigated on a broader basis especially in the Clinton River Basin and Downriver communities.

-- Provision for a larger staff in the Michigan Water Resources Commission to update stream survey reports and to survey those industrial waste sources not presently classified as adequate.

-- Provision for more testing of waste treatment plant effluents, especially for nutrient concentrations and nitrogenous oxygen-demanding material.

Research

-- Research and pilot plant studies to determine more effective means of reducing nutrients, especially phosphates from various sized treatment plants.

-- Research by educational or other groups to determine more effective means of reducing all oxygen-demanding wastes, especially the nitrogenous stage.

-- Study of the effect algal growth (secondary BOD) caused by nutrients to assess more completely the effect on a stream of a highly treated organic waste.

-- Research by industry groups and others towards the use of other than phosphate compounds as binders in synthetic detergents.

III. IMMEDIATE CONTROL NEEDS

The Southeastern Michigan area of the Lake Erie Basin has a Michigan drainage area of 4093 square miles and a shoreline of 150 miles. It includes all or part of 15 counties in Michigan and part of 2 counties in Ohio. In 1960, over 3.5 million people lived in the area.

Industrial Waste

More than 80 individual industries discharge in excess of one billion gallons of wastewater each day. These effluents contain suspended solids, dissolved solids, oils, grease, cyanide, toxic metals, acids, alkalies, bacteria, phenols, oxygen-demanding wastes, nutrients, and heat. Some effluents contain no significant concentration of contaminants, while some are grossly polluted with waste material.

The following is a summary of the adequacy of these treatment facilities rated by the Michigan Water Resources Commission:

Adequate treatment	-	42
Inadequate treatment	-	22
Unreliable treatment	-	9
Adequacy not established	-	18
Need not established	-	1

A number of industries include more than one type of discharge with different ratings for the separate discharges. The majority of the industries with inadequate treatment in the conference area are currently under stipulations for improvements in treatment.

Municipal Wastes

The municipalities within the basin provide for waste treatment at 44 plants, of which 19 provide primary treatment, 30 provide secondary treatment,

and five are sewage lagoons. Twenty-five communities or areas not currently providing adequate collection and treatment are under orders to discharge their wastes to adequate treatment facilities. Many of the communities in the basin currently provide treatment for their wastes at plants not in the community. Both the Detroit system and the Wayne County system serve many communities. Industrial wastes for many industries are presently treated with the municipal wastes.

The municipal waste treatment plants discharge over 650 million gallons per day, with the Detroit plant alone discharging 550 MGD to the Detroit River.

Combined Sewers

The majority of the people in the basin live in communities that have all or part of their sewage collection system as combined storm-sanitary sewers. This is especially true of the older, more urban sections of these communities. Stormwater overflows are estimated to discharge 2% of the yearly total raw sewage contributed to the Detroit sewage treatment plant directly to the Detroit River. This overflow, although a small proportion of the flow, constitutes a much higher proportion of suspended organic material, and an extremely high proportion of the total bacterial load discharged to the river.

In some suburban areas with separate sewer systems, the illegal practice of connecting roof, patio, or driveway drains to the sanitary sewer, results in an overload and subsequent non-effective treatment during storm periods, with an effect similar to stormwater overflow on the receiving stream.

IV. Costs

The following tables of immediate needs costs for pollution control are based on actual construction experience in the Michigan area. Cost figures do not include industrial treatment needs, except when the industrial wastes will be treated by a municipal plant. Secondary treatment may be assumed for all sources, except those where a sewage lagoon is adequate and more economically feasible. In addition to the cost for treatment, the cost for sewers is also tabulated. In certain areas adequate sewers exist; in other areas, all sewers are necessary; and in some metropolitan areas, interceptors must be constructed to transport wastes to a central plant from a number of presently inadequate plants. Secondary treatment is the maximum amount of treatment provided for in this tabulation, even if it is inadequate in terms of stream loadings. The costs are listed both by subbasin and by priority of need as defined previously.

In the case of many communities within the service area of the Detroit Water System, an alternate to the tabulated costs for treatment exists. This alternate is to tie in to an interceptor of the Detroit Water System, which is scheduled for construction within the immediate time period of this report, or which may actually be constructed ahead of schedule. Alternate cost estimates on this basis are not tabulated in this report.

The subbasin designations for many communities may not be those in the tabulation if the communities connect to a metro system or to the Detroit water system. The listed basin is the current waste discharge basin or the natural drainage basin.

POLLUTION CONTROL COSTS (thousands of dollars) by SUBBASINS

<u>Basin</u>	<u>Treatment</u>	<u>Sewer</u>	<u>Total</u>
<u>St. Clair River</u>			
St. Clair	4,299	9,188	13,487
Black	966	3,209	4,175
Pine	25	160	185
Belle	-	88	88
Total	5,290	12,645	17,935
<u>Lake St. Clair</u>			
Clinton River (8)	634	2,984	3,618
<u>Lake Erie</u>			
Minor tributaries	3,292	12,806	16,098
Huron	8,748	29,474	38,222
Raisin	2,410	5,132	7,542
Total	14,450	47,412	61,862
Lake Erie Enforcement Area	10,201	2,346	12,547
Total	24,651	49,758	74,409
<u>Detroit River Enforcement Area</u>			
Detroit Metro	155,500	171,500	327,000
Other	5,775	4,200	9,975
Total	161,275	175,700	336,975
<u>Total Southeastern Michigan</u>	191,850	241,087	432,937

POLLUTION CONTROL COSTS (thousands of dollars) by PRIORITY

<u>Priority</u>	<u>Treatment</u>	<u>Sewer</u>	<u>Total</u>
1	176,906	190,251	367,157
2	12,911	44,069	56,980
3	1,599	4,312	5,911
4	434	2,455	2,889
Total	191,850	241,087	432,937

Note: (8) Costs for interceptors for connection to Detroit Water Service included under Detroit Metro.

POLLUTION CONTROL COSTS BY GOVERNMENTAL UNITS
(thousands of dollars)

<u>Location</u>	<u>Priority</u>	<u>Treatment</u>	<u>Sewer</u>	<u>Total</u>
ST. CLAIR RIVER BASIN				
<u>St. Clair River</u>				
Port Huron	1	753	-	753
Marysville	1	123	-	123
St. Clair	1	105	-	105
Marine City	1	88	-	88
Cottrelville T.	1	656	1,838	2,494
Kimball T.	1	1,320	4,200	5,520
St. Clair T.	1	105	-	105
Clay T.	1	990	3,150	4,140
Algonac	1	88	-	88
East China T.	1	71	-	71
<u>Black River</u>				
Deckerville	4	63	325	388
Yale	3	34	-	34
Fort Gratiot T.	2	825	2,625	3,450
Peck	4	44	259	303
<u>Pine River</u>				
Emmett	4	25	160	185
<u>Belle River</u>				
Imlay City	3	-	88	88
LAKE ST. CLAIR BASIN				
<u>Clinton River</u>				
Leonard	4	44	259	303
Oxford Village	3	441	945	1,386
Washington	3	149	1,780	1,929
Clinton T. (1)	1	-	-	-
Mt. Clemens (1)	1	-	-	-
Sterling T. (1)	1	-	-	-
Utica (1)	1	-	-	-
Warren (1)	1	-	-	-
Pontiac (1)	1	-	-	-
Rochester (1)	2	-	-	-
Harrison T. (1)	2	-	-	-
Fraser (1)	2	-	-	-
Shelby T. (1)	2	-	-	-

Note: (1) For costs see Detroit Metro.

POLLUTION CONTROL COSTS BY GOVERNMENTAL UNITS (cont.)
(thousands of dollars)

<u>Location</u>	<u>Priority</u>	<u>Treatment</u>	<u>Sewer</u>	<u>Total</u>
LAKE ERIE BASIN				
<u>Lake Erie (minor tributaries)</u>				
Maybee	4	38	232	270
Bedford T.	2	2,486	10,238	12,724
Erie T.	1	768	2,336	3,104
<u>Huron River</u>				
Ann Arbor T. (2)	2	-	-	-
Ypsilanti T. (2)	2	-	-	-
Pittsfield T. (2)	2	-	-	-
Superior T. (2)	2	-	-	-
Dexter	2	72	-	72
Pinckney	4	63	325	388
South Lyon	2	166	893	1,059
South Rockwood	1	128	681	809
Stockbridge	3	38	150	188
Wixom	2	126	2,225	2,351
Flat Rock	1	145	-	145
Rockwood	1	90	-	90
Ann Arbor Metro	2	7,920	25,200	33,120
<u>River Raisin</u>				
Blissfield	2	72	-	72
Britton	4	50	263	313
Brooklyn	3	163	388	551
Cement City	4	38	200	238
Clayton	4	31	200	231
Clinton	2	45	-	45
Deerfield	3	56	325	381
Dundee	2	78	-	78
Madison T.	2	656	1,838	2,494
Ash T. (3)	1	-	-	-
Onsted	4	38	232	270
Palmyra T.	2	465	1,050	1,515
Petersburg	3	68	386	454
Tecumseh	3	650	250	900

Note: (2) For costs see Ann Arbor Metro.
(3) For costs see Monroe Metro.

POLLUTION CONTROL COSTS BY GOVERNMENTAL UNITS (cont.)
(thousands of dollars)

<u>Location</u>	<u>Priority</u>	<u>Treatment</u>	<u>Sewer</u>	<u>Total</u>
<u>Enforcement Area</u>				
Detroit Metro	1	155,500	171,500 ⁽⁴⁾	327,000
Grosse Ile	1	294	4,200	4,494
Riverview	1	331	-	331
Wayne County System				
Wyandotte (5)	1	4,200	-	4,200
Trenton (6)	1	390	-	390
Trenton	1	560	-	560
Estral Beach	1	56	325	381
Berlin T.	1	433	2,021	2,454
Luna Pier (7)	1	-	-	-
Frenchtown T. (3)	1	-	-	-
Monroe T. (3)	1	-	-	-
 Monroe Metro	 1	 9,712	 -	 9,712

Notes: (3) For costs see Monroe Metro.

(4) Sewer cost includes the new interceptor system, improvements in stormwater overflow control, and improvements in the city sewerage system.

(5) The participating communities are: Taylor T., Allen Park, Lincoln Park, Wyandotte, Southgate, Van Buren T. (part), River Rouge, Ecorse, Belleville, Brownstown, Dearborn T. (part), Romulus T. (part).

(6) The participating communities are: Gibraltar, Woodhaven.

(7) Refer to Erie T. on Lake Erie.

V. RECENT PROGRESS IN POLLUTION CONTROL

A. Detroit River-Lake Erie Project

In December 1961, the Honorable John B. Swainson, Governor of Michigan, requested the Department of Health, Education, and Welfare, to call a conference on water pollution problems in the Michigan Waters of the Detroit River and Lake Erie.

At the first session of the Conference in March 1962, at Detroit, Michigan, it was unanimously agreed that a study should be made of pollution problems in the area.

The Detroit River-Lake Erie Project, under the direction of the U.S. Public Health Service and in cooperation with State agencies, conducted a two-year study of the condition of the waters and sources of waste. In June 1965, the findings and recommendations of the study were presented to the Second Session of the Conference. Conferees agreed that the Michigan Water Resources Commission would implement the recommendations under State law.

Since that time, the Michigan Water Resources Commission has officially adopted the recommended criteria for water quality in the river and lake, as well as obtaining stipulations with 35 individual polluters, municipal and industrial, to facilitate control of their effluents to recommended levels by 1970. The following tables contain these water quality criteria and a summary of the State stipulations.

Water Quality Goals

	Detroit River				Lake Erie				Rouge River		Raisin River	
	Michigan Waters of Fighting Island Channel Pt. Hennepin To. Dt. 3.9		Trenton Channel Pt. Hennepin To Dt. 3.9		Michigan Waters		Zug Island Channel		1-94 Bridge to U.S.-24 Bridge		U.S.-24 Bridge to Mouth	
Coliform (total organisms/100 ml.)	**True mean density	<1000	**True mean density	<1000	**True mean density	<1000	**True mean density	<5000	**True mean density	<5000	**True mean density	<5000
Dissolved oxygen (mg/l)	Min. Daily Avg.	6.0 Min. >7.0	6.0 Min. >7.0	5.0 Min. >6.0	6.0 Min. >7.0	5.0 Min. >6.0	6.0 Min. >7.0	6.0 Min. >7.0	Min. 3.0	Min. 3.0	Min. 3.0	Min. 3.0
Phenols (ug/l)	Maximum Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	5.0 Maximum 2.0 Average	Maximum 5.0	Maximum 5.0	Maximum 5.0	Maximum 5.0
Oils and greases	#1	#1	#1	#1	#1	#1	#1	#1	#1	#1	#1	#1
Suspended and settleable solids	#2	#2	#2	#2	#2	#2	#2	#2	#2	#2	#2	#2
Chlorides (mg/l) as Cl	#3	#3	#3	#3	#3	#3	#3	#3	#3	#3	#3	#3
Iron (mg/l) as Fe	<0.3	<0.3	<0.3	<0.5	<0.3	<0.5	<0.3	<0.3	<2.0	<2.0	* N.A.	* N.A.
Ammonia (mg/l) as NH ₃ -N	<0.2	<0.2	<0.2	<0.5	<0.2	<0.5	<0.2	<0.2	<1.0	<1.0	<1.0	<1.0
Phosphates (soluble mg/l) as P	#4	#4	#4	#4	#4	#4	#4	#4	#4	#4	#4	#4
Cyanide (mg/l) as CN	None detectable	None detectable	None detectable	<0.025	None detectable	<0.025	None detectable	<0.025	<0.025	<0.025	<0.025	<0.025
pH	7.0 to 8.5	7.0 to 8.5	7.0 to 8.5	6.7 to 8.5	7.0 to 8.5	6.7 to 8.5	7.0 to 8.5	6.7 to 8.5	6.7 to 8.5	6.7 to 8.5	6.7 to 8.5	6.7 to 8.5
Color and turbidity	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5	#5
Dissolved organics	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6	#6
Points of measurement	Dt. 30.8W Dt. 28.4W Dt. 26.8W Dt. 25.7 Dt. 20.6 Dt. 17.4W Dt. 14.6W	Dt. 9.3E Dt. 3.9 (8500 feet to International Boundary)	Dt. 12.0W Dt. 8.7W Dt. 3.9 (Shore to 8000 feet)	All Michigan waters of Lake Erie below line extending due East and West through Detroit River Light to International Boundary	1-94 Bridge Schaefer Road Bridge Fort St. Bridge Jefferson Avenue Bridge	Monroe Street Bridge 1-75 Bridge U.S.-24 Bridge Line due North from Dundee Cement Dock						

** Determination to be made at later date on maximums.

* N.A. - Not applicable.

#1 No visible film of oil or globs of grease.

#2 Limited to the extent necessary to prevent the formation of deposits of either industrial or municipal waste origin.

#3 Limited to present levels and reduced where feasible.

#4 Limited to the extent necessary to prevent stimulation of nuisance growths of algae and weeds in the Detroit River and Lake Erie. On the basis of the best information available to the Commission at this time this limitation would be in the range of less than 0.015 mg/l of soluble phosphates expressed as phosphorus.

#5 Not offensive in appearance or otherwise unattractive as the result of wastes of industrial or municipal origin.

#6 Limited to the extent necessary to prevent interference with the use of the waters as a raw water source for potable use where applicable or which will not produce a detectable off flavor in the flesh of fish or the development of fungi or other growths as the result of industrial or municipal waste effluent.

SUMMARY OF MICHIGAN WATER RESOURCES COMMISSION STIPULATIONS

<u>Municipalities and Industries</u>	<u>Susp. Solids mg/l</u>	<u>Sol. Phos. (as PO₄) lb/day</u>	<u>Phenols µg/l</u>	<u>Oil mg/l</u>	<u>BOD mg/l</u>	<u>lb/day</u>	<u>Tot. Coli. MPN</u>	<u>Constr. Comple. Date</u>	<u>Remarks (1)</u>
Allied Chem. Corp. Semet-Solvay Div.	-	-	-	(2)	-	-	-	4/1/67	
Solvay Process	50	-	-	-	-	-	-	4/1/68	Cl
E. I. duPont de Nemours & Co.	-	-	-	-	-	-	-	4/1/67	pH
Time Container Corp. Monroe Paper Prod.	35	650	-	-	-	500	1000	1/1/69	
Scott Paper Co.	50	-	-	-	-	31,000	-	11/1/68	
Consolidated Pack- aging Co. - No. Plant	35	2,200	-	-	-	2,400	1000	1/1/69	
So. Plant	35	2,100	-	-	-	1,500	1000	1/1/69	
Ford Motor Co. Monroe Plant	-	-	-	-	-	-	1000	1/1/68	CN
Union-Bag-Camp Co.	35	1,350	-	-	-	2,500	1000	1/1/69	

(1) For "Remarks" see page 23.

(2) The effluent should not contain oil in amounts sufficient to create a visible film on the surface waters of the State.

SUMMARY OF MICHIGAN WATER RESOURCES COMMISSION STIPULATIONS (cont.)

Municipalities and Industries	Susp. Solids mg/l	Sol. Phos. (as PO ₄) lb/day	Phenols ug/l	Oil mg/l	BOD mg/l	lb/day	Tot. Coll. MPN	Constr. Comple. Date	Remarks (1)
American Cement Corp.	50	-	-	-	-	-	-	5/1/67	
Darling & Co.	-	-	-	-	-	600	1000	11/1/67	
Wyandotte Chem. Corp.	50	-	-	15	-	-	-	4/1/68	Cl
Pennsalt Chem. Corp.	50	-	-	-	-	-	-	4/1/68	Cl
McLouth Steel Corp. Trenton Plant	50	-	-	15	-	-	-	4/1/68	Fe
Revere Copper & Brass, Inc.	50	-	-	15	-	-	-	11/1/67	
Firestone Tire & Rubber Co.	-	-	-	-	-	-	-	11/1/67	Fe
Mobil Oil Co.	50	-	-	15	-	-	-	11/1/67	
Monsanto Chem. Corp. Inorganic Chem. Div. Trenton Resins Plt.	- - -	- - -	2000	-	-	2800	-	5/1/68 4/1/68	
City of Detroit (present area)	50	324,000	21,000	-	93	15	1000	11/1/70	
Wayne County (Wyandotte & Trenton)	50	19,000	3,000	-	10	15	1000	11/1/70	

(1) For "Remarks" see page 23.

SUMMARY OF MICHIGAN WATER RESOURCES COMMISSION STIPULATIONS (cont.)

Municipalities and Industries	Susp. Solids		Sol. Phos. (as PO ₄)		Phenols		Oil		BOD		Tot. Coli. MPN	Constr. Comple. Date	(1) Remarks
	mg/l	lb/day	lb/day	lb/day	ug/l	lb/day	mg/l	lb/day	mg/l	lb/day			
City of Riverview	50	470	35	-	-	0.2	15	-	-	920	1000	11/1/70	
City of Trenton	50	935	138	-	-	5	15	-	-	1840	1000	11/1/70	
Grosse Ile Twp. (formerly Wayne Co.)	50	500	20	-	-	1	15	-	-	980	1000	11/1/70	
City of Monroe	50	1200	128	-	-	-	-	-	-	350	1000	5/1/69	Separate sewers
Great Lakes Steel Blast Furnace Div.	50	-	-	-	-	180	15	-	-	-	-	4/1/68	
Strip Mill	50	-	-	-	-	-	15	-	-	-	-	4/1/68	
Ecorse Plant	50	-	-	-	-	-	15	-	-	-	-	4/1/68	Fe, pH
Ford Motor Co. (Rouge)	50	-	-	-	-	70	15	-	-	-	-	4/1/69	Fe

(1) For "Remarks" see page 23.

Remarks:

Fe: Iron was found to be a major constituent in the effluent of industries and the limit of 17 mg/l was recommended by both the Public Health Service and the Michigan Water Resources Commission. The following loading limitations were also included in the Michigan Water Resources Commission stipulations:

Ford Motor Company	-	2500 lbs/day
Firestone Tire and Rubber Co.	-	330 lbs/day
Great Lakes Steel Corp. -		
Ecorse Plant	-	4000 lbs/day
McLouth Steel Corp. -		
Trenton Plant	-	2500 lbs/day

CN: Cyanide concentration of .025 mg/l was recommended as the limit by both the Public Health Service and the Michigan Water Resources Commission. In addition, the State agency stipulation set a maximum loading of 25 lb/day for Ford Motor Company (Monroe).

pH: The recommended limit on the pH range for Great Lakes Steel (Ecorse Plant) effluent was set at 5.5-10.6 by both the Public Health Service and the Michigan Water Resources Commission. Public Health Service recommended that E. I. duPont de Nemours and Company comply with the State order that the effluent of this industry have pH in the range of 5.8-10.3.

Cl: Chlorides were found to be a significant waste constituent in the effluent of the several industries and limits of chlorides loading were set by the Michigan Water Resources Commission as follows:

Allied Chemical Corporation -		
Solvay Process	-	2,800,000 lb/day
Wyandotte Chemical Corporation -		
North Plant	-	1,300,000 lb/day
South Plant	-	64,000 lb/day
Pennsalt Chemicals Corp.		
East Plant		550,000 lb/day
West Plant		8,800 lb/day

B. Conference on Lake Erie and its Tributaries

The first session of the Conference in the matter of pollution of Lake Erie and its tributaries was held in Cleveland, Ohio, August 3-5, 1965. The second session was on August 10-12, 1965, at Buffalo, New York. The third meeting was held at Cleveland, Ohio, on June 22, 1966. A fourth meeting is scheduled for March 22, 1967, at Buffalo, New York.

Conferees representing the Indiana Pollution Control Board, the Michigan Water Resources Commission, the Ohio Department of Health, the Pennsylvania Sanitary Water Board, the New York State Department of Health, and the Federal Water Pollution Control Administration were present at the meetings.

It was agreed that each State water pollution control agency would develop time schedules for treatment facilities for each source of municipal and industrial waste on a plant by plant basis. The Michigan schedule for such activities, resulting from the Detroit River-Lake Erie Project recommendations, was deemed satisfactory to meet the demands of the Lake Erie Conference.

Other recommendations by the conferees include the following:

1. Control of highway runoff during construction.
2. Industrial plant practices. Plant by plant surveys throughout the basin to evaluate the impact on water quality and to take remedial action.
3. Federal surveillance program. Sampling program has been established in western Lake Erie and will be extended to cover the entire lake.
4. Phosphate removal program. The Federal Water Pollution Control Administration has indicated that phosphates can be removed at less cost than previously anticipated. Pilot plants are under construction at Detroit and Trenton, Michigan, to evaluate removal methods.

5. Dredging operations. Disposal of dredged material should be done in such a manner as to minimize polluttional effects. The Corps of Engineers has been asked to develop plans toward this end.
6. Technical Committee. The Technical Committee now studying phosphates and their effects would expand its activities to include other problems effecting Lake Erie.
7. Disposal of trash, garbage, and other refuse is also being studied by the State agencies.

C. Michigan Department of Public Health - Macomb County.

In May 1966, the Michigan Department of Public Health ordered a ban on the construction of new sewer lines to the Clinton River in 10 fast-growing Macomb County communities. The ban was intended to prevent further pollution of the Clinton River, a tributary of Lake St. Clair. The Health Department will not lift the ban until a workable program is initiated to clean up the Clinton River.

A consulting firm retained by Macomb County recommended connection to the Detroit sewer system as the most feasible and economic method of protecting the Clinton River and Lake St. Clair.

Most of the Macomb County communities have signed agreements with Detroit to be connected to their interceptor system.

Chlorination: The Michigan Department of Public Health has ordered all municipal treatment plants to chlorinate the effluent year-round, effective January 1967.

D. Pollution Control Program for the Detroit Regional Watershed.

Recognizing a need for all communities in the Detroit Regional Watershed to unite in the effort to abate pollution, the Detroit Board of Water Commissioners proposed its revised water pollution control program in 1966.

The 1966 program is comprehensive and complete and revises this 1957 program. The major objectives of the program were presented as follows:

1. Systematic and orderly development of a single pollution control system for the Detroit Regional Watershed, which includes all of the area covered in this report.
2. Construction of an area-wide wastewater interceptor system.
3. Installation and operation of facilities for advanced wastewater treatment.
4. Further reduction of stormwater overflows.
5. Acceleration of industrial wastewater control on a cooperative government-industry basis.
6. Improved methods of waste disposal for pleasure boats and freighters.
7. Regulation of water levels in the Lake St. Clair-Detroit-River-Lake Erie complex to aid in stream and shoreline beautification.
8. Tighter control of lake and river dredging and landfill practices.
9. International assurance that the Canadian communities will take equivalent action to enhance the water quality of the Great Lakes.
10. Continuation of a broad and sound financing base (founded upon user charges) to assure uninterrupted progress. Acceleration is possible through use of Federal and State grants.

Phase 1 is that portion of the total program to be completed by the year 1975. This portion of the program provides for the construction of:

Regional sanitary sewage interceptors in Wayne, Oakland, and Macomb counties;

Advanced treatment facilities at Detroit's wastewater plant in compliance with Detroit River-Lake Erie Project's recommendations;

Stormwater overflow control facilities.

Relief sewers and sewer renovations in the City of Detroit.

E. Other Action Taken by Michigan Water Resources Commission
in Pollution Abatement:

1. In February 1965, a final order of determination was issued against the Longworth Plating Company and the Village of Chelsea, located in the Huron River Basin. All wastewaters from the Longworth electroplating processes presently discharged to Chelsea's storm sewer, and ultimately to Lett's Creek, must be treated to reduce constituent concentrations to allowable limits.

2. In April 1966, the Michigan Water Resources Commission held a show cause conference regarding Huron Valley Steel Corporation's violation of a 1962 order to control its solids discharge to the Huron River. The company has been directed to proceed immediately with plans for design and construction of the necessary treatment facilities.

3. At a show cause conference in September 1966, McLouth Steel Corporation explained that its recent violation of a 1963 order to abate pollution in the Detroit River was the result of an operational error. The company assured the Commission, that in the future, all operational decisions to discharge waste material will be made only by specially designated top management personnel.

4. In December 1966, a final order of determination was issued against the Village of Novi, Michigan, located in the Rouge River Basin. Before June 1, 1969, the city must have constructed the sewage treatment facilities necessary to prevent the unhealthy and undesirable conditions existing in Walled Lake Creek caused by the discharge of its raw sewage.

5. In December 1966, a final order of determination was issued against the City of Walled Lake, located in the Rouge River Basin. By June 1, 1967, the city must have constructed the necessary sewer system and treatment plant to collect and treat its sewage before discharge to surface waters.

6. The Michigan Water Resources Commission, in cooperation with other State agencies, has been ordered by Governor Romney to develop rules and regulations controlling the waste discharges from pleasure boats. The State is optimistic that the new law will be enforceable by June 1, 1970.

7. In addition to those mentioned above, numerous other orders were issued relating to specific users of water. These include industrial and commercial establishments discharging waste products of a domestic or industrial nature to both surface and ground waters of the State. Maximum flows and concentrations of substances were stipulated where necessary.

8. The Commission staff, in accordance with recommendations of the Detroit River-Lake Erie Conference, conducted a surveillance program on the Detroit River, Michigan waters of Lake Erie, and the industrial outfalls in the conference area. This surveillance program was supplemented by the Federal Water Pollution Control Administration. The Water Quality Monitoring Program begun in 1955 was continued, as was the industrial waste surveys program in the Southeastern Michigan Basin.

9. In addition to matters called under Section 6 of the Act, the Commission under Section 5, scheduled at its December 1966 meeting a number of conferences throughout the State to establish water quality criteria. The criteria so established would be applied to intrastate waters in a certain priority, i.e., first, where grant money is involved, beginning with the July 1967 meeting. The following schedule was adopted for 1967, primarily to hold hearings on water quality criteria on interstate waters:

- January - Formulate proposed water quality criteria for the several uses.
- February - St. Joseph River and Lake Michigan.
- March - Lake Huron.
- April - St. Clair River, Lake St. Clair, Detroit River and Lake Erie.
- May
 - Menominee and Montreal Rivers - Lake Superior and St. Marys River.
 - Adopt implementation and enforcement plan for St. Joseph River, Lake Michigan, and Lake Huron.
- June
 - Adopt implementation and enforcement plan for Southeastern Michigan, Maumee River, Montreal River, Lake Superior, and St. Marys River.

VI. BACKGROUND

A. Basin Characteristics:

The St. Clair River-Lake St. Clair Basin includes St. Clair, Black, Belle, Pine, and Clinton Rivers.

The St. Clair River, the connecting waterway between Lake Huron and Lake St. Clair, flows in a southerly direction for about 40 miles. The upper channel, having an average width of one-half mile, and a depth varying from 25 to 75 feet, extends 28 miles from Lake Huron to Algonac. Below Algonac, the channel divides into the several sections of the lower delta portion of the river known as the St. Clair Flats. At this point, 32 percent of the flow enters Anchor Bay by the North Channel and 68 percent enters the main body of Lake St. Clair through Middle Channel, Chaneel Ecarte and South Channel. The South Channel, with the depth varying from 25 to 45 feet, is the main navigation channel into Lake St. Clair. The average flow is 177,000 cubic feet per second (cfs).

The principal tributaries draining into the St. Clair River on the American side are the Black, Pine, and Belle Rivers.

The Black River has a drainage area of 690 square miles comprising parts of Sanilac, Lapeer, and St. Clair counties. The main stem of the Black River flows southeasterly about 60 miles to the St. Clair River at Port Huron. The river has been improved by an 8200-foot channel requiring periodic dredging and maintenance for navigation. Deficient flows, recorded as low as 8 cfs in 1964, retard the waste assimilation properties of this stream.

The Pine River, with a total drainage area of 180 square miles in St. Clair County, flows southeasterly to the St. Clair River at St. Clair,

Michigan. An old channel dredged in the late 19th century serves for the transportation of sand and gravel.

The Belle River, draining 210 square miles of Lapeer and St. Clair counties, flows from the center of Lapeer County to Marine City on the St. Clair River. The stream is used mainly as a winter harbor for medium-size vessels. During 1964, flows as low as 4 cfs during fall months were recorded.

The northern section of the St. Clair River-Lake St. Clair Basin is a sparsely populated rural area which includes part of Sanilac, St. Clair, Lapeer, and Macomb counties. The major population centers along the St. Clair River are Port Huron, Marysville, St. Clair, East China Township, Marine City, and Algonac. These communities have a total population of about 50,000 and draw their water supply from the St. Clair River. Industrialized Port Huron is the major city with a population of 36,000.

Lake St. Clair is a shallow basin with low, marshy shores and gently sloping bottom, located in the Great Lakes chain between Lake Huron and Lake Erie. The maximum depth of the lake is 21 feet. However, a dredged channel, 700 feet wide and 25 feet deep, extends from the South Channel to the head of the Detroit River. The surface area of Lake St. Clair is 430 square miles and has a total drainage area of 5006 square miles; 4010 square miles are Canadian and 996 are American.

Currents in Lake St. Clair are predominantly north to south because of the overwhelming influence of the flow-through of the St. Clair-Detroit River influence. The water entering the lake from the Cutoff Channel flows in a general southwest direction, until it approaches the southern portion of the lake, where it runs westward into the Detroit River. In

Anchor Bay, the water flows counter-clockwise from the North Channel until it enters the main portion of the lake. The rest of the water in the lake flows in a clockwise direction until it joins the flow into the Detroit River.

These currents are modified and influenced by wind friction on open areas of the lake, particularly the eastern half of the lake. During the months of June through October, the most frequent winds are from the south and southwest. From November through March, winds from southwest and northwest are most frequent.

Retention time in Lake St. Clair, using average flow, is computed as approximately 8 days. This, of course, would vary under field conditions because of current movements, eddies, and recirculation in certain parts of the lake, due to the natural configuration of the bottom and shoreline. It does indicate, however, that the flushing interval is very short for a lake of this size. Therefore, eutrophication would be dependent on the quality of water in the St. Clair River.

The Clinton River, the major tributary on the United States side of the lake, has a drainage area of 760 square miles. It has had a mean flow of 484 cubic feet per second for the 29 years of record - 1935 to 1963. The river, with its origin in the Bushman Lake in upper Oakland County, flows easterly through the City of Pontiac to Mt. Clemens and out into Anchor Bay. The river flows about 50 miles and falls about 425 feet between its mouth and source. A dredged channel, 8 feet deep and 100 feet wide, extends up to Mt. Clemens.

The Clinton River adds polluted water to Lake St. Clair. The flow-through characteristics of the St. Clair-Detroit River system keeps many of these polluting constituents in suspension and subsequently flushes them from the lake.

Metropolitan Beach, located on the western shore of Lake St. Clair near Mt. Clemens, has the largest bathing beach and park facility in the basin. This 550-acre park has had, in the past, 1,400,000 visitors. Facilities are provided for swimming, water skiing, and boat mooring and launching.

The southwestern shoreline area of Lake St. Clair is heavily populated. The communities of St. Clair Shores, Grosse Pointe, Grosse Pointe Farms, Grosse Pointe Park, Grosse Pointe Shores, and Grosse Pointe Woods have a total population of 132,000. This area offers boating facilities and is the site of large marinas.

The Detroit River, the connecting waterway between Lake St. Clair and Lake Erie and the International Boundary between the United States and Canada, flows in a southerly direction about 31 miles from Peach Island to its mouth at Lake Erie. The Detroit River Basin has a four-county area of approximately 2040 square miles, and, according to the 1960 census, has a population of 3,863,480 in the Greater Detroit area.

The flow of the Detroit River is exceptionally steady because of the tremendous storage capacity provided by Lakes Superior, Huron, and Michigan. The average discharge of the Detroit River, for the period 1936 through April 1964, was 182,000 cfs. The extremes in discharge are usually a result of winds, ice, or sudden change in barometric pressure.

The upper thirteen miles of the river, having an average width of 2400 feet, a mean depth of 25 feet, is divided only at its mouth by Peach Island and Belle Isle. The river bed in this upper reach consists mainly of clay.

The lower section of the river contains Fighting Island (Canadian waters), Grosse Ile (American waters), and several smaller islands with large areas of marshland. In the lower river, shipping channels have been cut through exposed underlying rock to a depth of 28 feet.

The Rouge River, a tributary to the Detroit River, rises northwest of Detroit and flows southeasterly emptying into the Detroit River below Dearborn. The basin, covering an area of 464 square miles, lies almost entirely in an old lake bed. The topography is relatively flat and impervious with no natural storage. The main stream is 32 miles long and falls about 360 feet from its headwaters to the mouth. The lower 3.5 miles through Short Cut Channel consist of a dredged channel used for vessel traffic to industries in the area. The Short Cut Channel is an artificial connection between the Detroit River and the Rouge River. The natural S-shaped portion of the Rouge, now referred to as the Old Channel, receives limited use from the commercial ship traffic.

Discharge measurements are taken by the U.S. Geological Survey at the Rouge River, the Middle Rouge, and the Lower Rouge. The summation of the average discharges of record from these three gages shows an average flow of the Rouge River above the influence of the Detroit River backwater of approximately 235 cfs. This flow is not large enough to effectively dilute the large volumes of waste effluents from the industries along the Rouge River.

The automobile industry has been responsible for the rapid industrial growth which has occurred in the Detroit area during the past 30 to 40 years. This industry has brought about the establishment of many related activities such as steel mills, blast furnaces, tool and die manufacturing, and coke plants. Other industries include chemical plants, pulp and paper mills, oil refineries, and the manufacture of rubber and related products.

Extensive use has been made of the many islands for industrial and recreational purposes. Zug Island, Fighting Island, and the upper end of Grosse Ile are being used for the disposal of waste materials resulting from the manufacture of caustic soda and soda ash. Grassy Island and Mud Island are being used for the disposal of material from dredging operations; Belle Isle and Bois Blanc Island are devoted to recreational purposes.

The Huron River rises west of Detroit and flows in a southwesterly direction emptying into a large marsh at Pointe Mouillee. This marsh is subject to backwater from Lake Erie and has no clear dispersion into the lake. The river, with total drainage area of 892 square miles, is about 90 miles long and falls about 440 feet in its descent to the Detroit River. The major part of its drainage basin reaches the main stem above Ann Arbor, and from this point downstream, receives no important tributaries. Most of the upper part of the basin is hilly containing many lakes which provide natural storage.

The River Raisin, entering the lake at Monroe, drains an area of 1070 square miles. The total fall of the river from its headwaters in northeastern Hillsdale County to Lake Erie is 500 feet. The uplands of the north and west areas of the basin are characterized by the lighter-textured, well drained soils, while heavier-textured, more poorly drained soils occur in the lower lands of the south and east sections.

A series of low-head dams are spaced at one-mile intervals near the mouth of the river. The last 1.5 miles of the river contain a dredged channel for navigation serving the Port of Monroe. Lake-affected back-water extends approximately three miles up the river to the first low-head dam.

Lake Erie. While land in the Detroit area is used for industrial purposes, that bordering the western edge of Lake Erie is, in general, used for both farming and recreation. Summer residences and cottages dot the western shoreline of Lake Erie. The inland area in the Detroit River-Western Lake Erie Basin is also used for farming. The agricultural sections consist of relatively small individually owned farms. Chief yields are field crops, vegetables, sod grass, and fruits. There is also extensive production of dairy and poultry products. The forests have been denuded and now mainly consist of small, isolated woodlots, which have little or no effect upon the flow or quality of the streams.

This area is under the climatic influence of the Great Lakes. Because of the stabilizing influence of these large bodies of water, extreme temperatures occur rather infrequently in the Detroit area. The mean annual temperature is about 41.9°F, and the average annual precipitation at Detroit is 31.49 inches. Winters are marked by cloudiness and frequent snow flurries. The average wind velocity is 10 miles per hour.

B. Water Quality

St. Clair River

Soluble phosphate concentrations were generally low, that is less than .025 mg/l. Some greater concentrations were found but the phosphate input into Lake St. Clair does not appear to be excessive at this time.

The quality of the river water does not vary to any great extent along the reach of the river. This can be verified by examination of data collected at SR 39.0 and SR 13.7. The average concentrations of several parameters as measured across two ranges are shown in the table below.

<u>Parameters</u>	<u>Average Values*</u>	
	<u>SR 39.0</u>	<u>SR 13.7</u>
Dissolved Oxygen	8.9	8.9
NH ₃ -N	0.12	0.09
NO ₃ -N	0.31	0.28
Suspended Solids	16	3
Dissolved Solids	108	137
Phenols	3	3

*All results in mg/l, except phenols - ug/l.

The waste treatment of six American industries along the river are rated adequate by the Michigan Water Resources Commission. The communities in the sparsely populated St. Clair River Watershed discharge wastes of only 67,000 people. Five municipal sewage treatment plants with a total average flow of 13 million gallons per day discharge primary effluent into the river.

Black and Belle Rivers

The two American tributaries, Black and Belle Rivers, have small discharges compared to the flow of the St. Clair River. At the mouth of the Black River, coliform counts of as high as 6000 organisms/100ml were recorded. Low dissolved oxygen concentration is also characteristic of the mouth of this tributary.

Considerable bacteriological pollution was found at the Belle River, with median total coliform count of 29,000 organisms/100ml and a maximum of 130,000 organisms/100ml. Although the overall water quality degradation in the St. Clair due to this tributary is not readily detectable, the bacteriological pollution presents a health hazard.

Lake St. Clair

In 1964, a sampling program was conducted by the Lake Huron Program Office on Lake St. Clair. The data is summarized below:

LAKE ST. CLAIR - SUMMARY OF 1964 SURVEY

	DO	BOD ₅	NH ₃	NO ₂	NO ₃	Tot.Sol.	Phenol	Coliform
Avg	9.1	2	.22	.007	0.34	151	2	62
Max	10.2	7	.69	.019	1.80	204	12	250,000
Min	6.7	1	.07	.002	0.08	120	0	< 1
No. of Stations	39	22	22	22	22	40	23	42

pH values of 9.1 and 8.8 were measured at Station P17 and P18 on one occasion. Other than these two values, pH varied from 7.6 to 8.6. Most of the alkalinity measurements were between 70 and 90 mg/l, although the total range of values is somewhat larger. The other constituents exist in relatively insignificant concentrations. The water quality of the lake is good, although isolated problem areas do exist.

Metropolitan Beach, a recreational area for swimming, is located near sampling Station P17. Recorded coliform densities as high as 8600 organisms/100ml present a health problem to users of the beach.

Clinton River

The Clinton River is one of the major sources of pollution in Lake St. Clair. In 1966, this river was sampled by the Lake Huron Program Office. The downstream reach of the river, extending approximately 17 miles from Red Run to the mouth of the Clinton River, reflects the quality of the water entering the lake. The results of the 1966 survey on this section of the Clinton River are shown in the table below:

CLINTON RIVER (Red Run to Mouth)
Summer Survey (mg/l)

	Temp. °C	DO	BOD ₅	Cl	NH ₃ -N	NO ₃ -N	Tot. PO ₄	Total Solids	Susp. Solids
Avg	24	2.7	9	81	4.58	2.6	9.2	544	35
Max	26	6.1	14	103	6.00	4.9	14.4	670	169
Min	22	0.6	3	67	3.20	1.3	6.7	500	5

The data shows an average dissolved oxygen content of 2.7 mg/l, average BOD₅ of 9 mg/l, nutrient concentration of 7.18 mg/l inorganic nitrogen, and 9.2 mg/l total phosphates, and an average total solids concentration of 544 mg/l. All the sewage treatment plants on the Clinton River are secondary and most of the major industries on the river have treatment rated as adequate by the Michigan Water Resources Commission. The long-term average flow at Mt. Clemens is 468 cfs. In 1964, the minimum flow was 83 cfs. The total waste effluent discharged into the river is estimated at more than 71 cfs.

Milk River

The Milk River, located on the western shore of Lake St. Clair, is the site of a stormwater overflow system. Samples were collected at P22 at the mouth of the river and coliform densities were as follows:

<u>1964</u>	<u>MF/100ml</u>
July 21	390
August 13	100 ⁺
September 23	250,000
November 18	100

Precipitation (.2 inch at Metropolitan Airport) occurring on September 23 could have caused an overflow on that day. No precipitation occurred on the other sampling days. This stormwater overflow interferes with recreational use of the lake in the immediate area.

Detroit River

The water quality of the Detroit River has been discussed in detail in the "Report on Pollution of the Detroit River, Michigan Waters of Lake Erie, and Their Tributaries," by the Federal Water Pollution Control Administration. Action has been taken by the Michigan Water Resources Commission against the major polluters in accordance with the Federal Water Pollution Control Administration's recommendations. This has been discussed in the section on the Detroit River-Lake Erie Project in Section V of this report.

Huron River

Samples were collected at the mouth of the Huron River on a bi-weekly basis during 1966. The average BOD₅ concentration was 6 mg/l. The Huron River water is high in dissolved solids as indicated by the

average conductivity of 675 mg/l and dissolved solids content of 489 mg/l. The average phenol concentration of 5 ug/l is sufficient to cause taste and odor problems in water supplies. The river is also supplying high average concentrations of nutrients to Lake Erie: 1.15 mg/l total phosphates (as PO_4), .90 mg/l soluble phosphates (as PO_4), and 1.59 mg/l inorganic nitrogen (as N). The bacteriological pollution is represented by median coliform density of 36,000 MF/100ml, and maximum density of 95,000 MF/100ml. The communities of Dexter, Flat Rock, and Rockwood, discharge primary effluent to the river. The Huron Valley Steel Corporation and Peninsular Paper Company have waste treatment rated as inadequate by the Michigan Water Resources Commission.

River Raisin

Station T89, above the City of Monroe, was sampled 20 times in 1966. The average BOD_5 concentration was 6 mg/l. This station reflects high dissolved solids content, as indicated by a conductivity of 687 mg/l, and dissolved solids concentration of 670 mg/l. Average phenol concentration is 6 ug/l. The River Raisin adds high concentrations of nutrients to Lake Erie: .59 mg/l total phosphates, .46 mg/l soluble phosphates, and 3.81 mg/l inorganic nitrogen. Considerable bacteriological pollution is demonstrated by median coliform counts of 1850 MF/100ml, and maximum coliform concentrations of 44,000 MF/100ml. The dissolved oxygen content remains high in the reach of the river, with an average dissolved oxygen content of 9.9 mg/l. However, oxygen depletion is apparent as the river enters Lake Erie. At Station T80, at the mouth of the river, the dissolved oxygen concentration has often been depleted to near septic conditions.

The communities of Blissfield, Clinton, Dundee, and Monroe, discharge primary effluent to the river. Consolidated Packaging Corporation, Ford Motor Company, Monroe Paper Products Company, and Union Bag-Camp Paper Corporation, have treatment rated as inadequate by the Michigan Water Resources Commission. As a result of the Enforcement Project, action has already been taken against the City of Monroe and the industries mentioned above by the Michigan Water Resources Commission.

WATER USES

The principal water uses of the Southeast Michigan Basin include:

Municipal Water Supply - Use of surface waters of the river or lake as a municipal water source.

Total Body Contact - The complete immersion of the body in water as in swimming.

Partial Body Contact - Partial immersion of the body as in water skiing, wading, and stream fishing.

Fish and Aquatic Life - Habitat for fish and aquatic life and available for fishing.

Wildlife - Available for animal and fowl wildlife use.

Livestock - Used for stock watering of dairy cows, pigs, horses, etc.

Irrigation - Used for watering of agricultural lands, golf courses, parks, etc.

Industrial Water Supply - Use of surface waters for processing and manufacturing.

Cooling Water - Industrial and municipal surface water use for cooling of machinery.

Hydro-power - River waters used for the production of hydroelectric power.

Waste Assimilation - Assimilation of municipal and industrial wastes and wastewater.

Esthetics - The use of water for esthetic enjoyment. Camping, picnicking, and sight-seeing, while not directly water oriented activities, are considerably enhanced by the presence of a relatively clean water course.

Pleasure Boating - Includes canoes, small row boats, power boats, and sailboats.

Commercial Shipping - Use of lakes and streams by steamships and commercial fishing boats.

Table 1 is a description of the river and lake areas covered by this report, and Figures 1 and 2 show their locations in reference to the basins by area. The reach boundaries were based on consideration of changing water quality, observed and reported water uses (see Table 2), and/or certain physical features of the area. These water uses were developed through extraction of material from the Michigan Water Resources Commission reports, Bureau of Recreation reports, Michigan Department of Public Health reports, and the U.S. Public Health Service reports. However, full responsibility for designation of these uses is assumed by this office.

The Southeast Michigan Basin waters are heavily used for municipal and industrial activities and also provide a degree of recreation for those who live in the local areas. Parks and picnic areas are numerous in the Southeast Basin, but swimming and body contact activities are limited in several areas because of pollution of the waters.

TABLE 1. REACH DESCRIPTIONS

St. Clair River and Lake St. Clair Area

<u>Stream</u>	<u>Description</u>
St. Clair River	Port Huron to Lake St. Clair
Black River	St. Clair River to Deckerville
Pine River	St. Clair River to East of Capac
Belle River	St. Clair River to Imlay City
Lake St. Clair	Michigan waters of Lake St. Clair
Salt River	Lake St. Clair to near Richmond
Clinton River	Lower - Lake St. Clair to Rochester, Mich. Upper - Rochester to above Clarkston

Detroit River and Lake Erie Area

Detroit River	Upper - Lake St. Clair to So. Belle Isle Lower - So. Belle Isle - Lake Erie
Fox Creek	Detroit River to E. Jefferson Avenue
Connors Creek	Detroit River to E. Jefferson Avenue
Rouge River	Lower - Detroit River to 3.43 mile point Middle - 3.43 mile point to Upper Rouge River Upper - Upper Rouge River to Bloomfield Hills
Ecorse River	Detroit River to Southfield Road
Monguagon Creek	Trenton Channel to Wyandotte
Elizabeth Park Channel	Detroit River - Detroit River
Frank & Poet Drain	Trenton Channel to Metro Airport
Lake Erie	Michigan Waters of Lake Erie
Huron River	Lower - Lake Erie to 58.5 mile point Upper - 58.5 mile point to Big Lake

TABLE 1. REACH DESCRIPTIONS (cont.)

Detroit River and Lake Erie Area

<u>Stream</u>	<u>Description</u>
Swan Creek	Lake Erie to Wayne-Washtenaw County Line
Stoney Creek	Lake Erie to North of Milan
Sandy Creek	Lake Erie to west of Maybee
Raisin River	Lower - Lake Erie to $\frac{1}{2}$ mile west of U.S. 24 Middle - $\frac{1}{2}$ mile west of U.S. 24 to 79.7 mile point Upper - 79.7 mile point to Cement City
La Plaisance	Lake Erie to west 1 mile
Otter Creek	Lake Erie to east of Petersburg

TABLE 2. WATER USE

River & Reach***	Number code for water use*													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ST. CLAIR RIVER AND LAKE ST. CLAIR AREA														
St. Clair	PA	PA	PA	PA	PA	-	-	PA	PA	-	PA	PA	PA	PA
Black	-	-	-	PA	PA	PA	PA	PA	PA	-	PA	PA	PA	-
Pine	-	-	-	PA	PA	PA	PA	-	-	-	-	PA	PA	-
Belle	-	-	-	PA	PA	PA	PA	-	-	-	PA	PA	PA	-
Lake St. Clair	PA	PA	PA	PA	PA	-	-	-	-	-	PA	PA	PA	PA
Salt	-	-	-	PA	PA	PA	-	-	-	-	PA	PA	PA	-
Upper	-	PA	PA	PA	PA	PA	PA	-	-	-	PA	PA	PA	-
Lower	-	-	-	-	PA	PA	PA	-	-	-	PA	PA	PA	-
DETROIT RIVER AND LAKE ERIE AREA														
Upper	PA	PA	PA	PA	PA	-	-	PA	PA	-	PA	PA	PA	PA
Lower	PA**	PA**	PA**	PA	PA	-	-	PA	PA	-	PA	PA	PA	PA
Fox Creek	-	-	-	-	-	-	-	-	-	-	PA	-	PA	-
Connors Creek	-	-	-	-	-	-	-	-	-	-	PA	-	-	-
Rouge - lower	-	-	-	-	-	-	-	PA	PA	-	PA	-	-	PA
middle	-	-	-	-	PA	-	PA	PA	PA	-	PA	PA	-	-
upper	-	-	-	-	PA	-	PA	-	-	-	PA	PA	-	-

Notes: P - present water use.

A - anticipated water use.

- - no present use.

* - see key, Table 3.

** - use presently affected by pollution.

*** - reach description, Table 1.

TABLE 2 . WATER USE

River & Reach***	Number code for water use*													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DETROIT RIVER AND LAKE ERIE AREA														
Ecorse	-	-	-	-	-	-	-	-	-	-	PA	-	PA	-
Monguagon Creek	-	-	-	-	-	-	-	-	-	-	PA	-	-	-
Elizabeth Park Chan.	-	-	-	-	-	-	-	-	-	-	PA	PA	-	-
Frank & Poet Drain	-	-	-	-	-	-	-	-	-	-	PA	PA	-	-
Lake Erie	PA	PA	PA	PA	PA	-	-	PA	PA	-	PA	PA	PA	PA
Huron - lower	PA**	PA**	PA**	PA	PA	PA	PA	PA	PA	PA	PA	PA	PA	-
upper	-	PA	PA	PA	PA	PA	PA	-	-	-	PA	PA	PA	-
Swan Creek	-	PA	PA	PA	PA	PA	-	-	-	-	PA	PA	PA	-
Stoney Creek	-	-	-	-	PA	PA	-	-	-	-	-	-	PA	-
Sandy Creek	-	-	PA	PA	PA	-	-	-	-	-	-	PA	PA	-
Raisin - lower	-	P**	P**	PA	PA	PA	PA	PA	PA	-	PA	PA	PA	PA
middle	PA	PA	PA	PA	PA	PA	PA	PA	PA	PA	PA	PA	PA	-
upper	-	PA	PA	PA	PA	PA	PA	-	-	PA	PA	PA	PA	-
La Plaisance Creek	-	-	PA	PA	PA	-	-	-	-	-	-	PA	PA	-
Otter Creek	-	-	-	-	PA	PA	-	-	-	-	-	-	PA	-

Notes: P - present water use.

A - anticipated water use.

- - no present use.

* - see key, Table 3.

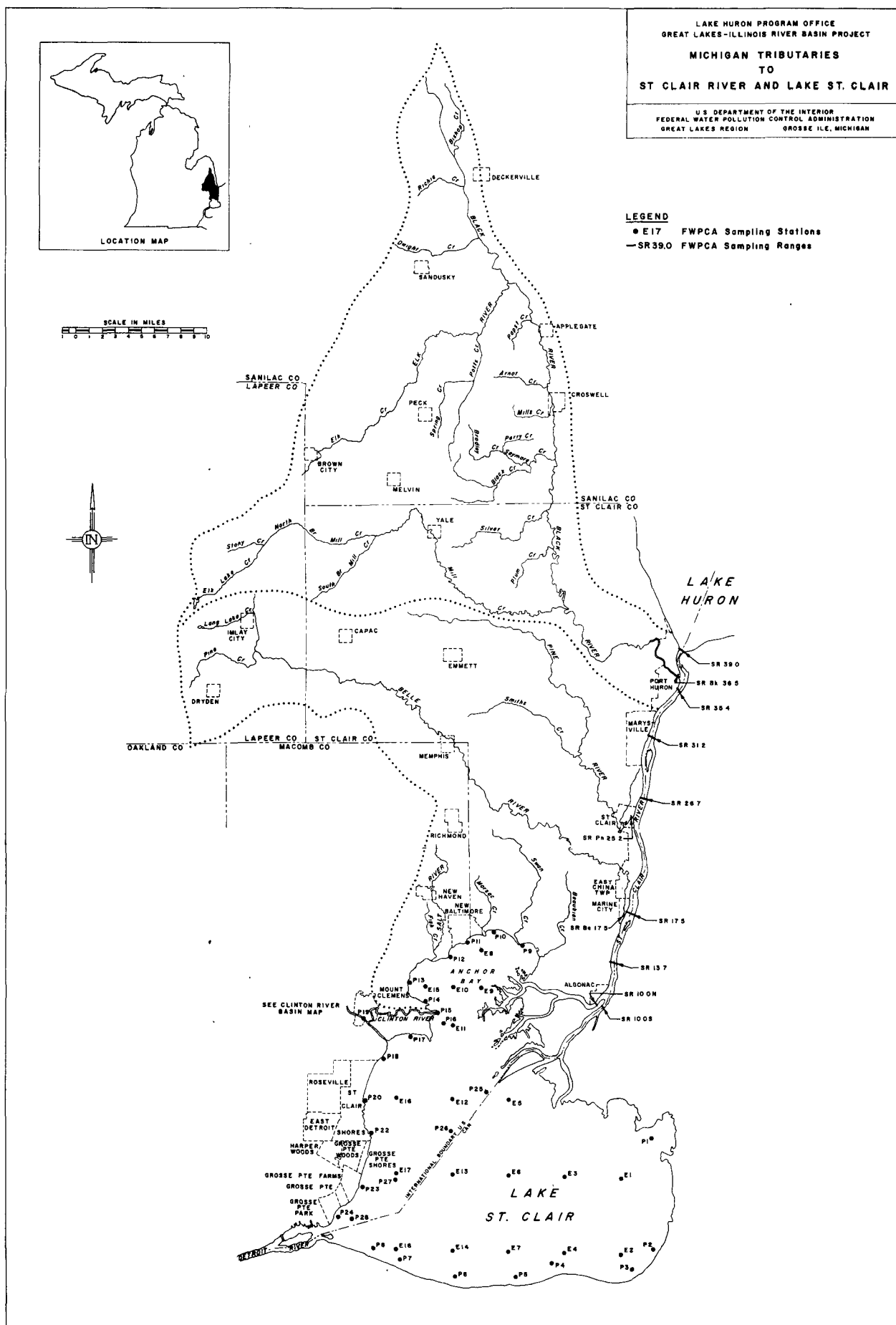
** - use presently affected by pollution.

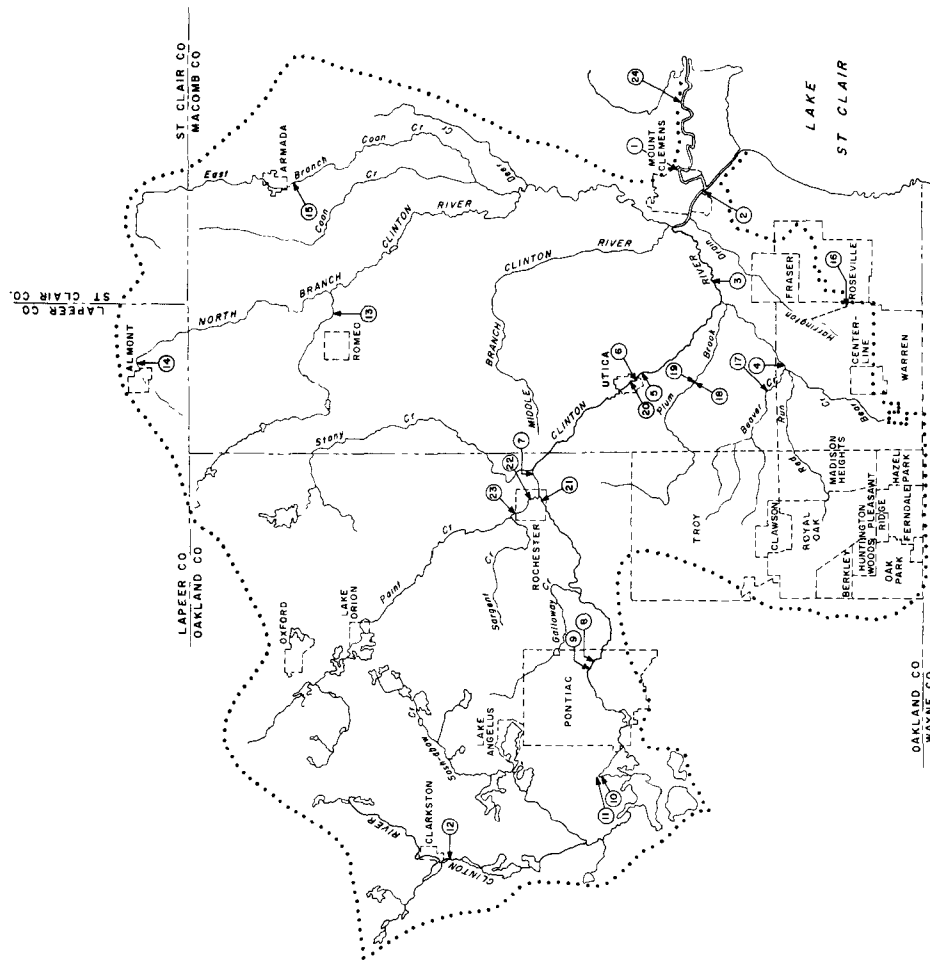
*** - reach description, Table 1.

TABLE 3. KEY TO WATER USE CODE

1. Municipal Water Supply
2. Total Body Contact
3. Partial Body Contact
4. Fish and Aquatic Life
5. Wildlife
6. Livestock Watering
7. Irrigation
8. Industrial Water Supply
9. Cooling Water
10. Hydro-power
11. Waste Assimilation
12. Esthetics
13. Pleasure Boating
14. Commercial Shipping

FIGURE 2





MUNICIPAL OUTFALLS

- 1 Mount Clemens
- 2 Clinton Twp No 1
- 3 Clinton Twp No 2
- 4 Warren
- 5 Sterling Twp No. 1
- 6 Utica
- 7 Rochester
- 8 Pontiac No 2
- 9 Pontiac No 1
- 10 Waterford Twp No 2
- 11 Waterford Twp No 1
- 12 Clarkston
- 13 Romeo
- 14 Almont
- 15 Armada

INDUSTRIAL OUTFALLS

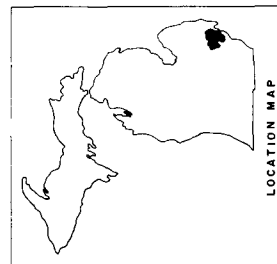
- 16 Robin Products Co
- 17 RW Corp Mich Div
- 18 Chrysler Corp Mich Missile Plant
- 19 Ford Motor Co
- 20 National Machine Products
- 21 Rochester Paper Co
- 22 Higbee Mfg Co Avon Tube Div
- 23 National Twist Drill
- 24 Selfridge A F Base STP

LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

MUNICIPAL & INDUSTRIAL WASTE OUTFALLS

CLINTON RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN



LOCATION MAP

FIGURE 4

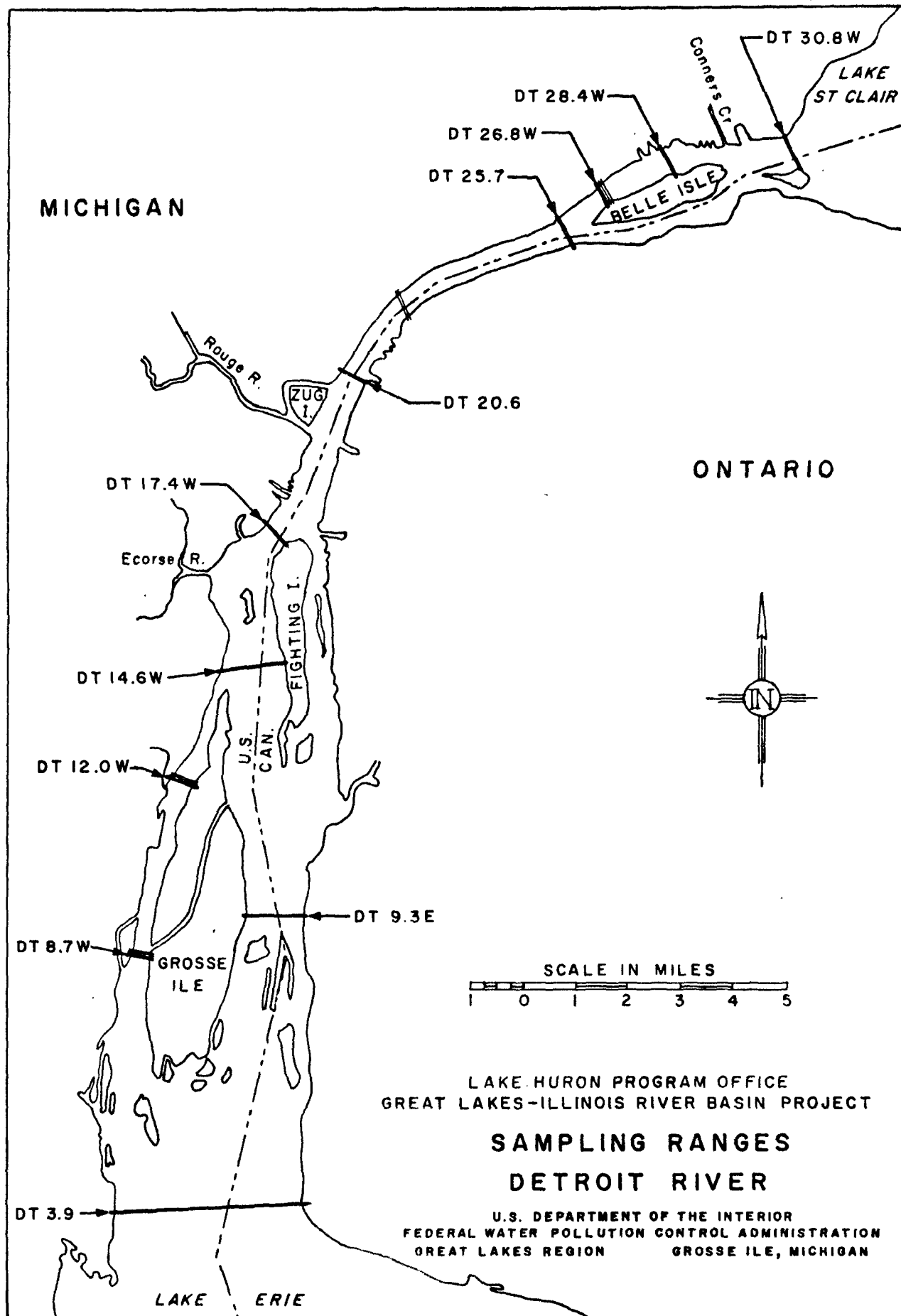


FIGURE 5

DETROIT RIVER-LAKE ERIE PROJECT

INDUSTRIAL WASTE OUTFALLS

U.S. WATERS
DETROIT RIVER

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

SCALE

FEET

1000 0 1000 3000 5000 7000

MILES

3 2 1 0

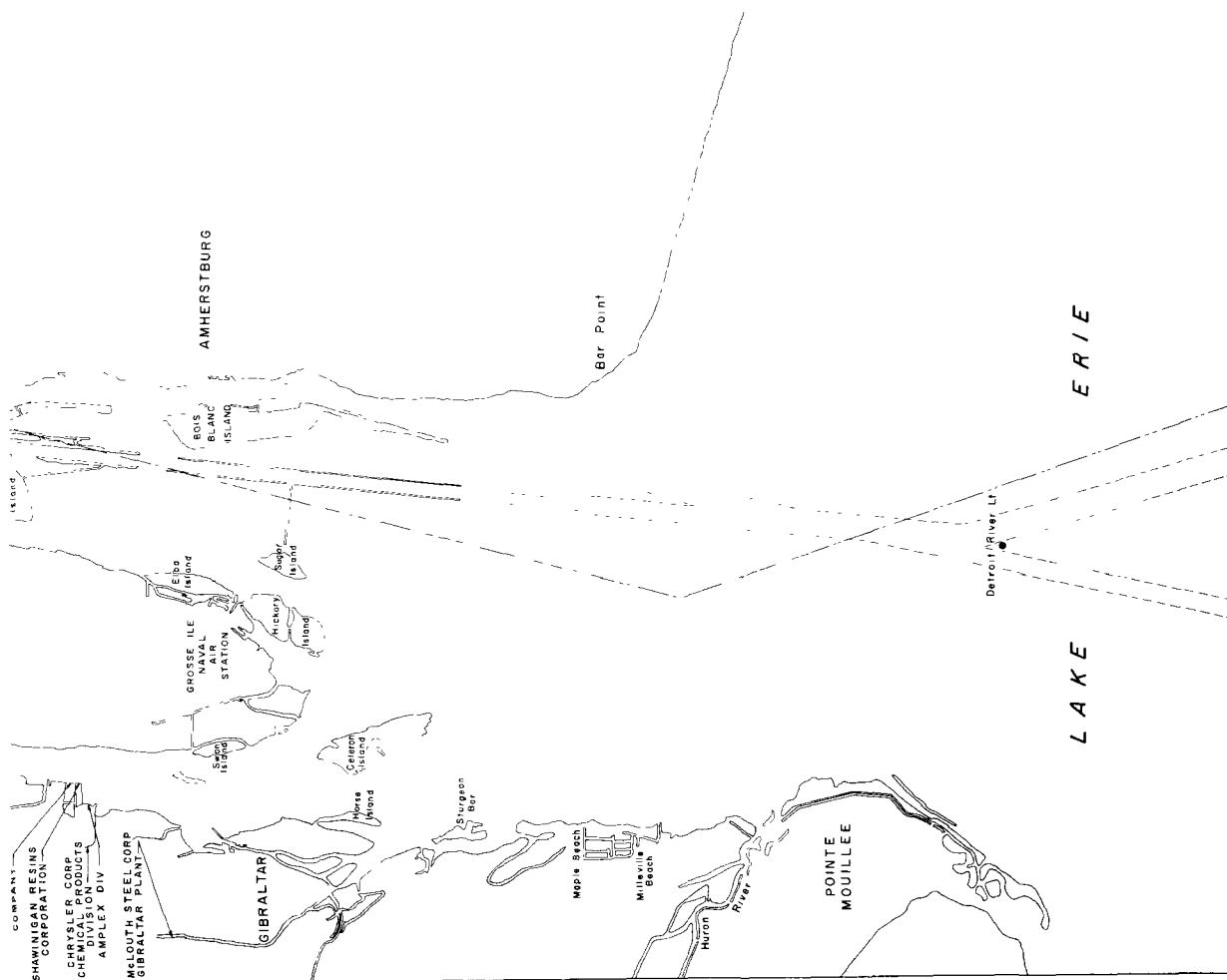
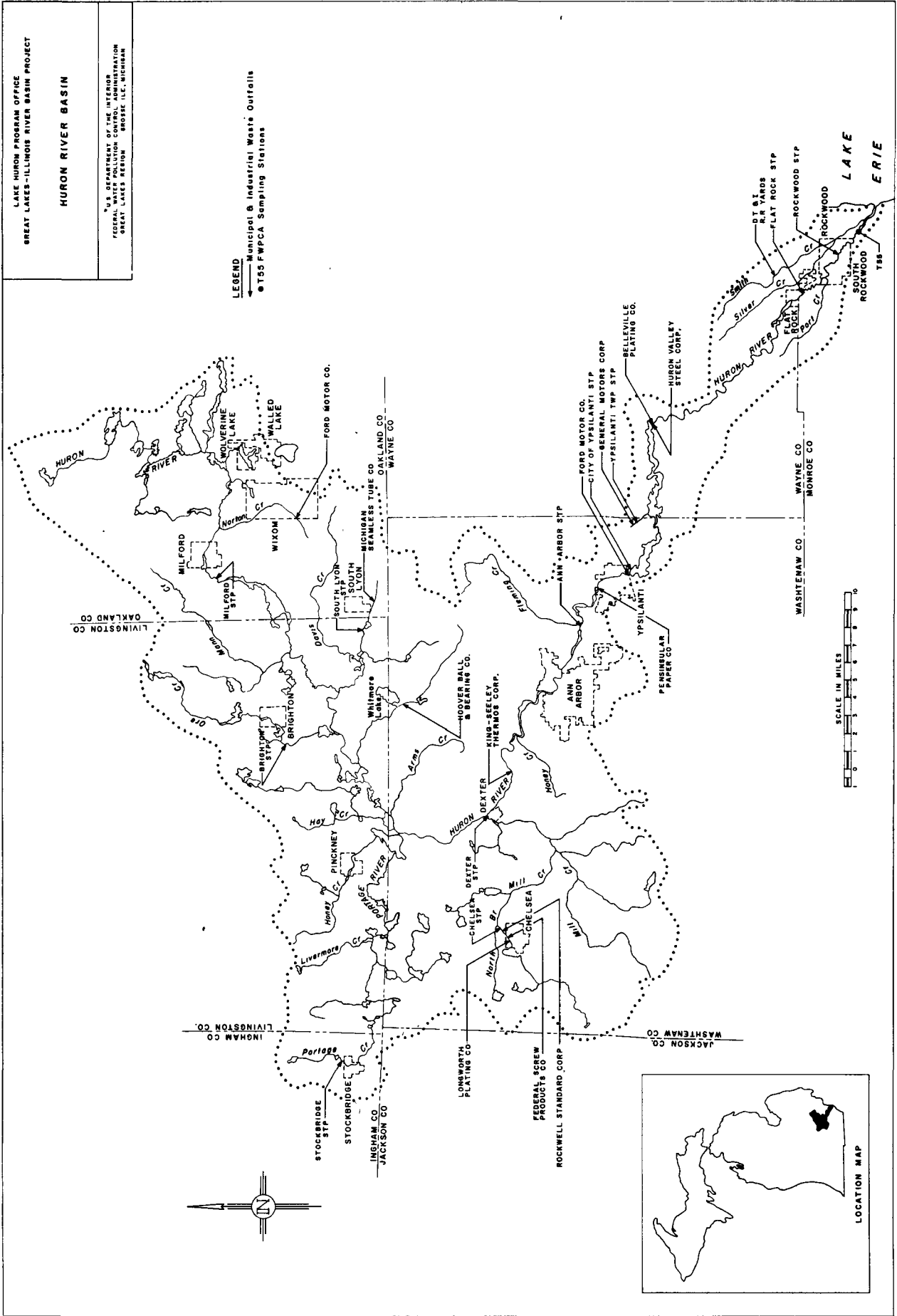


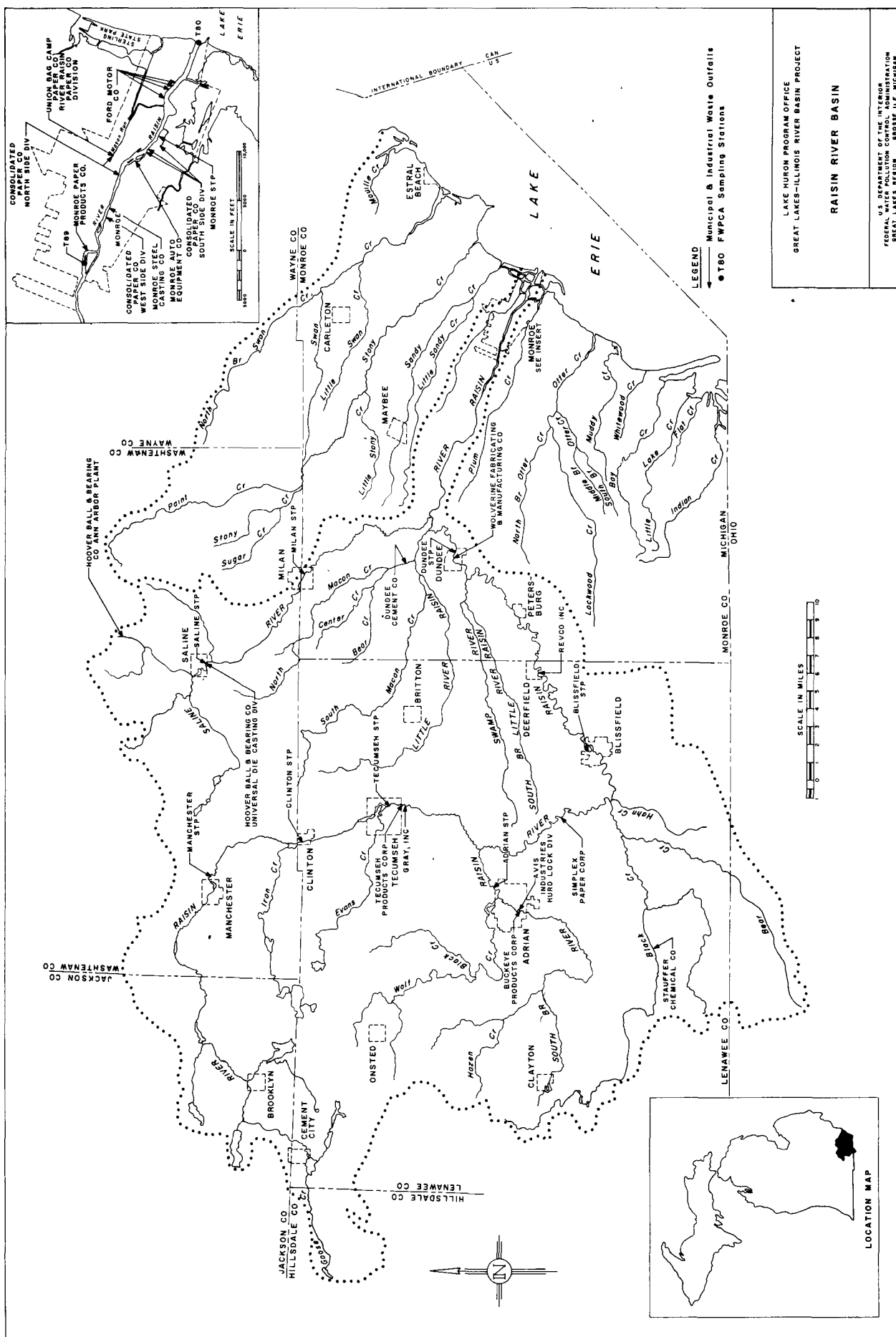
FIGURE 7



LAKE MURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

RAISIN RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION SPOKEE ILE, WISCONSIN



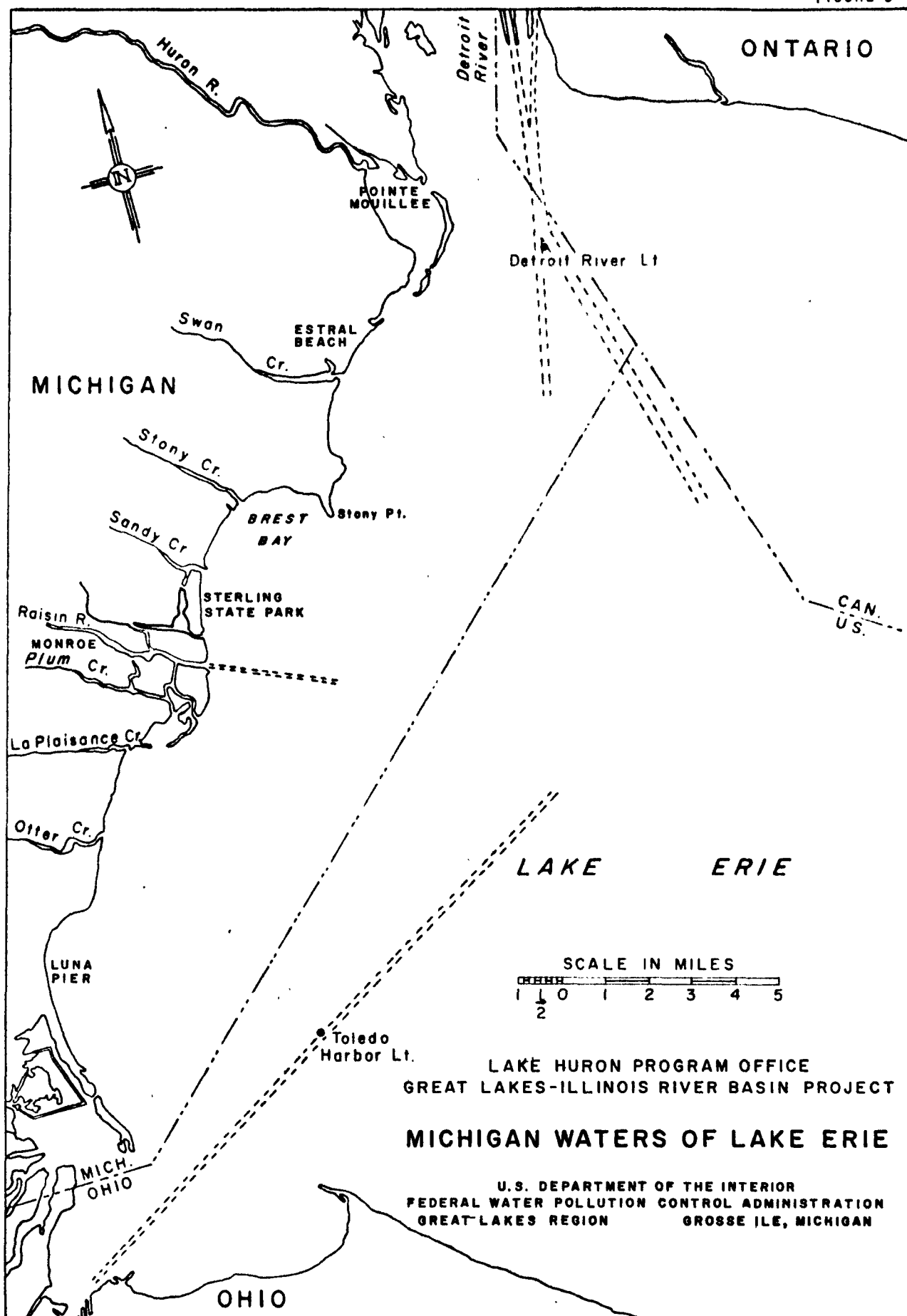




FIGURE 10

LEGEND

 Indicate Beginning and End of a Reach of a River
When Divided into 2 or More Parts for Water
Use Description.

NOTE Michigan Tributaries of the Detroit River
See Figure 11.

LOCATION MAP

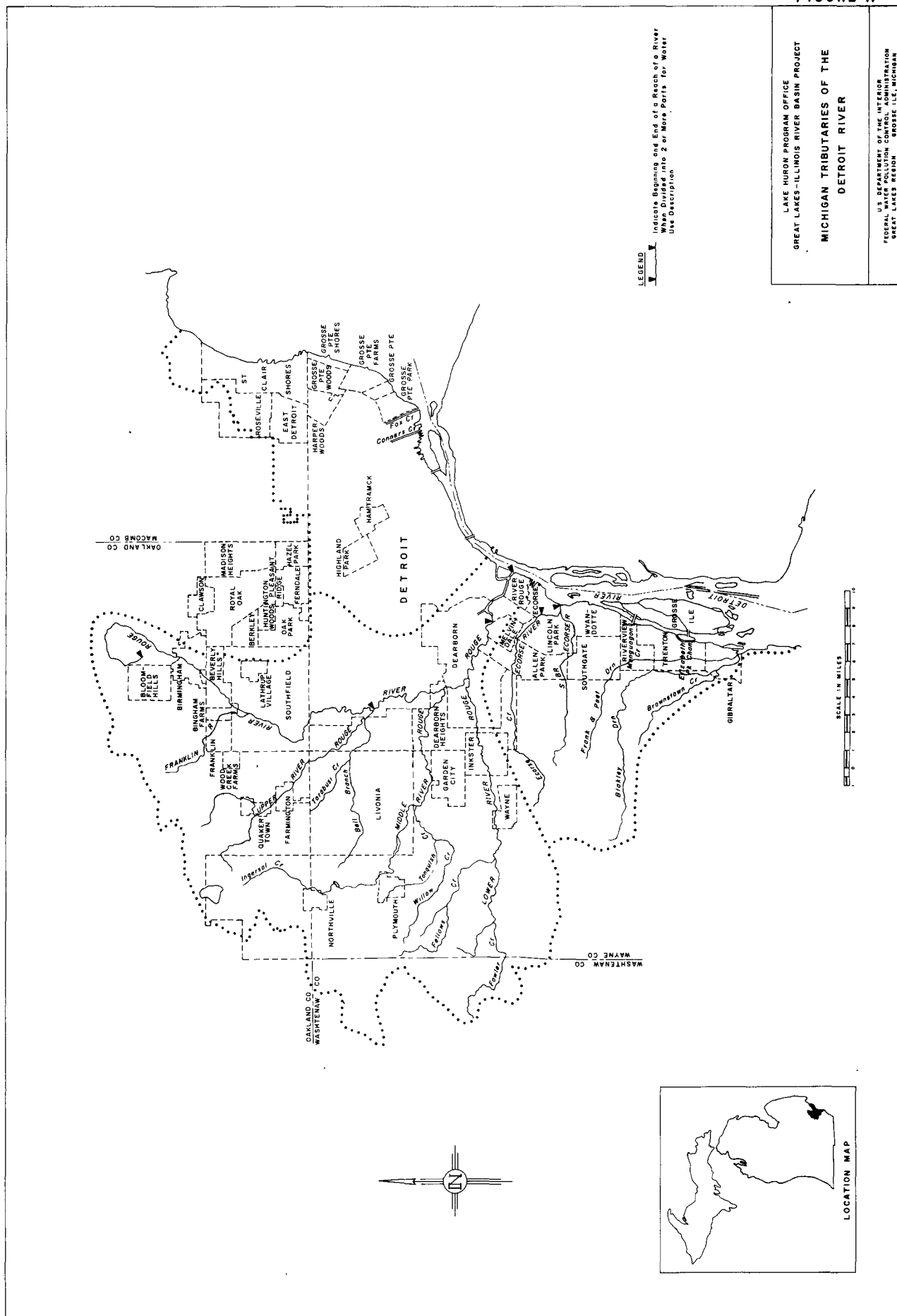


Map Description: This is a detailed map of the Detroit River basin and its tributaries. The Detroit River is shown flowing from Lake St. Clair to Lake Erie. Major tributaries include the Huron, St. Clair, and Raisin rivers. The map shows the international boundary between the United States and Canada. Key cities and towns are labeled, including Detroit, Ann Arbor, Ypsilanti, Milford, Rochester, and others. The map also shows the location of the Lake Huron Program Office and the Great Lakes-Illinois River Basin Project. A scale bar indicates distances in miles (0 to 10). A north arrow is also present.

**LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT**

LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
**SOUTHEAST MICHIGAN
TRIBUTARIES TO LAKE ERIE**
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN

FIGURE II



INSTITUTIONAL ORGANIZATIONS FOR WATER POLLUTION CONTROL IN MICHIGAN

The following is a list of Michigan Statutes and a brief explanation of their relationship to water pollution control:

Act 350, P.O. 1865 - Conservation Department directed to protect fish and fisheries.

Act 98, P.A. 1973 - Initiated the supervision of municipal water and sewer facilities by the Michigan Health Department.

Act 171, P.A. 1921 - Conservation Department was granted broad authority to "prevent and guard against pollution of lakes and streams within the State."

Act 61, P.A. 1939 - Director of Conservation was named State Supervisor of Wells (for oil and gas) and authorized "to prevent waste or damage to oil and gas, the fresh, brine, and mineral waters or to life and property."

Act 219, P.A. 1949 - Michigan Health Department's control of plans, construction, operation, and supervision of public water supplies, sewerage and sewage treatment facilities was strengthened.

Act 40, P.A. 1956 - Defines unlawful use of county and intercounty drains for carrying sewage and other wastes. County Drain Commissions are responsible for actions under this law.

Act 306, P.A. 1927 - Authorize local health departments to adopt and enforce regulations controlling installation and operation of private sewage disposal systems.

Act 245, P.A. 1929
Act 117, P.A. 1949)
Act 165, P.A. 1963) Amendments to Act 245, P.A. 1929
Act 405, P.A. 1965)

The Michigan Water Resources Commission by authority of the foregoing Acts, is composed of seven members: the Heads of Department of Health, Conservation, Agriculture and Highways, as well as members representing Industrial Management, Municipalities, and Organized Conservation Groups.

Act 20, P.A. 1964 - Water Resources Commission controls storage and established optimum flows for all legitimate uses on a stream.

The Act creating a Water Resources Commission, prohibited the pollution of any waters of the State and the Great Lakes, designated the commission as the State agency in matters concerning the water resources of the State and provided penalties for the violation of the Act. The Act as amended (1965) is composed of twelve major sections. Sections 1 to 4 create the commission, authorize it to make rules and regulations, to enforce provisions of the Act, and to inspect and investigate matters relating to water pollution. Section 5 details the establishment of standards for waters and effluent discharges, and to prevent any pollution. Section 6 (A) is a broad definition of injurious pollution. Section 6 (B) defines "the discharge of any raw sewage of human origin, directly or indirectly into any of the waters of the State shall be considered prima facie evidence of the violation of Section 6 (A)." In addition any governmental unit is held responsible for the acts of "persons" within its boundaries. Section 6 (C) authorizes townships to issue and sell the necessary bonds to construct treatment works. Section 6 (D) defines any violation of Section 6 as a public nuisance and provides for remedies in addition to those specified for water pollution violations. Sections 7 through 12 provide for the legal rights of accused polluters and penalties for those found to be guilty and for conducting hearings and issuing orders of determination, define certain terms and fulfill the legal requirements of Michigan laws. Two important subsections in this group are Sections 8 (B) requiring the filing of proposed use statements with the commission, before using the waters of the State sewage or waste disposal purposes, and Section 12 exempting certain copper or iron mining operations from the provisions of the Act.

Summary of duties:

The Michigan Water Resources Commission has primary responsibility for controlling pollution in the waters of the State, setting of legal water quality standards, comprehensive water resource planning, and establishing priorities for construction grant programs.

The Michigan Department of Public Health controls construction and operation of public sewage collection and treatment systems and public water supply systems, as well as licensing of operators of water supply and sewage treatment plants.

Water and Related Land Resources Planning in Michigan:

There are three Michigan Departments primarily responsible for the activities relevant to comprehensive water and related resource planning.

Department of Commerce (Office of Economic Expansion, State Resource Planning Division, and the Community Planning Division).

Department of Highways (Office of Planning).

Department of Conservation (Division of Recreation Resource Planning and the Planning Section of the Water Resources Commission), the Michigan Water Resources Commission has been designated by Governor Romney as the State agency to develop a comprehensive water and related land resource plan for Michigan.

An Inter-agency Committee was organized as directed by Governor Romney to "coordinate joint State-Federal programs with local and regional planning of Michigan's water and related land resources."

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