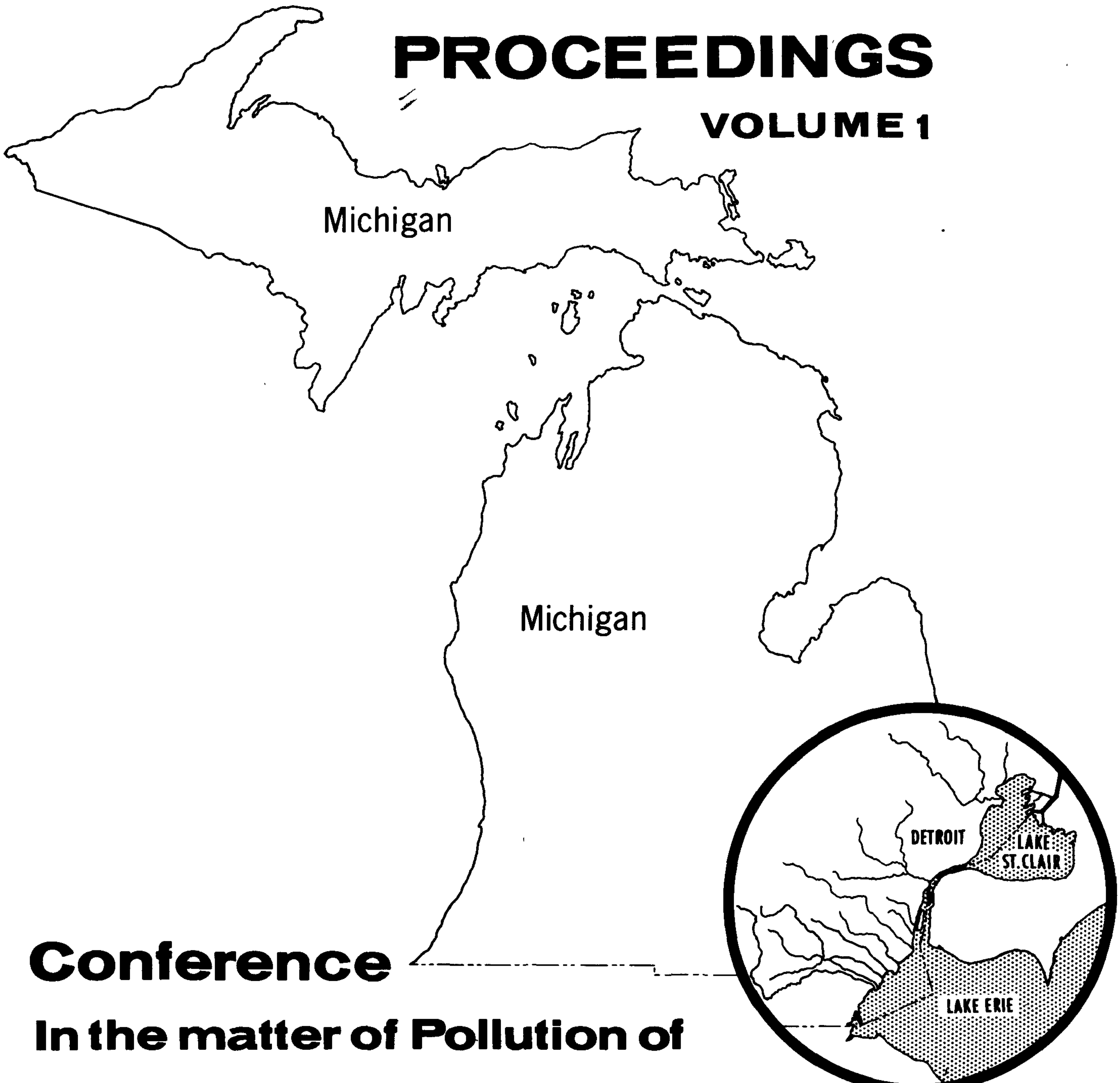
PROCEEDINGS

VOLUME 1



Conference

In the matter of Pollution of the navigable waters of the Detroit River and Lake Erie and their Tributaries in the State of Michigan

SECOND SESSION
JUNE 15-18, 1965

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PROCEEDINGS

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Conference

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

C O N T E N T S

C O N T E N T S

Second Conference in the Matter of Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries, convened at 9:30 a.m., Tuesday, June 15, 1965, at the Institute of Arts, Detroit, Michigan.

PRESIDING:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

CONFEREES:

Mr. Loring F. Oeming, Executive Secretary, Michigan Water Resources Commission

Mr. H. W. Poston, Regional Program Director, Department of Health, Education, and Welfare, Chicago, Illinois

PARTICIPANTS:

Hon. John D. Dingell, United States Representative from the 16th District of the State of Michigan

Hon. William D. Ford, United States Representative from the 15th District of the State of Michigan

PARTICIPANTS (Continued):

Richard D. Vaughan, Director, Robert S. Kerr Water Research Center, United States Public Health Service, Ada, Oklahoma

George L. Harlow, Project Director, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Ernest Premetz, Deputy Regional Director, Bureau of Commercial Fisheries, United States Department of the Interior, Ann Arbor, Michigan.

Hon. George Romney, Governor of the State of Michigan

Hon. James Rhodes, Governor of the State of Ohio

Hon. Weston E. Vivian, United States Representative from the State of Michigan

Colonel Edward C. Bruce, District Engineer, United States Army Engineer District, Detroit, Michigan

Lieutenant Maurice S. Power, Assistant Public Works Officer, United States Navy, United States Naval Air Station, Grosse Ile, Michigan

PARTICIPANTS (Continued):

Kenneth M. Mackenthun, Biologist, United States Public Health Service, Robert A. Taft Engineering Center, Cincinnati, Ohio

Gerald E. Eddy, State Geologist, Conservation Department, Michigan Water Resources Commission, Lansing, Michigan

Ralph W. Purdy, Chief Engineer, Michigan Water Resources Commission, Lansing, Michigan

John E. Vogt, Director of Engineering, Michigan Department of Health, Lansing, Michigan

C. C. Crumley, Sanitary Engineer, Michigan Department of Health, Lansing, Michigan

Al Barbour, Chairman, Wayne County Road Commissioners, Michigan

Merlin E. Damon, Sanitary Engineer, Macomb County Health Department, Mt. Clemens, Michigan

Todd A. Cayer, Sanitary Engineer, United States Public Health Service, 433 W. Van Buren, Chicago, Illinois

John Chascsa, President, Lake Erie Cleanup Committee, 7281 Center Street, Estral Beach, Newport, Michigan

PARTICIPANTS (Continued):

Gerald Remus, General Manager, Detroit Water Board, Detroit, Michigan

Gerard H. Coleman, Executive Director, Supervisors Inter-County Committee, 411 Veterans Memorial Building, Detroit, Michigan

George E. Hubbell, President, Hubbell, Roth & Clark, Inc., 2709 Telegraph Road, Bloomfield Hills, Michigan

George Hazey, General Manager, City of Wyandotte, 140 Elm Street, Wyandotte, Michigan

Gene Little, Manager, News - Information, Michigan State Chamber of Commerce, 215 South Washington, Lansing, Michigan

James D. Ogden, Administrative Assistant to Walter P. Reuther, International Union, United Auto Workers

Olga M. Madar, Director - Recreation, United Auto Workers, 8000 E. Jefferson, Detroit, Michigan

Fred E. Tucker, Coordinator, Industrial Health Engineering, National Steel Corporation, Research & Development, Weirton, West Virginia

PARTICIPANTS (Continued):

Hayse H. Black, Industrial Wastes Consultant, United States Public Health Service, 4676 Columbia Parkway, Cincinnati, Ohio

Robert C. McLaughlin, Vice President, Public Relations and Public Affairs, McLouth Steel Corporation

Frank Kallin, Ford Motor Company, The American Road, Dearborn, Michigan

A. J. Von Frank, Allied Chemical Corporation, Margaret Street, Philadelphia, Pennsylvania

Robert P. Logan, Assistant to Vice President - Manufacturing, Scott Paper Company, Philadelphia 13, Pennsylvania

Jack T. Garrett, Manager, Pollution Abatement, Monsanto Company, 800 North Lindbergh Boulevard, St. Louis, Missouri

William R. Day, Secretary, Wyandotte Chemicals Corporation, Wyandotte, Michigan

J. W. Tracht, Manager - Maintenance of Facilities (Corporate Representative), Pennsalt Chemicals Corporation, 900 First Avenue, King of Prussia, Pennsylvania

PARTICIPANTS (Continued):

C. D. Barrett, Sr., M. D., Director, Monroe County Health Department, Monroe, Michigan

Stanley W. Diroff, Supervisor, Monroe Township, 3090 S. Custer Road, Monroe, Michigan

Willis H. Hall, President, Greater Detroit Board of Commerce

OTHERS IN ATTENDANCE:

Milton P. Adams, Retired State Administrator, 1314 Weber Drive, Lansing, Michigan

James E. Akers, Director, Environmental Health, Monroe County Health Department, Courthouse, Monroe, Michigan

Plinio Aguilera, Student, University of Michigan, 2155-37 Cram Place, Ann Arbor, Michigan

William J. Agusta, Mayor, City of Monroe, City Hall, 120 S. Macomb Street, Monroe, Michigan

Herbert A. Anderson, United States Public Health Service, 418 Federal Building, 121 Ellicott Street, Buffalo, New York

OTHERS IN ATTENDANCE (Continued):

Robert H. Anderson, Project Manager, Stanley Engineering Company, 956 Hanna Building, Cleveland, Ohio.

Jack D. Andrews, Salesman, Birmingham Construction Company, 32807 Red Oaks, Birmingham, Michigan

Rollin D. Andrews, III, Instructor, Department of Fisheries, University of Michigan, Ann Arbor, Michigan

Mrs. James H. Angel, Water Chairman, Lakewood League of Women Voters, 2084 Elbur Avenue, Lakewood, Ohio

J. O. Appleton, Senior Engineer, Bechtel Corporation, 220 Bush Street, San Francisco, California

Joseph E. Archer, Laboratory Manager, Firestone Steel Products Company, 17423 W. Jefferson, Wyandotte, Michigan

William S. Armstrong, Supervisor, Waste Control, Dow Corning Corporation, Midland, Michigan

Emmett W. Arnold, M.D., Director of Health, Ohio Department of Health, 306 Ohio Departments Building, Columbus, Ohio

<u>OTHERS IN ATTENDANCE</u> (Continued):

Ralph E. Bailey, District Game Biologist, Michigan Department of Conservation, 3335 Lansing Avenue, Jackson, Michigan

Alvin R. Balden, Engineer, Chrysler Corporation, P. O. Box 1118, Detroit 31, Michigan

L. F. Baldwin, Commissioner, Michigan Water Resources Commission, 725 Water Street, Eaton Rapids, Michigan

Albert G. Ballert, Director of Research, Great Lakes Commission, 3528 Rackham Building, Ann Arbor, Michigan

H. Beasley, United States Coast Guard, Federal Building, Detroit, Michigan

Curtis G. Beck, Assistant Attorney General, Michigan Attorney General's Department, State Capitol, Lansing, Michigan

Mrs. Allan Becker, Water Chairman, Livonia League of Women Voters, 30201 Acacia, Livonia, Michigan

Raymond Bednarz, Plant Engineer, Darling & Company, 3350 Greenfield Road, Melvindale, Michigan

OTHERS IN ATTENDANCE (Continued):

Wallace J. Benzie, Sanitary Engineer, Michigan Department of Health, 2233 Hampden Drive, Lansing, Michigan

Charles R. Bick, Writer, Campbell-Ewald Company, G. M. Building, Detroit, Michigan

George R. Bingham, Sanitary Engineer, Wayne County Road Commission, 726 City-County Building, Detroit, Michigan

Molly M. Boelio, Public Information Specialist, Michigan Water Resources Commission, 200 Mill Street, Lansing, Michigan

William J. Bojarski, Chemist, United States Public Health Service, Naval Air Station, Grosse Ile, Michigan

Glen R. Blaint, Student, 1763-2, Ann Arbor, Michigan

Urban W. Boresch, Chief, Operations & Maintenance Branch, United States Army Corps of Engineers, 150 Michigan Avenue, Detroit, Michigan

Thomas E. Borton, Graduate Student, University of Michigan, Department of Environmental Health, Ann Arbor, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

Paul F. Bracke, Councilman, Harper Woods, 20233 Woodcrest, Harper Woods, Michigan

Robert A. Briggs, Chief, Civil Engineer Division, Detroit Edison Company, 2000 Second Avenue, Detroit, Michigan

Glenn Brown, Public Health Engineer, Wayne County Department of Health, Merriman Road, Eloise, Michigan

Jay C. Brown, Councilman, City of Riverview, 18062 Hinton Avenue, Riverview, Michigan

Robert Bryan, Land Use Specialist, Huron-Clinton Metropolitan Authority, 1750 Guardian Building, Detroit, Michigan

Robert J. Burm, Sanitary Engineer, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Frank A. Burn, Vice President, Hubbell, Roth and Clark, Inc., 2709 N. Telegraph Road, Bloomfield Hills, Michigan

Gerald Calhoun, District Sanitary Engineer, Michigan Water Resources Commission, 8227 Hampton, Grosse Ile, Michigan

William R. Cady, Technical Assistant, Solvay Process Division, Allied Chemical, 7501 W. Jefferson, Detroit, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

Andre L. Caron, Regional Engineer, National Council for Stream Improvement, Kalamazoo College, Kalamazoo, Michigan

Robert D. Carpenter, Executive Secretary, Huron River Watershed Counsel, 306 County Building, Ann Arbor, Michigan

Louis B. Carrick, Biologist, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Philip Chakich, Technical Supervisor, General Chemical Division, 800 Marion Avenue, River Rouge, Michigan

Gerry Chapbonneau, Laboratory Technician, Mount Clemens, Michigan

W. F. Chilton, Mechanical Engineer, Darling & Company (Melvindale), 4201 S. Ashland Avenue, Chicago, Illinois

Janice M. Christensen, Observer, 7636 Trafalgar, Taylor, Michigan

Ralph G. Christensen, Chief of Bacteriology, United States Public Health Service, LHPO, 7636 Trafalgar, Taylor, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

Jeannette Cleary, Observer, 129 Fanaud Park, Hazel Park, Michigan, and Kelley's Island, Ohio

William D. Collins, News Reporter, Monroe Evening News, 20 W. First Street, Monroe, Michigan

Grover W. Cook, Chief Biologist, United States Public Health Service, 1819 W. Pershing Road, Chicago, Illinois

Jack E. Cooper, DuBois-Cooper Associates, 10600 Puritan, Detroit, Michigan

Mrs. Max Coral, Detroit League of Women Voters, 1426 Chicago Boulevard, Detroit, Michigan

Ted Cotora, representing Congressman Dingell, 718 Brady, Dearborn, Michigan

Richard F. Coulon, Director, Eastern Michigan Nature Association, 153 Crocker, Mt. Clemens, Michigan

I. D. Cox, Supervisor, Plant Engineering, Ford Motor Company, P. O. Box 711, Monroe, Michigan

OTHERS IN ATTENDANCE (Continued):

Thomas P. Czepiol, Technical Director, Scott Paper Company, 9125 W. Jefferson, Detroit, Michigan

William Daniels, Vice President - Mills, Consolidated Packaging Corporation, Elm Avenue, Monroe, Michigan

Joseph Davis, Special Project Engineer, Scott Paper Company, 9125 W. Jefferson, Detroit, Michigan

Richard E. Davis, Sewage Plant Operator, W.C.R.C., 32859 Mecosta Avenue, Wayne, Michigan

Robert V. Day, Supervisor Sanitary Engineer, United States Public Health Service, LEPO, 7298 York Road, Cleveland, Ohio

Mrs. Ralph Cair Deblin, League of Women Voters, 17 Heatherwood, Ann Arbor, Michigan

Rolf A. Deininger, Assistant Professor, University of Michigan, Ann Arbor, Michigan

Herb DeJonge, Administrative Assistant, Governor's Office, Lansing, Michigan

Carl Leonard DeKeil, Representative 16th Congressional District, State Democratic Committee on Agriculture, 29821 Fort, Rockwood, Michigan

OTHERS IN ATTENDANCE (Continued):

Andrew T. Dempster, Director, Bureau of Sanitary Engineering, Detroit Department of Health, 8809 John C. Lodge, Detroit, Michigan

Dennis J. Dilworth, Budget Analyst, Michigan Department of Administration, Lewis Cass Building, Lansing, Michigan

Beatrice Hill Ditto, Retired, 25 E. Palmer, Apartment 44, Detroit, Michigan

Karl F. Dodge, Engineer of Design, Sewer and Water, Wayne County Road Commission, City-County Building, Detroit, Michigan

Richard H. Doherty, Drain Engineer, Macomb County Drain Commission, 115 Groesbeck, Mt. Clemens, Michigan

Beverly L. Driver, Student, University of Michigan, 429 Third Street, Ann Arbor, Michigan

Ronald K. Dunlap, Physical Science Technician, United States Public Health Service, 1151 Taylor Avenue, Detroit, Michigan

Marcel J. Dunn, Honeywell, 13631 Plymouth Road, Detroit, Michigan

Agnes L. Dye, Microbiologist, United States Public Health Service, 1269 Amanda Circle, Decatur, Georgia

OTHERS IN ATTENDANCE (Continued):

Dr. W. F. Echelberger, Jr., Institute & Research Associate, Civil Engineering Department, University of Michigan, Ann Arbor, Michigan

Duane Egeland, Chief Engineer, Wayne County Department of Public Works, 400 First National Building, Detroit, Michigan

Henning Eklund, Chief, Enforcement Section, United States Public Health Service, 433 W. Van Buren Street, Chicago, Illinois

Charles T. Elly, Analytical Chemist, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Berton E. Eubank, Assistant Superintendent Sewer Maintenance and Construction, Department of Water Supply, 19805 John R, Detroit, Michigan

Robert D. Farley, Assistant Director, Supervisors Inter-County Committee, 411 Veterans Memorial Building, Detroit, Michigan

Marvin B. Fast, Program Operations Officer, United States Public Health Service, Midwest Water Laboratory, 5114 First Building, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

Carlos Fetterolf, Aquatic Biologist, Michigan Water Resources Commission, 200 Mill Street, Lansing, Michigan

Ray R. Filipchuk, Director, Public Service & Engineering, City of Hazel Park, 22422 Stephenson, Hazel Park, Michigan

David Finck, Lake Erie Cleanup Committee, 3003 - 11th Street, Detroit Beach, Monroe, Michigan

Irene Finch, Secretary, Lake Erie Cleanup Committee, 3003 - 11th Street, Detroit Beach, Monroe, Michigan

John Jay Fischer, Recreation Specialist, United States Bureau of Outdoor Recreation, 15 Research Drive, Ann Arbor, Michigan

Olive Fisher, 21727 Roslyn Road, Harper Woods, Michigan

David W. Flotow, Technical Manager, Consolidated Packaging Corporation, Monroe, Michigan

Mrs. Robert Foerch, President, Michigan League of Women Voters, 4612 Woodward Avenue, Room 317, Detroit, Michigan

OTHERS IN ATTENDANCE (Continued):

Maria Fonseca, Student, University of Michigan, 928 S. Forest, Ann Arbor, Michigan

James Foote, Game Biologist, Conservation Department, Pointe Mouillee, Rockwood, Michigan

Sharm M. Francis, Secretary, United States Coast Guard, Marine Inspection, 424 Federal Building, Detroit, Michigan

Marianne Friedland, Editor, McGraw-Hill News Bureau, 856 Penobscot Building, Detroit, Michigan

Carl C. Friedrichs, Sales Engineer, Wallace & Tiernan, 2540 S. 27th Avenue, Broddview, Illinois

F. B. Frost, Regional Engineer, Michigan Water Resources Commission, Station B, Lansing, Michigan

S. L. Frost, Executive Secretary, Ohio Water Commission, State Office Building, Columbus, Ohio

Ernest Fuller, Research Engineer, Great Lakes Steel, Ecrose, Detroit, Michigan

John J. Gannon, Professor of P. H. Engineering, University of Michigan, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

Gordon Gast, Mayor Pro-Tem, City of Madison Heights, 31502 Madison Avenue, Madison Heights, Michigan

Edwin E. Geldrech, Research Bacteriologist, United States Public Health Service, Robert A. Taft Sanitary Engineering Center, Columbia Parkway, Cincinnati, Ohio

Mary Georges, League of Women Voters, 8981 Dawes, Detroit, Michigan

Walter E. Gerdel, Commissioner, Division of Sewage Disposal, City of Cleveland, 601 Lakeside Avenue, Cleveland, Ohio

Patricia S. Gilgallon, Water Resource Chairman, Southfield League of Women Voters, and Governor's Task Force on Water, 24407 Tamarack, Southfield, Michigan

Eugene A. Glysson, Associate Professor Civil Engineering, University of Michigan, Civil Engineering Department, Ann Arbor, Michigan

Brian L. Goodman, Project Director, National Sanitation Foundation, 2355 W. Stadium, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

Colonel L. J. Goodsell, Executive Director, Great Lakes Commission, Rackham Building, Ann Arbor, Michigan

Mrs. John Gord, Water Resources Committee, League of Women Voters of Greater Toledo, 2643 Weslyan Drive, Toledo, Ohio

W. H. Gray, Assistant to President, Wyandotte Chemicals Corporation, Wyandotte, Michigan

Karl D. Gregory, Assistant Professor, Department of Economics, Wayne State University, Detroit, Michigan

Michael A. Groen, Superintendent Sewage Division - D.P.W., City of Dearborn, 7446 Ternes Avenue, Dearborn, Michigan

Emma P. Gross, Observer, 203 W. Savannah, Detroit, Michigan

Richard D. Hall, Staff Engineer, Diamond Alkali Company, 300 Union Commerce Building, Cleveland, Ohio

William J. Haney, Macomb County Deputy Drain Commissioner, Macomb County, 115 Groesbeck Highway, Mount Clemens, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

Robert E. Hansen, Superintendent Water Purification and Pumping, 36570 Jefferson, Mt. Clemens, Michigan

John R. Hardy, Associate Civil Engineer - retired, Department of Water Supply, 17301 Beaverland, Detroit, Michigan

Edna Harlow, Observer, 3393 Grange Road, Trenton, Michigan

Iva Hartranft, Observer, 3213 Salem, Trenton, Michigan

Dr. Rolf Hartung, Assistant Professor, University of Michigan, School of Public Health, Ann Arbor, Michigan

Roland Hartranft, Draftsman, United States Public Health Service, 3213 Salem, Trenton, Michigan

Wilbur Hartranft, Boat Operator, United States Public Health Service, 3213 Salem, Trenton, Michigan

Don R. Hassall, Student, 1647-12 Beal Avenue, Ann Arbor, Michigan

Spenser W. Havlick, United States Public Health Service Traineeship, University of Michigan Environmental Planning Associates, 1604 Dexter, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

John A. Heath, Sales Engineer, Dow Chemical Company, 600 Northland Tower, Detroit, Michigan

R. R. Henderson, Superintendent of Water Treatment, City of Toledo, 600 Collins Park Avenue, Toledo, Ohio

Charles Henricks, Boat Operator, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Harold J. Henris, Boat Operator, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Harold J. Henris, Mrs., Observer, 31025 Island Drive, Gibraltar, Michigan

Harold C. Hickman, Vice President, George Jerome & Company, 1437 First National Building, Detroit, Michigan

Arthur M. Hinkley, Staff Executive, Greater Detroit Board of Commerce, 320 W. Lafayette, Detroit, Michigan

W. C. Hirn, Pate, Hirn & Bogue, 726 Michigan Building, Detroit, Michigan

John F. Hunter, Wastes Control Engineer, Wyandotte Chemicals Corporation, 1609 Biddle Avenue, Wyandotte, Michigan

OTHERS IN ATTENDANCE (Continued):

Kenneth G. Jackson, Attorney, Great Lakes Steel Corporation, 2900 Grant Building, Pittsburgh 19, Pennsylvania

Norbort A. Jaworski, Sanitary Engineer, United States Public Health Service at University of Michigan, 512 Hudson Avenue, Ypsilanti, Michigan

Michael E. Jensen, Student, University of Michigan, 1102 Oakland Avenue, Ann Arbor, Michigan

Mrs. J. Robert Jessup, Water Resource Committee Member, League of Women Voters of Grosse Pointe, 945 Lakepointe, Grosse Pointe, Michigan

Mrs. Lee R. Johnson, President, League of Women Voters of Grosse Pointe, 1214 Whittier Road, Grosse Pointe, Michigan

David L. Jones, Water & Sewer Commissioner, City of Livonia, 15100 Farmington Road, Livonia, Michigan

James Jones, Mayor, City of Riverview, 17700 Fort Street, Riverview, Michigan

Dr. Philip H. Jones, Associate, Great Lakes Institute, University of Toronto, Toronto, Canada

OTHERS IN ATTENDANCE (Continued):

Paul Kabler, Acting Deputy Chief, BASB, United States Public Health Service, 4676 Columbia Parkway, Cincinnati, Ohio

David B. Kahn, Observer, 15812 Kentucky, Detroit, Michigan

Kenneth M. Karch, Sanitary Engineer, School of Public Health, University of Michigan, 2705 Golfside Drive, Ypsilanti, Michigan

Earl N. Kari, Project Director, United States Public Health Service, 570 Pittock Block, Portland, Oregon

William D. Kee, Jr., Assistant Sanitary Engineer, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

William Q. Kehr, Project Director, United States Public Health Service, GLIRBP, 155 Rex Boulevard, Elmhurst, Illinois

Charles L. Keller, Lieutenant, United States Coast Guard, Belle Isle Coast Guard Station, Detroit, Michigan

Robert J. Kelly, General Representative - Civic & Community Affairs, Detroit Chapter, M.S.P.E., 18932 San Juan Drive, Detroit, Michigan

OTHERS IN ATTENDANCE (Continued):

H. Lincoln Kemp, Civic Affairs Committee, Detroit Chapter M.S.P.E., 18932 San Juan Drive, Detroit, Michigan

William T. Killeen, City Engineer, City of Birmingham, 151 Martin, Birmingham, Michigan

Evelyn Killutat, First Vice President, Warren League of Women Voters, 11109 Irnington, Warren, Michigan

G. C. Kimble, Technical Director, Union Bag-Camp Paper Corporation, P. O. Box 570, Savannah, Georgia

F. J. Kirkman, Maintenance Superintendent, Fireston Steel Products, Jefferson Avenue, Wyandotte, Michigan

Betty Klaric, Reporter, Cleveland Press, 901 Lakeside, Cleveland, Ohio

Mary Klein, Student, University of Michigan, 309 Maple Ridge, Ann Arbor, Michigan

Murray J. Knowles, Jr., County Drain Engineer, Monroe County Drain Commission and American Engineering Company, Courthouse, Monroe, Michigan, 206 S. Main Street, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

John J. Komraus, Administrative Assistant, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Alice Krawczyk, Observer, 9150 Byromar Lane, Grosse Ile, Michigan

Daniel F. Krawczyk, Chief Chemist, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

James V. LaMarre, Technical Supervisor, Consolidated Packaging Corporation, Monroe, Michigan

P. E. Landback, System Development Engineer, Detroit Edison Company, 2000 Second Avenue, Detroit, Michigan

V. W. Langworthy, Editor, Water & Sewage Works Magazine, Box 1315, Lansing, Michigan

Edith J. Lee, M.D., Detroit League of Women Voters, 150 Massachusetts, Highland Park, Michigan

Lawrence Leibold, Secretary & Treasurer, Lake Erie Cleanup Committee, 471 Arbor, Monroe, Michigan

Patrick Leibold, Detroit Beach Boat Club, 471 Arbor, Monroe, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

C. Leisure, Plant Manager, E. I. duPont de Nemours and Company, P. O. Box 4508, Ecorse, Michigan

Julie Lentz, Laboratory Assistant, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Harold M. Leonhard, Superintendent, Sewage Treatment, Wayne County Metropolitan System, 797 Central, Wyandotte, Michigan

George F. Liddle, Member, Michigan Water Resources Commission, 1607 Sixth Street, Muskegon, Michigan

Elbert C. Mackey, Budget Analyst, Michigan State Department of Administration, Lansing, Michigan

Ralph A. MacMullan, Director, Michigan Department of Conservation, Mason Building, Lansing, Michigan

Thomas H. Maher, University of Michigan, 615 Osweld Street, Ann Arbor, Michigan

Clarke W. Mangun, Jr., Regional Health Director, Region V, United States Public Health Service, 433 W. Van Buren Street, Chicago, Illinois

OTHERS IN ATTENDANCE (Continued):

Patrick Manor, Aquatic Sample Collector, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Angelo J. Marino, Consulting Engineer, Monroe, Frenchtown, Bedford Townships, South Rockwood, Long Building, Monroe ,Michigan

Richard W. Marshall, City Manager, City of Madison Heights, 300 W. 13 Mile Road, Madison Heights, Michigan

Mrs. Victor Martin, Member , League of Women Voters, 1340 Balmoral Drive, Detroit, Michigan

M. M. Mason, Engineer, United States Rubber Company, 6600 E. Jefferson, Detroit, Michigan

George McBride, District Engineer, Infilco Division of Fuller, 22528 Ford Street, Dearborn, Michigan

J. H. McCann, Administrator, St. Lawrence Seaway, Cobo Hall, Detroit, Michigan

John H. McCarthy, President, Detroit Water Board, 371 Chalmers Avenue, Detroit, Michigan

Thomas E. McCauley, District Service Manager, Nalco Chemical Company, 24616 W. Michigan Avenue, Dearborn, Michigan

OTHERS IN ATTENDANCE (Continued):

Nina I. McClelland, Student, University of Michigan, Ann Arbor, Michigan

E. J. McCoe, Technical Superintendent, Union Bag-Camp Company, P. O. Box 588, Monroe, Michigan

F. L. McCormick, League of Women Voters, 5700 Hillcrest, Detroit, Michigan

George E. McCoy, Director, Eastern Michigan Nature Association, 49 S. Highland, Mt. Clemens, Michigan

James O. McDonald, Construction Progress Representative, United States Public Health Service, Region V, 433 W. Van Buren Street, Chicago, Illinois

Mary A. McGlathery, Secretary, United States Public Health Service, LHPO, United States Naval Air Station, Grosse Ile, Michigan

Eddie McGloin, Administrative Aide, representing Senator Philip A. Hart, 848 Federal Building, Detroit, Michigan.

G. S. McIntyre, Director of Agriculture, Michigan Water Resources Commission, Cass Building, Lansing, Michigan

OTHERS IN ATTENDANCE (Continued):

Dorothy McLane, Observer, 8991 Niver, Allen Park, Michigan

Judy McLane, Chemist, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Lillian McMillin, 16139 Champaign, Allen Park, Michigan

Helen M. McNaughton, Clerk-Stenographer, United States Public Health Service, 7733 Cortland, Allen Park, Michigan

Walter McPartlin, Graduate Student, School of Public Health, University of Michigan, 512 Packard Street, Ann Arbor, Michigan

M. E. Meekins, Commander, Marine Inspection, United States Coast Guard, 424 Federal Building, Detroit, Michigan

James G. Meenahan, Technical Assistant, Semet Solvay Division, Allied Chemical Corporation, P. O. Box 58, Detroit, Michigan

Stephen Megregian, Deputy Project Director, United States Public Health Service, GLIRBP, 1819 Pershing Road, Chicago, Illinois

OTHERS IN ATTENDANCE (Continued);

Peter G. Meier, Student Aquatic Biology, University of Michigan, 805 Oxford Road, Ann Arbor, Michigan

Joe S. Metcalf, Manager, Product Quality, Inorganic Division, Monsanto Company, 800 N. Lindbergh, St. Louis, Missouri

Herbert J. Miller, Recreation Resource Planner, Michigan Department of Conservation, Steven T. Mason Building, Lansing, Michigan

Richard H. Miller, Information Officer, St. Lawrence Seaway Corporation, Cobo Hall, Detroit, Michigan

Edward Milliman, Commodore and Chairman, Crestline Boat Club and Pointe Mouillee Booster Club, 162 Detroit Street, Trenton, Michigan

John A. Moekle, Associate Counsel, Ford Motor Company, The American Road, Dearborn, Michigan

James B. Monahan, Associate, Consder, Townsend and Associates, P. O. Box 364, Bloomfield Hills, Michigan

Albert G. Moore, Leglislation Department, Cleveland Chamber of Commerce, 690 Union Commerce Building, Cleveland, Ohio

<u>OTHERS</u> <u>IN</u> <u>ATTENDANCE</u> (Continued):

Andrew J. Mozola, Associate Professor of Geology, Wayne State University, Department of Geology, Detroit, Michigan

Thomas A. Mulhern, Assistant Sanitary Engineer, United States Public Health Service, 7298 York Road, Cleveland, Ohio

W. V. Murphy, Assistant Vice President, McLouth Steel Corporation, 300 S. Livernois, Detroit, Michigan

James V. Murray, Design Supervisor Engineer, Michigan State Highway Department, S. T. Mason Building, Lansing, Michigan

John J. Musser, Geologist, United States Geological Survey, 2822 E. Main Street, Columbus, Ohio

Naomi Nash, Secretary, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Mrs. Charles Naubrecht, Water Resources Chairman, Detroit League of Women Voters, 9091 Esper, Detroit, Michigan

Mrs. Orville S. Newell, 12609 Monte Vista, Detroit, Michigan

OTHERS IN ATTENDANCE (Continued):

W. E. Nickels, Vice President Engineering, Trilex Corporation, Wayne, Michigan

Charles W. Northington, Director, United States Public Health Service, LEPO, 7298 York Road, Cleveland, Ohio

Edward D. O'Brien, Technical Supervisor, Time Container, Monroe Paper Products Division, 1151 W. Elm Avenue, Monroe, Michigan

Laurence B. O'Leary, Civil Engineer, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Victor X. Olesko, Civil Engineer, Wayne County Road Commission, 1230 First National Building, Detroit, Michigan

Bob Olson, District Representative, Nalco Chemical Company, 1464 Hartsough, Plymouth, Michigan

Chester Ordon, Professor, Wayne State University, Department of Civil Engineering, Detroit, Michigan

James. W. Orton, Sanitary Engineer, 8845 Salem, Detroit, Michigan

OTHERS IN ATTENDANCE (Continued):

John E. Osmer, Staff Engineer, Michigan Municipal League, 205 S. State Street, Ann Arbor, Michigan

C. R. Ownbey, Sanitary Engineer, United States Public Health Service, 1819 Pershing Road, Chicago, Illinois

Jesus Pacheco, Student, University of Michigan, 1738-7 Morfin, Ann Arbor, Michigan

Clyde L. Palmer, City Engineer, City of Detroit, 528 City-County Building, Detroit, Michigan

Steve Pappas, Assistant to Mr. McNutt, McNutt Rehabilitation, 5725 Woodward, Detroit, Michigan

M. Paraschak, Technical Supervisor, Allied Chemical, Canada, Amherstburg, Ontario, Canada

James E. Pemberton, Chief Engineer, Oakland County Drain Commissioner's Office, 550 S. Telegraph Road, Pontiac, Michigan

Jean Pennock, Laboratory Assistant, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

OTHERS IN ATTENDANCE (Continued):

Robert J. Peterson, Vice President, DuBois Cooper Associates, 10600 Puritan, Detroit, Michigan

John D. Phaup, Instructor, University of Michigan, Ann Arbor, Michigan

Donald M. Pierce, Sanitary Engineer, Michigan Department of Health, Lansing, Michigan

D. E. Powell, Supervisory Process Engineer, Mobil Oil Company, P. O. Box 477, Trenton, Michigan

Joseph W. Price, Sanitary Engineer, Washtenaw County, County Building, Ann Arbor, Michigan

Albert C. Printz, Jr., Sanitary Engineer, United States Public Health Service, Minneapolis, Minnesota

George Pruette, Newsman, WWJ, Detroit, Michigan

Howard Rafter, Superintendent Filtration, City of Highland Park, 237 Moss, Highland Park, Michigan

George Ramsey, Senior Stenographer, Department of Water Supply, 735 Randolph, Detroit, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

Richard D. Remington, Associate Professor of Biostatistics, School of Public Health, University of Michigan, Ann Arbor, Michigan

J. W. Renaud, Geologist, Wayne State University, 1443 Seminole, Detroit, Michigan

Wayne G. Rice, Deputy Secretary, Wayne County Board of Public Works, 1230 First National Building, Detroit, Michigan

John E. Richards, Engineer-in-Charge, Sewage and I. W. Unit, Ohio Department of Health, 371 Park Boulevard, Worthington, Ohio

Irene Raether, Secretary, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Robert L. Richardson, Student, 20037 Southfield, Detroit, Michigan

Maurice S. Richmond, Sanitary Engineer, Michigan Department of Health, 3500 N. Logan Street, Lansing, Michigan

John A. Roberts, Councilman, St. Clair Shores, 22560 Manor Drive, St. Clair Shores, Michigan

Jack Robertson, Manager Industrial Services, Roy F. Weston, Inc., 4 st. Albans Avenue, Newton Square, Pennsylvania

OTHERS IN ATTENDANCE (Continued):

J. V. Robillard, Chief Chemist, Monsanto Company, 5045 West Jefferson, West Trenton, Michigan

Art Robinson, Director of Public Relations, Ohio Department of Health, 450 East Town Street, Columbus, Ohio

Bill G. Rowden, Director, Macomb County Planning Commission, 115 Groesbeck Highway, Mt. Clemens, Michigan

John H. Ruskin, Associate Sanitary Engineer, Detroit Department of Health, 8809 John C. Lodge Freeway, Detroit, Michigan

Estol L. Savern, City Engineer, City of Madison Heights, 300 W. 13 Mile Road, Madison Heights, Michigan

William T. Sayers, Deputy Project Director, United States Public Health Service, TCUMRP, United States Naval Air Station, Grosse Ile, Michigan

Leroy E. Scarce, Chief Microbiologist, United States Public Health Service, 1819 W. Perhsing Road, Chicago, Illinois

<u>OTHERS IN ATTENDANCE</u> (Continued):

Richard S. Schmitz, Plant Engineering Coordinator, Chrysler Corporation, Power Training Group, Highland Park, Michigan

David A. Schuenke, Attorney, Office of General Counsel, Department of Health, Education, and Welfare, 5357 North Building, Washington, D. C.

James R. Scott, District Representative, Nalco Chemical, 24616 W. Michigan, Dearborn, Michigan

Tony Selfridge, Sales Engineer, Nalco Chemical 24616 W. Michigan Avenue, Dearborn, Michigan

Charles L. Sercu, Staff Assistant, Dow Chemical Company, Midland, Michigan

A. M. Shannon, Chief Water and Sewage Treatment, Department of Water Supply, 735 Randolph, Detroit, Michigan

J. W. Shaw, Civic Relations Coordinator, Marathon Oil Company, 15911 Wyoming, Detroit, Michigan

John M. Sherbeck, Superintendent Waste Water Works, City of Bay City, 1912 6th Street, Bay City, Michigan

<u>OTHERS IN ATTENDANCE</u> (Continued):

G. W. Shumate, Mayor, City of Gibraltar, 31134 Island Drive, Gibraltar, Michigan

Evelyn Silva, League of Women Voters, 1800 Littlestone Road, Grosse Pointe Woods, Michigan

Mrs. Leonard Slowin, Water Resource Chairman, League of Women Voters, 1124 Nottingham Road, Grosse Pointe, Michigan

Raymond Smit, Partner, Ayres, Lewis, Norris and May, 500 Wolverine Building, Ann Arbor, Michigan

Donald V. Smith, City Administrator, City of Southfield, Municipal Building, Southfield, Michigan

Lawrence Solomon, Governmental Analyst, City of Detroit, 1100 City-County Building, Detroit, Michigan

Merle E. Solomon, Supervisor, Grosse Ile Township, 8841 Macomb, Grosse Ile, Michigan

Joseph R. Stanifer, Commissioner, City of Monroe, 509 E. Second Street, Monroe, Michigan

OTHERS IN ATTENDANCE (Continued):

Martin T. Steege, Newsman, United Press International, 813 W. Lafayette, Detroit, Michigan

Frank Steele, Director Public Relations, Great Lakes Steel, Ecorse, Michigan

Morton Sterling, Chief, Bureau of Air Pollution, Control Department, Building and Safety Engineer, City of Detroit, 414 City-County Building, Detroit, Michigan

John S. Stock, Director, Division of Engineering & Sanitation, Wayne County Health Department, Merriman Road, Eloise, Michigan

Ester Struhsaker, Secretary, Michigan Water Resources Commission, 221 West Street, Lansing, Michigan

Darrel G. Suhre, Senior Associate Civil Engineer, Detroit Water Department, 735 Randolph Street, Detroit, Michigan

Floyd Swanson, Chemical Engineer, Stein Hall, P. O. Box 307, Argo, Illinois

George Syring, Superintendent, Darling and Company, 3350 Greenfield Road, Melvindale, Michigan

OTHERS IN ATTENDANCE (Continued):

Howard A. Tanner, Chief of Fisheries, Michigan Conservation Department, Mason Building, Lansing, Michigan

Phillip L. Taylor, Sanitary Engineer, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Mrs. Phillip L. Taylor, Observer, 3105 Patton Drive, Trenton, Michigan

William C. Treon, Metropolitan Government Reporter, The Plain Dealer, 1801 Superior Avenue, Cleveland, Ohio

George Trombley, Manager, Downtown Detroit Civic Improvement Bureau, 2007 Third Street, Detroit, Michigan

R. J. Tuholske, Division Manager, Pickands Mather & Company, 700 Penobscot Building, Detroit, Michigan

O. G. Uitti, Works Manager, Allied Chemical Corporation Plastics Division, Delray P. O., Detroit, Michigan

Joseph A. Urban, Chief Plant Engineer, Detroit Department of Water Supply, 9300 W. Jefferson, Detroit, Michigan

OTHERS IN ATTENDANCE (Continued):

Robert M. Vadasy, Aquatic Sampler, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Hazen Van Vliet, Supervising Engineer, The Detroit Edison Company, 2000 Second Avenue, Detroit, Michigan

C. J. Velz, Professor and Chairman, Department of Environmental Health, University of Michigan, Ann Arbor, Michigan

C. R. Walbridge, Manager, Process Wastes Control, Allied Chemical Corporation, General Chemical Division, P. O. Box 70, Morristown, New Jersey

Mrs. J. H. Walker, Observer, 1555 Villa, Birmingham, Michigan

Martin J. Walsh, Microbiologist, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

F. M. Warnement, Acting Commissioner - Air & Water Pollution Control Division, City of Toledo, 600 Collins Park Avenue, Toledo, Ohio

Moneta B. Warner, Observer, 9840 Arden, Livonia, Michigan

OTHERS IN ATTENDANCE (Continued):

Mrs. Neil Waterbury, Lake Erie Basin Study, League of Women Voters, Ginger Hill Lane, Toledo, Ohio

George H. Watkins, Executive Director, Lake Erie Watershed Conservation Foundation, 2016 Superior Building, Cleveland, Ohio

Joe Weaver, Newscaster, WJBK-TV, 7441 Second Boulevard, Detroit, Michigan

Thomas S. Welsh, Drain Commissioner, Macomb County, 115 Groesbeck, Mr. Clemens, Michigan

James D. Westfield, University of Michigan School of Public Health, Department of Environmental Health, Ann Arbor, Michigan

Roy H. Westphal, Director, Public Works, City of Gibraltar, 29450 Munro, Gibraltar, Michigan

P. M. Wilkins, Technical Manager, Mobil Oil Company, P. O. Box 477, Trenton, Michigan

Mrs. Leon Williams, Water Resources Commission, League of Women Voters, 311 Prospect, Toledo, Ohio.

OTHERS IN ATTENDANCE (Continued):

Mrs. Ayrees P. Wilson, Unit Chairman (Central Unit), League of Women Voters of Detroit, Detroit, Michigan

Ray E. Witter, Plant Manager, Monsanto Company, P. O. Box 306, Trenton, Michigan

Douglas J. Wood, Councilman, Village of Beverly Hills, Birmingham, Michigan

Kurt Yacuone, Aquatic Sampler, United States Public Health Service, United States Naval Air Station, Grosse Ile, Michigan

Curtis H. Yoas, Supervisor, Frenchtown Township, Monroe County, 1804 Newport Road, Newport, Michigan

C. V. Youngquist, Chief, Ohio Division of Water, State Office Building, Columbus, Ohio

Karl Zollner, Jr., Graduate Student, School of Public Health, University of Michigan, 512 Mack Road, Ann Arbor, Michigan

P R O C E E D I N G S

OPENING STATEMENT

BY

MR. MURRAY STEIN

The conference is open.

This second session of the conference in the matter of pollution of the navigable waters of the Detroit River and its tributaries within the State of Michigan, and Lake Erie and its tributaries within the State of Michigan, is being held under the provisions of Section 8 of the Federal Water Pollution Control Act. The Secretary of Health, Education, and Welfare is authorized to call a conference of this type when requested to do so by the Governor of a State.

The purpose of the conference is to bring together representatives of the State water pollution control agency, representatives of the U. S. Department of Health, Education, and Welfare, and other interested parties to review the existing situation, the progress which has been made, to lay a basis for future action by all parties concerned, and to give the State, localities, and industries an opportunity to take any indicated remedial action under State and local law.

This is a conference between the official State water pollution control agency of Michigan and representatives of the U. S. Department of Health, Education, and Welfare. For the purposes of the Federal Act, the official State water pollution control agency of Michigan is the Michigan Water Resources Commission. The Michigan Water Resources Commission may bring whomever it wishes to the conference and have them participate in the conference. However, only the representatives of the Michigan Water Resources Commission and the Department of Health, Education, and Welfare constitute the conferees.

The State of Michigan has designated as its conferee for the conference Mr. Loring Oeming, Executive Secretary of the Michigan Water Resources Commission, and Mr. Oeming has several of his commission members and others with him as consultants.

I wonder if you would introduce them at this point, Mr. Oeming?

MR. OEMING: Yes, Chairman Stein.

I would like to introduce the members of the commission or their alternates who are here and who are acting, pursuant to an action taken by the commission, as consultants to the State conferee.

Starting at your left, Mr. Lynn Baldwin, who represents conservation groups on the Water Resources Commission.

Next is Mr. Al Balden, who is an alternate for Jim Gilmore, representing industrial-management groups on the commission.

Next is Mr. George McIntyre, Director of Agriculture and Chairman of the Water Resources Commission.

Next is George Liddle, who represents municipal groups on the commission.

Next is John Vogt, who is from the Michigan Department of Health and is alternate for Dr. A. E. Heustis, member of the commission.

Then we have Jim Murray, who represents the State Highway Director.

And, last, Dr. Ralph MacMullan, Director of Conservation.

MR. STEIN: Thank you, Mr. Oeming.

Mr. H. W. Poston, on my right, of the Department of Health, Education, and Welfare, who is the Regional Program Director for this region, with headquarters in Chicago, has been designated as conferee for the Federal Government.

My name is Murray Stein. I am from Washington, D. C. headquarters of the Department of Health, Education, and Welfare, and the representative of the Secretary of Health, Education, and Welfare, Anthony J. Celebrezze.

Both the States and the Federal Government have responsibilities in dealing with water pollution problems. The Federal Water Pollution Control Act declares that the primary responsibilities and rights for controlling water pollution rest with the State. Consistent with this, we are charged by law to encourage State action to abate pollution of navigable waters. However, the Secretary of Health, Education, and Welfare also is charged by law with specific responsibilities in the field of water pollution control, as pollution of navigable waters which endangers the health or welfare of any person is subject to abatement in accordance with the provisions of the Federal Act.

A first session of this conference was held March 27th and 28th, 1962, in Detroit. On the basis of a written request to the Secretary of Health, Education, and Welfare, dated December 6, 1961, from John B. Swainson, then Governor of Michigan, the Secretary of Health, Education, and Welfare on January 19, 1962, called a conference under the provisions of Section 8 of the Federal Water

Control Act in the matter of pollution of the navigable waters of the Detroit River and its tributaries within the State of Michigan, and Lake Erie and its tributaries within the State of Michigan.

In light of conference discussions, the conferees unanimously agreed to the following conclusions and recommendations:

1. Lake St. Clair, the Detroit River, and Lake Erie, within the State of Michigan, and their tributaries within the State of Michigan, are navigable waters within the meaning of Section 8 of the Federal Water Pollution Control Act.

2. Pollution of navigable waters subject to abatement under the Federal Water Pollution Control Act is occurring in the Michigan waters of Lake St. Clair, the Detroit River, and Lake Erie, and their tributaries. The discharges causing and contributing to the pollution come from various industrial and municipal sources.

3. This pollution causes deleterious conditions so as to interfere with legitimate water uses, including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating and other forms of recreation.

4. It is too early -- this was in 1962 -- on the basis of the record of the Conference, to make an adequate judgment of the adequacy of the measures taken toward abatement of the pollution. The Conference discussions demonstrate that there are many gaps in our knowledge of sources of pollution and their effects.

5. Cognizance is taken of the program of the Michigan Water Resources Commission for development of adequate pollution control measures on a progressive basis and the excellent progress being made by many municipalities and industries under this program. Delays encountered in abating the pollution may well be caused by the existence of a municipal and industrial complex concentrated in an area with a limited water resource. The conferees are also aware of the vast problems that Detroit faces as a result of the storm water outflow from a system of combined sewers. The problem thus becomes one of approaching the entire area on a coordinated basis and putting in adequate facilities based on an overall plan.

6. Cognizance is also taken of the six-county study as a useful approach to the solution of the pollution problem in the Detroit area.

7. The Department of Health, Education, and

Welfare, in order to close the gaps in the knowledge as to sources of pollution, nature of pollution, and the effects thereof, appropriate methods of abatement, and appropriate methods to avoid delays in abatement, will initiate an investigation and study to gather data and information on the waters involved. This investigation and study will be carried on in close cooperation with the State agencies concerned, with the details of the investigation to be determined by the technical staffs of the Department of Health, Education, and Welfare, the Michigan Health Department and the Michigan Water Resources Commission. The Department of Health, Education, and Welfare will establish a resident survey group to provide technical assistance for this investigation.

8. The Department of Health, Education, and Welfare will prepare reports on the progress of this investigation at six month intervals which will be made available to the Michigan Water Resources Commission. The Michigan Water Resources Commission will make information contained in these reports available to all interested parties.

9. The Conference will be reconvened at the call of the Chairman with the concurrence of the Michigan Water Resources Commission to consider the results obtained

from the investigation and study, and to agree on action to be taken to abate pollution.

We are now here three years later. The study has been made and has been completed. This second session of the Conference, we hope, will be useful in describing the problem clearly, in delineating the progress which has already been accomplished, and in indicating what still needs to be done to correct the pollution problems of the Detroit River and Michigan waters of Lake Erie.

It was evident during the study and investigation, and it was evidenced at the first session of the Conference, that the City of Detroit, other municipalities, and many of the industries in the area had done much to prevent water pollution.

As has been pointed out many times, these cities and industries did have an active program. However, it was recognized that while they did have an active program, the Conferees did find that the waters covered by the Conference were in a polluted condition.

The task of the technical group was made considerably more difficult by having to go out and determine, with the present analyses, in all cases, which industries were and which industries were not providing adequate treatment, and, if so, how adequate they were.

As you will see when the report is presented, this is not a blanket indictment or a blanket improvement. We should bear in mind that we should give credit where credit is due, and recognize that as this country gets more complex, there are situations such as we find in Detroit, where you can't make a wide judgment applying to all cities and all industries, and as this develops you will see that considerable progress has been made.

You can imagine what the state of the river would be, for example, if Detroit did not have the active program that it has and had not had the waste collecting treatment system that it has, and I think the river is in the shape it is in now due to that effort, and we should give the City of Detroit that kind of credit.

There is another point that should be made. After this study, and we believe at least the investigators who made the study believe that they have uncovered the facts throughout the situation, we will try to get a concession on all facts here, and move forward based on these facts.

We believe that the situation in Detroit, while very, very complex, can still be understood, because the physical facts subject to measurements and the techniques of measurement are the same, whether they are employed by representatives of the Federal Government, the State Government, the Municipal Government, or industry. Hopefully, we will get an agreement on a factual basis. We need an agreement before we can move forward.

Now a word about the procedure governing the conduct of the Conference. The Conferees will be called upon to make statements. The Conferees, in addition, may call upon participants whom they invited to the Conference to make statements. At the conclusion of such statements, the Conferees will be given an opportunity to comment or ask questions, and at the conclusion of the Conferees' comments or questions, I may ask a question or two. This procedure has proven effective in the past in developing a clear statement of the problem and in reaching agreements on equitable solutions.

At the end of all statements, we will have a discussion among the Conferees and try to arrive at agreement on the facts of the situation. Then we will attempt to summarize the Conference orally, giving the Conferees, of course, the right to amend or modify the summary.

Under the Federal law, the Secretary of Health, Education, and Welfare is required, at the conclusion of the Conference, to prepare a summary of it which will be sent to all the Conferees. The summary, according to law, must include the following:

1. Occurrence of pollution in navigable waters subject to abatement under the Federal Act;

2. Adequacy of measures taken toward abatement of pollution; and

3. Natureof delays, if any, being encountered in abating the pollution.

Subsequent to the Conference, the Secretary of Health, Education, and Welfare is required to make recommendations for remedial action if such recommendations are indicated. In the past, when the Conferees are agreed unanimously on the recommendations, the Secretary has always adopted those recommendations of the Conferees.

A record and verbatim transcript will be made of the Conference by Mr. Al Zimmer. Mr. Zimmer is making this transcript for the purpose of aiding us in preparing a summary, and also providing a complete record of what is said here. We will make copies of the summary and transcript available to the Michigan Water Resources Commission. We have found that, generally, for the purpose of maintaining relationships within a State, that the people who wish transcripts should request them through their State agency, rather than come directly to the Federal Government. The reason for this is that we would prefer that the people who are interested in the problem to follow their normal relations in dealing with State agencies rather than the Federal Government on these matters when the Conference has been concluded. This has worked successfully in the past, and we will be most happy to make this material available to the State for distribution.

I would suggest that all speakers and participants, other than the Conferees, making statements come to the lectern and identify themselves for the purpose of the record.

Those stairs coming up look a little more precipitous and rickety than they are. I think you will make it if you take a deep breath.

(Laughter.)

The first person we would like to call on is indeed an old friend, and, from a technical person like myself who has been in this program for almost a quarter of a century, one of the national architects of the Federal program and indeed recognized, as I saw by one of your local papers a while ago, as Michigan's expert on water pollution control. He has worked on all water pollution control measures since he has been in Congress. He has been one of our most perceptive critics and one of the most instructive builders in the program, and has probably contributed as much to the progress of water pollution control programs in the National Government and in the States as any man in the country today.

The Honorable John D. Dingell.

(Rising applause.)

STATEMENT OF REPRESENTATIVE JOHN D. DINGELL, DEMOCRAT, 16th DISTRICT OF MICHIGAN

CONGRESSMAN DINGELL: Mr. Chairman, members of the Conference:

For the record, my name is John D. Dingell. I am a Member of Congress, elected from the 16th Congressional District of Michigan. Geographically, my district is perhaps the most critically and directly affected by the proceedings today, and by the pollution of the Detroit River, which is the subject matter of our conference. My district extends down the Detroit River beginning at the foot of West Grand Boulevard, and runs clear to the mouth of the Huron River some 22 miles distant; it comprises the southwest portion of the City of Detroit, all of the cities of Dearborn, Ecorse, River Rouge, Wyandotte, Southgate, Riverview, Trenton, Gibraltar, Rockwood, the Villages of Woodhaven and Flat Rock, and the Townships of Grosse Ile and Brownstown.

I do not intend to discuss the contents of the Public Health Service Report on the Detroit River. It is too well documented and sufficiently well known for our purposes today. Suffice it to say, the modest and reasonable recommendations contained therein should be implemented forcefully and vigorously at the present time. Neither the City of Detroit, nor any other municipalities or industries concerned have any God-given right to befoul the waters of the River, its tributaries, or Lake Erie.

The people I have the honor to represent have strong feelings on the subject of pollution of our Detroit River. To them it is a source of water for home and industry. It is an area of recreation for hunting and fishing, although now much degraded, and was formerly a fine place for swimming. Its once pure waters were at one time the seat of a flourishing sport and commercial fishery. Today its commercial fishery is gone, and its sport fishery produces catches running more and more heavily to the less desirable species of fish. Our fishermen, with reason, complain of the taste of the fish, tainted with industrial and municipal wastes.

Watercraft on the River are smeared with oil and pollutants; all too frequently, there are well documented reports of duck kills, some of them massive, stemming from the pollution of our River.

Cottagers, swimmers, and those who walk along the shore complain of the quality, the color, and the smell of the dying waters of our River.

The contents of the excellent Report on the Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries, completed after three years of study and an expenditure of some $750,000 of Federal funds, fully and properly characterizes the condition of the River and simply proves the obvious, and, Mr. Chairman, very frankly documents the obvious. Almost any of my constituents could tell us today, from their experience on the River and from the knowledge common to all in this area, that our River is grossly polluted.

We are gathered together today to discuss what is to be done, indeed, what must be done! On behalf of the people I have the honor to serve -- and, let me say that I take the trouble to familiarize myself very carefully with the view of my people, being a Member of Congress, I say, let us clean up the River, and I say further, let us carry out the recommendations of the report.

We know the sources of pollution, industrial and municipal. These are documented fully in the report. We have ample knowledge in the art of cleaning up the causes of the pollution such as exists in the Detroit Metropolitan Area. Our scientific knowledge is adequate, our knowledge of finances and our resources to meet the clear need are sufficient. We must not be lacking in determination.

I have heard the voices of only a very few men of limited knowledge and vision cry for the status quo, challenge the validity of the report, and attack the veracity and character of its authors. I report to you that this is not the attitude of the people of the Sixteenth District of Michigan, nor is it the thinking of the people of Southeast Michigan.

I repeat to you, our people who know the condition of our River cry, "Cleanup!" Those who use the River, the fishermen, the duck hunters, the cottagers, the boaters and the water skiers, the citizens who would swim again at Sterling State Park and at other beaches in our area all say, "Cleanup."

Our industries with wise and provident leadership know of the need for such cleanup, and our municipal leaders, save only the very few of the most limited vision, recognize and support the need for such cleanup.

We in this area ask only that the matter be approached in the same reasonable and understanding manner as have other cities which have found themselves in the same position. The matter can be handled with deliberate speed, and when I say "deliberate," I mean deliberate and a growing effort.

Our people recognize the pollution of our River from municipal and industrial discharge and the need for additional and improved treatment facilities. That secondary treatment must be installed by the City of Detroit and other municipalities which utilize the River for disposal of their sewage effluent, no one seriously challenges. Our people agree that industry must spend more for construction and repair and for more careful and adequate operation of its waste treatment plants.

We ask again, respectfully, Mr. Chairman, that only that time which is sufficient be afforded to city and industry for this cleanup. Our people ask that you consider, in fixing the time limits, the financial abilities of our industry to program the cost of what we all concede are badly needed improvements in waste handling. This includes, of course, construction and improvement in our existing plants. Our people urge that you consider problems of the City of Detroit and of the other municipalities in financing the cost of secondary treatment.

The City of Detroit has performed better than most cities in providing treatment of its municipal wastes, and I wish to endorse the comment of the Chairman of the Conference this morning on that point.

Unfortunately, its performance is no longer adequate to the needs of this time. What would serve a much smaller metropolitan area of the 1930's or 1940's is not adequate to the demands of a thirsty giant of a metropolitan area of the late 1960's. The knowledge of those earlier days as to water use, the methods of treatment, the hazards to our environment, the danger and destruction to fish and wildlife and recreational values have come a long way since the day when primary treatment by a city the size of Detroit was considered adequate.

It is no small task that we face in this area. The best estimates that I have seen place the cost of secondary treatment of Detroit's sewage as high as $100 million. Similar preliminary estimates fix the possible cost of new construction for abatement of industrial pollution at a nearly equal figure.

To the people of this area, and on their behalf, to the officers conducting this Conference, I say that these figures can be handled by our people and industry without undue economic hardship.

Without going into the matter in detail, I believe that a very modest increase in water rates to the customers of the City of Detroit system will sufficiently support a proper schedule of constructing adequate facilities.

Public Law 660 as amended offers grants up to $600,000 for one city construction and $2.4 million for multiple city construction of sewage abatement works.

Changes in Public Law 660 now awaiting final consideration in the Congress provide for grants of up to $1.2 million for single city construction and $4.8 million for multiple city construction of abatement works. In each case I believe on the basis of Detroit's services to its suburbs in sewage treatment, the area would qualify, under Public Law 660, for the larger, multiple city type grants.

I anticipate, in the near future, introducing amendments to Public Law 660 to provide for grants of up to $5 million for single city facilities and $20 million for multi-city grants. I believe that this will have a further beneficial effect not only on the pollution problems of the City of Detroit, but also upon similar problems of the many other large cities like New York, which has need of pollution control and abatement construction, the cost of which I have heard estimated as high as $1 billion; of Chicago, Philadelphia, and other cities whose needs run to several hundred millions for the secondary treatment of municipal sewage, and a great deal more for elimination of combined storm and sanitary sewers and for abatement of industrial pollution.

I feel that the Conference should not consider, at this time, the problem of storm waters adding to the pollution of the River resulting from the inadequately combined system of storm and sanitary drains of the City of Detroit. This would be too costly at the present time, and would, I believe, hinder completion of secondary treatment, which is more important and more economically feasible. The possibility of a breakthrough in this area, because of research stimulated by new Federal legislation, makes deferral of this problem both possible and desirable.

It would seem preferable to me that this Conference continue jurisdiction over the Detroit River and its tributaries to assure a fair and expeditious cleanup. This kind of continuing supervision could assure reopening of the vexatious storm overflow problem at the appropriate time.

I believe that the Michigan Water Resources Commission, with the assistance and encouragement of the United States Public Health Service, can carry out a plan fixing an equitable time and manner for a real cleanup in a way which will reasonably satisfy all concerned. I believe that fine agency, under the able leadership of Mr. Loring F. Oeming, with the strong backing of the Federal Government, has the technical ability and the inclination to do a good job. This I believe was clearly demonstrated by Mr. Oeming's recognition of the seriousness of the pollution problem when he publicly praised the thoroughness of the Public Health Service Report.

I am sure Mr. Oeming recognizes the responsibility which this entails. I am certain he knows that failure to carry out this high responsibility will result in the narrowing of the responsibility of the several States in the area of pollution abatement. Certainly, failure of Michigan's Water Resources Commission to meet this test will increase the pressure for more Federal action in this area.

Mr. Chairman, I have offered you no panacea and I have given no solution. I have simply stated support of the people of my district for the incontrovertible findings of the excellent study of the Detroit River, which was completed so carefully by the Public Health Service. Secondary treatment is not only possible, but is economically feasible. It is also urgently needed.

I have stated that this problem can be resolved by reasonable men with minimal cost to the many involved and with enormous benefit to all, and I find it is something which is made available in the case of about 70 percent of the municipalities in the country today, and I can see no reason why Detroit, through appointed officials, should discuss the need for special privileges.

I am sure that this Conference under its able Chairman, Mr. Murray Stein, will manifest the order, reason, and fairness I have seen in similar proceedings. I only urge that the same fundamental philosophy of Public Law 660 on whose original enactment I worked, and to which I have authored so many amendments, motivate all who are engaged in this program.

The benefits of cleaning up pollution of the Detroit River mean longer life to Lake Erie, pure water for municipalities, for industry, recreation, fish and wildlife, and will make this a better place to live for present and future generations. This is economically possible without undue hardship and dislocation to our people. I say, "Let us begin!"

Thank you, Mr. Chairman.

MR. STEIN: Thank you, Congressman.

Are there any comments or questions, Mr.

Oeming?

MR. OEMING: I have none.

MR. POSTON: No.

CONGRESSMAN DINGELL: I do, Mr. Chairman, have with me today the statement of my good friend and colleague from the 15th Congressional District, Congressman William Ford, that I would like to present to the Conference at this time.

Congressman Ford is very much concerned with the pollution of the Detroit River, and I believe his suggestions and his support of the Conference which he states for consideration merit attention by this body.

MR. STEIN: Could that be read into the record?

CONGRESSMAN DINGELL: I would present it to the Chairman and to the Conference. If they desire to have it read into the record, that will be appropriate, but I think it should be inserted at this point.

MR. STEIN: I think perhaps Mr. Oeming wants to hear it. If you wish, we can have someone read this for you.

CONGRESSMAN DINGELL: I've been getting very dry, Mr. Chairman. I would prefer to have someone else read it. A member of Mr. Ford's staff is here this morning, and I am sure he would be happy to present it.

MR. STEIN: Before you leave though, I would like to comment that I think it is evident to all, by your analysis of the problem in this particular area, why Congressman Dingell is one of the nation's experts in water pollution control.

I add again, as a technical man who stands with his entire career in the field, as you can see, Congressman Dingell is very strongly for water pollution control in addition to the normal problems when he comes into his own district. This, to my mind, takes considerable fortitude and courage.

Your point is well taken, sir, about putting an undue financial burden on anyone. As you know, our philosophy is to see whether we can have industries and municipalities, where appropriate, construct reasonable treatment methods and works without putting a burden on them or putting them out of their business.

Anyone can clean up pollution if you are going to put an industry out of business or close down a city. The challenge is to have industry maintain its competitiveness and allow the city to grow, and still have the water utilized for a maximum number of uses.

This often takes adroit financial analyses and painstaking hard work, and, Congressman, this is a notion that is well taken.

CONGRESSMAN DINGELL: I would point out, Mr. Chairman, that you have done this admirably in the conferences that you have conducted on many other rivers, and I think in some 34 cases, and I can see no reason why our people here have anything to fear from the enforcement of the Public Health Service.

MR. STEIN: I don't think so, sir. You know, as we have pointed out before the Congress, we have had cases involving more than 1,000 industries and more than 1,000 cities, the industries and the cities ranging from the largest to the smallest.

Only once have we been to court against one city. Never have we had to take an industry to court. I think this speaks of our philosophy. We measure our success by the solutions we arrive at at the conference table, rather than by the number of court actions we bring.

With reference to your last point, your recommendation that we continue jurisdiction, just yesterday and this morning I had word that the Governor of Ohio has requested a similar conference and enforcement action on the entire Lake Erie situation. This, as I see it now, will probably involve Michigan, Ohio, Pennsylvania and New York.

As you know, if any Governor makes a request for an interstate action like that, we have no option and we must take it, so I guess we will maintain jurisdiction.

I think Detroit is in an enviable position, because we do have a head start in Detroit and possibly we will be able to see our way clear to a solution. The other areas involved in the Lake Erie situation may yet have to go through the travail and agony of evolving a program, and I think we are close to that in this area.

Thank you very much.

CONGRESSMAN DINGELL: Thank you, Mr. Chairman.

A member of Congressman Ford's staff is here, and I am sure he would be more than pleased to read this.

(Applause.)

MR. STEIN: Would you identify yourself for the record, please?

STATEMENT OF THE HONORABLE WILLIAM D. FORD, U. S. REPRESENTATIVE, 15TH CONGRESSIONAL DISTRICT, MICHIGAN, READ BY JAMES PLAKAS

MR. PLAKAS: For the record, I am Jim Plakas, representing Congressman William D. Ford from the 15th Congressional District.

The statement I am about to read is the statement of the Congressman, and it reads as follows:

Mr. Chairman, members of the Commission, and delegates to the meeting:

I should first like to commend you for the effort which has been put forth to arrange this meeting on the subject of Water Pollution in the Detroit River and the waters tributary to and attached to it. There can be no question in the mind of anyone in the Detroit area that the time for delay and meaningless discussion is long past, and we have arrived at a time for action, the delay of which threatens one of the principal natural resources not only of our own area, but of the entire United States.

When one realizes that we in Michigan are virtually surrounded by what is estimated to be, not only the largest fresh-water reservoir in the world, but a fresh-water system of lakes and rivers representing one-seventh of the total available supply in the world, we can quickly grasp the enormity of our responsibility for the future of this resource. We have recently received the report on "Pollution of the Detroit River, Michigan Waters of Lake Erie, and Their Tributaries -- Summary, Conclusions and Recommendations," prepared under the direction of, and as the result of a Federal Grant to the United States Department of Health, Education, and Welfare, Public Health Service, Division of Water Supply and Pollution Control.

This very comprehensive analysis of the water pollution problem in the Detroit Metropolitan area and its effect on the Great Lakes, gives scientific and detailed support to facts concerning the pollution of our rivers and Lake Erie which have long been known to the residents of the area and people who have in recent years watched the consistent diminution of available fresh water for human consumption, swimming, boating and recreational uses, not to mention the effect on fish and wildlife.

I have lived within a very short distance of the Detroit River all of my life, and as a boy knew it to be not only the place from which our drinking water came, but a river lined with beaches used by many thousands of our people, and fished from Lake St. Clair to Lake Erie throughout the year. The people from my Congressional District who still use the lower Detroit River for recreation, such as those owning small boats for fishing and pleasure boating, are painfully aware of the increasing sludge which chokes the lower Detroit River. I have heard a neighbor say that "Putting your boat in the Detroit River is like dipping a casting in a bath of oil."

For the first time, in this report, we have the specific municipalities and private industries identified which are responsible for the pollution, in a very direct analysis which discloses exactly the type and volume of pollution entering the Rouge River, the Huron River, the Raisin River, the Detroit River and, subsequently, Lake Erie.

The City of Detroit, which would not be where it is but for the existence of the deep and once clear waters of the Detroit River, contributes 95 percent of the municipal waste which goes into the Detroit River in its northern part, and becomes a principal source of pollution to all those downstream from the city.

Representative William D. Ford

In years gone by, cities like Wyandotte, having water intakes in the Detroit River below the City of Detroit, have expressed deep concern for the increase in pollution which has in recent years made it necessary to dump ever-increasing amounts of chlorine into the water to make it potable, or at least passable.

Now, however, since the purchase of the Wayne County Water Department by the City of Detroit, an investment, incidentally, of more than $50,000,000, the City of Detroit and the many communities connected to its water system, all have in common the problem of a water intake on the lower Detroit River. More than $50,000,000 of Wayne County taxpayers' money has been invested in a water plant intended to be a principal source of supply for all of southern and western Wayne County, and which will not produce usable tap water for human consumption if present circumstances are permitted to continue.

Therefore, it is indeed a strange anomaly to hear water officials from the City of Detroit attempt to minimize the problem of Detroit River pollution, and suggest that secondary sewage treatment, as recommended in the Public Health Service report, would be a waste of money. This kind of horse-and-buggy economy is largely responsible for the situation we find ourselves in at the present time, and if it continues will diminish the growth and development potential of the Detroit Metropolitan area by amounts that are astronomical and represent literally thousands of times the cost of secondary sewage treatment by the City of Detroit.

However, private industry certainly has an obligation to discontinue, or mitigate, the conditions which led them to contribute 1.1 billion gallons of waste to our fresh water system every day, more than twice as much as all municipalities discharging waste into the river combined.

As the report so clearly indicates, industry is polluting these waters "bacteriologically, chemically, physically and biologically." The list of items deposited in the river by industry reads more like an inventory of a metal junkyard and chemical waste disposal facility than an analysis of a fresh water supply necessary to the sustenance of millions of people.

As people walk about our Capitol in Washington, one of the things that tourist guides call their attention to is the huge cast-iron dome in the center of the Capitol, which I am sure is familiar to every citizen of this country. One of the figures which truly astounds people as they stand below this overwhelmingly large structure is the guide's information that the dome weighs nine million pounds.

Imagine then, if you will, what we are talking about in terms of daily pollution in the Detroit River when you realize that every day six million pounds of waste products are discharged from United States industries and municipalities into the river, and twenty million pounds of waste goes from the United States waters of the Detroit River to the Michigan side of Lake Erie. We are literally filling in Lake Erie with our own waste and, in so doing, not only jeopardizing our own health and future, but betraying the trust which we as caretakers of this national resource owe to everyone else.

Mr. Stein, as the principal Federal officer charged with water pollution enforcement, I think will agree with me that no one wants to see the Federal Government assume complete control of enforcement and clean-up. It is an inescapable conclusion, reached by anyone who will give the matter a moment's thought, that the immediate action necessary on every front to halt this pollution and effectively do something to clean up our waters, must be a joint effort between government at all levels -- municipal-county-State-Federal, private industry and the citizens.

Representative William D. Ford

Congressman John D. Dingell (16th District, Michigan) and I are actively supporting legislation which would increase Federal funds available to municipalities who are willing to undertake the construction of improved sewage treatment facilities for the purpose of water pollution abatement, as well as improving, generally, public health conditions. However, Federal money alone will not do the job, and it will require a vigorous effort on the part of local officials to inform the public of the need for such facilities and to get projects started, which will result in their design and installation without further undue delay.

The State of Michigan has had great difficulty in obtaining a water pollution law with teeth, and some of the industries named in the report I have mentioned before have actively opposed enactment of legislation in Lansing that would strengthen the enforcement of anti-pollution measures. We have been greatly encouraged by progress made in this session of the Michigan Legislature, and certainly do not believe that it is too early to act.

Many of you know that the first conference on the Michigan waters of Lake Erie was called by the then Governor, John B. Swainson, in March of 1962, and that as a result of that meeting, the United States Government, through several agencies, became involved in the activity which led to the study resulting in the report we have been discussing today.

One might ask, however: Since that time in 1962, when the Federal Government and the State of Michigan determined through its representatives to take bold steps for a solution, what has the State of Michigan done? It might also be asked: What have the major industries, who must certainly have known in advance what the conclusions of this research would be, done to demonstrate that water pollution problems can be solved on a voluntary or cooperative basis without Federal Government coercion?

It should be noted that most of the downriver and out-County communities of Wayne County have recently entered into contracts obligating themselves to the expenditures of large amounts of money for the construction of new sewage treatment facilities, for sewage wastes coming from those communities. We in the suburbs might very well ask: What has our neighbor, the City of Detroit, done as its share in this project?

There is much discussion from time to time about the shift of responsibility for local problems to the Federal Government. And our own Governor, who himself has been critical of this shift, has nevertheless suggested a real reason for it when he has said, on more than one occasion, that if the State fails to meet the needs of the people, people will turn to Washington for assistance.

As a Congressman, I believe firmly that the question of a fresh water supply, and the availability of this supply as a national resource is clearly the proper subject of Federal legislation. Further, I feel that there can be no more admirable expenditure of public funds than for the purpose of water pollution abatement.

However, I truly hope that consistent with legislation we have already passed in this session of the 89th Congress, the Federal Government will lend its resources to an over-all citizen-business-government partnership in solving these problems.

I am prepared to say, however, that if we continue to discuss these matters without demonstrating a genuine effort on the part of the people responsible for pollution to abate these conditions, I will vigorously support any Federal legislation for the enforcement of pollution abatement that will make up for this lack of enlightened cooperation by the people most directly involved.

Thank you very much for permitting me to present this statement, and please accept my sincere best wishes to everyone participating in this Conference, in the hope that it will be a successful effort in the war against pollution.

Thank you, Mr. Chairman.

MR. STEIN: Thank you.

Do you have any comments or questions, Mr. Oeming?

MR. OEMING: Well, yes, Mr. Chairman.

I would like to comment on one of the questions that is raised in Congressman Ford's statement as to what has been done or what has transpired during this two or three year period that the study has been going on.

Just for your information and those here present, a report will be presented by the State agency to review the situation and review the progress that has been made, and, in addition, I am sure that many of the individual municipalities and industries will have their own statements to make upon invitation by the State Conferee.

So, I think this question will be answered at this Conference, that there were so many things done, and this Conference will bring those out.

MR. PLAKAS: Thank you.

MR. STEIN: Do you have any questions or comments, Mr. Poston?

MR. POSTON: No, sir.

MR. STEIN: I wonder if you would convey my thanks to Congressman Ford.

Since he has been in Congress, and he is a relatively new member, he has been consistently interested in water pollution control and has taken hold of this subject, and he seems to have quite a background.

We appreciate his contribution.

MR. PLAKAS: Thank you. I will convey your message.

MR. STEIN: Thank you.

At this point, I would like to review the agenda so that we will know where we stand. We are pretty much on schedule.

We first had the opening remarks, and next the appearances of members of Congress. Congressman Vivian, who we expected might be here, I think may very well have been delayed or called somewhere else in connection with the reception for the astronauts. If the Congressman should come in, we will put him on when he does, as we usually do in cases of that kind with a

Congressional delegation.

However, we are now going to have the Report on Pollution of the Detroit River by the Federal representatives. Then, after that, we will have a recess for lunch. We will reconvene at 2:30, when we expect to have appearances by Governor Romney, and the Governors of Ohio, Pennsylvania and New York, and the Premier of Ontario, who he has invited to attend. Perhaps one of them will appear and make a statement. We will then resume the presentation of the report, and we will hope to recess at about 5:30.

Tomorrow morning, if the report has not been completed today, we will continue with that, and then have clarifying questions by the conferees. If the report is completed this afternoon, we will start with the clarifying questions, after which we will have appearances of other invited Federal agencies, such as the Corps of Engineers, Department of the Interior, Fish and Wildlife Service, and the Bureau of Outdoor Recreation.

We will then have the same luncheon recess tomorrow, following which we will have a presentation of reports and statements by the State agencies, Michigan Water Resources Commission, Michigan Department of Health, Conservation Department, and Economic Expansion.

On Thursday, and continuing on, we will have appearances by the State invitees, with presentations of reports and statements of the municipalities and other local governmental units, and industries. This will continue until we have completed with that.

We will have a discussion and a resume of the Conference at the end of all these appearances.

Of course, we would like to move ahead as expeditiously as possible, but this can give you an idea of the program to expect. Before we get into the meat of the Federal report, we might take a five minute recess. Let us make it just a five minute recess.

Thank you.

(After recess.)

MR. STEIN: May we reconvene?

Mr. Poston.

MR. POSTON: Mr. Chairman, Conferees:

I would like to proceed immediately with a presentation of the Summary, Conclusions, and Recommendations of our studies that were made at the request of the Detroit conferees at the time of their meeting in March of 1962.

H. W. Poston

For this purpose, Mr. Richard Vaughan, who was Project Director up until October 4, 1964, and Mr. George Harlow, who has been Director since that time, will make this presentation.

Mr. Vaughan will come first, and will be assisted by Mr. Harlow in pointing out some of the locations on the map that we have at the right.

I would like to give you Mr. Vaughan at this time.

STATEMENT OF RICHARD D. VAUGHAN,

SANITARY ENGINEER AND DIRECTOR,

DETROIT RIVER - LAKE ERIE PROJECT

TO OCTOBER 4, 1964

MR. VAUGHAN: Mr. Chairman, Conferees, Ladies and Gentlemen:

For the record, my name is Richard D. Vaughan, and I am a Sanitary Engineer and Director with the Public Health Service of the U. S. Department of Health, Education, and Welfare.

At this time, I would like to read to you a Summary of the Report on Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries.

A water pollution investigation of the Detroit River and the Michigan waters of Lake Erie has been made by personnel of the Detroit River - Lake Erie Project of the Public Health Service, U. S. Department of Health, Education, and Welfare, under the authority of Section 8 of the Federal Water Pollution Control Act as amended (33 U.S.C. 466 et seq) and at the request of the conferees of the Federal - State conference on water pollution held in Detroit, Michigan, on March 27 and 28, 1962.

Richard D. Vaughan

The investigation was conducted to fill the gaps in existing technical information on water quality, sources and quantities of wastes, and the extent of pollution in the United States waters of the Detroit River and the Michigan waters of Lake Erie. The investigation was conducted in cooperation with the State regulatory agencies. The valuable assistance and special participation of personnel of the Michigan Water Resources Commission and Michigan Department of Health is recognized. Assistance was also rendered by the Corps of Engineers, U. S. Geological Survey, the International Joint Commission, and especially the U. S. Navy, who provided space for the operations.

Intensive surveys were made of 6 municipal and 42 industrial waste sources to ascertain their individual contributions to the waste loadings in the waters under study. These surveys were joint efforts of the Project and the appropriate State regulatory agency. In the area of industrial waste surveys, Michigan Water Resources Commission personnel collected the samples and, after analysis by the Project, the Commission personnel evaluated the findings and made recommendations where appropriate. In some cases the Project personnel made additional recommendations.

Richard D. Vaughan

A cooperative study was undertaken with the Michigan Department of Health and the Michigan Water Resources Commission to determine and compare the characteristics of overflows from combined sewers with those from separate storm sewers.

Generally, laboratory procedures were performed in accordance with "Standard Methods for the Examination of Water and Wastewater, Eleventh Edition." Any deviations were based on proven research described in the literature.

The main body of this report contains a narrative description of all major activities of the Project, accompanied by appropriate maps, graphs, and tables. All tables and figures are contained in the seven sections which constitute the main body of the report.

SUMMARY OF FINDINGS - DETROIT RIVER

Water Uses

The Detroit River is actually a strait connecting the waters of Lake St. Clair to those of Lake Erie. Its average discharge, based on United States Lake Survey records through April 1964, is 182,000 cubic feet per second. During the study period the discharge averaged 170,000 cubic feet per second.

The water uses of the Detroit River are as follows:

1. Shipping and navigation. Tonnage shipped through the Detroit River during a recent eight-month season exceeded the entire combined tonnage shipped through the Suez and Panama Canals during an entire year. To maintain navigation, dredging operations are carried on in the Detroit River and Lake Erie by the U. S. Corps of Engineers.

2. Major staging area for migrations of watterfowl. Estimated winter populations since 1950 ranged from a minimum of 5,000 in 1961-1962 to 100,000 in 1963-64.

3. Recreation. There are at least 18 recreational areas and 63 marine facilities in the study area.

4. Water supply. Heavy use is made of the Detroit River for municipal and industrial water supply. The major municipal user is the City of Detroit, serving the water supply needs of over three million people both in Detroit and adjacent communities. Three municipal water supply intakes serving the Detroit area are located in the U. S. section of the Detroit River.

5. Sport Fishing. The fish of the Detroit River and adjacent waters of Michigan Lake Erie are a valuable natural resource providing recreation for many

anglers in the metropolitan area. Sales of bait, tackle, and fishing gear as well as sales and rentals of boats and motors to sportsmen constitute a business activity of considerable economic importance to the area.

Description of Water Quality and Interference with Water Uses

Several prior investigations concerning water quality in the Detroit River have been made by government agencies and private consulting engineering firms during the last 50 years. Reports of these investigations show the progressive deterioration of the Detroit River water quality from headwaters to mouth due to municipal and industrial waste discharges. Comparison of waste loadings discharged to the Detroit River during the 1948 IJC survey and the 1963 Public Health Service survey reveals over 50 percent reduction in phenols, cyanide, oil, and suspended solids from industrial sources during the 15-year period.

The water quality of the Detroit River from its head to its junction with the old channel of the Rouge River (approximately 10 miles downstream) is satisfactory during dry weather conditions. During overflows from combined sewers, the only part of the Detroit River free from pollution is the stretch above

Conners Creek and midstream down to the Rouge River.

From their points of discharge all types of wastes had a tendency to hug the United States or Canadian shores and then slowly extend outward into the main body of the river. Thus the pollution is not as great in the middle of the River.

Coliform Bacterial Density. High total coliform densities, especially when accompanied by high fecal coliform densities, indicate the presence of animal (including human) wastes which may contain pathogenic organisms capable of causing enteric diseases in humans. The presence of these organisms above acceptable levels is a threat to the health and welfare of those who use this water for domestic water supply and recreational purposes. A widely used standard for swimming is 1,000 organisms per 100 ml.

Bacterial densities differed greatly between dry and wet weather conditions. During dry conditions the geometric mean coliform density in the upper Detroit River was under 500 organisms per 100 ml., with average values at the headwaters under 100 organisms per 100 ml. Below Zug Island and the Rouge River the geometric mean coliform densities increased to values exceeding 5,000 organisms per 100 ml. During wet conditions no change was noted at the head of the Detroit River, but below Conners Creek geometric means rose to approximately 7,000 per 100 ml. in the upper River and to over 80,000 in the lower Detroit River. During wet and dry weather almost all of the lower Detroit River has geometric mean values in excess of 2,400 organisms per 100 ml., and most of the lower Detroit River exceeds 5,000 organisms per 100 ml. during wet conditions.

Fecal coliform ratio to or percentage of total coliforms provides additional information on water quality. The range noted during the study was 30 to 90 percent of the total coliform densities, with higher values observed in the lower Detroit River during wet conditions. Fecal streptococci were generally less than either total or fecal coliforms.

Geometric mean densities depict only average conditions and tend to mask extremely high values. These high values can indicate significant effects on many water uses, especially those affecting human health and welfare. Maximum values during the survey ranged from 4,900 organisms per 100 ml. at the headwaters to 770,000 organisms per 100 ml. in the lower River.

At the head of the Detroit River average total coliform densities were approximately the same during wet and dry conditions throughout the range. At all locations from just below Belle Isle to the mouth of the Detroit River average coliform densities near the United States shore during wet conditions were 5 to 10 times higher than corresponding values during dry weather. Study of the results of sampling in the Detroit River by personnel of the City of Detroit during the past four years indicates a pronounced downward trend (as evidenced by median values) in coliform densities in American waters near the shore, especially during the years 1962 and 1963.

Effluents from the main Detroit Sewage Treatment Plant, Wyandotte Sewage Treatment Plant, and overflows from combined sewers are significant souces of coliforms, fecal coliforms, and fecal streptococci to the Detroit River.

Four years of operating records of several area water and sewage treatment plants were evaluated. These records indicate a substantial reduction in monthly geometric mean coliform densities during 1962 and 1963 compared with the preceding two years, especially in the Detroit Sewage Treatment Plant effluent. A corresponding reduction in coliform density at the Wyandotte Water Treatment Plant was observed in these two years. Little change was noted in suspended solids in sewage effluent or influent in area plants during the period.

Monthly geometric mean values in several Detroit River sewage treatment plant effluents indicate substantial reduction during the past few years. During certain months with geometric mean values under 20,000 organisms per 100 ml., densities of daily samples varied widely, with daily averages frequently over 100,000 per 100 ml. Such erratic control of coliform organisms is not considered unusual when chlorination is practiced following primary sewage treatment.

Pollution from partially treated municipal wastes and overflows from combined sewers endangers the users of the domestic water supplies from the Wyandotte intake and, at times, users of the domestic water supplies from the Southwest intake of the City of Detroit. Pollution from these sources also interferes with recreational uses at all times in the lower Detroit River. Pollution originating from the Detroit and Wyandotte Sewage Treatment plants and combined sewers along the entire shoreline of the River must be abated to improve water quality and increase the uses of the Detroit River.

BOD and DO. Insufficient dissolved oxygen in water can kill fish and other aquatic life or prevent their propagation. Low levels of dissolved oxygen can cause objectionable odors and thus interfere with recreation and aesthetic enjoyment.

Dissolved oxygen in the upper River is stable at 93 - 106 percent of saturation, but gradually diminishes to an average saturation of 67 percent at the mouth in that section of the River most affected by the Trenton Channel. The minimum observed value during the survey was 5.1 mg/l at the mouth.

The major sources of biochemical oxygen demand (BOD) are the effluents of the main Detroit Sewage Treatment Plant and the Scott Paper Company on the Rouge River.

While the present oxygen level in the lower Detroit River does not cause major interference with water uses, the drop from 100 percent saturation in the upper River to 67 percent in the lower is a warning of dire consequences in the future unless appropriate action is taken and represents a threat to water uses in the Detroit River and Michigan Lake Erie.

<u>Suspended and Settleable Solids</u>. Excessive amounts of suspended solids in water can cause interference with domestic and industrial water treatment processes, harmful effects to fish and other aquatic life by clogging the gills and respiratory passages of aquatic fauna, turbidity which interferes with light transmission, and can

interfere with boating and aesthetic enjoyment of the water. When a part of the suspended solids settles out on stream and lake bottoms as sludge or bottom deposits, damage to aquatic life can occur since these deposits blanket the bottom, killing eggs and essential fishfood organisms and destroying spawning beds. When the suspended solids carry with them toxic material, aquatic life can be killed when the toxic materials leech out into the water above.

A substantial increase in suspended solids occurred in the Detroit River from its head to mouth with a range of 5 - 20 mg/l in the upper and 14 - 65 mg/l in the lower river. Settleable solids showed a similar increase from a range of 5 - 10 mg/l to 10 - 24 mg/l.

The largest contributor of suspended and settleable solids is the Detroit Sewage Treatment Plant. The Wyandotte Chemical Company is also a significant contributor of suspended and settleable solids.

Sludge banks are present and are particularly extensive near the mouth of the River as it empties into Lake Erie. These deposits of sludge are primarily due to suspended and settleable solids in municipal and industrial wastes discharging into the Rouge and Detroit Rivers. The bottom deposits caused by pollution create unfavorable environmental conditions for the propagation of game fish. Sludge deposits along the shoreline and in marinas interfere with recreational use and the aesthetic enjoyment of water. Pollution in the form of these deposits interferes with navigation, requiring annual dredging operation to maintain channels, marinas, and harbor facilities.

Oil and Grease. Oil and grease were repeatedly observed in the Detroit River.

The major sources of oil are the main Detroit Sewage Treatment Plant effluent and several industrial sources.

Although good oil pollution control has been effected by the State regulatory agencies during wildfowl over-wintering periods, the continued presence of excessive quantities of this pollutant in waste effluent poses a constant threat to fish and wildlife, as well as interfering with recreational use of the water. Oil spills were observed during the study period by the Project.

Phenols. High levels of phenols in waters cause disagreeable taste and odors in drinking water, tainting of flesh in game fish, and may even result in fish kills when concentrations are excessive. Phenols are present in Detroit raw water supplies in sufficient concentration to cause disagreeable tastes and odors, and expensive water treatment procedures are required to eliminate the problem. Average phenol concentrations should not exceed 2 micrograms per liter (ppb) and maximum values should not exceed 5 micrograms per liter to prevent nuisance taste and odors in water supplies.

Average phenol concentrations in the Detroit River increased from 3 - 5 micrograms per liter at its head to greater than 10 micrograms per liter in the lower River, and 6 - 9 micrograms per liter at the mouth. Average phenol concentrations at all ranges in the Detroit River exceeded recommended levels during the survey.

The major sources of phenols are the main Detroit Sewage Treatment Plant effluent, which treats the wastes of numerous industries, and other industrial sources.

Excessive phenol concentrations in the waters and bottom muds of the Detroit River taint the flesh of fish and have interfered with domestic water treatment at the Wyandotte plant.

Chlorides. Chloride concentrations above certain levels can interfere with domestic and industrial water supplies by causing objectionable tastes in drinking water and corrosion in industrial processes.

Richard D. Vaughan

Chlorides in the Detroit River increased from uniform concentrations of 7 - 10 mg/l at the head to average values ranging from 9 - 69 mg/l at the mouth. High values were observed in the Trenton Channel and at the mouth near the United States shore.

The principal contributors of chlorides to the Detroit River are the Allied Chemical Corporation, Pennsalt Chemical Company, and the Wyandotte Chemical Company.

Increases in chloride concentrations indicate a change in the mineral content of the Detroit River from head to mouth. Although these concentrations are not yet significant enough to cause major interference with water use, the doubling of chloride loadings in a 30-mile stretch of the river is of concern. Future action may be necessary to prevent an undesirable situation.

Iron. Excessive concentrations of iron in water can cause interference with domestic and industrial water supplies. Iron is toxic to certain species of fish and other aquatic life in relatively low concentrations. Iron concentrations should not exceed 0.3 mg/l (ppm) in the receiving stream to prevent interference with municipal and industrial water supply and to protect fish and wildlife.

Richard D. Vaughan

Average iron concentrations in the Upper Detroit River meet recommended levels, but downstream the concentrations increase to average values of 0.52 mg/l. The iron concentration at the mouth ranges from 0.47 - 0.63 mg/l.

Although the Detroit Sewage Treatment Plant is a significant contributor of iron to the Detroit River, the largest sources of iron are the Great Lakes Steel Company and the Ford Motor Company.

Iron concentrations in the waters and bottom muds of the Detroit River pose threats to fish and other aquatic life and represent a potential interference with industrial water supply.

Nitrogen. Nitrogen compounds coupled with phosphorus can act as essential nutrients causing the growth of algae in bodies of water where other environmental factors are satisfactory. In small quantities these algae are desirable as a major source of food for fish. When algal growth exceeds certain limits, nuisances result from the blooms. They are unsightly, can result in obnoxious odors, and some species can be toxic to fish. The level of inorganic nitrogen compounds (nitrates, nitrites, and ammonia) above which undesirable blooms can be expected to occur is 0.30 mg/l.

Richard D. Vaughan

Nitrogen compounds show a significant increase from the head to the mouth of the River. Inorganic nitrogen (nitrates, nitrites, and ammonia) increased from approximately 0.2 mg/l at the head to over 0.4 mg/l at the mouth of the River. Ammonia increased dramatically below the Rouge River and Zug Island from a range of 0.08 - 0.14 mg/l to 0.16 - 0.41 mg/l. High ammonia levels at the Wyandotte water treatment plant causing a variable chlorine demand, have necessitated greater chlorine dosages to assure a safe supply at all times. The presence of this material not only results in additional expense but also represents an interference with the effectiveness of chlorine in disinfecting water supplies, and thus is a hazard to the health and welfare of the users. High ammonia levels can be expected to cause similar problems at the new southwest intake operated by the City of Detroit.

The main source of nitrogen to the Detroit River is the effluent of the main Detroit Sewage Treatment Plant.

Essential nutrients for plant growth, including inorganic nitrogen compounds and phosphates, increase significantly from the headwaters to the mouth of the Detroit River. Excessive concentrations of these constituents cause interference with almost all legitimate water uses.

Phosphates. Soluble phosphates in relatively small concentrations are readily available as an essential plant nutrient. The insoluble portion of the total phosphate concentration can be converted to the soluble form and thus become available for such plant utilization. Soluble phosphates present in greater concentrations than 0.015 mg/l, reported as phosphorus, in combination with inorganic nitrogen compounds in excess of 0.30 mg/l and accompanied by satisfactory environmental conditions such as light and heat, may produce overabundant growths of algae with concomitant odors and detriment to fish life.

Phosphates (reported as phosphates) increased from average values of 0.03 - 0.30 mg/l at the head to 0.18 - 1.20 mg/l at the River's mouth. All but two soluble phosphate values in the upper Detroit River were less than 0.001 mg/l with the highest value located near the United States shore just downstream from the combined sewer outfall at Conners Creek. These values increased to a range of 0.176 to 0.204 mg/l at the mouth.

The main source of phosphates to the Detroit River is the main Detroit Sewage Treatment Plant effluent.

Biology. The waters of the Detroit River from head to mouth were found to contain low numbers of planktonic algae, with counts averaging 500 per ml. Low densities of animal plankton were also found. Plankton entering the river with water masses from Lake St. Clair were carried as a "standing crop" downriver to Lake Erie with little change in density or species composition either vertically or horizontally across the river. The rate of travel is too rapid for the domestic and industrial wastes to appreciably alter the number of plankton.

The bacterial slime Sphaerotilus was found, attached to bridge abutments, pilings, piers, buoys, etc., in abundant quantities in the Detroit River below the Rouge River and Detroit Sewage Treatment Plant outfall.

Composition of bottom organisms in the Detroit River changed from a pollution-sensitive population typically found in clean waters to a predominantly pollution-tolerant population in the lower areas of the River below Zug Island and the Rouge River. This change was especially pronounced along the United States shore. In the reach of the Detroit River from Zug Island to the mouth, habitats suitable for the support of a variety of bottom organisms have been destroyed by the deposition of organic solids and oils, especially in areas nearest the Michigan shore.

Clinging and burrowing mayfly nymphs, both pollution-sensitive organisms associated with clean bottom conditions, in themselves valuable as fish food, were found in the upper ranges of the Detroit River but were completely absent from the River below the Rouge River and Detroit Sewage Treatment Plant and in the entire Michigan waters of Lake Erie. Habitats in the lower Detroit River formerly suitable for the support of this once-abundant organism have been totally destroyed by pollution.

Sources and Characteristics of Wastes

A total municipal waste volume of 540 million gallons is discharged daily into the Detroit River, containing the following loadings of constituents:

1. Wastes equivalent in oxygen-consuming capacity to raw sewage from a population of over 3,000,000.
2. Innumerable coliform bacteria.
3. Over 25,000 pounds of iron.
4. Over 600,000 pounds of suspended solids and almost 300,000 pounds of settleable solids.
5. Over 16,000 gallons of oil.
6. Over 1,200 pounds of phenolic substances.
7. Over 34,000 pounds of ammonia.
8. Over 150,000 pounds of total phosphates,

including 70,000 pounds of soluble phosphates.

9. Over 500,000 pounds of chlorides.

A total industrial waste volume of 1.1 billion gallons is discharged daily into the Detroit River, containing the following loadings of constituents:

1. Wastes having an oxygen-consuming capacity equal to raw sewage from a population of over 1,000,000.

2. Over 3,000 gallons of oil.

3. Over 800,000 pounds of suspended solids, of which almost 700,000 are settleable.

4. Over 1,400 pounds of phenols.

5. Over 8,000 pounds of ammonia.

6. Over 80,000 pounds of iron.

7. Over 2 million pounds of chlorides.

8. Over 200,000 pounds of acid.

MR. STEIN: Mr. Vaughan, do you want these tables which follow to appear in the record?

MR. VAUGHAN: Yes, I do, Mr. Chairman.

MR. STEIN: Without objection, it will be done.

MR. VAUGHAN: Would you like me to mention it? We have other tables.

MR. STEIN: No; it will be done from this point forward.

(Tables 11-V, 12-V and 13-V are as follows.)

TABLE 11-V. SOURCES OF INDUSTRIAL WASTES--ROUGE RIVER

Industry	Volume (MGD)	Product	Production	Significant Waste Constituents	Waste Treatment or Control
Allied Chemical Corporation					
General Chemicals Division	9.11	sulfuric acid, aluminum sulphate.	- -	acid	ponds, pH monitors.
Plastic Division	0.48	coal tar, pitch, oil.	-	phenols, NH_3	dephenolizers, settling, oil separators.
Semet-Solvay Division	5.9	high-grade coke and by-products	-	phenols	dephenolizer, oil separator
Solvay Process Division	15.2	soda ash	1,000 tons/day	suspended solids, chlorides, phenols	lagoons
American Agricultural Chemical Company	1.15	fertilizer, gelatin, fluoride salts	-	acid	none
Darling and Company	1.13	fats and meat meal	-	BOD, coliform, N, suspended solids, oil	sedimentation
Ford Motor Company	400	steel, castings, coke, glass, automobiles	-	phenols, CN, NH_3, iron, oil	oil separator, sedimentation, subsurface injection.
Peerless Cement Company	8.1	Portland cement	3 1/4 million barrels/year	suspended solids	none
Scott Paper Company	43.8	high-grade paper tissue	240 tons/day	BOD, pH, Susp. solids, phenols.	screening, clarifiers
TOTAL	484.87				

TABLE 12-V. SOURCES OF INDUSTRIAL WASTE--UPPER DETROIT RIVER

Industry	Volume (MGD)	Product	Production	Significant Waste Constituents	Waste Treatment or Control
Allied Chemical Corporation					
Solvay Process Division	6.4	soda ash	1,000 tons/day	suspended solids, chlorides, phenols	lagoons
Anaconda-American Brass Company	5.3	copper	-	toxic metals, acid	neutralization, settling
Great Lakes Steel Corporation					
Blast Furnace Division	90	coke, pig iron, coke by-products	-	iron, susp. sol., phenols, oil, NH_3, cyanides	clarifiers, dephenolizer
Parke Davis and Company	8.1	pharmaceuticals	-	none	none
Revere Copper and Brass Company	2.9	brass and copper	-	oil, toxic metal	oil separators
U.S. Rubber Company	42	tires	-	none	oil skimmers
TOTAL	154.7				

TABLE 13-V. SOURCES OF INDUSTRIAL WASTES - LOWER DETROIT RIVER

Industry	Volume (MGD)	Product	Production	Significant Waste Constituents	Waste Treatment or Control
Chrysler Corporation Amplex Division	0.32	gears	-	none	none
Chemical Products Division	0.27	chemical adhesives, brake linings, soluble oils	-	none	none
Engine Plant	1.1	engines	55,000/mo.	oil	air flotation and oil skimmer, chemical coagulation
Dana Corporation	0.38	auto and truck frames, trilevel RR car carriers	-	phenols, acid, oil, iron	none
E. I. duPont deNemours and Company	1.4	sulfuric acid, oleum	-	acid	none
Firestone Tire and Rubber Company	1.0	wheel rims	11,400,000 lbs. /mo.	acid, iron, oil, suspended solids	oil separator, ponds, diffuser pipes
Fuel Oil Corporation	12,240*	ship washing	18 ships/yr.	oil, suspended solids	oil separator
Great Lakes Steel Corporation Hot Strip Mill	72	sheet steel	-	oil, iron, suspended solids	oil skimmers and settling basins
Rolling Mill	72	strip, sheet and bar steel	-	oil, phenols, acid, iron, suspended solids	oil separators
Koppers Company, Incorporated	0.8	naphthaline, paraffin epoxy resins	-	phenols, oil	none
McLouth Steel Corporation Gibraltar Plant	1.6	cold rolled steel	80,000 tons/mo.	acid, iron, suspended solids, oil	oil skimmers, lagoons
Trenton Plant	65.7	Stainless steel	2,530,000 tons/yr.	iron, suspended solids, oil	chemical coagulation, settling neutralization, oil separators
Mobile Oil Corporation	1.1	gasoline, naptha, kerosine, oils	-	phenols, oil, chlorides, suspended solids	oil separator, ponds
Monsanto Chemical Company	18	phosphates and detergent	-	phosphates, suspended solids	lagoons
Pennsalt Chemicals Corporation East Plant	97	chlorine, caustic, NH_3, hydrogen peroxide, acid, ferric chloride	-	NH_3, chlorine, chlorides, suspended solids	none
West Plant	6.8	organic chemicals	-	phenols, chlorides, suspended solids, oil, oxidizing agents	lagoons, oil skimmers
Shawinigan Resins Corporation and Monsanto Saflex Division	0.4	polyvinyl butyral Ethyl acetate	500,000 lbs/week	acid, BOD, suspended solids	lagoons, neutralization
Wyandotte Chemicals Corporation North Plant	57	soda ash, bicarb of soda, lime, calcium carbonate, cellulose	-	phenols, chlorides, suspended solids, nitrogen	lagoons
South Plant	54.7	chlorine, lime, glycol, cement, soda, dry ice	-	chlorides, suspended solids, phenols	lagoons, oil separator
Propylene Oxide Plant	1.0	propylene oxide	65 tons/day	chlorides, suspended solids	lagoons
TOTAL	452.57				

*gallons per hour when washing ship.

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MR. VAUGHAN: Thank you, Mr. Chairman.

Stormwater Overflow Studies

Studies were performed jointly with the Michigan Department of Health and the Michigan Water Resources Commission to compare the characteristics of discharges from the combined sewers serving the City of Detroit (Conners Creek system) and the separate storm sewers serving Ann Arbor, Michigan.

The following is a summary of waste constituents found in the stormwater overflows from combined sewers:

1. Total coliform, fecal coliform, and fecal streptococcus densities many times approached values found in raw sewage. Coliform counts of over 100,000,000 organisms per 100 ml were found during summer months. Lower results were found in the winter.

2. Total coliform densities in the separate stormwater system at Ann Arbor regularly exceeded 1,000,000 organisms per 100 ml. Average total coliform densities from the Detroit combined system were approximately 10 times higher than those in the Ann Arbor separate system. Fecal coliform densities were found to be approximately 30 times greater than similar values in the separate system, while comparable fecal streptococcus levels were at

least twice as high.

3. Phenol, BOD, phosphate, ammonia, and organic nitrogen concentrations were two to five times higher in the combined overflow than in separate storm discharge.

4. In the Detroit area, rainfall sufficient to cause overflows from all combined sewers (0.3 inch) can be expected to occur approximately 33 days each year. Rainfall sufficient to cause overflows from certain parts of the system (0.2inch) can be expected to occur about 45 days each year.

5. Calendar year 1963 was the driest on record for the City of Detroit according to rainfall records of the U. S. Weather Bureau. Even during this year, the Conners Creek pumping station was observed to overflow 12 times during a 6-month period in 1963. During the first 12 months of operation of the automatic sampler, the Conners Creek installation overflowed and collected samples 23 separate times. Both figures exclude the period of raw sewage bypass from this station by the City of Detroit.

6. The volume of overflow at the Detroit installation during the survey varied from 40 million gallons to 509 million gallons. The greatest volume was

observed during the overflow of longest duration. This volume, which originated from only 25 percent of the City of Detroit, is approximately the same as the daily discharge of partially treated sewage from all sewage treatment plants into the Detroit River.

7. Volume figures indicate a discharge into the Detroit River of 4 1/4 billion gallons from the combined sewers serving the Conners system during the first year of operation of the sampling station.

8. It is estimated that 2 percent of the total raw sewage contributed to the Detroit area sewers reaches the Detroit River each year. This is over 5 billion gallons of raw sewage contributed to the Detroit River from this source each year. This figure should be considered conservative since the Conners system is designed for more storage capacity than many other combined sewers in the Detroit and downriver collection systems.

Total bacterial densities were found to increase from the headwaters to the mouth during a typical overflow. The following is a summary of data on bacterial densities:

1. Coliform, fecal coliform, and fecal streptococcus densities increased in the Detroit River, following an overflow from combined sewers, 10 to 50 times

over the values found during dry weather conditions.

2. Coliform densities in the Detroit River following an overflow often exceeded 300,000 organisms per 100 ml and at times exceeded 700,000 organisms per 100 ml.

3. All high bacteriological values in the Detroit River during or following an overflow were found below Conners Creek. Bacteriological densities above this point stayed fairly constant during wet and dry conditions. Conners Creek represents the farthest upstream location on the Detroit River of many combined sewer outfalls.

4. City of Detroit sampling records show individual values exceeding 800,000 organisms per 100 ml in the Detroit River on the day following significant rainfall.

5. High bacteriological densities following overflows were found at both the City of Wyandotte water intake and the new intake of the City of Detroit near Fighting Island. The Wyandotte values exceeded 100,000 organisms per 100 ml and the Fighting Island values 10,000 organisms per 100 ml.

6. Rainfall, overflow, and stream quality records show that during a 9-month period in 1963 (March -

November) overflows from combined sewers affected water quality in the Detroit River during part or all of 88 days. This represents 32 percent of the days in the 9-month period. This phenomenon occurred during the year of lowest accumulated rainfall and implies an even greater effect on Detroit River water quality during a year of normal rainfall.

During heavy rains causing overflow, visual observations were made of the Detroit River by Project field personnel, who noted condoms, debris, and garbage as well as excrement floating down the River.

Special Studies

Several special studies were conducted by the Project to provide additional information on complex problems. The following were investigated:

1. The effect of pollution originating from unsewered homes or from inadequately functioning installations on Grosse Ile.

2. Growth and die-off of bacteria in the Detroit River.

3. Bypass of 75 MGD of raw sewage for 10 consecutive days by the City of Detroit during November 1963.

4. Detroit's bypassing of treated effluent

through an alternate outfall to the Rouge River and its adverse effect on water quality in the lower Detroit River.

5. Physical and chemical characteristics of deposits on the bottom of the Detroit River.

6. Distribution of flow in the Detroit River by dye tracer studies.

7. Tributaries of the Detroit River thought to be of significance in the contribution of industrial or domestic wastes and subsequent deterioration of the main river.

Detailed information on the results of these studies can be found in Section V in the main body of the report.

MR. STEIN: Mr. Vaughan, this material is contained --

MR. VAUGHAN: It is in the main body.

MR. STEIN: Would you want that to appear in the transcript?

MR. VAUGHAN: Yes, I would.

MR. STEIN: Without objection, that will be done. The main body of the report, which I think both Mr. Poston and Mr. Oeming are familiar with, will appear in the transcript.

I think that probably is a good idea, because I don't know how these references could be checked if it is not readily available.

MR. VAUGHAN: I might add that the reason we are not giving the main body of the report is that it is over 300 pages long.

(The main body of the report, entitled "Findings," is as follows.)

Richard D. Vaughan

REPORT ON POLLUTION OF THE DETROIT RIVER, MICHIGAN WATERS OF LAKE ERIE, AND THEIR TRIBUTARIES

FINDINGS

SECTION I

INTRODUCTION AND BACKGROUND

INTRODUCTION

Under Section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.), the Governor of any State may request that the Secretary of Health, Education, and Welfare call a conference on pollution of interstate or navigable waters if that pollution is endangering health or welfare. On December 6, 1961, the Honorable John B. Swainson, then Governor of the State of Michigan, made such a request.

Governor Swainson, in his request, stressed the exemplary record of pollution abatement of the Michigan Water Resources Commission but stated that critical pollution problems in Michigan's southeastern complex made demands far beyond the scope of normal pollution control activities. The letter specifically requested the Secretary of Health, Education, and Welfare to assist the State of Michigan to identify and recommend methods for correcting the sources of pollution going into the Detroit River and subsequently into Lake Erie.

On December 19, 1961, Secretary of Health, Education, and Welfare Ribicoff replied to Governor Swainson, agreeing to his request and stressing the desirability of a cooperative State-Federal approach in meeting these water pollution control problems in the State of Michigan.

After a preliminary investigation of the problem by Federal and State water pollution control agencies, a conference was held on March 27 and 28, 1962, at the Veterans Memorial Building in Detroit, Michigan. Presentations concerning the present status of pollution in the southeast Michigan area were given by representatives of local, State, and Federal governmental agencies, civic groups, and industries to a group of State and Federal conferees. Of a total of six conferees, four represented the Michigan Water Resources Commission and two, including the Chairman, the U. S. Department of Health, Education, and Welfare. The proceedings of this conference contain much valuable information covering the status of pollution in the southeast Michigan area.

The conferees unanimously agreed to the following conclusions and recommendations:

1. Lake St. Clair, the Detroit River, Lake Erie, and their tributaries within the State of Michigan are navigable waters within the meaning of section 8 of the Federal Water Pollution Control Act.

2. Pollution of navigable waters subject to abatement under the Federal Water Pollution Control Act is occurring in the Michigan waters of Lake St. Clair, the Detroit River, Lake Erie, and their tributaries. The discharges causing and contributing to the pollution come from various industrial and municipal sources.

3. This pollution causes deleterious conditions so as to interfere with legitimate water uses, including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating, and other forms of recreation.

4. It is too early, on the basis of the record of the conference, to make an adequate judgment of the adequacy of the measures taken toward abatement of the pollution. The conference discussions demonstrate

that there are many gaps in our knowledge of sources of pollution and their effects.

5. Cognizance is taken of the program of the Michigan Water Resources Commission for development of adequate pollution control measures on a progressive basis and the excellent progress being made by many municipalities and industries under this program. Delays encountered in abating the pollution may well be caused by the existence of a municipal and industrial complex concentrated in an area with a limited water resource. The conferees are also aware of the vast problems that Detroit faces as a result of the storm water outflow from a system of combined sewers. The problem thus becomes one of approaching the entire area on a coordinated basis and putting in adequate facilities based on an overall plan.

6. Cognizance is also taken of the six-county study as a useful approach to the solution of the pollution problem in the Detroit area.

7. The Department of Health, Education, and Welfare, in order to close the gaps in the knowledge as to sources of pollution, nature of pollution and the effects thereof, appropriate methods of abatement, and appropriate methods to avoid delays in abatement, will

initiate an investigation and study to gather data and information on the waters involved. This investigation and study will be carried on in close cooperation with the State agencies concerned, with the details of the investigation to be determined by the technical staffs of the Department of Health, Education, and Welfare, the Michigan Department of Health, and the Michigan Water Resources Commission. The Department of Health, Education, and Welfare will establish a resident survey group to provide technical assistance for this investigation.

8. The Department of Health, Education, and Welfare will prepare reports on the progress of this investigation at six-month intervals which will be made available to the Michigan Water Resources Commission. The Michigan Water Resources Commission will make information contained in these reports available to all interested parties.

9. The conference will be reconvened at the call of the chairman with the concurrence of the Michigan Water Resources Commission to consider the results obtained from the investigation and study, and to agree on action to be taken to abate pollution.

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ORGANIZATION OF THE PROJECT

In order to carry out the mandate of the conference, the Detroit River-Lake Erie Project was established by the Public Health Service of the U. S. Department of Health, Education, and Welfare, with the following objectives:

1. To determine the extent of pollution in the United States portion of the Detroit River and the Michigan section of Lake Erie.

2. To investigate principal sources of pollution in this area and the contribution from these sources.

3. To determine the effect of pollution on various water uses.

4. To prepare a plan, or plans, for abatement of pollution in the area.

The Detroit River-Lake Erie Project was conducted as a special project of the Enforcement Branch of the Division of Water Supply and Pollution Control, Public Health Service, U. S. Department of Health, Education, and Welfare. Immediate supervision was provided by a Project Director who in turn was responsible to the Regional Program Director, Water Supply and Pollution Control, PHS, DHEW, Region V, Chicago, Illinois.

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As required in conclusion number 8, six-month Progress Reports were prepared by the Project and furnished to the Michigan Water Resources Commission for distribution to interested parties. These reports described the organization and function of the Project and were accompanied by pertinent facts regarding plans and accomplishments toward meeting Project objectives. Each report contained a current personnel roster and organization table. A Technical Committee was established to inform interested parties of Project plans and activities of other local and State agencies to prevent needless duplication of effort. Table 1-I lists the members and technical advisors to this committee.

TABLE 1-I

DETROIT RIVER-LAKE ERIE PROJECT

TECHNICAL COMMITTEE

MEMBERS:

H. W. Poston (Chairman),
Regional Program Director
Department of Health, Education, and Welfare,
Public Health Service, Region V
Water Supply and Pollution Control
433 West Van Buren Street,
Chicago 7, Illinois

Richard D. Vaughan

A. R. Balden

Chemical Engineering Department

Chrysler Corporation

Box 1118

Detroit 31, Michigan

Gordon Gregory

Metropolitan Research Bureau

United Auto Workers

8000 East Jefferson Avenue

Detroit, Michigan

Peter G. Kuh

Enforcement Branch

Department of Health, Education, and Welfare

Public Health Service

Division of Water Supply and Pollution Control

330 Independence Avenue, S. W.

Washington 25, D. C.

J. O. McDonald

Program Representative, Construction Grants

Department of Health, Education, and Welfare

Richard D. Vaughan

Public Health Service, Region V

Water Supply and Pollution Control

433 West Van Buren Street

Chicago 7, Illinois

Gerald Remus, General Manager

City of Detroit Board of Water Commissioners

735 Randolph Street

Detroit 26, Michigan

TECHNICAL ADVISORS:

Keith S. Krause

Chief, Technical Services Branch

Department of Health, Education, and Welfare

Public Health Service

Division of Water Supply and Pollution Control

330 Independence Avenue, S. W.

Washington 25, D. C.

Dr. Justin Leonard

Michigan Department of Conservation

Stevens T. Mason Building

Lansing, Michigan

Richard D. Vaughan

Loring F. Oeming

Executive Secretary

Michigan Water Resources Commission

Reniger Building, 200 Mill Street

Lansing, Michigan

Donald M. Pierce

Michigan Department of Health

Lansing, Michigan

PROJECT DIRECTOR

Richard D. Vaughan

Project Director

Detroit River-Lake Erie Project

Public Health Service

U. S. Naval Air Station

Grosse Ile, Michigan

Phone No.: 676-6500

After the decision of the conferees to establish a field study, headquarters were located at the U. S. Naval Air Station, Grosse Ile, Michigan. A staff of 25 persons was recruited and necessary equipment and supplies procured. Extensive modification of facilities was required prior to full-scale operation. The technical staffs of the Michigan Water Resources Commission, the

Michigan Department of Health, and the Public Health Service met soon after the conference to discuss the scope and function of the study. Agreement concerning each agency's role in the undertaking was reached and procedures established to assure satisfactory communication among those concerned. The resultant operational plan recognized the responsibilities of both Federal and State organizations and was designed to obtain the needed facts with a minimum expenditure of funds and maximum participation from each of the three agencies.

Following the acquisition of headquarters, a detailed program management plan was compiled using the Program Evaluation and Review Technique. A target date of October 1, 1964, was established for completion of the final report. A description of the office, laboratory, and field activities as well as the magnitude of accomplishments during each six-month period are given in each of the four Progress Reports.

Coordination with the Detroit Field Unit of the International Joint Commission was effected to increase the efficiency of both organizations and prevent needless duplication of effort. The IJC Detroit Field Unit is staffed by personnel of the Michigan Water Resources Commission and the Public Health Service, making

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In general, samples were collected weekly, between 9 A. M. and 1 P. M. Intensive studies were also conducted to determine variation in water quality throughout the day, with samples taken at 3 hour intervals. In all, over 25,000 samples were collected, upon which over 135,000 determinations were made. 44 types of bacteriological, chemical, physical, and biochemical tests were performed.

With the exception of certain biological and bottom deposit studies, all samples were collected at or near the surface of the River or Lake. A special survey was made to assure that this procedure produced representative results. Samples collected at varying depths were compared for several measures of pollution and the correlation coefficients computed. A coefficient greater than 0.7 was considered sufficient to warrant substitution of surface for depth sampling. The differences among results at varying depths were not great enough to justify the additional time, expense, and decrease in scope involved in conducting an overall depth sampling program. Over 3,500 determinations were made on 758 samples before this conclusion was drawn, and for one index -- dissolved oxygen -- depth sampling was continued (to cover the event that other seasons might show greater differences among depths).

Spot samples from industrial waste sources were collected throughout the survey, and special surveys, conducted cooperatively with State agencies, were made of both domestic and industrial installations. Composite sampling for a continuous period coupled with waste discharge measurements acted as controls to the special surveys.

Seasonal bottom fauna studies were made in the Detroit River to determine both the presence and number of biological organisms in the bottom deposits, and the effect of waste sources on these organisms. At the same time physical and chemical measurements were made in the waters under study to correlate with biological observations. In addition to the bottom fauna studies, plankton organisms were collected routinely.

Sampling Technique

Samples were collected in a special scoop sampler designed to hold a half-gallon glass bottle for future chemical and physical analysis and a small sterile bottle for bacteriological analysis. This technique eliminated the necessity for pouring from sampler to bottle and allowed both the bacteriological and chemical sample to be collected simultaneously. Standard equipment was used for the collection of samples to be analyzed for biologic specimens and dissolved oxygen. Accepted engineering and biologic techniques were used in the collection of these samples. Whenever applicable, procedures described in "Standard Methods" were followed, especially those limiting the elapsed time from collection to analysis.

<u>Sampling Analysis</u>

After collection the samples were taken to the receiving room of the Project laboratory. Samples for bacteriological analysis were taken to this section of the laboratory for immediate processing and incubation. Samples for chemical analysis were divided into aliquots to expedite the testing program. Special preparation or preservation was required for certain chemical analyses. At this time samples for analyses requiring special laboratory equipment were mailed to the Great Lakes-Illinois River Basin Project laboratory in Chicago.

All laboratory procedures were performed in accordance with "Standard Methods." Minor modifications were made on two determinations -- ammonia nitrogen and organic nitrogen -- to improve the sensitivity and expedite a systematic analytical scheme. Before adopting these modifications a thorough study was made to evaluate the impact of the change. After analysis the results were recorded on combination laboratory and data sheets and forwarded to a separate evaluation section.

Bacteriological Analysis

All water samples collected for bacterial study were examined for total coliform content by the Membrane Filter (MF) technique described in "Standard Methods," using lauryl sulfate tryptose broth. A Most Probable Number (MPN) test by multiple tube dilution was used as an occasional check against the MF technique. Fecal streptococcus determinations were made using the MF technique as described in "Standard Methods." KF Streptococcus Agar (Difco No. 0496-01) was used in place of M-enterococcus Agar.

Fecal coliform populations were estimated by inoculating sheen colonies from the total MF plates directly into fermentation tubes of EC Medium (Difco No. 0314-02), one colony per tube of medium with incubation in a water bath set at 44.5 - 45°C for 24 (±) 2 hours. The number of colonies picked ranged from 10 to 20 per sample. If 10 colonies were picked and none was positive, the result was recorded as "10%." If none of 20 colonies was positive, the result was recorded as "5%." This test is termed a temperature differential test. The presence of gas in the fermentation tubes indicates that the coliforms present originated from the gut of warm-blooded animals (fecal coliforms). Absence of gas indicates the absence of fecal coliforms, since coliforms derived from non-fecal sources generally fail to produce gas at 44.5 - 45° C. Mr. Harold F. Clark of the Robert A. Taft Sanitary Engineering Center advised with regard to procedures, preparation of media, incubation of cultures, and tabulation of results.

Over 100 duplicate samples were analyzed for coliform density by both MF and MPN techniques; in all but two cases the membrane filter result was within the 95% confidence limit of the corresponding MPN result. The MF results were consistently lower than corresponding MPN determinations, especially in lower coliform densities. Nine samples representing degrees of bacterial densities common in relatively unpolluted river water were collected and ten replicates were analyzed for total coliform organisms by both the MPN and membrane filter technique. The MF results were again lower than corresponding MPN determinations, with the expected differential.

Data Evaluation

Results of laboratory analyses and field activities were tabulated and statistically summarized by a separate Engineering Evaluation Section using electronic data-processing facilities. The results of the evaluation in the early stages of Project operation furnished guidelines for future sampling activity. By considering several statistical descriptions of data collected early in Project operation, it was possible to eliminate many sampling stations that furnished duplicate or nearly duplicate results.

Dr. Richard D. Remington, Professor of Biostatistics at the University of Michigan, reviewed statistical procedures and recommended, when appropriate, additional or alternate methods of evaluation. He also used complex statistical approaches to check the reliability of Project technical data and assure its maximum use.

Dr. Lawrence Polkowski, Professor of Sanitary Engineering at the University of Wisconsin, assisted in formulating statistical procedures and in the studies of pollution from shorefront homes and unsewered communities.

Special Investigations

Bacterial regrowth in the receiving stream after discharge from the Rouge River and the Detroit

Sewage Treatment Plant was studied specifically, with negative results. The investigation showed neither significant regrowth or die-off of coliform population in the Detroit River after discharge from these waste sources. The short time of water movement from waste sources to the mouth of the River could have influenced these findings.

Another special investigation was made of the bottom of the waters under study to determine the effect of waste sources upon this area of the environment. Bottom sediment samples were collected at one-mile grids in Lake Erie and regular intervals in the Detroit River. These samples were analyzed for significant chemical and physical constituents and samples above waste sources compared with those below.

To evaluate the effects of particular waste sources upon water quality, a familiarity with currents in the Detroit River and Lake Erie was necessary. Fluorescent dye was placed in waste sources and traced.

Effects of discharges from combined sewers during or following significant rainfall were the subject of another special study. The waters under study were sampled during and following heavy rains and the results compared statistically with dry-weather sampling. Results of other investigations in the past were examined to see if significant variation in water quality could be expected downstream from outfalls of combined sewers. Later a second study was conducted by the State regulatory agencies and the Public Health Service in cooperation with two municipalities. These results were correlated with rainfall intensity in the drainage area. A special report on this study has been compiled by the Michigan Department of Health.

During the operation of this Project, several unusual circumstances occurred which merit special mention. One such is the by-passing to the Detroit River for 10 days of a substantial percentage of the domestic wastes from the City of Detroit sewerage system. This action was required to replace sluice gates in a major pumping station in the system. Since advance notice of this action was given, it was possible to design and carry out a special sampling program which furnished a great deal of insight into the effect of domestic waste on water quality at different locations in the Detroit River and Lake Erie.

ACKNOWLEDGEMENTS

During the preparation of this report, valuable assistance has been rendered by a great number of individuals and representatives of private groups and governmental agencies.

The extensive participation of the Michigan Water Resources Commission and the Michigan Department of Health in the conduct of the Project was an essential part of this State-Federal undertaking.

Laboratory and administrative assistance and industrial and demographic projections were furnished by the Great Lakes-Illinois River Basins Project of the Public Health Service. In turn, information collected by the Detroit Project will be utilized by the Great Lakes Project in their comprehensive study of the Great Lakes Basins.

Staff of the Robert A. Taft Sanitary Engineering Center furnished guidance and assistance in the preparation of the portion of this report on biology.

Special acknowledgement for important contributions must go to the following agencies and organizations:

<u>International</u>

International Joint Commission

Federal

U. S. Coast Guard

U. S. Corps of Engineers

Detroit District Office

Lake Survey

U. S. Department of Commerce,

Weather Bureau

U. S. Department of Interior

Bureau of Commercial Fisheries

Geological Survey

U. S. Navy

U. S. Department of Health, Education, and Welfare,

Public Health Service

Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

Great Lakes - Illinois River Basins Project, WS&PC, Region V, Chicago, Illinois

State of Michigan Agencies

Michigan Department of Conservation

Michigan Department of Health

Michigan Water Resources Commission

Regional Agencies

Regional Planning Commission - Detroit

Metropolitan Area

Supervisors Inter-County Committee

County Agencies

Monroe County Health Department

Washtenaw County Health Department

Wayne County Health Department

Wayne County Road Commission

Municipal Agencies

City of Ann Arbor

City of Detroit

City Planning Commission

Department of Health

Department of Public Works

Water Department

City of Monroe

Port of Monroe Authority

City of Trenton

City of Wyandotte

Municipal Service Commission

Universities

Central Michigan University

Department of Biology

Ohio State University

Franz Theodore Stone Laboratory

University of Michigan

Great Lakes Research Division

Richard D. Vaughan

School of Natural Resources,

Department of Wildlife Management

Museum of Zoology, Mollusk Division

School of Civil Engineering

School of Public Health

Others

Great Lakes Fisheries Commission

National Sanitation Foundation

Grateful acknowledgement is also made to the many others, too many to name, whose help made this study possible.

BACKGROUND

Other Investigations

Many investigations of water resources have been made in the Detroit area. Some dealt with one specific problem while others investigated water pollution in general and the effect on water quality of various wastes sources. These studies have been conducted by governmental units at all levels, universities, and consulting engineers. Four such undertakings will be discussed here to provide background for the investigations, findings, and conclusions of the Detroit River-Lake Erie Project.

Investigation by the International Joint Commission, 1913

Following the Boundary Waters Treaty of 1909 between the governments of Canada and the United States, a field investigation was made of the bacteriological quality of certain international waters, including the Detroit River. Bacteriological techniques and methods of reporting differed from modern practices, but the report is invaluable in furnishing data on water quality at this early date, prior to sewage treatment in the area.

Findings included:

(a) Bacterial densities changed markedly from the head of the Detroit River to its mouth, increasing from less than 5/100ml at the head to 11,592/100ml at the mouth.

(b) High bacteriological densities were most pronounced close to each shore.

(c) No sewage treatment was provided, with numerous outfalls along the River Rouge and both shores of the Detroit River.

(d) Sampling of bathing beaches near Grosse Ile indicated constant gross pollution.

(e) The Detroit River from Fighting Island to its mouth was unfit for a source of drinking water with any known method of water purification.

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Three communities were, however, using the River as a source of domestic supply.

Any reader of the report should consider the date it was written and the status of sanitary engineering technology at that time. Since 1913 sewage treatment facilities have been installed at most locations, and water treatment technology has progressed to the point where raw water of higher bacterial density can be treated with safety, so long as there is no operational failure.

Results were reported as an index per 100 ml rather than an actual colony count as in more modern techniques. A crude approximation of comparable MPN values may be obtained by multiplying the index by 2.4.

In the latter part of May 1913, ten daily samples were collected from each of ten stations across the Detroit River near its mouth, and the average coliform index during this period was 11,592 per 100 ml. The difference may be due to seasonal changes, uneven choices of sampling stations, or variableness of waste discharges.

The report emphasized the urgent need for effective sewage treatment in the area and the bacterial deterioration of the Detroit River from head to mouth.

Fox Creek Drainage Report, 1948

A board of consulting engineers, consisting of Samuel A. Greely, Malcomb Pirnie, and William Storrie, prepared this report for the City of Detroit to evaluate the effect of combined sewer overflows into the Detroit River upon the City's raw water supply.

The findings of the Board regarding the quality of raw water at the Detroit Water Works intake are summarized below:

(a) Pollution of Lake St. Clair and the Detroit River has increased over the years, and this is reflected at the municipal water intakes.

(B) Despite increasing pollution, the raw water at Detroit is better than that at several of the large Great Lakes cities and is readily amenable to treatment by methods commonly used in practice today.

(c) The maximum M. P. N. in any sample of recent years was 15,000 per 100 c. c. and the maximum daily average was 7,030 per 100 c. c.

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(d) For the most part the high M.P.N. values follow rains and are accompanied by recognizable increases in turbidity.

(e) Minor increases in coliform density are frequent, with or without any unusual rainfall, and usually are accompanied by small changes in turbidity or chlorine demand.

The report described several sources of pollution and how they affect the characteristics of the raw water.

A. FOX CREEK. Of the several sources, Fox Creek will cause the most serious trouble if permitted to discharge increased pollution. At the present time, at the sewage discharged into Fox Creek is limited to excess combined flows from Grosse Pointe Park not exceeding 800 c.f.s., and the effects have not been severe. However, float tests have demonstrated that under certain conditions water from the mouth of Fox Creek at Windmill Point will reach the intake. Thus the discharge of sewage into Fox Creek at any time is undesirable.

B. CONNER CREEK. There is considerable evidence of pollution of the Belle Isle bathing beaches from Conner Creek, but very little to indicate serious pollution of Detroit raw water since the new intake was completed in 1932. The inlet to the intake lagoon is 1,000 feet below Conner Creek, on the opposite side of the United States channel. A very strong wind from the west or northwest might overcome the natural direction of surface water flow downstream and force surface water across the channel to the intake. However, there is no record of such an occurrence and the new intake, purposely located upstream to avoid pollution from Conner Creek, has well served.

The report described the dangers involved in the proposed discharge of combined sewage through Fox Creek as follows:

If the proposed Fox Creek sewer should be allowed to discharge any combined sewage through Fox Creek, the effect on the Detroit water supply would be damaging and perhaps disasterous.

To remove the dangers of such pollution, the discharge of untreated sewage through any existing or future outlets upstream of Conner Creek should be prohibited. To accomplish this, the Board favors the adoption of a comprehensive plan based largely on the installation of separate sewers.

The Board made several recommendations to the City of Detroit, nine of these have been selected as pertinent background to the present study.

These are:

8. Lake Huron will become essential as a source of water supply only if pollution within practicable limits in Lake St. Clair and its tributary waters is not controlled.

9. The water works intake at the east end of Belle Isle is well located and should be the source of the raw water supply for many years. It is the safest and most economical location in the upper Detroit River and Lake St. Clair. The necessity for moving to another location will arise only if the "upstream" population increases far beyond the present estimates, or if the pollution of the waters of Lake St. Clair and the Detroit River is not adequately controlled and the quality of these waters is further deteriorated.

10. The characteristics of the present raw water supply do not constitute an unreasonable burden on water purification facilities as compared to other large water purification plants on the Great Lakes.

12. The capacity of the water works

chlorination equipment should be increased and provision should be made for prechlorination at the intake shaft on Belle Isle.

13. Adequate control of all factors causing or likely to cause pollution of the water supply requires that discharge of untreated sewage through the existing and future outlets upstream from Conner Creek and along the west shore of Lake St. Clair and Anchor Bay be entirely prohibited. There should be no discharge of untreated sewage at Fox Creek.

14. Immediate steps should be taken to modernize equipment in the Fairview Pumping Station.

15. More effective regulations and control should be instituted by the proper authorities over the discharge of sewage and oil from vessels using these waters.

21. To provide data for planning and guidance for safe operation, it is recommended that routine and regular samples of the waters related to the Fox Creek problem be taken and analyzed. Sampling stations should be selected in the head waters of the Detroit River and at several points in Lake St. Clair as far north as Anchor Bay where, throughout the year, so far as practicable, samples should be taken and analyzed at regular intervals,

and the trend of the quality of the raw water recorded. In the selection of sampling points, consideration should be given to those used by the International Joint Commission in its 1947 survey.

22. The water recreation afforded to the Metropolitan Area by Lake St. Clair and the upper reaches of the Detroit River is unique and invaluable. An adequate control of the several sources of pollution together with a comprehensive plan for sewerage and sewage disposal are essential to the safeguarding of these waters.

IJC Report on Pollution of Boundary Waters, 1951

During the period 1946-48 the International Joint Commission made a special survey of pollution in international waters. Requested to do so in April 1946 by the governments of Canada and the U.S.A., the Commission was charged with answering four basic questions:

1. Are the waters referred to, in the preceding paragraph, or any of them, actually being polluted on either side of the boundary to the injury of health or property on the other side of the boundary?

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2. If the foregoing question is answered in the affirmative, to what extent, by what causes, and in what localities is such pollution taking place?

3. If the Commission should find that pollution of the character just referred to is taking place, what measures for remedying the situation would, in its judgment, be most practicable from the economic, sanitary, and other points of view?

4. If the Commission should find that the construction or maintenance of remedial or preventive works is necessary to render the waters sanitary and suitable for domestic and other uses, it should be to indicate the nature, location, and extent of such works and the probable cost thereof, and by whom and in what proportions such cost should be borne.

Field investigations determined the present condition of the waters under study (which included the Detroit River) from the standpoint of 16 measures of water quality. Waste sources were qualitatively and quantitatively investigated, as well as physical features of the rivers including discharge and transboundary movement of pollution. Major uses of the waters and the effect of pollution upon these uses were described. A summary of the finding and recommendations is given below:

1. These waters are seriously polluted in many places on both sides of the boundary. The most serious pollution exists in the St. Clair River below Port Huron and Sarnia, in Lake St. Clair along the west shore, in the Detroit River below Belle Isle, and in Lake Erie's west end. There is progressive over-all degradation of the water between Lake Huron and Lake Erie.

2. There is a transfer of pollution from each side of the boundary to the other. This has been demonstrated by float studies, by analytical results, and by accidental discharges of specific substances.

3. There has been injury to health and property on both sides of the boundary. This has been manifested in the following ways:

a. Health. A potential menace is present where these polluted waters are used for domestic purposes. They are in such condition that they cannot be safely used as a potable supply without complete and continuously effective treatment. Much of the threat to health arises from such factors as bacterial overloading beyond the safe limits of water purification processes; variations in pollution with accompanying erratic chlorine demand; interference of certain types of pollution with disinfectants; and the probability of certain infections being carried through a water treatment process, especially if there is any interruption or breakdown in a part of that process. This danger was realized in Detroit in 1926 when 45,000 cases of dysentery were reported among the water consumers.

These waters are so polluted in many areas as to render them unsafe for bathing purposes. Both warning and prohibitory actions in this respect have been taken by appropriate authorities. Case histories of some typhoid fever patients in Detroit have pointed strongly to infections contracted at a Lake St. Clair beach. This damage is not only reflected in cases of typhoid fever and other reportable diseases, but it may include enteric, ear, and upper respiratory infections.

The sewage pollution present in these boundary waters must be considerable as an actual and potential health hazard, whether it be through public water supplies, bathing beaches, or to other means. If the 1913 to 1948 trend in water pollution is permitted to continue the time will come when it will be impossible to use these waters safely for domestic purposes.

b. Property. Injury to property has been illustrated in the cost of extending water intakes and of water treatment, both for municipalities and industries; in economic loss to owners of bathing beacnes and other waterfront property; in damage to water craft; and in destruction of fish and wildlife.

c. Industry. There is evidence that these waters are polluted to such a degree as to affect their use in certain industires. An economic loss to the community and to industry as well will occur when a plant is unable to locate in an area because of inability to secure a satifactory water supply.

4. Substantial progress has been made in control or elimination of pollution during the period of this investigation. Both municipalities and industries have contributed to this activity. Municipal progress has been confined largely to the planning stages, whereas industry has advanced many of its programs to the construction stage. As a result of improved control of industrial wastes discharge taste difficulties in municipal water supplies were much less pronounced at the conclusion of this study

than prior to 1946.

5. Public hearings held by the Commission revealed a common acceptance on the part of municipal officials and industrial management of the presence of serious pollution in these waters and the need for correction. The hearings also substantiated the findings of the Advisory Board that there was injury to health and property and interference with the various water uses on both sides of the boundary. Financing of the necessary remedial works was asserted by municipal officials to be the principal obstacle to correction.

6. Frequent releases of pollution in the form of slugs or spills create intensified injury to the users of these waters and cause acute difficulties in water purification plants.

7. The condition of these waters requires that remedial measures be undertaken as early as possible.

The Advisory Board respectfully recommends to the Commission that:

1. Remedial measures for the abatement and control of pollution in the Lake Huron-Lake Erie section of the boundary waters be undertaken

at the earliest possible date. These measures should be sufficient to restore and protect the uses of these waters to which the people of both countries are rightfully entitled. Major consideration should be given to uses for domestic and industrial water supplies, recreation, fish and wildlife, sanitary procedures, and navigation.

2. The "Objectives for Boundary Water Quality Control," prescribed in this report, be recognized in the development of remedial and pollution-preventive measures by municipalities and industry, these objectives should apply to both existing and new sources of waste.

3. Treatment of municipal wastes by sedimentation and disinfection of the effluent be undertaken by all communities as the initial step; that a program of more efficient or secondary treatment be inaugurated at as early a date as possible; and that a median coliform M.P.N. value not exceeding 2,400 per 100 ml as set forth in the "Objectives for Boundary Water Quality Control" at dilution of waste discharges be considered as the objective for bacterial control to attain reasonable stream sanitation. The more efficient or secondary treatment recommended will be most urgent in those zones of concentrated waste

near large centers of population or where much industrial waste is involved. It is recognized that local conditions, on either side of the boundary, may give additional emphasis to the need for this higher degree of treatment. The estimated cost for installation of intercepting sewers and primary treatment works for municipalities in the section is $51,000,000, of which $35,000,000 is for United States and $16,000,000 for Canadian communities. For the additional cost of secondary treatment of municipal wastes the estimate is $37,000,000, of which $33,000,000 is on the United States side and $4,000,000 on the Canadian side. These works must be financed through public funds.

4. Overflows from combined sewers during storm periods be treated by sedimentation and disinfection or by other methods where necessary to protect the purposes for which these waters are or may be utilized.

5. Industrial wastes be treated to comply, as soon as ppssible with the "Objectives for Boundary Waters Quality Control." The estimated cost for industrial waste treatment works is $16,000,000, of which $13,000,000 is for United

States and $3,000,000 for Canadian industries. The correction and prevention of pollution resulting from the disposal of industrial wastes is the responsibility of industry.

6. Slugs and spills of objectionable wastes from industrial plants may be avoided.
Retention tanks or lagoons for equalizing rates of discharge may be utilitzed when approved by enforcing authorities where slugs and spills cannot be otherwise controlled.

7. Sewage from vessels equipped with flush toilets and from crafts used for living purposes be controlled by the installation of holding tanks, and that the tanks be emptied either by transfer of the contents to shore treatment facilities or disinfected and dumped overboard in nonrestricted areas. No garbage or other refuse be discharged overboard into these waters.

8, Materials from dredging operations be dumped only at locations where they will not interfere with legitimate water uses.

9. Consideration be given to joint community action on metropolitan or regional bases in the effective solution of mutual water and sewerage problems in this section.

10. Definite plans be made for financing remedial municipal works be formulated. In this, there should be cooperation between the Commission and Federal, State, Provincial, and municipal governments.

11. Continuing contact with pollution control progress be maintained through a technical committee or board having representation from both countries.

12. The Commission take such measures as may be legally available to it to have the pollution abatement and prevention program herein outlined inititated, promoted, and effectively prosecuted.

Two highly significant accomplishments were, first, the establishment of IJC objectives for water quality and, second, the establishment of a technical committee or board to maintain continuing contact with pollution control. The IJC objectives are listed in Table 2-I, following.

TABLE 2-I. SUMMARY OF IJC OBJECTIVES FOR BOUNDARY WATERS QUALITY CONTROL

General Objectives

All wastes, including sanitary sewage, storm water, and industrial effluents, shall be in such condition when discharged into any stream that they will not create conditions in the boundary waters which would adversely affect the use of those waters for the following purposes: Domestic water supply or industrial water supply, navigation, fish and wildlife, bathing, recreation, agriculture, and other riparian activities.

In general, adverse conditions are caused by:

1. Excessive bacterial, physical, or chemical contamination.

2. Unnatural deposits in the stream, interfering with navigation, fish and wildlife, bathing, recreation, or destruction of aesthetic values.

3. Toxic substances and materials imparting objectionable tastes and odors to waters used for domestic or industrial purposes.

4. Floating materials, including oils, grease, garbage, sewage solids, or other refuse.

Specific Objectives*

1. Coliform Organisms - Median MPN:

2400/100 ml.

2. Phenolic -type wastes: Average 2 ppb, Maximum 5ppb.

3. pH: 6. 7 to 8.5.

4. Iron: 0.3 ppm..

5. Odor: 8.

6. Unnatural color and turbidity: Shall not be offensive.

7. Oil and floating wastes: No adverse effect on water use.

8. Highly toxic wastes: No adverse effect on water use.

9. Deoxygenating wastes: No adverse effect on water use.

Effluent Recommendation to Achieve Specific Objectives

1. Phenolic - type waters: 20 ppb.

2. pH: 5. 5 to 10.6.

3. Iron: 17 ppm.

4. Oil: 15 ppm.

*After initial dilution.

Wayne County Water Supply Investigation, 1955

This report, prepared in 1955 by Hazen and Sawyer, Consulting Engineers for the Wayne County Road Commission, investigated possible expansion of the Wayne County Metropolitan Water Supply System to serve the Wayne County area south and west of Detroit. A great deal of water quality data was collected for this survey in the Detroit River and upper Lake Erie during calendar year 1955. Alternate sites and proposals for additional water intake and treatment facilities were considered with respect to cost and quality of water which could be obtained. An intake tower between Grassy Island and Fighting Island was recommended as most suitable.

Three of the conclusions are given below:

4. Previous investigations and the extensive data collected in the past year show that the Detroit River flow effectively shields the mid-river water from shore pollution, and that water of good quality could be obtained by a properly-located intake between Fort Wayne and Fighting Island South Light.

5. Water of equally good bacterial quality can be obtained from the western end of Lake Erie, but in other respects Lake water is inferior to the water available from the Detroit River above Fighting Island South Light.

6. While the water in the middle of the Detroit River is remarkably free of shore pollution and Lake Erie water is good, it must be recognized that no water supply from the Detroit River will remain satisfactory unless upstream sewage and industrial waste pollution is controlled by adequate collection and treatment works. We anticipate that the pollution control activity will continue in the Great Lakes - Detroit River area and that disposal facilities will be added as necessary. These steps must be taken to protect existing water supplies and bathing beaches whether or not a new water works intake is built.

Several interesting observations contained in this report pertain to the problems faced by the Detroit River - Lake Erie Project. One is the description of the shore-hugging or streamlined flow phenomenon of wastes after they are discharged into the river. This recognition of lateral stratification in the River is coupled with the remark that there is little cross-flow of water from one side of the River to the other. The report also describes the existence of barometric seiches in Lake Erie which can cause reversal of flow in the Detroit River.

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Use of the Wayne County sampling data for selecting an area of the best quality water is of interest. Chloride and coliform concentrations were used as tracers of pollution and as an indication of current distribution in the River and the Lake. The engineers concluded that the most important single source of pollution in upper Michigan Lake Erie was the Trenton Channel of the Detroit River and that the Livingston Channel and the western side of the Amherstburg Channel discharge relatively light clean water into the Lake. The report concludes that the only good intake site in Lake Erie for domestic water should be beyond Point Aux Peaux. Maps indicate that coliform densities south of Point Aux Peaux were less than 1,000 per 100 ml. These maps also will show the dispersion of high concentrations of coliforms and chlorides from the Detroit River out into Lake Erie for a distance of approximately 7 to 10 miles.

The report refers to high and extremely variable plankton counts in Lake Erie beyond the influence of the Detroit River. It attributes these high counts to nutrients carried into the Lake by the Maumee and Raisin Rivers. The report also refers

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to serious operation problems at the Monroe water works caused by sudden and severe plankton growths, specifically filter-clogging from algae. It also mentions the relocation of the Monroe intake (to its present position) in 1950 to obtain water less prone to tastes and odors from algae. The report attributes high turbidity in Lake Erie to algae and, in some areas, to wind action stirring up mud on the shallow bottom.

Another significant report statement is quoted below:

"Variations in mid-river coliform densities may be caused by a number of circumstances, but for the most part, high values in the lower Detroit River follow heavy rains, freshets in the Rouge River, and combined sewer overflows."

Graphs in the report pursue this point by showing coliform results during wet and from dry periods on logarithmic probability paper. At the west shore location of a range near Fort Wayne the median coliform density during wet weather was 82 times as great as the median coliform density during dry weather. This effect was less pronounced in mid-channel and at other ranges but at other shore-line sampling points the ratio of wet weather median densities to dry weather values was more than 7 to 1. Probability plots revealed two distinct log-normal distributions for coliform densities during wet and dry periods.

The report draws three conclusions on coliform densities during wet and dry periods:

1. While the coliform density in the mid-river water is greater following rains than in dry weather, the relative increase is small.

2. Shore pollution does not make its way across the river in concentrated slugs. The pollution that reaches the main stream is mixed with a large volume of water and diluted many times.

3. The effect of shore pollution on mid-river water quality increases moderately with distance down the Detroit River as far as Fighting Island South Light; below Fighting Island South Light the effect is greater.

The report describes a special depth study which was performed to determine the validity of using surface samples to represent the bacterial quality of the water. This study indicated sufficient similiarity of surface to deep waters to permit the use of surface sampling as representative of bacterial water quality. This conclusion agrees with a similar study performed by the Detroit Project in 1962 for bacterial, chemical, and physical measures of water quality. Principal sources of pollution are described in the report and include industrial waste discharges into the St. Clair River, combined sewer overflows into the Detroit River from Conners Creek to Trenton, effluents from the Detroit, Dearborn, and Wayne County Sewage Treatment Plants, raw sewage from Windsor and Amherstburg, Ontario, and wastes from industrial plants on both sides of the Detroit River and on the Rouge River.

The report recommends that the Michigan Water Resources Commission continue its pollution control program and that the Commission take steps to see that on the United States side of the international boundary the following are accomplished.

1. Municipal sanitary sewage is to receive adequate treatment.

2. Sewage treatment plants and interceptors are to be constructed for the growing suburban areas around Detroit to minimize combined sewer overflows, particularly where the results of such overflows may affect the quality of water used for municipal supplies.

4. Industries are to install facilities to prevent the discharge into the Detroit River of

oil and unsightly materials, and phenols and other taste-producing substances where such wastes affect the potability of water used for municipal purposes.

The report also says that: "The City of Detroit should provide adequate chlorination of the effluent leaving the plant."

The report also warns that the mid-stream quality in the upper part of the Detroit River may not remain satisfactory indefinitely if upstream pollution is allowed to increase without control.

Another important statement from this report is quoted below:

If pollution of the Trenton Channel and possibly the lower Huron River is allowed to go unchecked, the water at Monroe is almost certain to suffer. Actually, it is reasonable to believe that severe degradation will not be permitted and that the State Water Resources Commission will intervene to protect Lake Erie water.

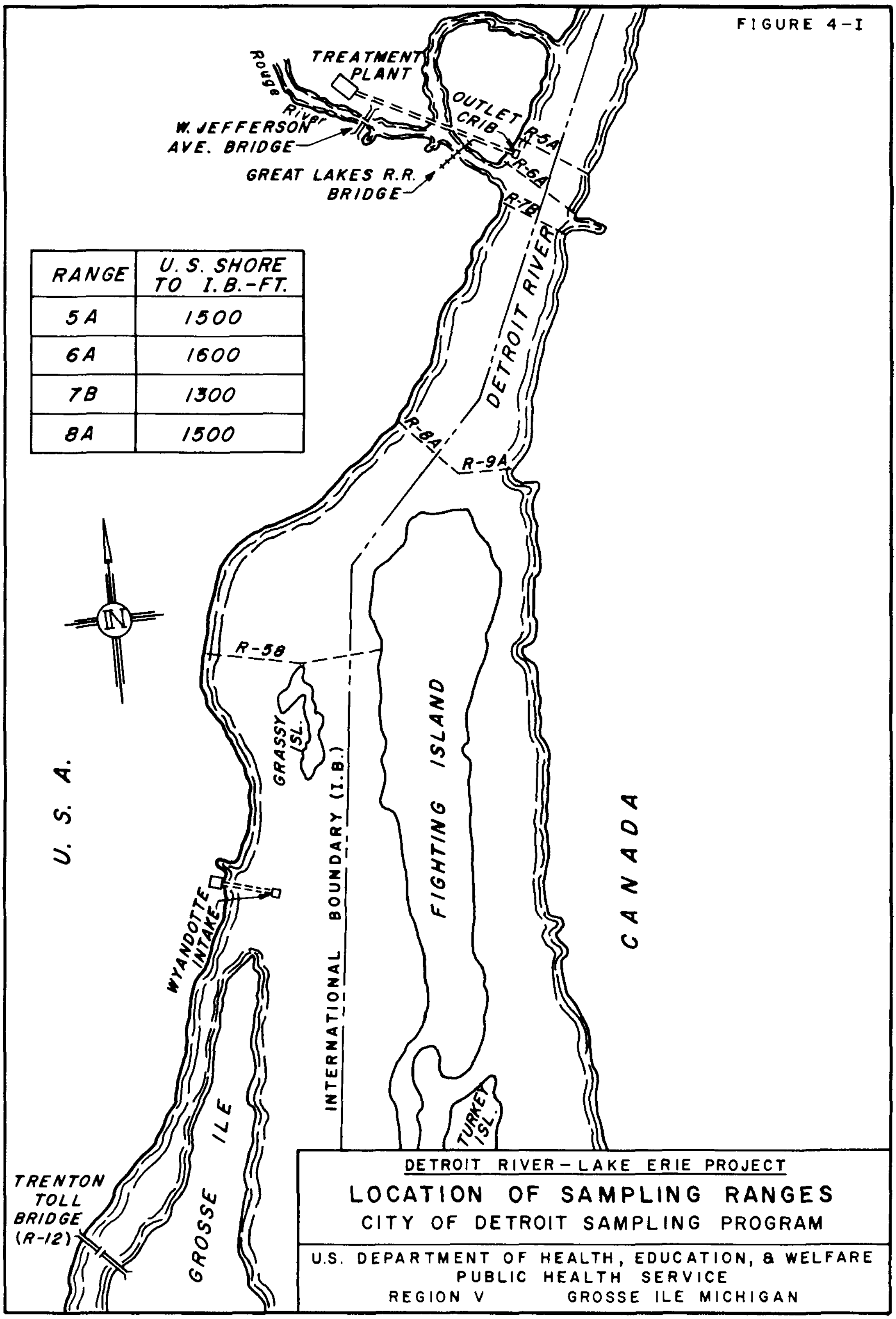
City of Detroit Sampling Program

The City of Detroit has been determining total coliform densities in the Detroit River from prior to the construction of the Detroit Metropolitan Sewage Treatment Plant in 1941. Ranges were selected above and below the point of discharge of plant effluent. Median counts were determined and plotted on semi-logarithmic graph paper. Figures 5-I through 10-I were taken from graphs prepared by the City and depict trends in this measure of water quality from 1959 through 1963. The International Joint Commission boundary waters objective of 2,400 coliform organisms per 100 ml is also shown on the six graphs. Figure 4-I shows a location map for the sampling ranges.

While the median value for coliform organisms is accepted as a reasonable measure of central tendency of occurrence, it certainly tends to mask unusually high or low values. There appears to be a pronounced downward trend in coliform densities in American waters near the shore, especially during the years 1962 and 1963. Additional comments on trends in water quality in the water under study will be made in Section V of this report.

(Figures 4-I through 10-I follow)

FIGURE 4-I



RANGE	U. S. SHORE TO I. B.-FT.
5A	1500
6A	1600
7B	1300
8A	1500

DETROIT RIVER – LAKE ERIE PROJECT

LOCATION OF SAMPLING RANGES

CITY OF DETROIT SAMPLING PROGRAM

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

FIGURE 5-I

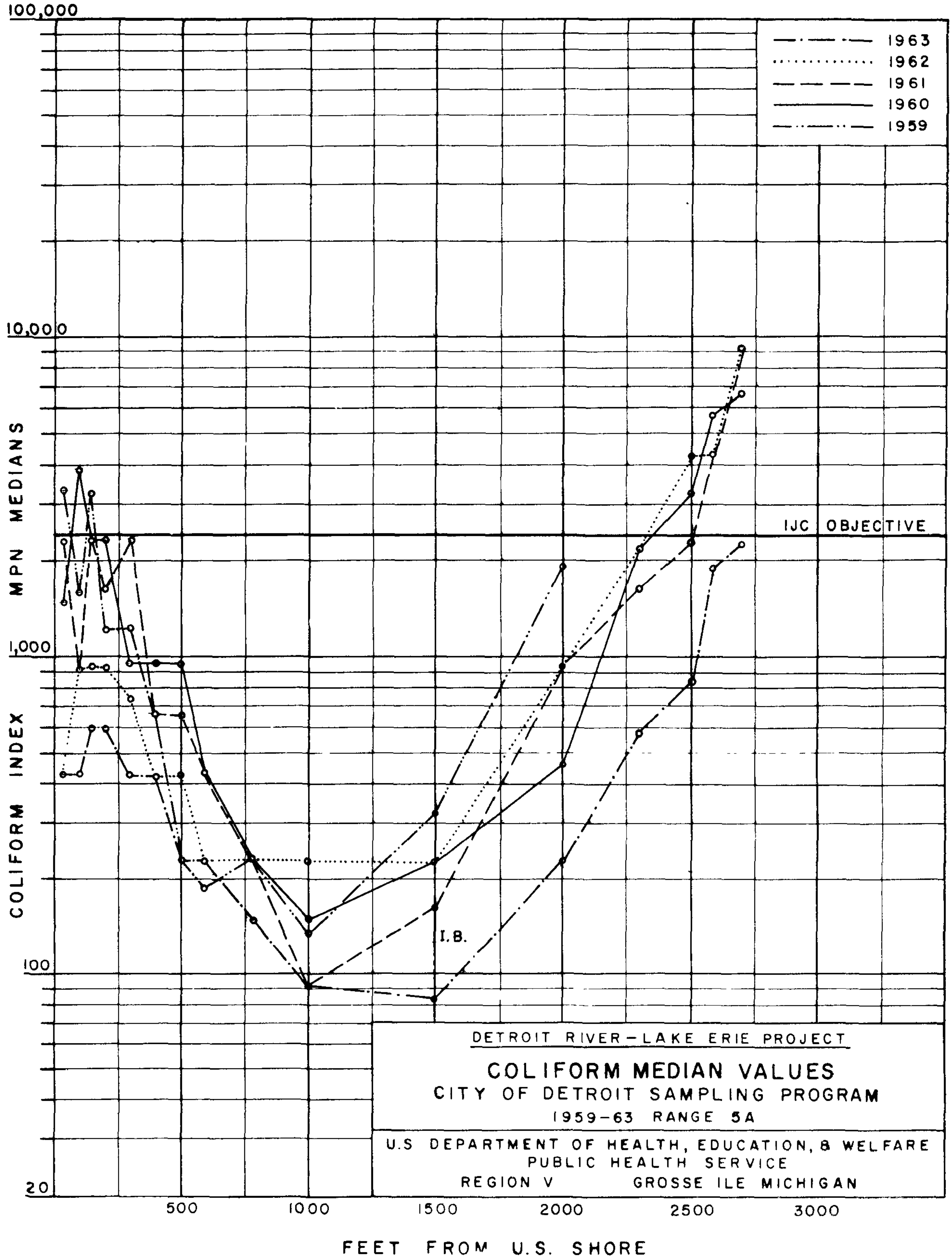
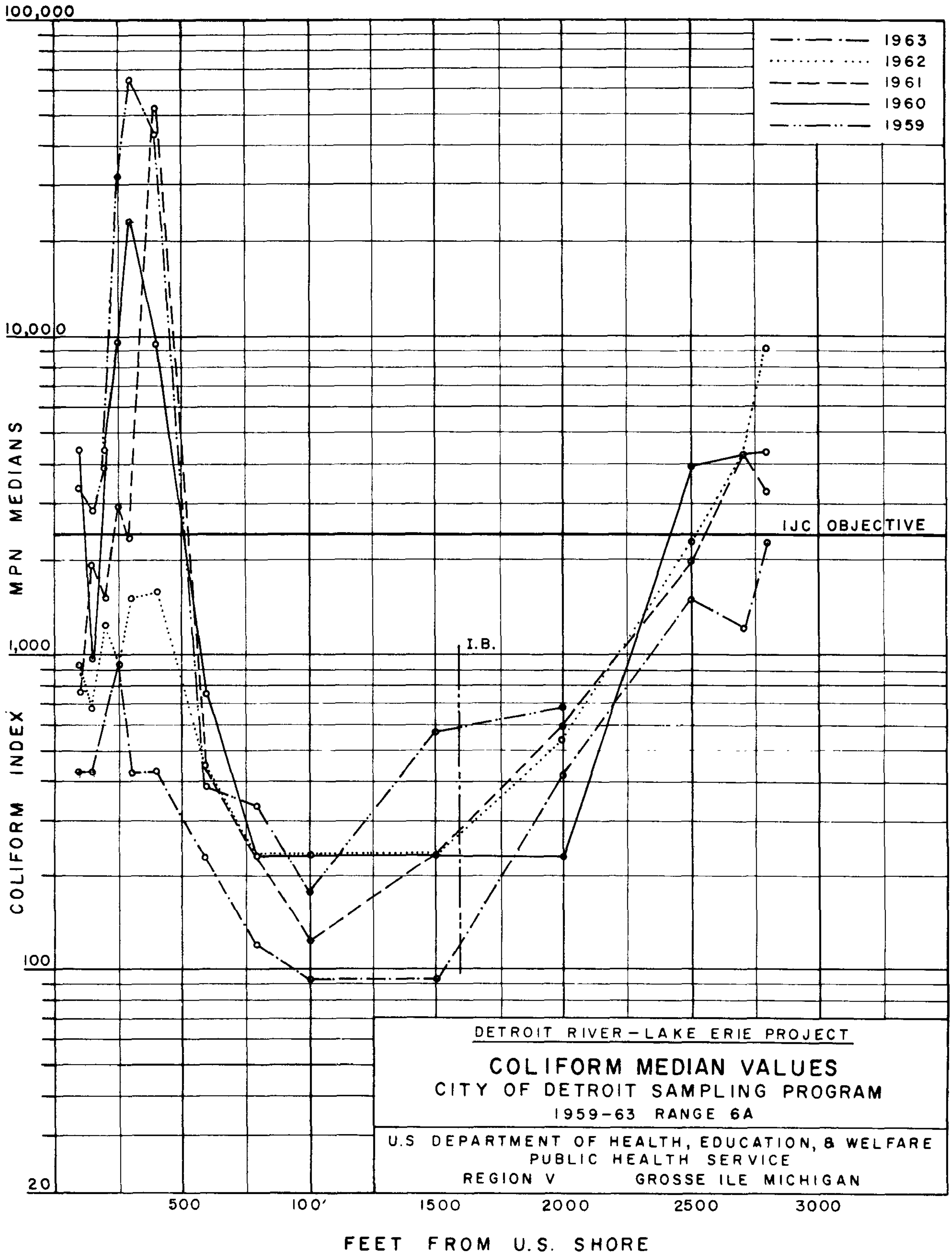

100,000
10,000
1,000
100
20
1963
1962
1961
1960
1959
IJC OBJECTIVE
I.B.
COLIFORM INDEX MPN MEDIANS
500
1000
1500
2000
2500
3000
FEET FROM U.S. SHORE
DETROIT RIVER – LAKE ERIE PROJECT
COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959–63 RANGE 5A
U.S DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE MICHIGAN

FIGURE 6-I

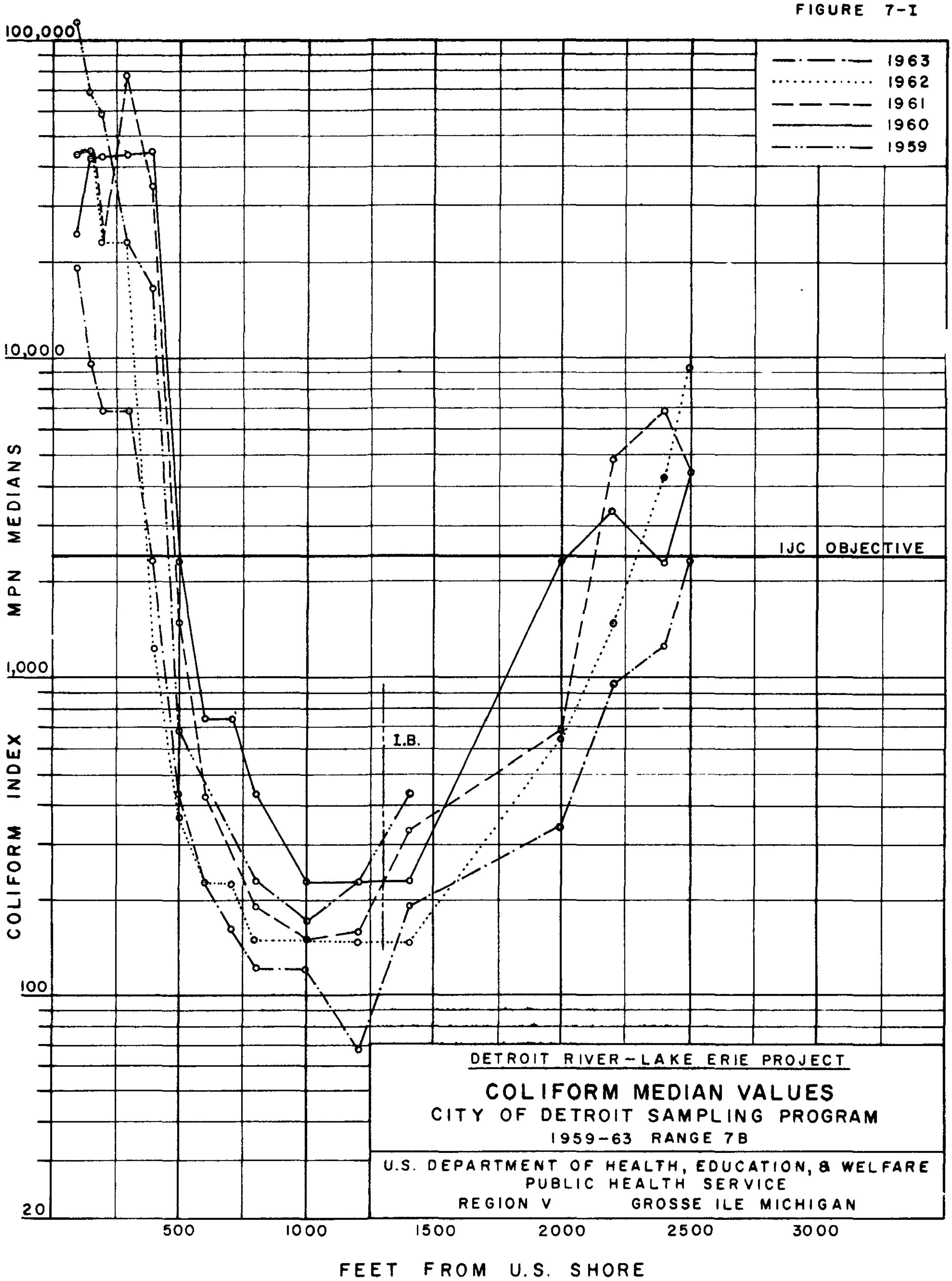


DETROIT RIVER – LAKE ERIE PROJECT

COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959–63 RANGE 6A

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

FIGURE 7-I



DETROIT RIVER-LAKE ERIE PROJECT

COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959-63 RANGE 7B

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

FIGURE 8-I

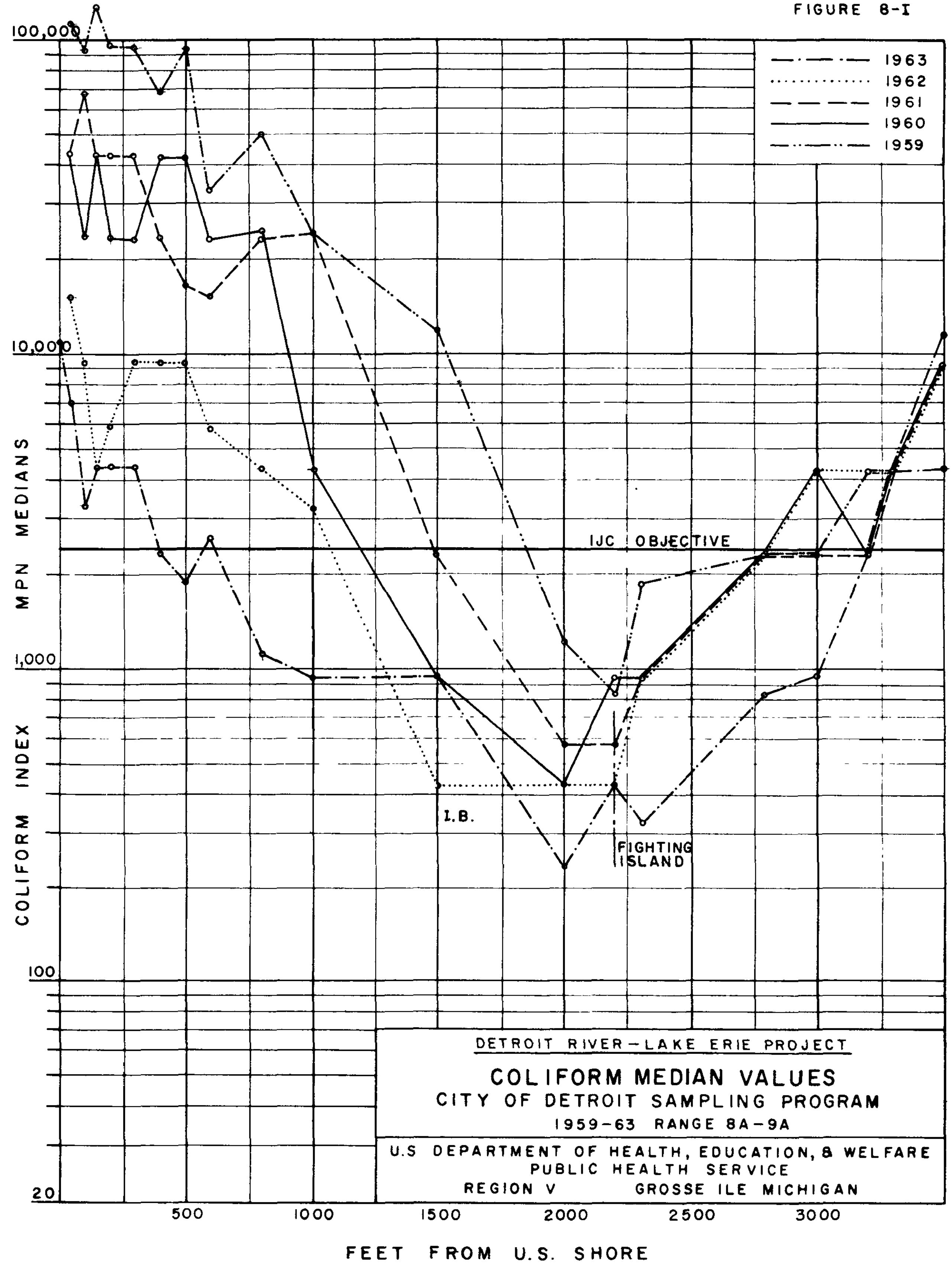

1963
1962
1961
1960
1959
100,000
10,000
1,000
100
20
COLIFORM INDEX MPN MEDIANS
IJC OBJECTIVE
I.B.
FIGHTING ISLAND
500
1000
1500
2000
2500
3000
FEET FROM U.S. SHORE
DETROIT RIVER—LAKE ERIE PROJECT
COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959-63 RANGE 8A-9A
U.S DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE MICHIGAN

FIGURE 9-I

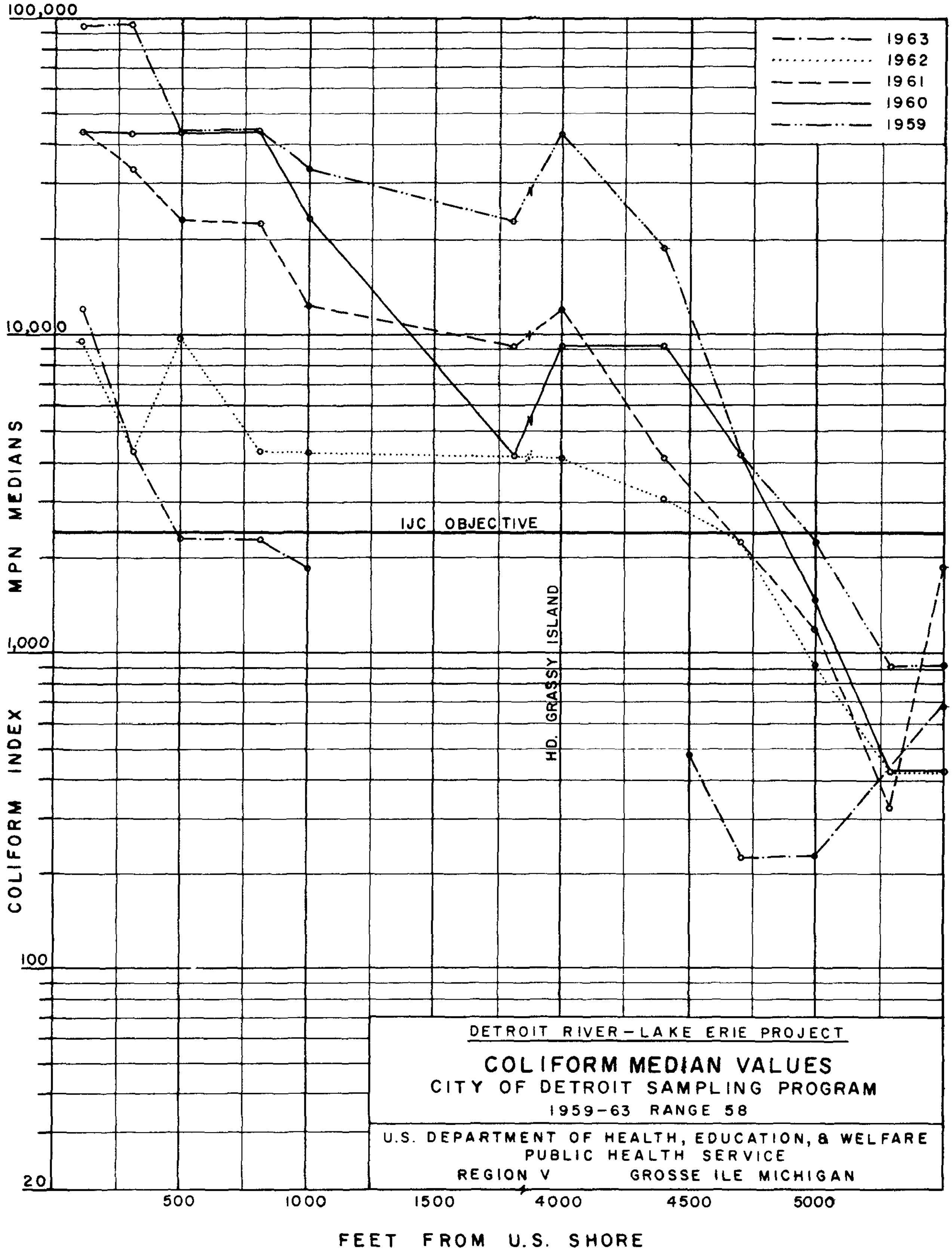
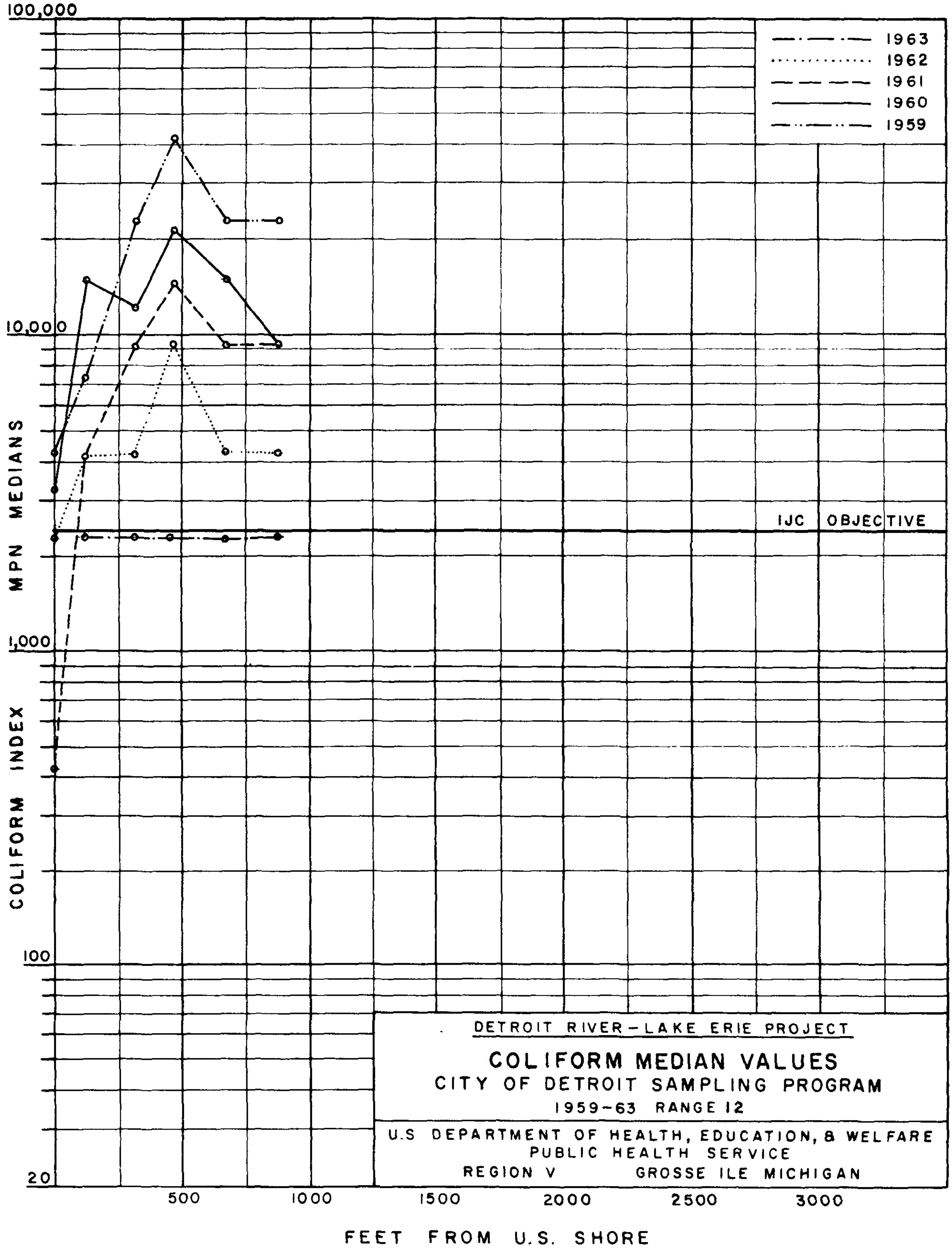

100,000
10,000
1,000
100
20
MPN MEDIANS
COLIFORM INDEX
1963
1962
1961
1960
1959
IJC OBJECTIVE
HD. GRASSY ISLAND
500
1000
1500
4000
4500
5000
FEET FROM U.S. SHORE
DETROIT RIVER—LAKE ERIE PROJECT
COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959—63 RANGE 58
U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE MICHIGAN

FIGURE 10-I



100,000
10,000
1,000
100
20
COLIFORM INDEX MPN MEDIANS
1963
1962
1961
1960
1959
IJC OBJECTIVE
500
1000
1500
2000
2500
3000
FEET FROM U.S. SHORE
DETROIT RIVER-LAKE ERIE PROJECT
COLIFORM MEDIAN VALUES
CITY OF DETROIT SAMPLING PROGRAM
1959-63 RANGE 12
U.S DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE MICHIGAN

Richard D. Vaughan

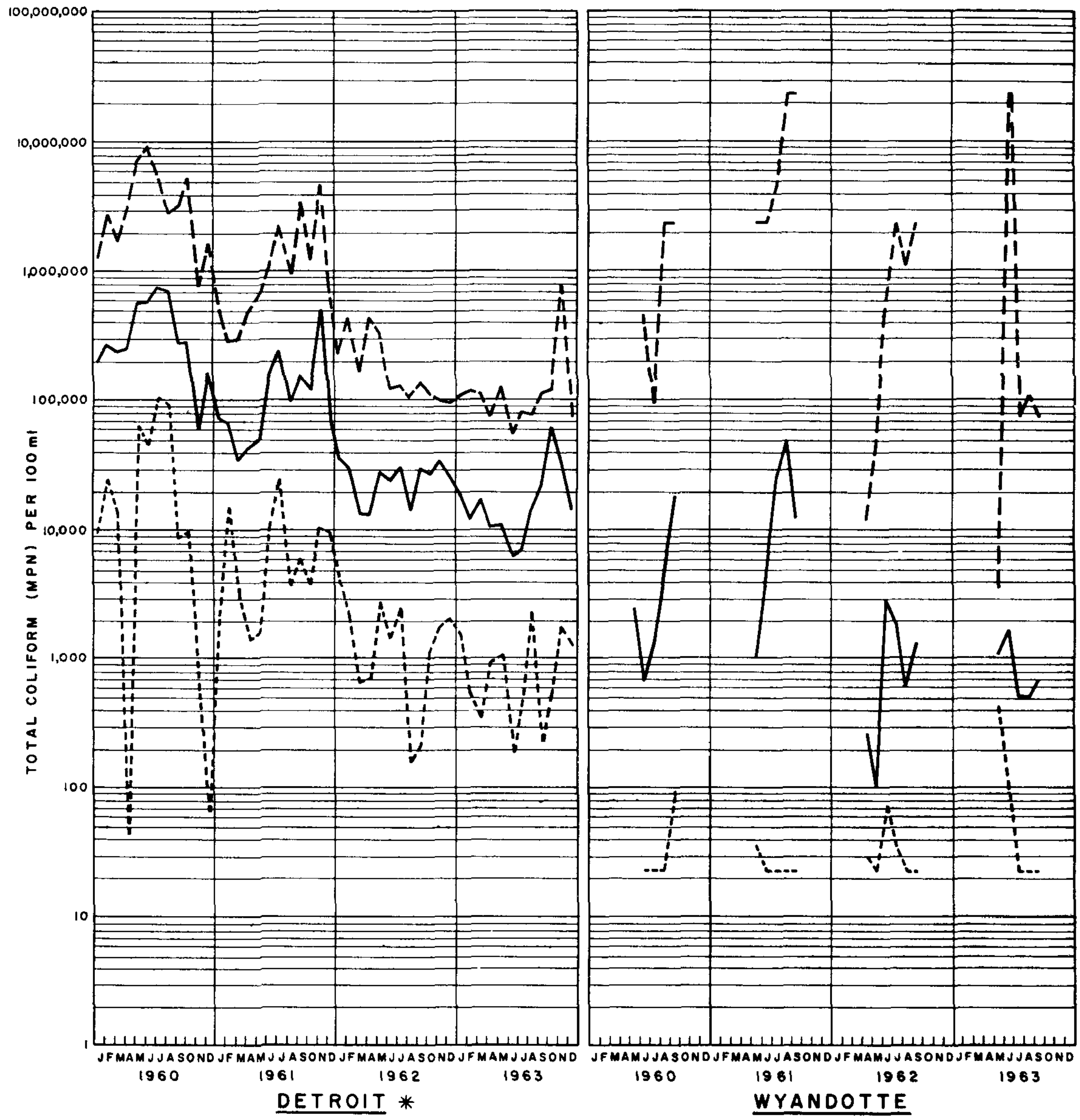
Water and Sewage Treatment Plant Operating Records, 1960-1963

This Project has studied the operating records of several municipal water and sewage treatment plants in the southeast Michigan area. Figures 11-I through 14-I summarize the more significant findings for the period 1960-63, at Detroit, Wyandotte, Trenton, and Monroe plants. Figure 11-I depicts monthly geometric mean coliform densities in the plant effluents accompanied by maximum and minimum daily geometric means occurring during each month. Figures 12-I and 13-I summarize the monthly geometric mean coliform densities and monthly mean chloride values at the municipal water intakes. Figure 14-I shows the monthly average suspended solids in the effluent and influent of the area sewage treatment plants. The coliform values for the Monroe, Wyandotte, and Trenton Sewage Treatment Plants were available only during those summer months during which the plants chlorinated their effluent.

Figure 11-I indicates a notable reduction in the monthly average total coliform density at all four plants, especially during the years 1962 and 1963. These values are shown on semi-logarithmic paper to allow plotting of maximum and minimum daily averages on the same chart as monthly averages. The maximum daily geometric means are quite erratic and still high.

(Figure 11-I follows)- 2 pages

FIGURE II-I



LEGEND

- ——— Monthly Geometric Mean
- — — — Maximum Monthly Value *
- - - - - - Minimum Monthly Value *
- * Maximum & Minimum Daily Geometric Mean During The Month At Detroit

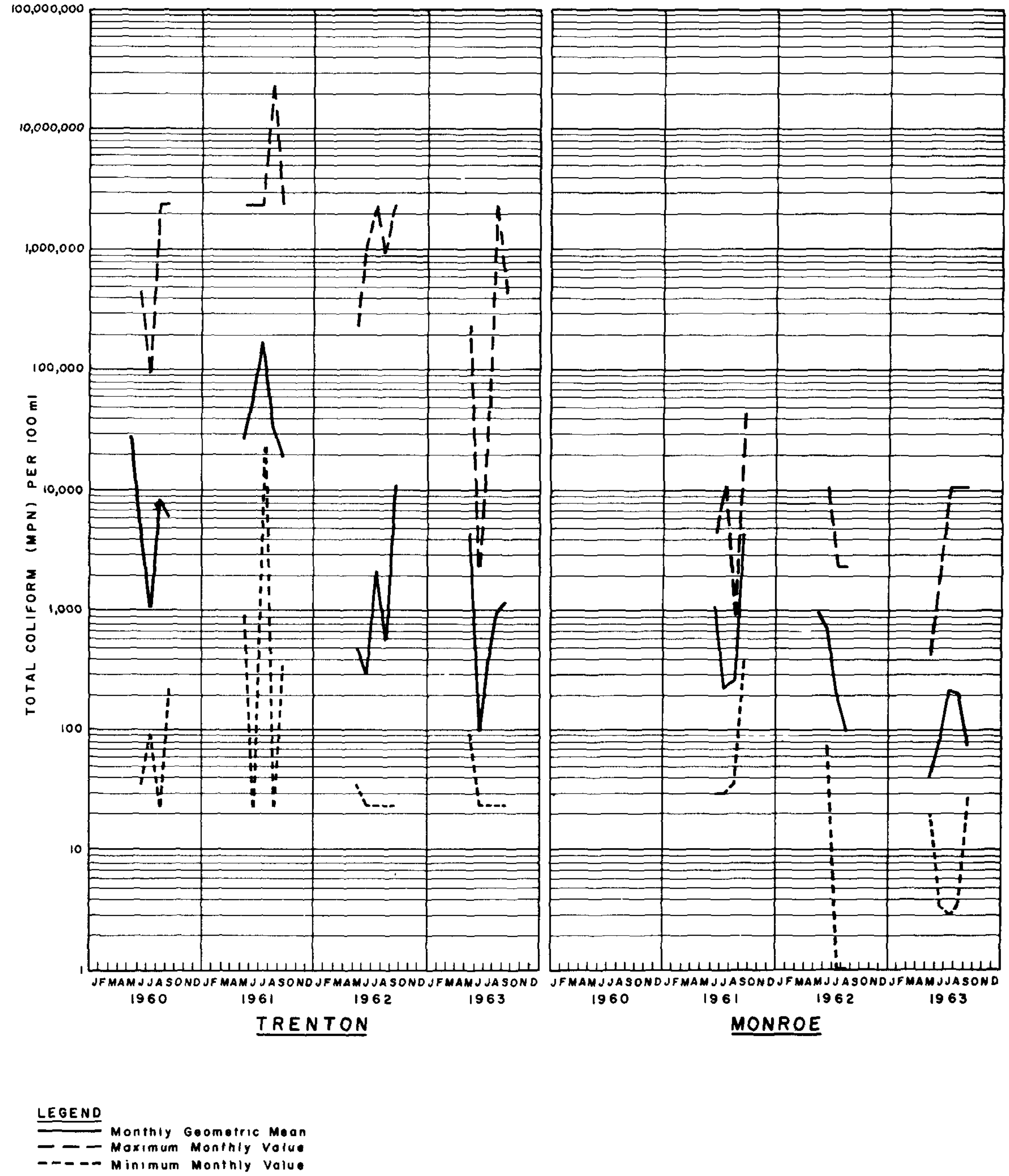
DETROIT RIVER–LAKE ERIE PROJECT

COLIFORM CONCENTRATIONS IN EFFLUENT

SEWAGE TREATMENT PLANT RECORDS

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

FIGURE II-I (Cont'd.)



DETROIT RIVER—LAKE ERIE PROJECT

COLIFORM CONCENTRATIONS IN EFFLUENT

SEWAGE TREATMENT PLANT RECORDS

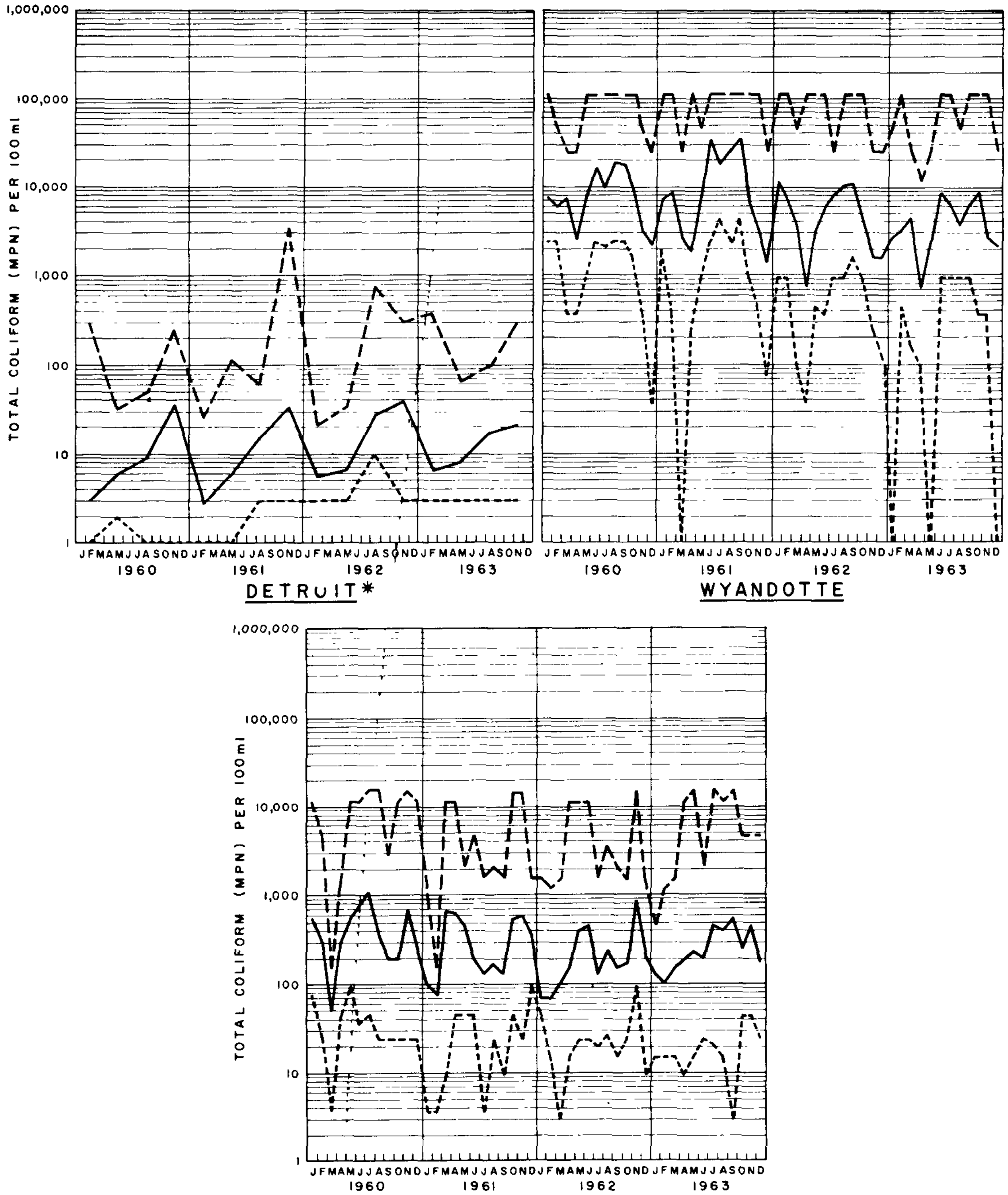
U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

Figure 12-I shows consistently low total coliform densities at the Detroit intake based on tri-monthly geometric means of the Public Health Service Water Pollution Control Surveillance System station located there. Very little overall change is noted in the monthly coliform levels at the Monroe intake; however, very erratic maximum daily values were observed during this period. A closer look at the Monroe data reveals that total coliform densities at the intake exceeded 2,400 organisms per 100 ml 38 days in 1960, 17 days in 1961, 13 days in 1962, and 21 days in 1963. A significant reduction in the monthly geometric mean coliform densities at the Wyandotte intake was observed during the years 1962 and 1963.

Figure 13-I, showing average monthly chloride concentrations at the Detroit and Monroe intakes, depicts a consistent chloride level at the Detroit intake with all values between the limits of 5 and 9 mg/l and the great majority of values between 6 and 8 mg/l. At the Monroe intake, however, values rose from levels in the range of 30 mg/l in 1960 and 1962 to 40 mg/l in 1963.

(Figures 12-I and 1-I follow.)

FIGURE 12-I



LEGEND

——— Monthly Geometric Mean
— — — Maximum Monthly Value
------- Minimum Monthly Value
* Results of Public Health Service Water Pollution Surveillance System at Intake. (Tri-monthly)

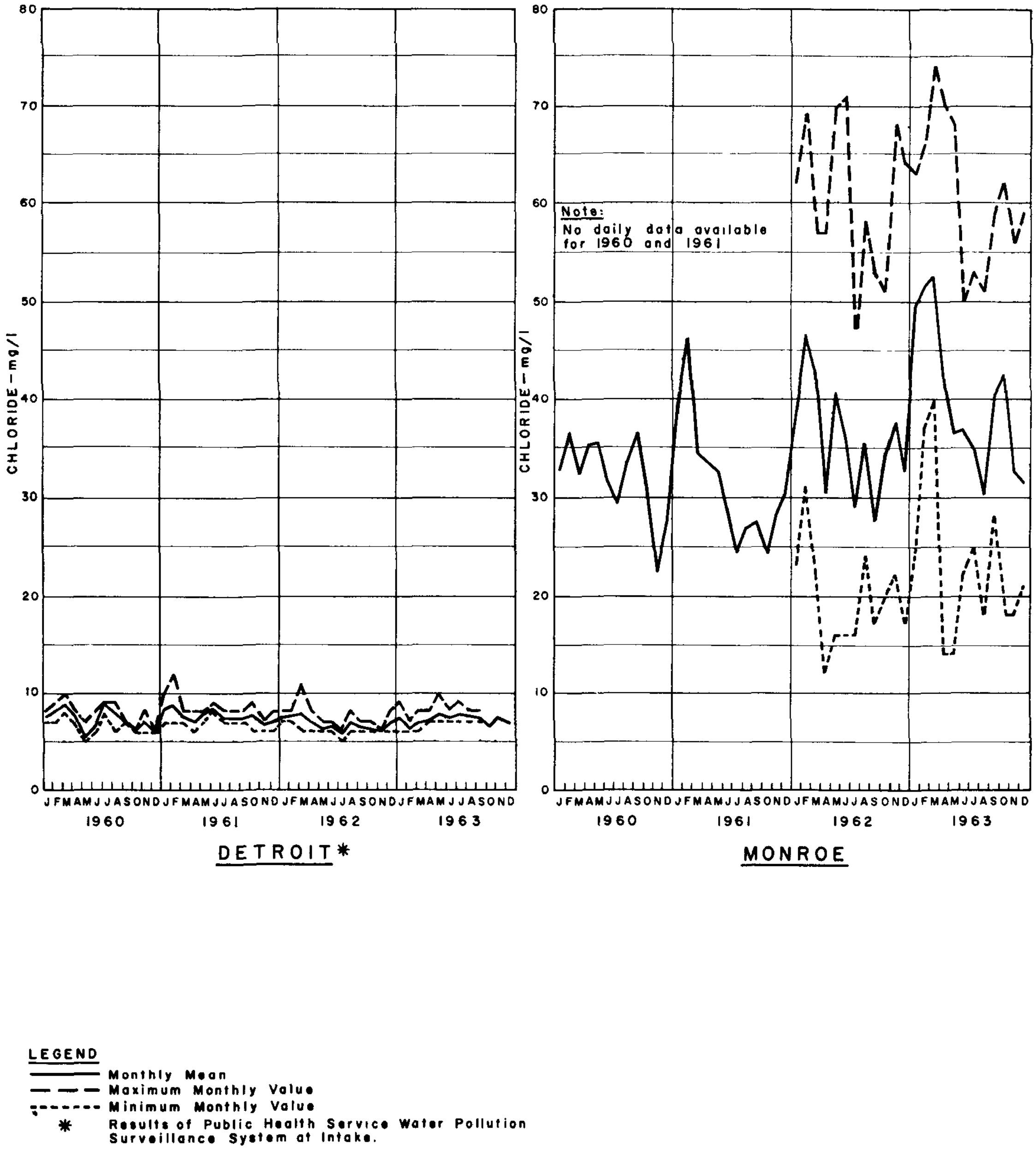
DETROIT RIVER–LAKE ERIE PROJECT

COLIFORM CONCENTRATIONS AT INTAKE

WATER TREATMENT PLANT RECORDS

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

FIGURE 13-I



DETROIT RIVER-LAKE ERIE PROJECT

CHLORIDE CONCENTRATIONS AT INTAKE

WATER TREATMENT PLANT RECORDS

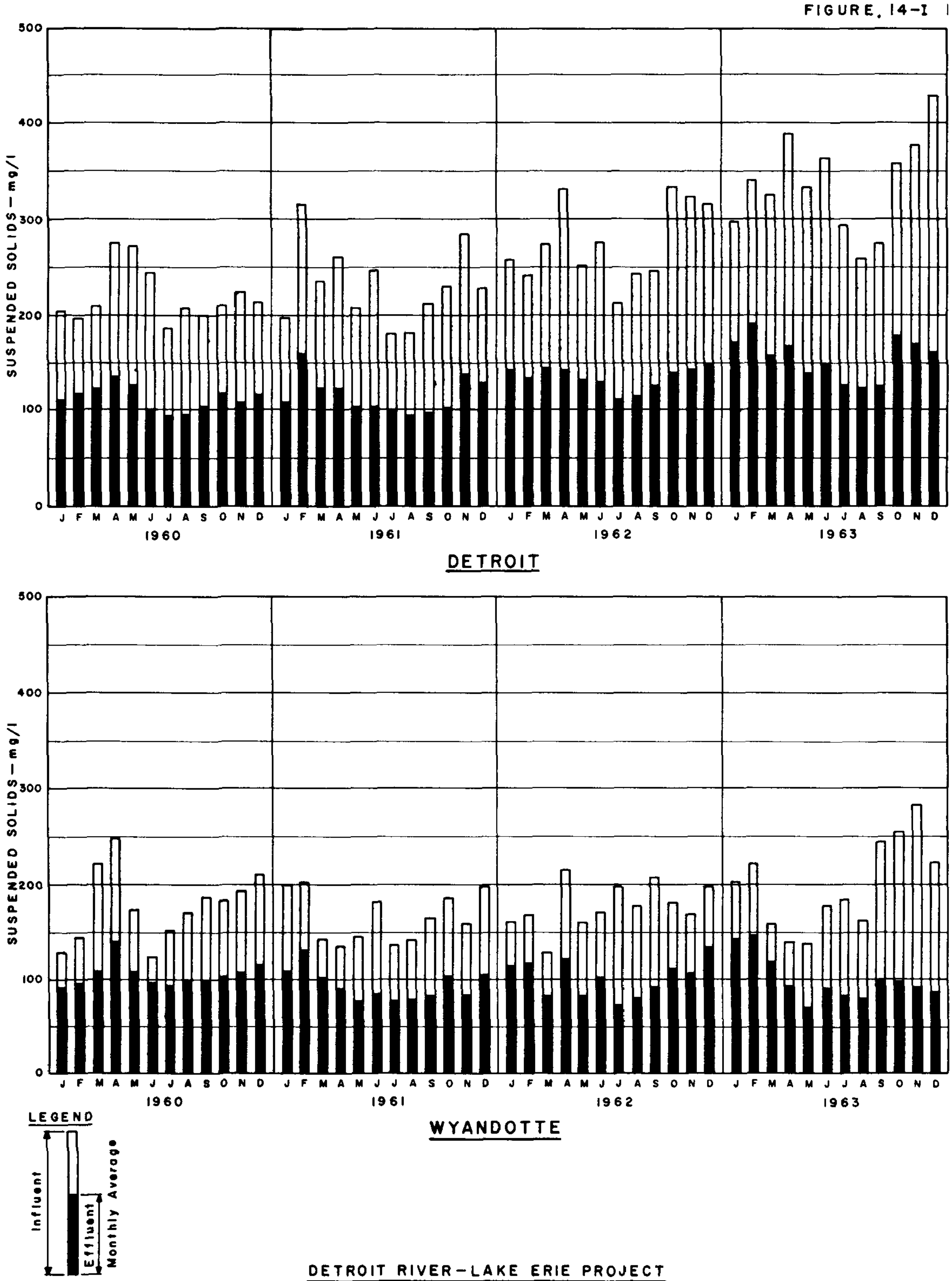
U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

Figure 14-I reveals little significant change in effluent suspended solids concentrations and indicates removal efficiency in the general range expected of primary sewage treatment facilities, or approximately 40-60%.

Since plotting values on semi-logarithmic paper may tend to mask trends because of a compressed scale, the monthly geometric mean coliform densities were plotted in Figure 15-I for the effluent of the Detroit Sewage Treatment plant and the Wyandotte Water Treatment Plant. This presentation more markedly demonstrates the reduction in total coliform densities at these two locations during the years 1962 and 1963.

(Figures 14-I and 15-I follow)

FIGURE. 14-I I



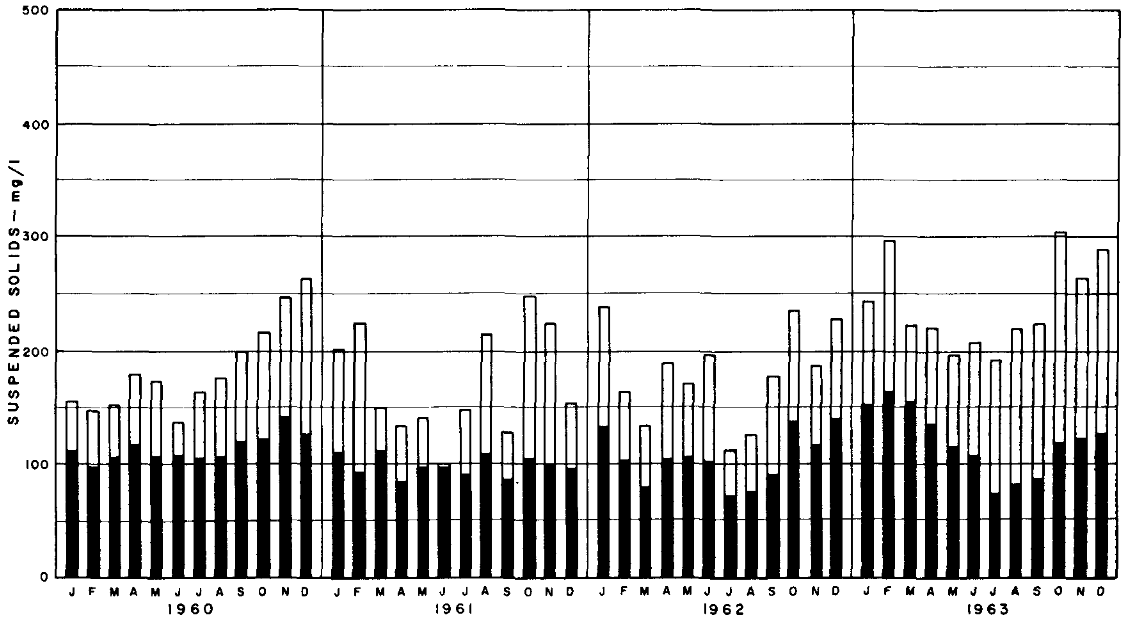
DETROIT RIVER–LAKE ERIE PROJECT

SUSPENDED SOLIDS IN EFFLUENT & INFLUENT

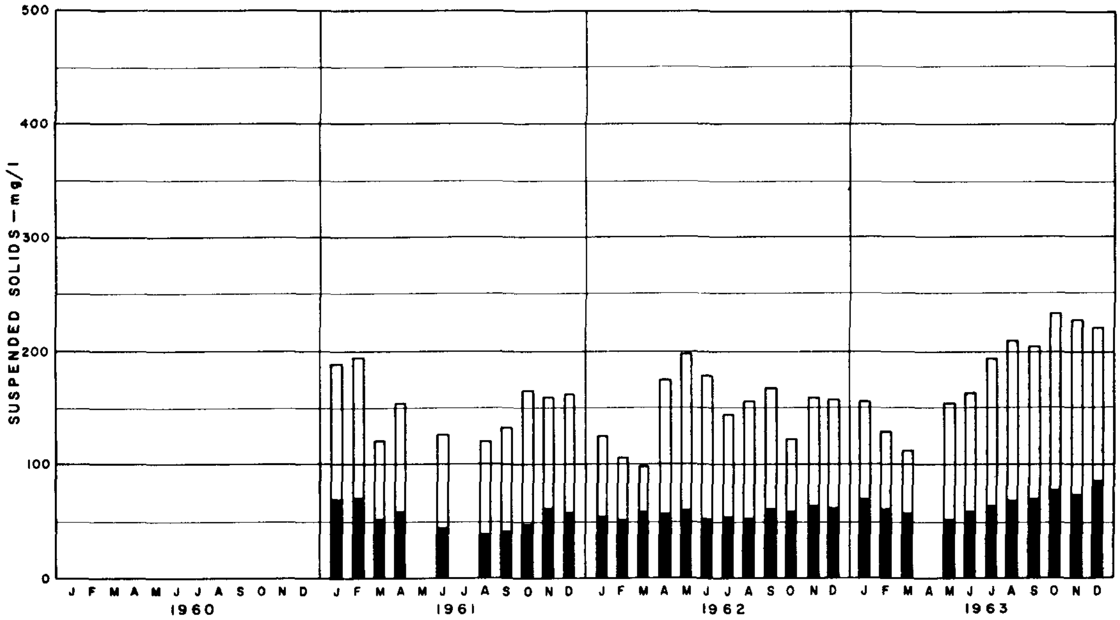
SEWAGE TREATMENT PLANT RECORDS

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

FIGURE 14-I (Cont'd.)



TRENTON



MONROE

LEGEND

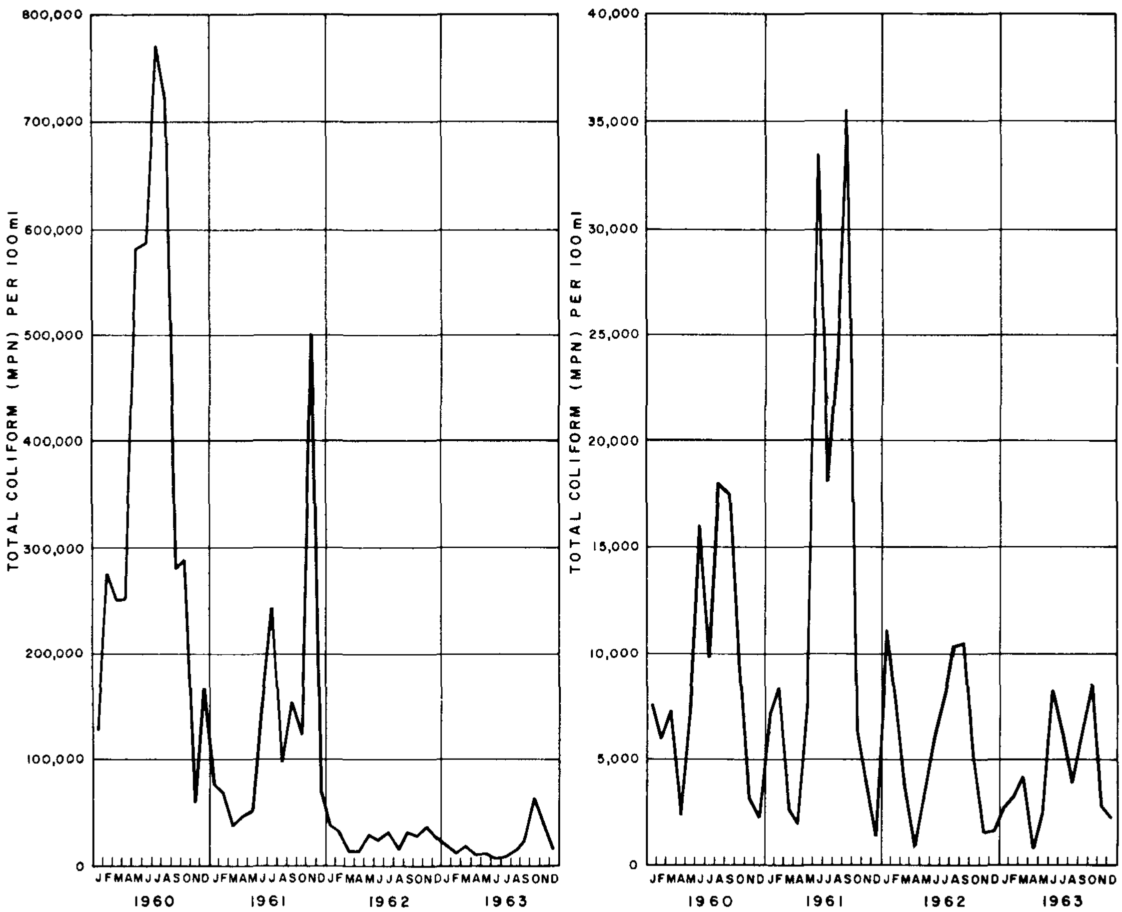
DETROIT RIVER–LAKE ERIE PROJECT

SUSPENDED SOLIDS IN EFFLUENT & INFLUENT

SEWAGE TREATMENT PLANT RECORDS

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

FIGURE 15-I



SEWAGE TREATMENT PLANT EFFLUENT

DETROIT

WATER TREATMENT PLANT INTAKE

WYANDOTTE

DETROIT RIVER—LAKE ERIE PROJECT

MONTHLY GEOMETRIC MEAN COLIFORM CONCENTRATIONS

SEWAGE & WATER TREATMENT PLANT RECORDS

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

Richard D. Vaughan

DESCRIPTION OF AREA

The Detroit River, outstanding among great waterways of the world, performs a number of important functions for the area. It provides a shipping channel for the heavy Great Lakes traffic between Lake Erie and Lake Huron. In fact, the tonnage transported through the Detroit River is greater than that past any other port in the world. The River provides vast quantities of water for municipal and industrial purposes on both sides of the River. It receives large volumes of untreated and partially treated sewage and industrial wastes. Finally, the River provides, potentially, excellent opportunities for recreation.

Due to its location in the heart of the Great Lakes drainage basin, the Detroit area has developed into one of the most important industrial centers in the entire United States and the world's center of the automobile industry. It has a four-county area of approximately 2,040 square miles and, according to the 1960 census, a population of 3,863,480. Table 3-I breaks down the population figure by cities.

TABLE 3-I, POPULATIONS OF MAJOR CITIES

MACOMB COUNTY	
East Detroit	45,756
Mount Clemens	21,016
Roseville	50,195
St. Clair Shores	75,657
Warren	89,246
OAKLAND COUNTY	
Berkley	23,275
Birmingham	25,525
Ferndale	31,347
Hazel Park	25,631
Madison Heights	33,243
Oak Park	36,632
Pontiac	82,233
Royal Oak	80,612
Troy	19,058
MONROE COUNTY	
Monroe	22,968
WAYNE COUNTY	
Allen Park	37,052
Dearborn	112,007
Detroit	1,670,144
Ecorse	17,328
Garden City	38,017

WAYNE COUNTY (Continued)

Grosse Pointe Park	15,457
Grosse Pointe Woods	18,580
Hamtramck	34,137
Highland Park	38,063
Inkster	39,097
Lincoln Park	53,933
Livonia	66,702
River Rouge	18,147
Southgate	29,404
Trenton	18,439
Wayne	19,071
Wyandotte	43,519

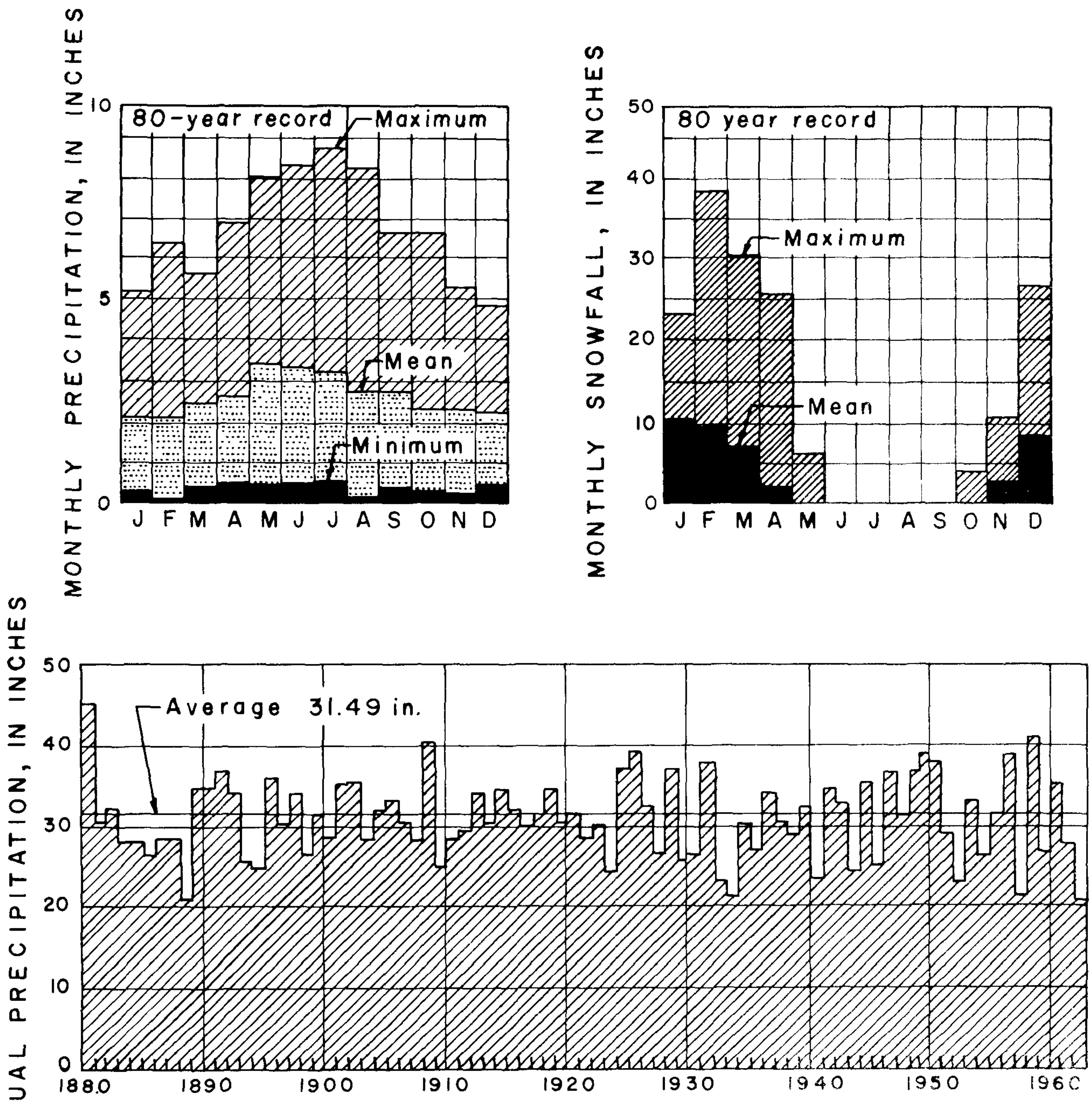
Climate

Detroit is situated centrally in the Great Lakes region and is under the climatic influence of these large bodies of water. Because of the stabilizing influence of the Great Lakes, extreme temperatures occur rather infrequently in the Detroit area. Records from the U. S. Weather Bureau station in Detroit indicate that temperatures of 100°F or more occur about once in every four years and sub-zero temperatures occur on only about four days each winter.

The growing season, which is defined as being the length of period between spring and fall frosts, has ranged from 122 days to 208 days, the average being 171 days.

The mean annual temperature at Detroit is about 49.1°F. The average annual precipitation at Detroit is 31.49 inches. (See Figure 16-I.) Variations in monthly precipitation and in snowfall are shown in the same figure. A little less than 25 per cent of this total precipitation runs off to the streams. Short and irregular periods of drought occur from time to time but long periods of drought are rare. Winters are marked by cloudiness and frequent snow flurries. Summers have plentiful sunshine without extreme heat. Prevailing winds are from the southwest with winds from the northwest being next in frequency of occurrence. The average wind velocity is about 10 miles per hour. Figure 17-I presents the climatological data on per cent of sunshine, maximum and mean wind velocity, relative humidity, and temperature.

(Figures 16-I and 17-I follow.)

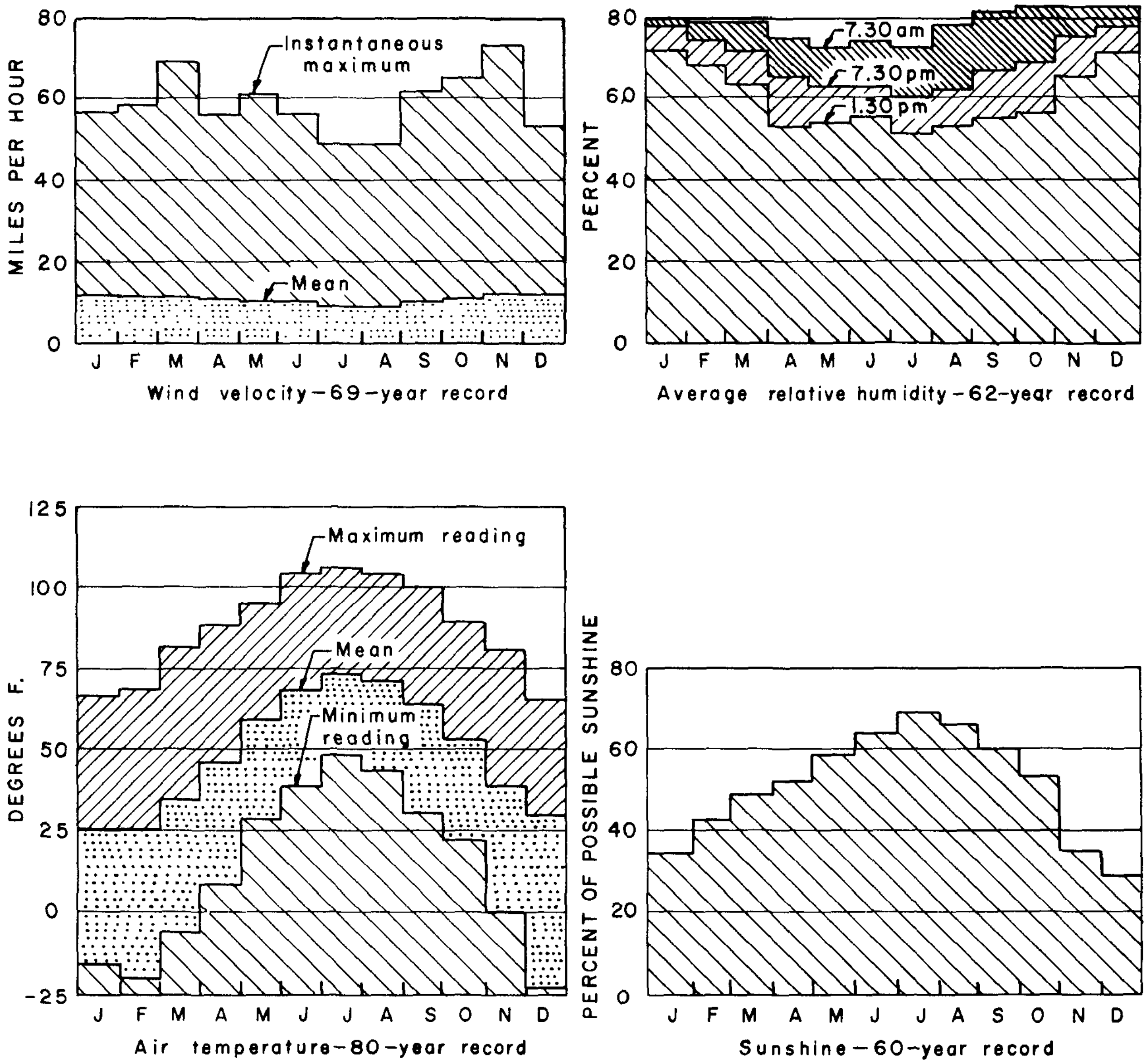


FROM GEOLOGICAL SURVEY CIRCULAR 183
AND RECORDS OF WEATHER BUREAU U.S. DEPT. OF COMMERCE

DETROIT RIVER – LAKE ERIE PROJECT

PRECIPITATION AT DETROIT

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



FROM GEOLOGICAL SURVEY CIRCULAR 183

DETROIT RIVER - LAKE ERIE PROJECT

CLIMATOLOGICAL DATA FOR DETROIT

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

Geology

The bedrock of this area consists mainly of sedimentary rocks laid down during the Devonian Period of the Paleozoic Era. These sedimentary rocks are principally limestones, shales, and sandstones, with some conglomerates. The thickness of the beds varies from 200 to 1,700 feet. A glacial and postglacial drift mantle overlies these rock beds throughout the area. It varies in thickness up to 600 feet and is responsible for much of the smoothness of the ground surface of the region. While the surface in general is smooth or broadly rolling, it is broken here and there by low morainic accumulations and by beach ridges of former lakes.

Extensive beds of rock salt underlie the entire area. In the lower reaches of the Detroit River and in the western end of Lake Erie, the depth of cover over the salt beds is approximately 1,000 feet; in the upper reaches the depth of cover increases to about 2,000 feet. Throughout the area the beds are stratified by dolomitic sediment and shale.

Groundwater

Groundwater occurs through the area, but that available locally is usually of high mineral content and uncertain quantity. It is principally a calcium and magnesium bicarbonate water, with varying amounts of iron and sulfate and, often, hydrogen sulfide.

Land Use and Development

The area serves three important economic functions, agriculture, industry, and recreation. The land bordering the western edge of Lake Erie is in general used for farming and recreation while that in the Detroit area is used for industrial purposes.

The inland area in the western Lake Erie basin is mostly used for farming, chiefly divided into small individually owned farms growing field crops, vegetables, sod grass, and fruits. There is also extensive dairy and poultry farming. The forests have been cut down and there remain only small, isolated woodlots which have little or no effect upon the flow or quality of the streams.

The automobile industry has been responsible for rapid industrial growth in the Detroit area during the past 30 to 40 years. This industry has brought 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.

Summer residences and cottages dot the western shoreline of Lake Erie. Public bathing beaches are noted in the Detroit River at Belle Isle and in Western Lake Erie at Sterling State Park. Pointe Mouillee is an important wildlife habitat along with other reaches of the waterway which serve as overwintering locations for migrating birds.

Bodies of Water Under Study

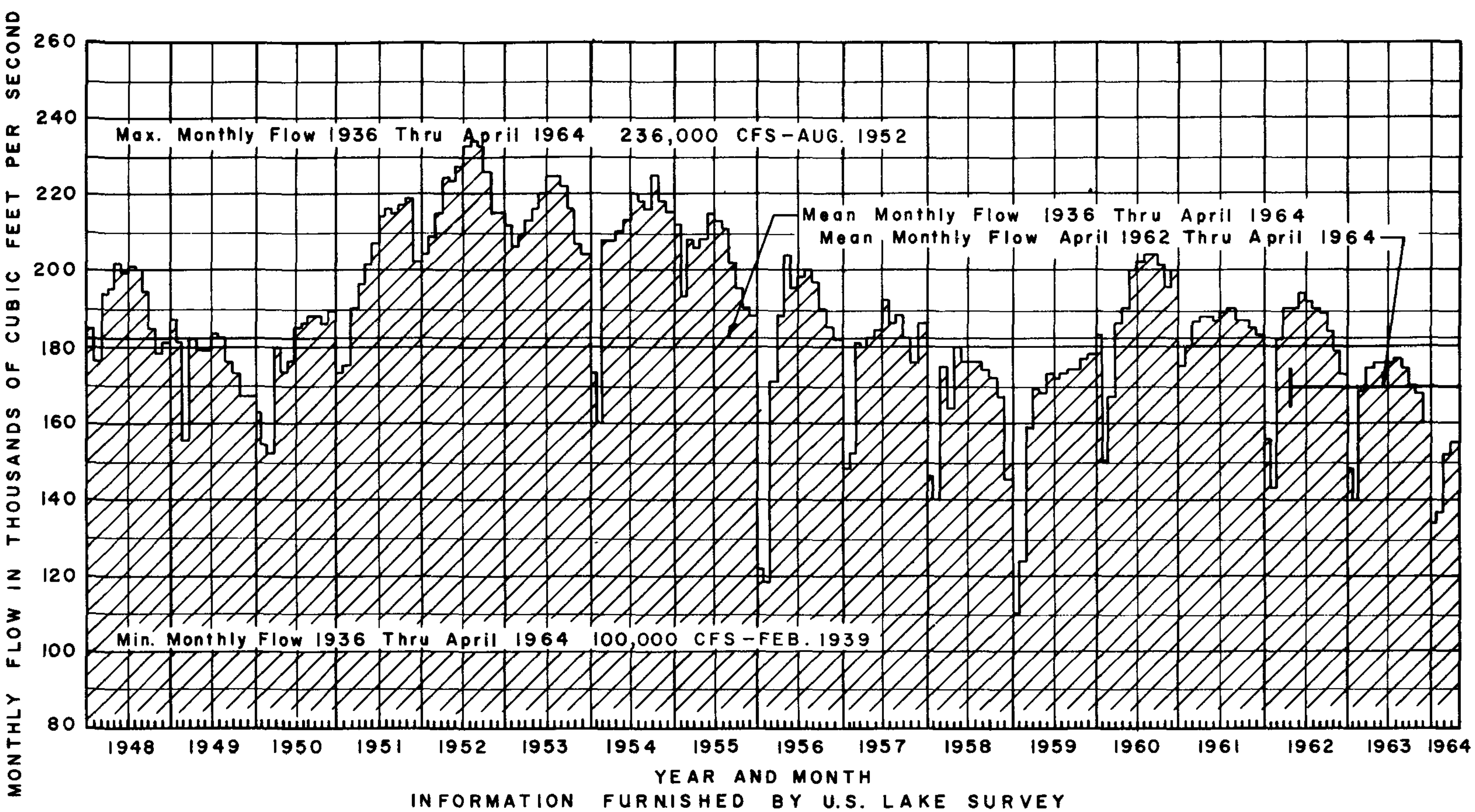
A. DETROIT RIVER. The Detroit River is the outlet for Lake St. Clair. It begins at Windmill Point and flows in a southwesterly and then southerly direction for about 31 miles to its mouth at Lake Erie. The normal drop in water level between Lake St. Clair and Lake Erie is 2.8 feet. The River, considering just its own drainage area, drains an area of 1,786 miles in the United States. The upper 13 miles of the stream has an unbroken cross-section with an average width of 2,400 feet, except at its head where it is divided by Peach Island and Belle Isle. The stream bed in the upper reach consists of clay. Mean depth in this upper reach is approximately 25 feet; the maximum depth reaches 52 feet. The lower portion broadens out and is characterized by many islands and shallow expanses. The two largest islands are Fighting Island and Grosse Ile. There are several smaller islands, and the waters are spotted with large areas of marshland. In the lower River underlying rock is exposed and the shipping channels have been cut through it to a depth of 28 feet.

The flow of the Detroit River is exceptionally steady. Because of the tremendous storage provided by Lakes Superior, Huron, and Michigan, it is exceeded in this respect by few, if any, rivers in the world. A monthly hydrograph of the Detroit River since 1948 is shown in Figure 18-1.

The average discharge of the Detroit River for the period 1936 through April, 1964, was 182,000 cfs. The monthly averages ranged from 100,000 cfs to 236,000 cfs. These extremes were probably affected by winds, ice, or sudden change in barometric pressure. From April, 1962, through April, 1964, the flow averaged 170,000 cfs.

(Figure 18-I follows.)

FIGURE 18-I



INFORMATION FURNISHED BY U.S. LAKE SURVEY

DETROIT RIVER—LAKE ERIE PROJECT

HYDROGRAPH OF MONTHLY MEAN FLOWS DETROIT RIVER AT DETROIT, MICH.

JANUARY 1948 THROUGH APRIL 1964

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

In general, the higher the stage of a river, the greater its flow. However, because of the small differences in level between Lake St. Clair and Lake Erie, the relationship between stage and discharge for this River is not easily determined. It is affected by several factors: first, by dredging operations that are carried on for the improvement of navigation through certain reaches in the River; second, by differences in level between Lake Erie and Lake St. Clair caused by varying rates of inflow from the respective drainage areas; and, third, the most pronounced, by winds or changes in barometric pressure usually occurring over a part of Lake Erie and causing abnormally high or low elevations of water at the outlet of the Detroit River. When the effect of this third factor occurs, the water may pile up at the western end of Lake Erie to an elevation above that of Lake St. Clair and, as a result, the flow of the Detroit River may actually reverse its direction. This is an extremely rare occurrence but, according to the U. S. Lake Survey (Table 4-I), has occurred twelve times since 1911 with the last occurrence in January, 1948. By a reverse mechanism the water level at the lower end of the River may suddenly drop, causing a great increase in discharge for a given stage. As an illustration, on January 31, 1914, the elevation of the water at the mouth of the river dropped more than 6 feet in 10 hours. This phenomenon resulted from a severe storm over Lake Erie.

(Table 4-I follows.)

TABLE 4-I. GRADIENT REVERSALS IN DETROIT RIVER

DATA FROM U.S. LAKE SURVEY

Date	Lake St. Clair Gaging Station	Lake Erie Gaging Station	Maximum Difference in Elevation Between Lake Erie and:		Time in Hours Elevation of Lake Erie Exceeded:	
			Ft. Wayne	Lake St. Clair	Ft. Wayne	Lake St. Clair
Feb. 5-6, 1911	Windmill Pt.	Amherstburg	0.35	0.62	6	7.5
Jan. 30-31, 1914	Windmill Pt.	Amherstburg	0.35	0.8	5	4.5
Dec. 29-30, 1915	Windmill Pt.	Amherstburg	0.5	0.86	4.5	5
Apr. 10-11, 1918	Windmill Pt.	Amherstburg	0.15	0.45	2	6
			0.15	0.55	4.5	7
Sept. 4-5, 1918	Windmill Pt.	Amherstburg	0.4	0	2.5	0
Feb. 19-20, 1927	Windmill Pt.	Amherstburg	0.1	0.2	2	4
Mar. 8-9, 1928	Windmill Pt.	Amherstburg	0.2	0.2	3	3
Mar. 21-22, 1932	Grosse Pt. Yacht Club	Amherstburg	0.1	0.4	1	7.5
			0.3		1.5	
Jan. 29-30, 1939	Grosse Pt. Yacht Club	Gibraltar	0.9	1.45	8.5	7
Feb. 9-10, 1939	Grosse Pt. Yacht Club	Gibraltar	0.9	1.55	12.5	14.5
Mar. 4-5, 1944	Grosse Pt. Yacht Club	Gibraltar	--	0	--	0
Jan. 1-2, 1948	Grosse Pt. Yacht Club	Gibraltar	--	0.65	--	4

B. ROUGE RIVER. The Rouge River, a tributary to the Detroit River, rises northwest of Detroit and flows southeasterly, emptying into the Detroit River near Ecorse. It has two tributaries, the Middle and Lower branches, and drains an area of about 467 square miles. Its basin lies almost entirely in an old lake bed and as a result, except for perhaps the upper fringe, it is relatively flat and impervious and has practically no natural surface storage. The main stream is approximately 32 miles long and falls about 360 feet from its headwaters to the mouth. The lower 3.5 miles, through the Short-Cut Canal, consists of a dredged channel for use of vessel traffic serving the industries in the area. Controlling depths approximate 21 feet for a middle channel width of 200 feet. The Short-Cut Canal is an artificial connection, 3,000 feet long, from the Detroit River to a bend in the Rouge River which eliminates an "S" shaped curve near the mouth.

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 from Detroit River backwater of approximately 235 cfs.

Two small tributaries, Ecorse River and Monguagon Creek, enter the Detroit River below the Rouge River. Their contribution of flow is insignificant when compared to that of the Detroit River.

C. HURON RIVER. The Huron River rises west of Detroit and flows in a southwesterly direction, emptying into the Detroit River just above Pointe Mouilles. Its drainage basin has the shape of a mallet with the handle providing the outlet. The river is about 80 miles long and falls about 440 feet in its descent to the Detroit River. The major part of its drainage reaches the main stem above Ann Arbor and from this point downstream receives no important tributaries. Most of the upper portion is hilly and contains many lakes which provide much natural storage. The drainage area is 890 square miles.

The closest gaging station to the mouth where reliable records are kept by the U. S. Geological survey is at Ann Arbor. Here the average discharge of record is 445 cfs and the drainage area is 711 square miles. This gage does not indicate the total or daily contribution of water to the Detroit River because: (1) eight impounded lakes between the gaging station and the mouth provide considerable storage which smooths out the stream fluctuations, and (2) it does not take into account approximately 179 square miles of drainage area.

D. MICHIGAN WATERS OF LAKE ERIE. The western end of Lake Erie is characterized by shallow water, with maximum depths of 29 feet. For several miles from the Michigan shore, the water is generally less than 25 feet deep, and near the Detroit River outlet, depths in excess of 20 feet are rare. This ship channel is dredged through the shallow water to a depth of 28.5 feet. Lake Erie is subject to hard winds from both the east and west, and from time to time barometric seiches occur. The effect of changing winds and seiches is to raise and lower the lake level at the western end near Monroe, and to create marked variations from normal water movements and currents. The only significant tributary to Michigan Lake Erie besides the Detroit River is the Raisin River. Minor tributaries include the creeks named Swan, Stony, and Sandy north of the Raisin River, and those called Plum, LaPlaisance, and Otter south of the Raisin River. Table 13-I gives descriptive measurements of the Michigan waters of Lake Erie.

TABLE 5-I. CHARACTERISTICS OF MICHIGAN LAKE ERIE

Mean Depth	14.3 feet
Maximum Depth	29 feet
Surface Area	105 square miles
Volume	960,960 acre - feet
Drainage Area [1]	1,525 square miles

[1] Excluding the Detroit River and Lake surface area

E. RAISIN RIVER. The Raisin River, entering the lake at Monroe, drains an area of 1,125 square miles. It rises approximately 50 miles due west of Monroe and for 20 miles flows in an easterly direction. For the next 30 miles it flows southerly before taking a sharp turn to flow in a northeasterly direction for 20 miles. The final 15 miles of the River, flowing in an easterly direction, receive no important tributaries. The shape of the basin is very similar to that of its neighbor, the Huron River. The average discharge of record measured near Monroe is 714 cfs.

Five low-head dams are spaced at approximately 1-mile intervals near the mouth of the River.

The last 1.5 miles of the River contain a dredged navigation channel serving the Port of Monroe with controlling depths of 21 feet and a middle channel width of 200 feet. Lake-affected backwater extends approximately 3 miles up the River to the first low head dam. The improved channel, widened to 300 feet, extends 3 miles into Lake Erie.

F. LAKES. Numerous inland lakes are located in the headwater reaches of the tributary streams in the Detroit area. All of them are in headwater areas and are fed by small drainage areas. These lakes, unlike many small lakes elsewhere, do not provide much recharge to groundwater supplies and thus the rate of water supply that can be continuously obtained from lakes in this area is generally limited to their outflow rates which are relatively small.

SECTION II

WATER USE INVENTORY

Richard D. Vaughan

INTRODUCTION

In an area as diversified and complex as the study area of the Detroit River-Lake Erie Project, all water uses must be considered in order to arrive at the best plan for maximum potential use of the waters.

This report contains a summary of the many and varied water uses in the study area.

Water uses have been divided into the following categories: commercial shipping, dredging operations, fish and wildlife, recreational uses, municipal and industrial water supply, industrial and domestic waste disposal, and combined sewer overflows. No one use is presented as more important than another.

COMMERCIAL SHIPPING

Because of a strategic geographical location, the Detroit River has become an important artery of commercial shipping between the upper and lower Great Lakes. Millions of tons of iron ore from the Minnesota ranges pass through the river on their way to the steel mills of Cleveland and Pittsburgh. Coal is transported up the river from the Appalachian fields to the industries along Lakes Michigan and Superior. The opening of the St. Lawrence Seaway has also contributed significantly to the traffic in the river. Tonnage shipped through the Detroit River is so great that during a recent eight-month season, 130,560,000 tons of total commerce were shipped through the river. This exceeds the entire combined tonnage shipped through the Panama and Suez Canals in one year.

Although records for the 1963 shipping season are not yet available, the shipping information for the 1961 and 1962 seasons is presented in Table 1-II. All of the following information is taken from the U.S.Army Corps of Engineers publication entitled, "Waterborne Commerce of the United States, Calendar Year 1961 and 1962." All records include Port of Detroit traffic and Windsor-Detroit traffic. This data therefore includes barge, ferry, and tugboat traffic. An explanation of the terminology follows the tables.

(Table 1-II follows)

TABLE 1-II. WATERBORNE COMMERCE OF THE DETROIT RIVER

	1961	1962
TOTAL PASSAGES		
Upbound	10,891	10,191
Downbound	11,098	10,390
TONNAGE SUMMARIES		
Upbound	33,091,926 +	35,375,199
Downbound	63,090,136	64,663,909
Dept. of Defense Controlled and Special Cargo	3,933	-
Total	96,185,995	100,039,108
TONNAGE BREAKDOWN		
Overseas Imports (upbound)	669,341	773,065
Overseas Exports (downbound)	3,807,891	4,166,334
Canadian Imports (upbound)	1,128,032	2,149,157
Canadian Imports (downbound)	2,981,227	2,883,829
Canadian Exports (upbound)	4,267,650	3,707,134
Canadian Exports (downbound)	4,986,691	6,249,152
Coastwise Shipping (upbound)	75,650	119,941
Coastwise Shipping (downbound)	14,616	24,523
Lakewise Shipping (upbound)	26,865,236	28,510,856
Lakewise Shipping (downbound)	51,072,866	51,134,844
Internal Shipping (upbound)	33,856	55,791
Internal Shipping (downbound)	73,927	171,952
Local (upbound)	52,161	59,255
Local (downbound)	152,918	33,275
PASSENGER TRAFFIC		
Upbound	528,392	557,910
Downbound	523,834	562,005
Local Traffic	1,051,065	1,119,319
Through Traffic	1,161	596
Total	1,052,226	1,119,915

+ Tonnage figures for the Detroit River, as given by the Corps of Engineers, do not include Canadian-Canadian or Canadian-Foreign trade. Figures for this type of trade are kept at Sault Ste. Marie, and in 1961, 9,998,357 tons of such commerce are recorded at that point. A figure of 9,157,790 tons of eastbound commerce is recorded, and based on this, it is estimated that about 7,500,000 tons of this foreign commerce passes through the Detroit River unrecorded by the Corps of Engineers or by Canada.

TABLE 1-II (CONTINUED). WATERBORNE COMMERCE OF THE DETROIT RIVER

COMPARATIVE TRAFFIC

Year	Tons	Passengers
1962	100,039,108	1,119,915
1961	96,185,995	1,052,226
1960	111,165,158	1,092,975
1959	92,618,415	1,140,929
1958	87,878,763	979,021
1957	130,515,923	873,420
1956	124,849,617	1,078,452
1955	132,507,367	1,100,474

TRANSACTIONS OF PORTS ON THE DETROIT RIVER	1961	1962
U.S. Overseas Imports	171,131	233,486
U.S. Overseas Exports	526,087	303,109
U.S. Receipts of Canadian Shipments	1,587,045	2,478,221
U.S. Shipments to Canadian Ports	210,914	182,826
U.S. Coastwise Receipts	64,080	81,146
U.S. Coastwise Shipments	14,616	13,173
U.S. Lakewise Receipts	20,958,960	22,337,730
U.S. Lakewise Shipments	1,074,196	1,060,533
U.S. Internal Shipping Receipts	30,707	55,791
U.S. Internal Shipping Shipments	68,147	135,521

EXPLANATION OF TERMINOLOGY

Overseas Exports and Imports refers to tonnage shipped through the Detroit River by the United States to and from foreign ports, including the Canal Zone.

Canadian Exports and Imports refers to the shipping trade between the United States and Canada.

Coastwise Shipping refers to domestic traffic involving transportation over the ocean, e.g., Chicago to Boston.

Lakewise Shipping refers to traffic between U.S. ports on the Great Lakes System.

Internal Shipping refers to traffic involving carriage on both inland waterways and the waters of the Great Lakes System.

Local commerce includes movement of freight within the confines of a single arm or channel of a port, or within the limits of a port having only one project, arm, or channel, except ferries. The term is also applied to marine products, sand, and gravel taken from the Great Lakes.

Richard r Vaughan

different types of cargo were Over the river during the 1961 and 1962 transported varied from bulk products like iron ore to ...ed products such as steam turbines. The seasons ...go to be shipped overseas was scrap iron and hig...h 1,064,828 tons passing down the river during ...ar 1961. Rolled and finished steel mill products ...stituted the largest foreign import with 188,768 tons ...assing through the river or being unloaded in the Detroit port area during the 1962 season. In the domestic and U. S. Canadian trade categories, the largest downbound tonnage consisted of iron ore and concentrates with 34,986,741 tons of the material being recorded in 1962. The largest upbound cargo was bituminous coal and lignite, with 26,446,249 tons passing up the river during the 1962 season.

The ships traversing the river varied from tugboats and great lakes freighters to the latest ocean vessels. One downbound vessel had a maximum draft of 28 feet while 8,825 of the vessels over the two year period had a draft of 12 feet or less.

The passenger traffic figures show that the majority of the passenger traffic is confined to the Detroit area. The major contributors to the heavy local traffic are the Bob-Lo Excursion Company's pleasure boats, the

S.S. St. Claire and S.S. Columbia, which ı sðquent ex-

cursion trips to Bois Blanc Island off the

of Grosse Ile.

DREDGING OPERATIONS

The dredging operations in the Project's study area come under the jurisdiction of the U.S. Army Engineer District, Detroit, Corps of Engineers. These operations of the Corps are divided into the major categories of New Work and Maintenance Work. All of the work under their direction is handled by their own equipment and personnel or is contracted out to low bidders. Figures 1-II and 2-II show the areas of new work and maintenance dredging operations along with the designated disposal sites.

(Figures 1-II and 2-II follow)

FIGURE I-II

DETROIT RIVER—LAKE ERIE PROJECT

U.S. CORPS OF ENGINEERS DREDGING OPERATIONS AND DISPOSAL AREAS

U.S. WATERS
DETROIT RIVER

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

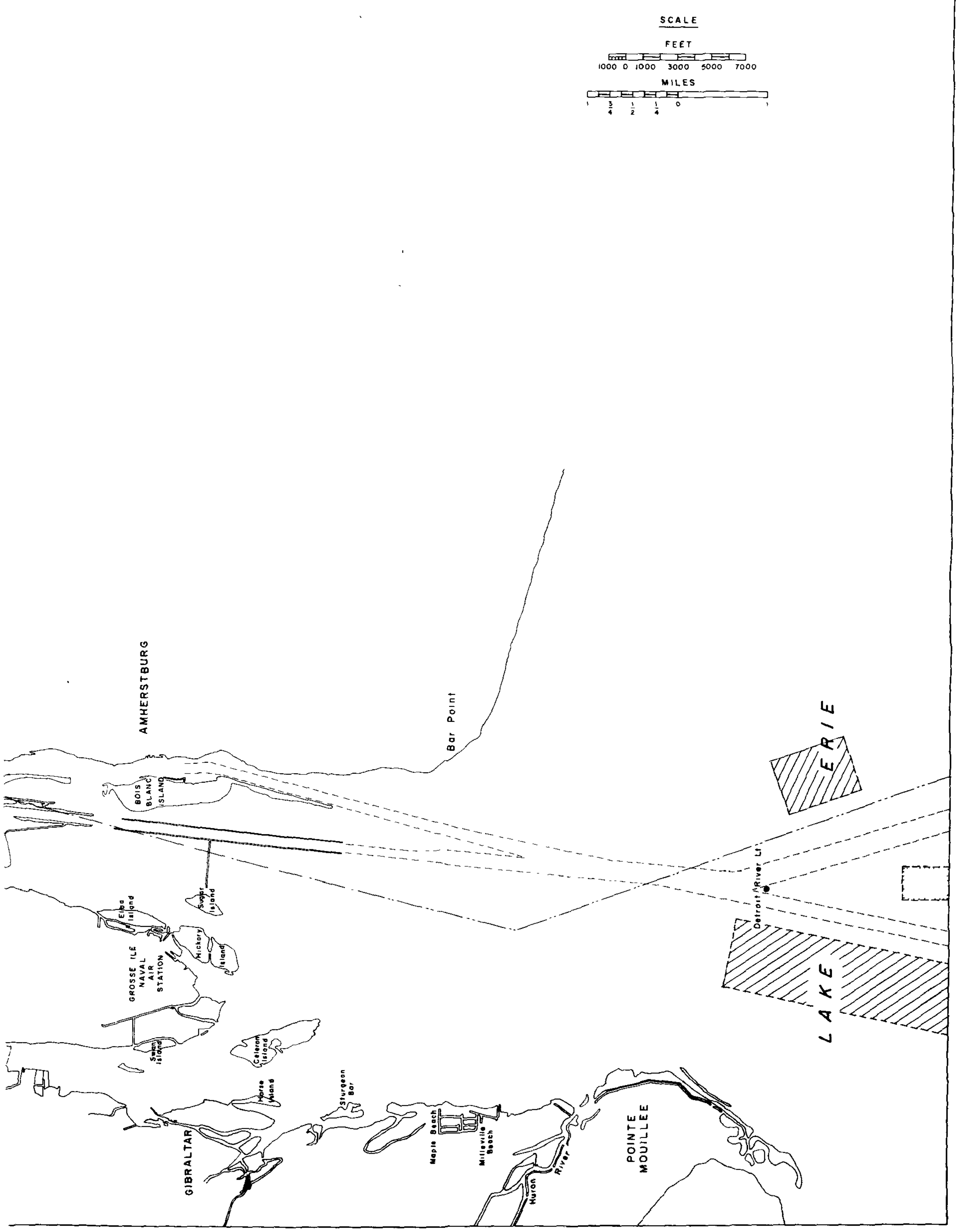


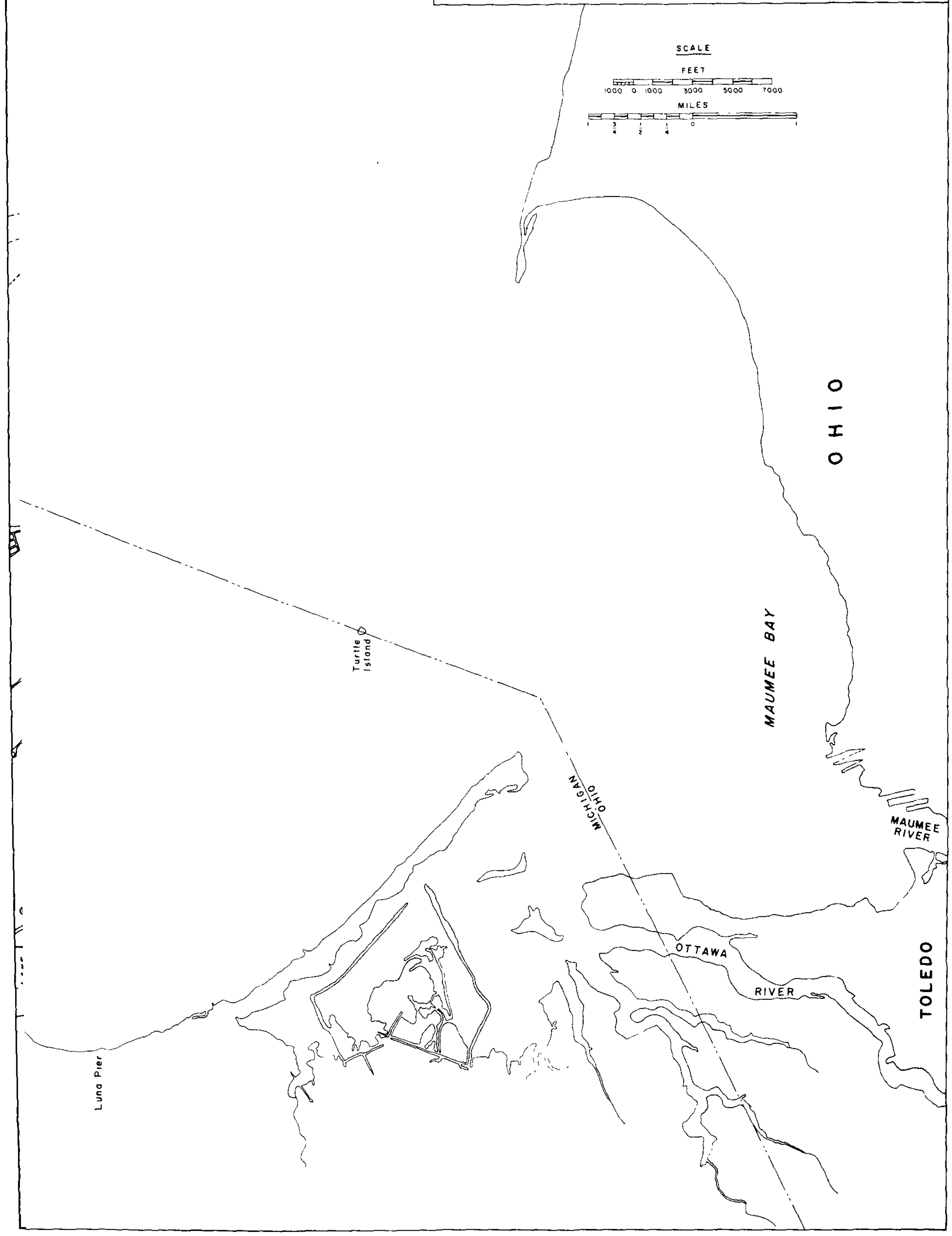
FIGURE 2-II

DETROIT RIVER–LAKE ERIE PROJECT

U.S. CORPS OF ENGINEERS DREDGING OPERATIONS AND DISPOSAL AREA

LAKE ERIE

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



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NEW WORK

Trenton Channel

The Trenton Channel, on the west side of the Detroit River and nine miles in length, flows in a southerly direction between the Michigan mainland on one side and Grassy Island, Michigan and Grosse Ile, Michigan on the other side. The Wyandotte Reach of the Trenton Channel extends from the junction with the Detroit River at the head of Fighting Island; downstream to the Grosse Ile toll bridge. The Trenton Reach extends further downstream in the natural channel on the west side of Grosse Ile to the turning basin at the City of Trenton.

The work scheduled by the Corps of Engineers for improvement of the Trenton Channel provided for the following:

a. A channel 300 ft. wide and 27 ft. deep in the Wyandotte Reach, extending for a distance of about six miles from the Detroit River through channel to a point just downstream of the Grosse Ile toll bridge.

b. A channel 300 ft. wide and 28 ft. deep in Trenton Reach, extending for a distance of about one mile from the 27-foot deep channel just downstream of the Upper Grosse Ile Bridge to, and including, a turning basin 28 feet in depth and about 15 acres in area outside the

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dredging project channel limits at the McLouth Steel Corporation dock.

The Corps of Engineers divided this work into three sections for purposes of bidding and awarding of contracts. These sections are as follows:

Section A - Comprising all of the work required in 6,450 feet of the Wyandotte Reach. The materials in this section to be excavated consist principally of sand, clay and gravel, which are being pumped into the Mud Island dike by a 20-inch hydraulic pipeline dredge. The pay quantity for this section was calculated as 180,000 cubic yards and a contract amounting to $299,810 awarded to Price Brothers - McClung Division, Price Brothers Company, Dayton, Ohio. Work began around mid-April 1963 and was completed during the month of June 1963.

Section B - Comprising all of the work in the lower 22,450 feet of the Wyandotte Reach between the lower end of the

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Upper Wyandotte Reach and a point approximately 700 feet downstream of the Grosse Ile toll bridge. The excavated material in this section also consists principally of sand, clay and gravel and comprises a pay quantity of 124,600 cubic yards. This material was deposited in a dump area located in Lake Erie south of the Detroit River Light between the West Outer Channel and East Outer Channel. This work was contracted to Peter Kiewit Sons Company, Omaha, Nebraska.

Section C - Comprising all of the work required between a point approximately 700 feet downstream of the Grosse Ile toll bridge and a point approximately 5,800 feet downstream of the bridge, including the turning basin. This section consists principally of a limestone ledge rock with a sand, gravel, clay and silt overburden. A portion of the material 100,000 cubic yards was hauled by dump and/or deck scows to Mud Island where it was rehandled by a land-based plant in the construction of the Mud Island dike. The remaining 342,700 cubic yards of pay quantity was hauled to the Lake Erie Disposal area in dump scows. The contract for this section was awarded to the Dunbar and Sullivan Dredging Company, Detroit, Michigan. The cost of sections B and C together amounted to $4,491,036.

East Outer Channel

Dredging operations in the East Outer Channel were confined to an area 35,000 feet in length beginning about 6,000 feet down channel from the Detroit River Lighthouse. The pay quantity of excavated material in the channel was 2,769,000 cubic yards of clay with some sand and gravel. Disposal was in the dump ground located between the East and West Outer Channels. Work was under contract in September 1962 and completed in October 1962.

MAINTENANCE WORK

Rouge River

The dredging of the channels of the Main Rouge, Old Rouge and Short Cut Canal commencing at the Ford Motor Company turning basin and extending to the Detroit River is classified as maintenance work. Dredging operations are annual and commence about the middle of September and continue until just before Christmas. In 1962 approximately 174,000 cubic yards of silt, industrial waste and clay were removed and hauled by the U.S. Hopper Dredge Hains to Grassy Island and pumped within the diked area. In 1963, 255,000 cubic yards were removed. Table 2-II represents a summary of the average chemical constituents of the Rouge River shoal material as reported by the Corps of Engineers.

The costs of maintenance dredging by the Corps of Engineers in the Rouge were $206,288 in 1962 and $258,524 in 1963. To help defray the cost of dredging various industries were charged an amount (see Table 3-II) commensurate with the cost of removing that portion of the dredged material deposited by industrial waste discharges.

(Tables 2-II and 3-II follow.)

TABLE 2-II. CHEMICAL CONSTITUENTS ROUGE RIVER SHOAL MATERIAL

RESULTS EXPRESSED IN PERCENT OF SAMPLE

	1962[1]						1963					
Location No.[2]	Fe_2O_3	CaO	MgO	Al_2O_3	Carbon & Organic Loss on Ignition	Insol. Sil.Mat.	Fe_2O_3	CaO	MgO	Al_2O_3	Carbon & Organic Loss on Ignition	Insol. Sil. Mat.
1	17.4	3.4	4.1	1.1	16.8	55.4	13.9	10.6	1.5	5.9	18.6	47.2
2	11.6	4.6	5.2	6.8	20.9	49.2	13.5	7.0	1.2	5.3	19.6	51.9
3	21.9	2.5	2.7	1.7	19.0	52.0	13.7	8.3	1.1	6.3	19.7	49.3
4	13.8	1.1	4.3	6.1	17.7	55.3	20.4	4.3	1.6	4.7	20.0	46.5
5	16.1	4.8	2.1	3.8	21.2	51.8	22.9	3.4	1.3	4.9	22.0	42.8
6	15.7	4.5	1.8	6.8	21.1	49.8	10.5	4.3	1.7	1.8	18.3	63.1
7	18.6	3.3	3.9	3.1	21.6	49.2	16.6	4.1	1.2	4.2	21.4	51.2
8	16.2	6.1	Tr	2.7	20.6	52.3	17.9	3.8	1.5	9.1	18.4	47.1
9	12.5	5.0	1.3	2.2	17.4	61.1	10.0	8.1	1.0	1.4	12.8	64.8
10	17.4	4.9	3.6	1.3	22.8	48.3	9.0	5.5	1.0	1.7	15.3	66.8
11	12.3	6.0	Tr	4.1	22.0	55.3	10.2	5.1	1.1	1.8	20.8	60.0
12	6.1	13.2	Tr	0.1	42.7	37.5	7.6	7.0	Tr	1.3	35.9	47.8
13	2.6	10.3	2.1	2.1	42.3	40.0	9.6	6.7	1.7	1.8	39.6	39.9
14	8.4	8.0	7.6	4.4	22.9	48.1	5.9	8.7	Tr	3.4	31.5	49.2
15	5.1	4.2	7.3	10.7	22.0	50.5	12.0	9.2	1.0	1.2	33.1	40.0
16	3.4	11.2	2.1	0.8	29.0	53.1	10.1	8.6	1.6	1.5	42.9	34.2
17	4.9	11.7	2.6	3.0	21.7	55.7	8.0	6.8	1.0	1.0	30.3	52.2
18	5.5	6.6	1.7	4.2	22.3	59.1	6.2	8.3	1.1	1.8	22.2	59.5
19	5.4	6.8	1.0	4.4	17.0	64.7	2.5	6.6	1.3	1.9	17.8	69.1
20	6.7	8.1	1.0	5.9	9.1	69.0	7.6	10.2	1.8	1.8	26.0	52.0
21	5.5	10.0	2.3	5.6	14.5	61.7	10.5	20.2	1.6	0.7	29.2	37.2
22	6.9	7.2	2.7	3.1	17.9	61.7	7.9	12.6	1.2	1.4	23.3	52.8

1. Data furnished by the Corps of Engineers
2. See Figure 1-II

TABLE 3-II. PARTICIPATING COSTS - ROUGE RIVER MAINTENANCE DREDGING

Industry	Year	Amount
Ford Motor Company	1962	17,051.11
	1963	35,671.83
Scott Paper Company	1962	1,836.54
	1963	8,701.66
Allied Chemical Corporation-Solvay Process Division	1962	4,469.49
	1963	5,379.53
American Cement Corporation-Peerless Cement Division	Fixed Annual Charge	3,500.00

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Detroit River

The Corps of Engineers removes some 100,000 cubic yards annually from the Livingstone Channel and 200,000 cubic yards annually from the East Outer Channel. The upper Livingstone Channel annual maintenance dredging is primarily carried out to remove diked material (rocks and boulders) which wave action has caused to topple into the channel. The lower Livingstone Channel and the East Outer Channel operation consists of removal of solids originating upstream and deposited in areas where the velocity decreases as the river approaches and enters Lake Erie.

Raisin River

Monroe Harbor dredging is classified as maintenance work and in 1962 and 1963 consisted of dredging from the Monroe Harbor terminal turning basin to a point about 8,000 feet into Lake Erie. This is an annual operation and usually takes place during the month of October. Two hundred and seventy one thousand cubic yards of excavated material consisting principally of silt, paper pulp and clay were hauled by the U.S. Hopper Dredge Hoffman to a disposal area in Lake Erie in 1962. Similar operations were repeated in 1963 with 390,000 cubic yards of material being removed by the U. S. Hopper Dredge Lyman.

The costs of maintenance dredging by the Corps of Engineers in the Raisin River were $58,774 in 1962 and $128,536 in 1963. To help defray the cost of dredging in the Raisin River, the Consolidated Paper Co. is charged a fixed annual fee of $5,000.

FISH AND WILDLIFE

Sport Fishing

Values of the Detroit River sports fishery are taken from the Michigan Department of Conservation general creel census records, 1928 - 1963 (Table 4A-II). Seven principal species are caught by anglers. In order of importance, these are: yellow perch, white bass, rock bass, walleye (also called yellow pike and pickerel), sheepshead (or freshwater drum), smallmouth bass, and northern pike. The first four of these species constituted about 90 per cent of the total catch for the period 1928-1963: perch-49%, white bass-20%, rock bass-13%, walleye-9%.

In 1963, angling quality, as expressed in catch of fish per hour of angling, was five times higher than the composite average of 1.3 fish per hour. Species composition of the 1963 catch did not follow the usual pattern, however. Fifty percent of the catch was white bass; the remainder was composed of about half perch and half smelt. Only 2 percent of the catch was walleye, compared with the composite catch of 8 percent. There is a definite migration of this highly prized species between Lake Erie and Lake St. Clair, as tagging studies have demonstrated.

The sport fishery, especially in the lower Detroit River, has a high potential resource value. This was indicated by a study done by the Michigan Department of Conservation in 1952. The Institute for Fisheries Research in its report, "The Fish Fauna and the Fishing of the Detroit River in Vicinity of Sugar and Stony Islands" (1952), summarizes results of the netting survey and other analyses. Game fish, belonging to 12 different species, composed 55 percent of the adult population. There was a good variety and abundance of forage fishes on which game fishes feed. Neither the population of rough fishes, such as carp and gizzard shad, nor the population of obnoxious fishes such as the dogfish (or bowfin) and the gars, were too large. (The parasitic sea lamprey is not found in the River or Lake.)

The study also established that the several species of game fish grew at well above the growth rate of these species in inland waters of Michigan, and that angling quality in the Grosse Ile area compared favorably with angling quality of other Michigan non-trout waters. A netting survey, made by the Institute for Fisheries Research in the spring of 1964 to supplement the 1952 survey of the area, substantiated the conclusion that the fish population of the lower Detroit River is a valuable resource for sport fishing (communication from the Institute's director, dated July 2, 1964).

In Michigan waters of Lake Erie, a large variety of species are caught by sportsmen, as the composite creel census data for the period 1928 - 1963 show (Table 4B-II). The catch over this period has been composed predominantly of perch (72 percent). Rock bass, bull heads, white bass, and walleye rank next in order of importance. The 1963 census data indicates high angling quality, with a catch per hour of angling at 4 fish, compared with the composite catch per hour of 1.5 fish. But all the fish caught were of one species--yellow perch. Similarly, in 1960, 97 percent of the catch was perch; in 1961, 70 percent was perch. In 1962, only about a third of the catch was perch, with white bass constituting another third and rock bass about a fifth of the catch. The valued walleye composed only 3 percent of the 1962 catch, and it was absent from the 1960, 1961, and 1963 catches. Factors contributing to recent changes in the species composition of the Lake Erie fishery will be discussed in a later section of this report.

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COMMERCIAL FISH CATCHES

Records of the Michigan Department of Conservation over the last 18 years show significant variations in the amount of catch of various species of fish. Catches from Lake Erie by Michigan fishermen for scattered years in the last two decades expressed in pounds of fish presented in Table 4-II. The fish are not necessarily caught in the Michigan waters of Lake Erie since the fishermen living in the State of Michigan may enter into Lake Erie waters of other States.

Records obtained from the Michigan Department of Conservation date back through 1944.

The figures show interesting rises and declines in the fish catches. Fish showing a definite decline through the years are the bowfin, northern pike and the sauger. Others such as the bullhead, catfish, sheepshead, white bass, and yellow pike exhibit fluctuations in catch through the years, while the yellow perch and carp show a definite rising trend in the catch. Lake Erie also yielded good catches of whitefish, lake herring, and ciscoe until the turn of the century when their population was decimated.

(Tables 4-II, 4A-II and 4B-II follow.)

TABLE 4-II. COMMERCIAL FISH CATCHES IN LAKE ERIE BY MICHIGAN FISHERMEN

Pounds of Fish

Fish	1944	1948	1952	1957	1961	1962	1963
Blue Pike		19,651	248				
Bowfin	8,345	8,076	1,200		10		
Buffalo					803	4,097	13,934
Bullheads	47,422	51,154	16,153	52,288	8,983	7,132	3,545
Burbot	31	146		50			
Carp	599,265	533,885	893,325	620,354	1,297,792	1,275,626	833,241
Catfish	35,397	27,111	27,686	56,536	85,557	51,646	40,533
Chubs							
Garfish							
Gizzard Shad			1,080		1,489		
Goldfish	1,482	699	50				
Lake Herring							
Lake Trout							
Lake Whitefish	669	9,491	729				
Mooneyes			442				
Menominee Whitefish							
Northern Pike		10,439	2,014	2,161	1,190	79	71
Rock Bass	2,920	7,902	520	520	654	251	3
Round White-fish							
Saugers	5,898	4,419	802	145			
Sheepshead	120,828	80,327	32,388	64,637	94,494	82,292	71,321
Smelt					12		
Sturgeon					68	61	42
Suckers					62,259	56,471	60,905
White Bass	54,668	32,865	65,488	45,029	159,341	210,201	126,121
White & Red-Horse Suckers	35,194	41,733	27,496	19,128			
Yellow Perch	19,775	17,480	40,522	109,204	103,608	96,875	89,701
Yellow Pike	225,878	402,908	285,130	288,509	105,094	52,912	93,047
Total	1,157,772	1,248,286	1,395,273	1,258,561	1,921,354	1,837,643	1,332,464
Value			$122,078.45	$109,032.95	$145,159.68	$101,618.13	$94,594.30

TABLE 4 A-II. GENERAL CREEL CENSUS RECORDS FOR MICHIGAN WATERS OF THE DETROIT RIVER, 1961-1963, WITH 1928-1963 TOTAL*

Year	Number of Anglers	Total Hours	Fish	Catch per Hour	Small-mouth Bass	Large-mouth Bass	Blue gill	Pump-kin-seed	Rock Bass	Crap-pies	Perch	Walleye
1961	477	1,290	3,773	2.92	44	-	-	1	250	-	3,126	58
1962	122	210	1,440	6.86	-	-	7	-	2	-	341	21
1963	No records											
Total (1928-63)	4,236**	12,979	17,503	1.35	260	37	24	20	2,266	36	8,453	1,370

Year	North-ern Pike	Bull-heads	Channel Catfish	Carp	Suckers	Smelt	Fresh-water Drum	Bur-bot	Bass	Chub	Sauger	Red-horse	Muskel-lunge	Dog fish
1961	52	-	29	9	-	4	25	-	173	-	-	-	1	1
1962	-	-	10	-	-	295	44	-	720	-	-	-	-	-
1963	No records													
Total (1928-63)	192	28	52	31	29	417	716	4	3,486	1	74	4	2	1

* Tabulation prepared by Institute for Fisheries Research, Michigan Department of Conservation, to supplement creel census table, 1928-60, published in "Joint Federal-State of Michigan Conference on Pollution of the Navigable Waters of the Detroit River, Lake Erie, and their Tributaries within the State of Michigan," Transcript of First Session, March 27, 1962, Vol. II, Part 1, pp. 391-392.

** Number of anglers not recorded in 1928 and 1929.

TABLE 4-B-II. GENERAL CREEL CENSUS RECORDS FOR MICHIGAN WATERS OF LAKE ERIE, 1961-63, WITH 1928-1963 TOTAL*

Year	Number of Anglers	Total Hours	Fish	Catch per Hour	Rock Bass	Yellow Perch	Wall-eye	Northern Pike	Bull-heads	Channel Catfish	Carp	White Bass	Fresh-water-Drum
1961	47	300	571	1.90	2	404	-	-	-	101	64	-	-
1962	173	526	1,186	2.25	266	416	32	-	-	-	-	441	27
1963	79	160	640	4.00	-	640	-	-	-	-	-	-	-
Total (1928-63)	9,787**	38,019	37,001	1.50	4,269	40,924	1,366	1,171	3,497	327	634	2,776	989

Year	Small-mouth Bass	Large-mouth Bass	Blue-gill	Pumpkin-seed	Crappies	Dogfish	Shad	Sucker	Redhorse	Goldfish	Sauger
1961	-	-	-	-	-	-	-	-	-	-	-
1962	4	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-
Total (1928-63)	178	39	141	477	153	3	3	40	1	10	3

* Tabulation prepared by Institute for Fisheries Research, Michigan Department of Conservation, to supplement creel census table, 1928-60, published in "Joint Federal-State of Michigan Conference on Pollution of the Navigable Waters of the Detroit River, Lake Erie, and their Tributaries within the State of Michigan," Transcript of First Session, March 27, 1962, Vol. II, Part 1, pp. 391-392.

** Number of anglers not recorded in 1928 and 1929.

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WATERFOWL

The Detroit River is known as a major staging area for migrations of canvasbacks, redheads, scaups, and black ducks, using the Atlantic and Mississippi flyways. As a canvasback feeding area, the Detroit River is in a class with the famous marshes of Chesapeake Bay. In the Great Lakes region, the area is considered among the few remaining areas providing significant waterfowl habitat. The principal reason for this is the estimated 6,000 acres of shoal water on the American side of the Detroit River between the Ambassador Bridge and the head of Lake Erie, which contain preferred natural waterfowl foods such as wild celery, coontail, water milfoil, various pondweeds, and waterweed. The celery beds constitute one of the few good winter feeding grounds for the canvasbacks in the Great Lakes region. Associated with these plant beds are snails and other crustaceans which are important animal foods for the diving ducks.

Biologists from the Department of Interior's Bureau of Sport Fisheries and Wildlife and the Michigan Conservation Department have conducted serial surveys of waterfowl use in the Detroit River between the Ambassador Bridge and Lake Erie during various seasons. Since 1950, the minimum winter duck population was 5,000 in the 1961-62

TABLE 5-II. RECREATIONAL AREAS

AREA I

PARK AREA	OWNERSHIP	WATER FRONTAGE	AREA (ac)	FACILITIES	ATTENDANCE (Year)	ESTIMATED (1) VALUE ($)
Riverside Playfield	City of Detroit	870 ft.	10.2	R PG		474,000.00
Gabriel Richard Park	City of Detroit	1,638 ft.	21.9	Pg A L		G8,000,000.00
Owen Park	City of Detroit	427 ft.	8.2	Pg L		G100,000.00
Detroit Memorial Park	City of Detroit	1,181 ft.	33.3	M a Wp		1,570,500.00
Stockton Park	City of Detroit	300 ft.	2.75	L		G10,000.00
Engel Park	City of Detroit	663 ft.	34.32	A Pa R L		G857,000.00
Peter Maheras Playfield	City of Detroit	1,232 ft.	53	A Pa		G420,000.00
Brush Ford Park	City of Detroit	2,928 ft.	33.3	Pa Pg		650,000.00
Lakewood East Park	City of Detroit	Included in Above	28.0	M		Included in above
Belle Isle	City of Detroit	Island	927	Sb Mu A G C Pa Pg M	12,000,000 (1959)	G55,000,000.00

TABLE 5-II. RECREATIONAL AREAS (CONTINUED)

PARK AREA	OWNERSHIP	WATER FRONTAGE	AREA (ac)	FACILITIES	ATTENDANCE (Year)	ESTIMATED VALUE ($)
AREA II						
Henry Belanger Park	City of River Rouge	644 ft.	10	R C Pg	75,000	600,000.00
Ecorse Park	Wayne County		3	L	200,000	
AREA III						
Bishop Park	City of Wyandotte	1260 ft.	9.2	A Wp Mu		7,500.00
Riverview Municipal Marina	City of Riverview	85 ft.		R		
Elizabeth Park	Wayne County	3600 ft.	162	Pa Pg A R	750,000	
AREA IV						
Sterling State Park	State of Michigan	7800 ft.	624	Sb C Bh Pa	911,246('60) 1239,216('59)	
Kress Park	Private	400 ft.		Pa Bh Pg		
AREA V						
Toledo Beach	Private	600 ft.		Pa Sb Am		

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Area I The shoreline between Windmill Point and confluence of the Detroit River with the Rouge River.

Area II The shoreline of the Detroit River between the Rouge and Ecorse Rivers.

Area III The shoreline of the Detroit River and Lake Erie between the Ecorse and Huron Rivers.

Area IV The Lake Erie shoreline between the Huron and Raisin Rivers.

Area V The Lake Erie shoreline between the Raisin River and the Michigan-Ohio line.

The facilities listed in column 5 are general, and in some cases may not be complete. The code explanation is as follows:

A - Athletic facilities (tennis, baseball, etc.)

Am - Amusement facilities (ferris wheel rides, etc.)

Bh - Bathhouse

C - Concession stand

D - Dance pavilion

F - Fishing area

G - Golf course and/or driving range

L - Extensive landscaping

M - Marina facilities and boat rentals

Mu - Music facilities (bandstand, music shell)

Pa - Picnic areas

Pg - Playground (children's equipment, etc.)

R - Boat Ramp

Sb - Swimming (beach)

Sp - Swimming (pool)

Wp - Wading pool or spray pool

MARINA FACILITIES

One of the fastest growing recreational uses of water in the Detroit area, as well as in the entire United States, is pleasure boating. Figures presented by the Outboard Boating Club of America show that over $2,500,000,000 was spent on recreational boating in the United States in 1962 as compared with $720,000,000 a decade earlier.

An evaluation of the use of the Detroit area water resources for pleasure boating can be obtained by tabulating the various indicators of boating popularity such as marina facilities, boat registrations and boat launchings.

The major marinas and the number of boat wells they represent are tabulated in Table 6-II and presented in Figures 3-II and 4-II. The areas into which the facilities are located contain the same boundaries as those areas in the preceding section.

(Table 6-II follows, comprising 8 pages)

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA I

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Rental Boats
Bayview Yacht Club	Ft. of Clairpoint Detroit	69	65	0	0	City	5	Det STP	0
Browns Marina	14455 Riverside Detroit	16	16	0	0	City	2	Det STP	0
Detroit Boat Basin	9666 E. Jefferson Detroit	200	200	0	3	City	4	Det STP	0
Detroit Boat Club	Belle Isle	72	72	0	0	City	17	Det STP	0
Detroit Yacht Club	Belle Isle	284	284	15	N.A.	City	14	Det STP	0
Edison Boat Club		25-40	25-40	0	N.A.	City	3	Det STP	0
Gregory Marina		129	129	0	N.A.	City	4	Det STP	0
Keans Detroit Yacht Harbor	100 Meadowbrook Detroit	300	250	0	5-10	City	2	Det STP	0
Memorial Park Marina		274	274	6-30	some	City	1	Det STP	0
Harbor Hill Marina		60	35	0	0	City	1	Det STP	0
Roostertail Marina	100 Marquette Detroit	88	88	0	1	City	3	Det STP	0
Sinbads Marina	100 St. Clair Detroit	104	100	0	0	City	2	Det STP	0
Sinbads Marina Inc.	11200 Freud Detroit	226	226	2	0	City	2	Det STP	0

TABLE 6-II. MARINA FACILITIES SUMMARY (CONTINUED)

AREA I

Marina Name	Address	#of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facili-ties	Type of Treatment	# of Rental Boats
St. Clair Sail Club	Just North of Gregorys	30	24	0	0	City	2	Det STP	0
Windmill Point Boat Co.	14301 Riverside Detroit	62	62	0	NA	City	0	Det STP	0
Woodhaven Area (Private	Homes)	79	79	0	NA	City	0	Det STP	0
Windmill Pt. Area (Priv	ate Homes)	130	130	0	NA	City	0	Det STP	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA II

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Rental Boats
Ecorse Boat Basin	4685 W. Jefferson Ecorse	68	68	0	0	City	1	Septic Tank	0
Nicks Marina	4409 W.Jefferson Ecorse	53	53	0	0	City	1	Septic Tank	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA III

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Boat Rentals
Andy's Boat Harbor	St. John & Perry Pl, Wyan.	85	70	0	10	City	0	Wyan STP	0
Hidden Boat Harbor	693 Biddle Wyandotte	100	100	0	0	Wyan	2	Wyan STP	0
Johnsons Marina	Wyandotte	54	54	0	0	Wyan	20	Wyan STP	0
Mellins Marina	653 Biddle Wyandotte	75	45	0	NA	Wyan	2	Wyan STP	0
Pier 500	507 Biddle Wyandotte	75	75	0	0	Wyan	4	Wyan STP	0
Holdens Boat Works	2775 Riverside Trenton	15	14	0	0	Det	0	None	0
Howey's Boat Works	2751 Riverside Trenton	40	40	0	0	Det	2	None	0
Liggett Boat Works	2965 Riverside Trenton	45	45	0	0	Det	1	Tren STP	0
Humbug Marina	N. Adams Drive Gibraltar	200	200	0	0	City	2	Tren STP	0
Gibraltar Boat Yard	13770 Blakeley Gibraltar	70	70	0	0	City	2	Tren STP	0
Vicks Boat Livery		9	9	0	0	City	1	Wyan	0
Elba Mar Yacht Club	23117 E. River Grosse Ile	260	26	0	0	City	2	Septic T	0
Ford Yacht Club	29500 S.Pointe Grosse Ile	185	185	0	100	City	5	Septic T-	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA III (CONTINUED)

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Boat Rentals
Naval Air Station	Grosse Ile	50	65	0	2	City	2	Cesspool	8
Grosse Ile Yacht Club	29677 Hickory Grosse Ile	121	120	0	80	City	7	Septic T	0
Hoovers	28821 E. River Grosse Ile	50	50	0	NA	Well	3	Septic T	40
Island Boat & Country Club	25215 W. River Grosse Ile	60	60	0	0	City	10	Septic T	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA IV

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Rental Boats
Bellinos Marina		100	50	0	0	Well	2	Septic T	52
Detroit Beach Boat Club		105	31	0	NA	Well	2	Septic T	0
Lezotte Boat Livery	Pointe Mouillee	10	10	0	0	Well	1	Septic T	6
Pointe Mouillee Marina	37245 Pt. Mouillee, Rockwood	36	25	0	0	Well	2	Septic T	26
Swan Boat Club		38	30	2	0	Well	2	Septic T	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA V

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Rental Boats
Andrew's Boat Dock	2937 E. Sterns N. Maumee Bay	50	50	0	NA	Pump	1	Privy	0
Bloome's Livery	Luna Pier	0							12
Bolles Harbor Boat Livery	7970 Harbor Rd. Bolles Harbor	108	108	Boats 12	0	Creek	1	Septic T	0
Brewers Boat Livery	2881 E. Sterns N. Maumee Bay	Docks 134	50-75			Pump	1	Privy	2
Callahans Boat Livery	7976 Harbor Rd. La Plaisance Cr.	30	20	0	0	Pump	1	Septic T	5
Du Valle Livery	4346 LaPointe Dr. Luna Pier								20
Harbor Marine	13951 Bridge Dr. La Plaisance Cr.	25	25			Pump	None		0
Joe's Boat & Bait	13468 N. La Plaisance	14	10	0	0	Pump	1	Septic T	15
John's Marina	7330 Perch Drive N. Maumee Bay	125	100	0		Pump	1	Septic T	3
L & E Boat Livery	13961 N. La Plaisance	Docks 22	22	0	0	None	None		6
Lost Peninsula Marina		124				None	None		
Lotus Harbor Sales & Service	7120 Summit St. Halfway Creek	275	275	0		Pump	1	Septic T	10
Macks Boat Dock	2941 E. Sterns N. Maumee Bay	5 20 at Docks	5	0		Pump	1	Privy	0

TABLE 6-II. MARINA FACILITIES SUMMARY

AREA V (CONTINUED)

Marina Name	Address	# of Boat Wells	# of Boats in Summer	Living Aboard	# Boats with Treat. Devices	Type of Water Supply	# of Toilet Facil-ities	Type of Treatment	# of Rental Boats
Meaders Band	10712 Lakeside Luna Pier								14
Monroe Boat Club	La Plaisance Creek	75	75	25 Boats	1	Pump	1	Septic T	0
Monroe Marina	6647 La Plaisance Rd.	50	50	5 Boats	0	Pump	1	Septic T	0
North Cape Yacht Club	Near Toledo Beach	70 und. constr.				Pump	1	Septic T?	
Otter Creek Marina	Otter Creek	34				Pump	1	Privy	
Shoe String Marina	5800 S. Otter Creek	14 26 by 1964		0	0	Pump	1	Septic T	0
Stanley's Boats	2947 E. Sterns N. Maumee Bay	45	45	0		Pump	1	Privy	0
Straits Boat Livery	8528 E. Dunbar Plum Creek	12	12	0		Pump	1	Chemical T.	14
Toledo Beach Marina	North of Toledo Beach	150 600 ultimately				Pump	1	Septic T.	30

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BOAT REGISTRATIONS AND LAUNCHINGS

Of the five counties chosen for the boat registration figures, all but Oakland County have shorelines on Lake St. Clair, the Detroit River, or Western Lake Erie. The northwest suburbs of Detroit are in Oakland County, and for this reason the boat registrations for this county are also included in the list.

Exact boat launching figures for the Wyandotte Municipal Ramp and the Elizabeth Park ramp are available because a charge is levied at these ramps which necessitates the keeping of launching records. There are other free public launching ramps along the River for which usage figures are not available.

Boat Registrations[1]

Macomb County	18,057
Monroe County	5,899
Oakland County	37,302
St. Clair County	7,744
Wayne County	74,842
Total	143,844

Boat Launchings - Wyandotte Municipal Boat Ramp[2]

1961	5,847
1962	5,382

Boat Launchings - Elizabeth Park Marina

Trenton[3]

1961	8,974
1962	8,418

Boat Launchings - Detroit Engel Parks Ramps[4]

1962 Season	18,000 (estimate)

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[1]Michigan Department of State, through September 30, 1962.

[2]City of Wyandotte, 1962 figures are through October 15, 1962.

[3]Wayne County Board of Road Commissioners, through October 6, 1962.

[4]City of Detroit Department of Parks and Recreation.

INDUSTRIAL WATER USES

The information summarized in Table 7-II is a compilation on the use of water by Michigan industries in the study area. Figures 5-II and 6-II locate the points of waste discharge from each industry. The order of presentation is basically geographical, with data given first for plants on the Detroit River beginning at the headwaters and proceeding downstream, then the industries on the River Rouge, followed by data for those on the Raisin

River. Space requirements have dictated the following coded information:

Columns 2 and 8 - Source and Discharge Point

Det Riv	- Detroit
Riv Rouge	- Main stem of River Rouge
Rouge SC	- Short cut canal of River Rouge
Rouge OC	- Old channel of River Rouge
UG	- Underground
City or City Sewer	- The water supply or treatment facilities of the municipality in which the plant is located.
Rais Riv	- Raisin River

Columns 3 - Amount

gpm	- gallons per minute
gph	- gallons per hour
gpd	- gallons per day
mgd	- million gallons per day
mgy	- million gallons per year

Column 4 - Pre-treatment (treatment of water by the industry prior to use)

Scr	- Screening either course or fine
F	- Filtered

A	- Addition of alum
SA	- Addition of sodium aluminate
Chl	- Chlorination

Column 6 - Final treatment (general treatment given wastewater prior to discharge into receiving waters)

AF	- Air Floatation
CC	- Chemical coagulation
Chl	- Chlorination
Cl	- Clarifier
DF	- Drum filter
Dis	- Distillation
Dp	- Dephenolizing equipment
E	- Excelsior filtration
GC	- Grit chamber
N	- Neutralization
OC	- Oil centrifuging
OWS	- Oil water separating apparatus
P	- Ponds
PS	- Primary settling
SS	- Sludge sintering
SSP	- Sub-surface percolation
St	- Sludge thickening

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Column 7 - Major Constituents

A - Acidity as $CaCO_3$

B - Biochemical Oxygen Demand

C - Chlorides

Cn - Cyanide compounds

Cr - Chromium compounds

Fe - Soluble iron

Fl - Fluorides

N - Nitrogen compounds

O - Oil

P - Phenols

pH - High or low pH values

S - Sulfur compounds

SS - Settleable solids

SusS - Suspended solids

T - High temperatures

X - Ether extractables

Bact - Coliform Bacteria

(Table 7-II, Figures 5-II and 6-II follow.)

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Detroit Edison Conners Cr.	Det Riv	208,000 gpm (Max.)	Scr Chl	Cooling	None	T	Det Riv
	City			Potable & Sanitary			City Sewers
U.S. Rubber Co.	Det Riv	42 mgd		Process & Cooling	OWS		Det Riv
	City	0.5 mgd		Potable & Sanitary			City Sewers
Parke Davis & Co.	Det Riv	17.3 mgd		Cooling	None		Det Riv
	Det Riv	0.63 mgd		Process		SusS pH	City Sewers
	City	0.45 mgd		Potable & Sanitary			City Sewers
Anaconda American Brass Co.	Det Riv	5.3 mgd		Cooling & Process	N PS	pH O	Det Riv
	City	0.0625 mgd		Potable & Sanitary		Cn	City Sewers

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Mistersky Power Station	Det Riv			Cooling	None	T	Det Riv
	City			Potable & Sanitary			City Sewers
Revere Copper & Brass	Det Riv	2.9 mgd		Process	OWS	O Cu	Det Riv
	City	0.36 mgd		Potable & Sanitary			City Sewers
Detroit Edison Delray	Det Riv	190,000 gpm (Max.)	Scr Chl	Cooling	None	T	Det Riv
	City			Potable & Sanitary			City Sewers
Great Lakes Steel Blast Furnace	Det Riv	90 mgd	Chl	Process & Cooling	CC DF SC Dis Dp	P Fe SusS	Det Riv
	City	38,000 gpd		Potable & Sanitary	PS Chl		Det Riv
Allied Chem. Solvay Process	Det Riv	21.6 mgd		Process & Cooling	Cl P	SusS P N	Rouge OC & Det Riv
	City			Sanitary			City Sewers

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

Detroit River

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Detroit Edison River Rouge	Det Riv	480,000 gpm (Max.)	Scr Chl	Cooling	None	T	Det Riv
	City			Potable & Sanitary			City Sewers
Great Lakes Steel Strip Mill		42.13 mgd		Process	Cl SS PS	SS O T	Det Riv
		30.27 mgd		Cooling & Condens.	None		Det Riv
		100,000 gpd		Potable & Sanitary			County Sewers
Fuel Oil Corp.	City	12,240 gph		Vessel washing Batch operation	CWS & E	O SusS	Det Riv
Dana Corp.	City	0.384 mgd		Process & Cooling Sanitary & Potable	None	A pH Fe P	City Sewers Det Riv
Great Lakes Steel Ecorse	Det Riv	72 mgd	Chl	Cooling & Process	CWS P	A Fe SusS O	Det Riv
	City	1.1 mgd		Potable & Sanitary			County Sew Det Riv

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pts.
E. I. DuPont	Det Riv	1.4 mgd		Process & Cooling	None	Ph C	Det Riv
	City			Sanitary & Potable	Soil Absorption		
Wyandotte Chem. North Plt.	Det Riv	57 mgd		Process & Cooling	P on Fighting Island OWS	SusS O P N Cn	Det Riv
	City of Wyandotte			Sanitary & Potable			County Sewers
Wyandotte Chem. South Plt.	Det Riv	54.7 mgd		Process & Cooling	P OWS	C SS P O	Det Riv
	City			Potable & Sanitary			County Sewers
Koppers Co. Inc. Tar Prod. Div.	Det Riv	0.802 mgd		Cooling & Process	None	pH A P	County Sewer Det Riv
	City of Wyandotte	4500 gpd		Potable & Sanitary			County Sewers
Pennsalt Chem.Corp. Industrial Div.	Det Riv	97 mgd		Process & Cooling	None	N C SusS	Det Riv
	City of Wyandotte			Potable & Sanitary			County Sewers

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Pennsalt Chem.Corp. Organic Chem. Div.	Det Riv	6.77 mgd		Process & Cooling	CC OWS P	N S P pH O X	Monguagon Cr.
	City of Wyandotte			Potable & Sanitary			County sewers
Firestone Tire & Rubber Co.	Det Riv & City	1.03 mgd	A SA F	Process & Cooling	OWS P	A pH O Fe SusS	Det Riv
	City of Wyandotte	12,000 gpd (est)		Potable & Sanitary			County Sewers
McLouth Steel Trenton	Det Riv	65.67 mgd		Process & Cooling	GC CC Cl St OC SS	SusS O Fe T	Det Riv
	City	(1962) 2,282 mgy		Potable & Sanitary	2.06 mgd to Wayne Co		County Sewers
Mobil Oil Co.	Det Riv	1.12 mgd		Process & Cooling	Ps F OWS CC AF DF Dp	Salt P X O	Det Riv
	City			Potable & Sanitary			County Sewers
Chrysler Corp. Engine Plt.	City	75,000 gpd		Potable & Sanitary	Wayne Co		County Sewers
	City	1.1 mgd		Process & Cooling	OWS AF CC		Elizabeth Park Cr.

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Detroit Edison Trenton Channel	Det Riv	250,000 gpm (Max.)	Scr Chl	Cooling	None	T	Det Riv
	City			Potable & Sanitary			County Sewers
Monsanto Chemical	Det Riv	5.76 mgd		Cooling	P	T Phosphates	Det Riv
	City	12.5 mgd		Process			Det Riv
Shawinigan Resins Corp. & Monsanto Saflex Div.	Det Riv	383,000 gpd		Process & Cooling	P N	pH B SusS	Det Riv
	City	33,000 gpd		Potable & Sanitary			County Sewers
Chrysler Corp. Amplex Div.	Det Riv	0.317 mgd		Cooling	None		Det Riv
	City			Potable & Sanitary			County Sewers
Chrysler Corp. Cycleweld	Det Riv	0.265 mgd		Cooling	None		Det Riv
	City	5,000 gpd		Potable & Sanitary			County Sewers

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

DETROIT RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
McClouth Steel Gibraltar	Det Riv	1.64 mgd		Process & Cooling	OWS P	A Fe O pH SusS	Frank & Poet Drain
	City	55 gpm		Potable & Sanitary			County Sewer

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

ROUGE RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Allied Chem. Semet-Solvay Div.	Det Riv	6 mgd	Scr	Process	Dp OWS	O P	Rouge OC
	City			Boilers	None		Det Riv
		1.12 mgd		Process	Dp	P O	Det Riv
				Sanitary			City Sewers
(Plastics Div.) Allied Chem.	Det Riv	0.475 mgd		Cooling & Process	Dp PS E	P O	Rouge OC
	City			Potable & Sanitary			City Sewers
Peerless Cement Co. East Plant	Riv Rouge	7.93 mgd		Cooling & Process	None	SusS	Rouge OC
	City			Potable & Sanitary			City Sewers
Scott Paper Co.	Rouge Riv	50 mgd	Lime Soda Softening	Process	Cl	B SusS A pH P	Rouge OC
	City			Potable & Sanitary			City Sewer

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

ROUGE RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituent	Discharge Pt.
Allied Chem. General Chem. Div.	Rouge Riv	9.11 mgd	Chl	Process	P	A pH	Rouge SC
	City			Potable & Sanitary	SSP		County Sewers
American Agric. Chem. Co.	Rouge Riv	0.577 mgd		Cooling & Process Potable & Sanitary	None	Fl pH	Rouge Riv
Ford Motor Co. Rouge Complex	Rouge OC	350-600 mgd	Scr	Cooling Process	GC Cl OWS ST DF	SusS P Cn N O pH	Riv Rouge & UG
	All Sources	913 mgd (1963)					
	City			Potable & Sanitary			City Sewers
Darling & Co.	Rouge Riv	1.13 mgd		Process & Cooling	Chl P	Bact SusS B N O	Rouge Riv

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

LAKE ERIE

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge PT.
Detroit Edison Enrico Fermi	Lake Erie	135,000 gpm		Cooling & Condensing	N.A.	T	Swan Cr. & Lake Erie
	Lake Erie	16,100 gpd		Demineralizing Regenerating			Swan Cr. & Lake Erie
		200 gpm		Potable & Sanitary			Swan Cr. & Lake Erie

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

RAISIN RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Ford Motor Co. Monroe	Lake Erie	2.0 mgd	F Chl	Cooling & Process	CC Cl		Raisin Riv
	Lake Erie	126 mgd		Dilution		Cn O	Raisin Riv
	Lake Erie	0.168 mgd	F Chl	Potable & Sanitary	PS Chl	Bact	Raisin Riv
Consolidated Paper Southside Plant	Lake Erie & Wells	7 mgd		Process	Cl	Bact SusS B	Raisin Riv
	City			Sanitary & Potable			City Sewer
River Raisin Paper		4.573 mgd		Process	CC Cl	SusS B	Mason Run
	City			Potable & Sanitary			City Sewer
Consolidated Paper Northside Plant	Lake Erie	7.533 mgd		Process	CC Cl	SusS B Bact	Mason Run& Raisin Riv
	City			Sanitary & Potable			City Sewer

TABLE 7-II. INDUSTRIAL WATER SUPPLY AND WASTE DISPOSAL (CONTINUED)

RAISIN RIVER

Industry	Water				Waste		
	Source	Amount	Pre Treatment	Use	Final Treatment	Major Constituents	Discharge Pt.
Consolidated Paper Westside Plant	Raisin Riv	1.15 mgd		Process	CC Cl		
	City			Sanitary & Potable		B	City Sewer
Monroe Auto Equipment Co.	City	0.0157 mgd		Process		O	Raisin Riv & City
	City			Potable & Sanitary			City Sewer
Monroe Paper Products	Raisin Riv	2.21 mgd		Process	CC Cl	SusS B Bact	Raisin Riv
	City			Potable & Sanitary			City Sewer

FIGURE 5-II

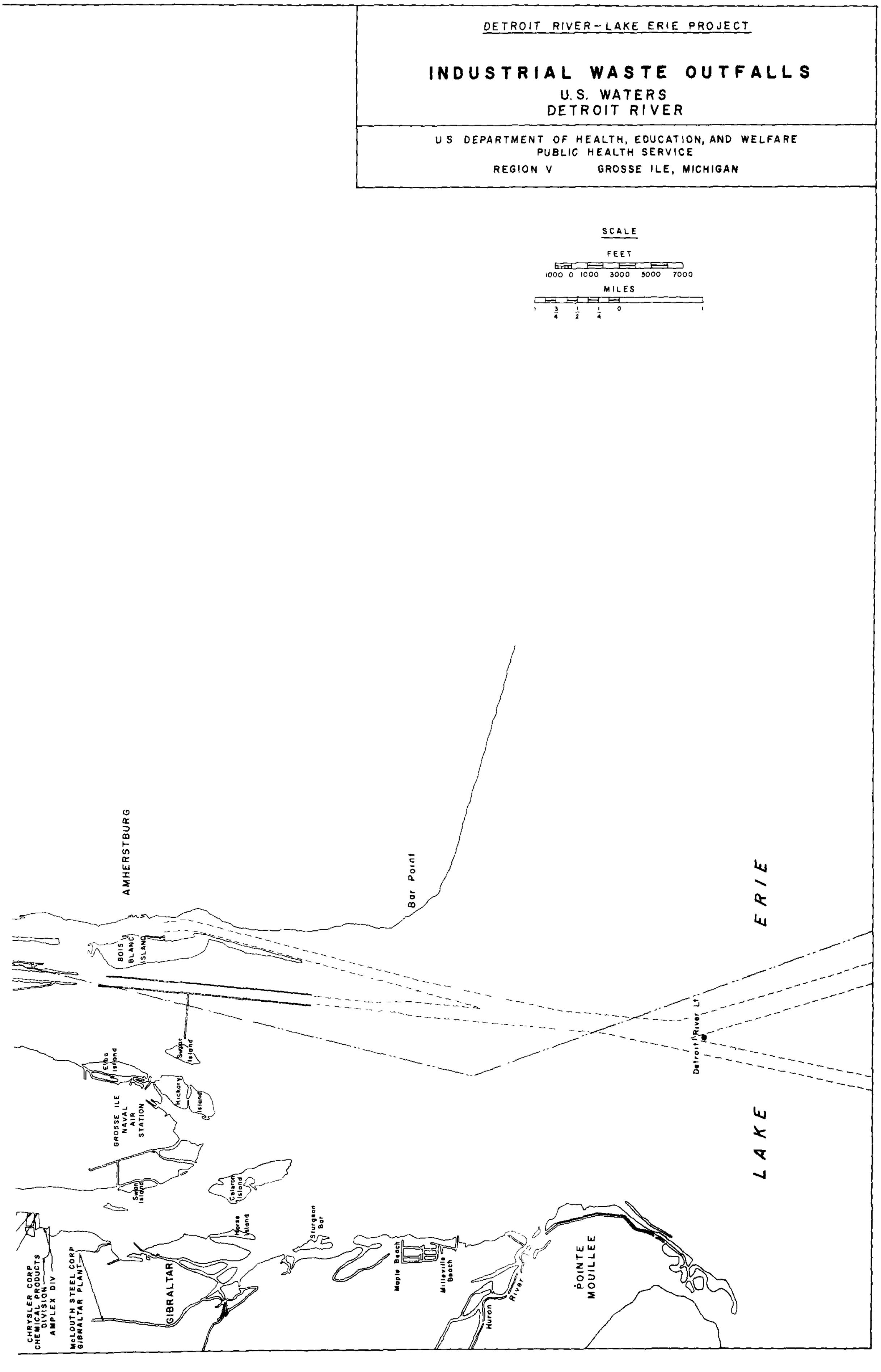
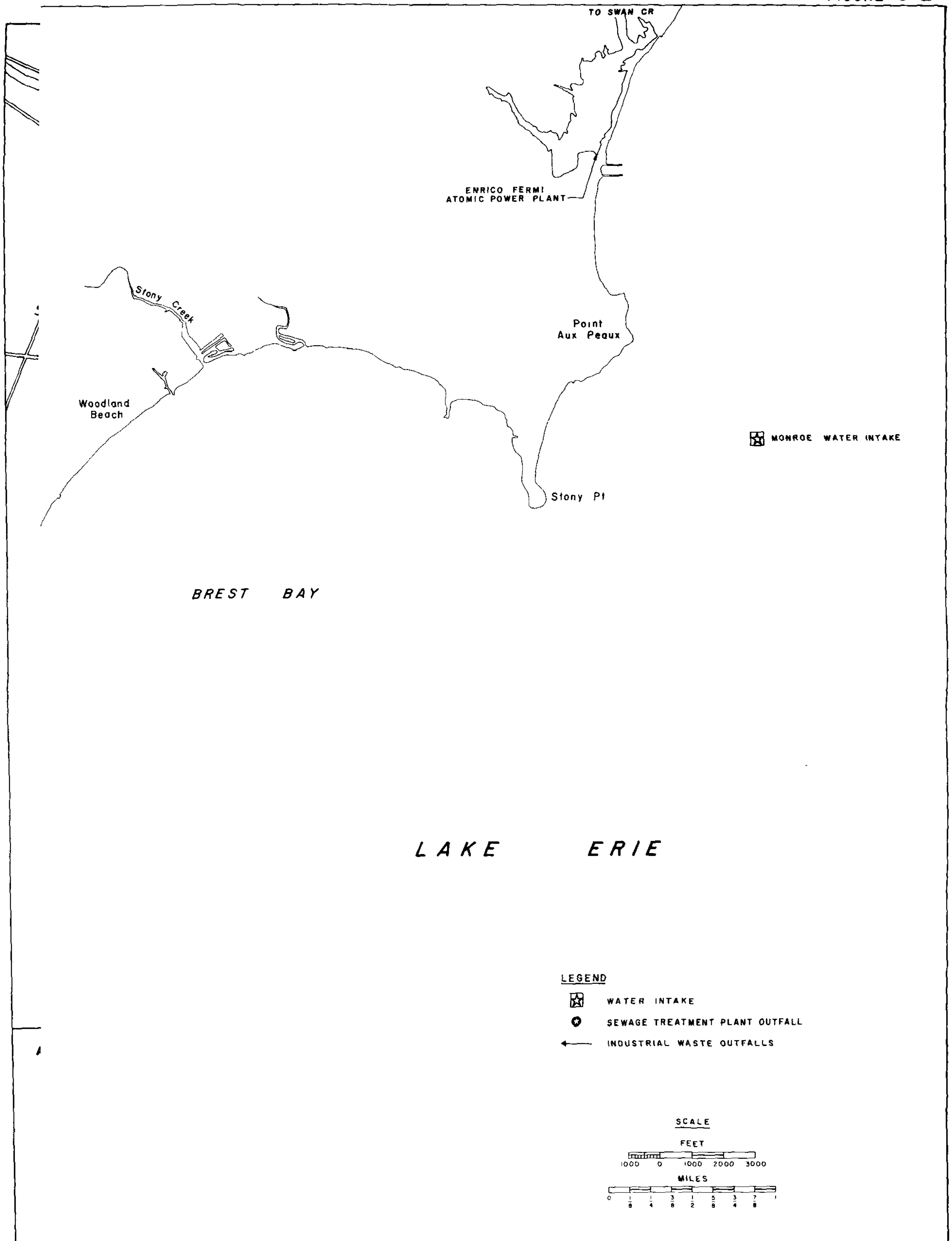

DETROIT RIVER-LAKE ERIE PROJECT
INDUSTRIAL WASTE OUTFALLS
U.S. WATERS
DETROIT RIVER
U S DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN
SCALE
FEET
1000 0 1000 3000 5000 7000
MILES
AMHERSTBURG
Bar Point
BOIS BLANC ISLAND
ERIE
LAKE
Detroit River Lt
Elba Island
Sugar Island
Hickory Island
GROSSE ILE NAVAL AIR STATION
Swan Island
Celeron Island
Horse Island
Sturgeon Bar
CHRYSLER CORP CHEMICAL PRODUCTS DIVISION AMPLEX DIV
McLOUTH STEEL CORP GIBRALTAR PLANT
GIBRALTAR
Maple Beach
Milleville Beach
Huron River
POINTE MOUILLEE

FIGURE 6-II



DETROIT RIVER-LAKE ERIE PROJECT

WATER INTAKE — DOMESTIC AND INDUSTRIAL WASTE OUTFALLS

MICHIGAN WATERS OF LAKE ERIE

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

Richard D. Vaughan

MUNICIPAL WATER USES

The data presented in Table 8-II have been extracted from the State of Michigan, Municipal Water Facilities Inventory as of January 1, 1963. This inventory was recently updated by the Michigan Department of Health to reflect changes which have occurred since the last published inventory of 1958. Locations of municipal water intakes in the study area are shown in Figures 6-II and 7-II.

(See page 218 for Figure 6-II.)

(Table 8-II and Figure 7-II follow.)

TABLE 8-II. MUNICIPAL WATER USE

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity (MGD)	Average Daily Output (MGD)	Treatment
Allen Park	Wayne	(37,800)	10,133	10,133	W.C.M.W.S.	-	-	-
Berkley	Oakland	(23,300)	6,618	6,618	S.E.O.W.A.	-	-	-
Beverly Hills	Oakland	(5,000)	x	x	S.E.O.W.A.	-	-	-
Birmingham	Oakland	(25,500)	7,716	7,716	S.E.O.W.A.	-	-	-
Brownstown Twp.	Wayne	(4,000)	364	364	Flat Rock W.C.M.W.S.	-	-	
Canton Twp.	Wayne	(300)	75	75	Detroit	-	-	
Centerline	Macomb	(10,200)	2,231	2,231	Detroit	-	-	
Clawson	Oakland	(14,900)	4,193	4,193	S.E.O.W.A.	-	-	
Dearborn	Wayne	(112,500)	32,366	32,366	Detroit	-	-	
Dearborn Twp.	Wayne	(79,800)	17,571	17,571	W.C.M.W.S.	-	-	
Detroit	Wayne	(3,211,600)	389,000	389,000	Detroit River	1114	487	P-Dc Ca Tc Mtbp Sc Frs Dc
Detroit Water Wks. Pk. Plt.		760,000 ('58)				320	191 ('58)	
Detroit Spring-wells Plt.		673,000 ('58)				452	163 ('58)	

TABLE 8-II. MUNICIPAL WATER USE (CONTINUED)

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity (MGD)	Average Daily Output (MGD)	Treatment
Detroit Northeast Plt.		477,000 ('58)				192 ('63)	115 ('58)	
Detroit Southwest Plt.		200,000			Detroit River	150	75 (est)	
East Detroit	Macomb	(45,800)	12,482	12,482	Detroit	-	-	
Ecorse	Wayne	(17,400)	4,505	4,505	Detroit			
Farmington	Oakland	(6,900)	2,137	2,137	Detroit			
Farmington Twp.	Oakland	(2,900)	780	780	Detroit			
Ferndale	Oakland	(31,400)	9,745	9,745	Detroit			
Flat Rock	Wayne	7,000			Huron River		1.0	P-Dc Calo (MtpsSV) Frs Dc Kc
Garden City	Wayne	(38,300)	9,506	9,506	W.C.M.W.S.	-	-	
Gibraltar	Wayne	(2,500)	835	835	W.C.M.W.S.	-	-	
Grosse Ile Twp.	Wayne	(6,700)	1,770	1,770	W.C.M.W.S.	-	-	
Grosse Pointe Pk.	Wayne	(15,400)	3,995	3,995	Detroit	-	-	
Grosse Pointe Shores	Wayne	(2,400)	725	725	Detroit	-	-	

TABLE 8-II. MUNICIPAL WATER USE (CONTINUED)

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity	Average Daily Output	Treatment
Grosse Pointe Woods	Wayne	(18,800)	5,563	5,563	Detroit	-	-	
Hamtramck	Wayne	(34,100)	7,867	7,867	Detroit			
Harper Woods	Wayne	(20,000)	5,318	5,318	Detroit			
Hazel Park	Oakland	(25,800)	7,526	7,526	Detroit via Royal Oak Twp.	-	-	
Huntington Woods	Oakland	(8,700)	2,413	2,413	S.E.O.W.A.	-	-	-
Huron Twp.	Wayne	(800)	222	222	Detroit			
Inkster	Wayne	(39,100)	9,959	9,959	Detroit	-	-	
Lathrup Village	Oakland	(3,600)	1,066	1,066	S.E.O.W.A.	-	-	
Lincoln Park	Wayne	(54,000)	14,751	14,751	Detroit	-	-	
Livonia	Wayne	(67,500)	18,125	18,125	Detroit	-	-	
Madison Heights	Oakland	(33,400)	8,975	8,975	Detroit via Royal Oak Twp.			
Melvindale	Wayne	(13,100)	3,648	3,648	Detroit			
Monroe	Monroe	24,500	8,000	8,000	Lake Erie	8.0	3.0	PDc Cal MSv Frs Ng Vs

TABLE 8-II. MUNICIPAL WATER USE (CONTINUED)

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity (MGD)	Average Daily Output (MGD)	Treatment
Nankin Twp.	Wayne	(43,600)	12,310	12,310	Detroit-Flat Rock			
Oak Park	Oakland	(36,700)	9,480	9,480	Detroit			
Pleasant Ridge	Oakland	(3,800)	1,236	1,236	S.E.O.W.A.			
Plymouth Twp.	Wayne	(3,000)	800	800	Detroit			
Pontiac	Oakland	(80,000)	21,088	19,319	From Wells to Detroit in 63		9.145	Wells-DcDhKc
Redford Twp.	Wayne	(71,600)	18,550	18,550	Detroit	-	-	-
River Rouge	Wayne	(18,200)	4,024	4,024	Detroit			
Riverview	Wayne	(6,800)	1,760	1,760	W.C.M.W.A.			
Rockwood	Wayne	(2,200)	-	-	Flat Rock			
Romulus Twp.	Wayne	(9,900)	2,679	2,679	W.C.M.W.A.			
Roseville	Macomb	(50,900)	12,800	12,800	Detroit			
Royal Oak	Oakland	(82,000)	21,720	21,720	Detroit			
S.E.O.W.A.	Oakland	-	-	-	Detroit			

TABLE 8-II. MUNICIPAL WATER USE (CONTINUED)

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity (MGD)	Average Daily Output (MGD)	Treatment
Southgate	Wayne	(29,500)	7,489	7,489	Detroit			
Southfield	Oakland	(28,500)	6,716	6,716	S.E.O.W.A.			
St. Clair Shores	Macomb	(76,900)	21,108	21,108	Detroit			
Sterling Twp.	Macomb	(8,100)	2,355	2,355	Detroit			
*Sycamore Beach	Monroe	200	50	x	Well			
Taylor Twp.	Wayne	(50,000)	13,875	13,875	Detroit			
Trenton	Wayne	(19,000)	5,036	5,036	W.C.M.W.A.			
Troy	Oakland	19,058	x	x	Detroit in 1963			
Utica	Macomb	1,400	696	687	Clinton Riv to Detroit '63			
W.C.M.W.A.	Wayne	-	-	-	Detroit			
W.C.M.W.S.	Wayne	-	-	-	Detroit			
Warren	Macomb	(95,300)	27,222	27,222	Detroit			
Wayne	Wayne	(16,400)	4,413	4,413	W.C.M.W.A.			

TABLE 8-II. MUNICIPAL WATER USE (CONTINUED)

Community	County	Estimated Population Served 1963	Number of Accounts	Number of Meters	Source of Supply	Rated Capacity (MGD)	Average Daily Output (MGD)	Treatment
Wyandotte	Wayne	43,900	12,523	12,523		10	6.0	P-DcS Cal MlpVs TcdSc Frs Kc

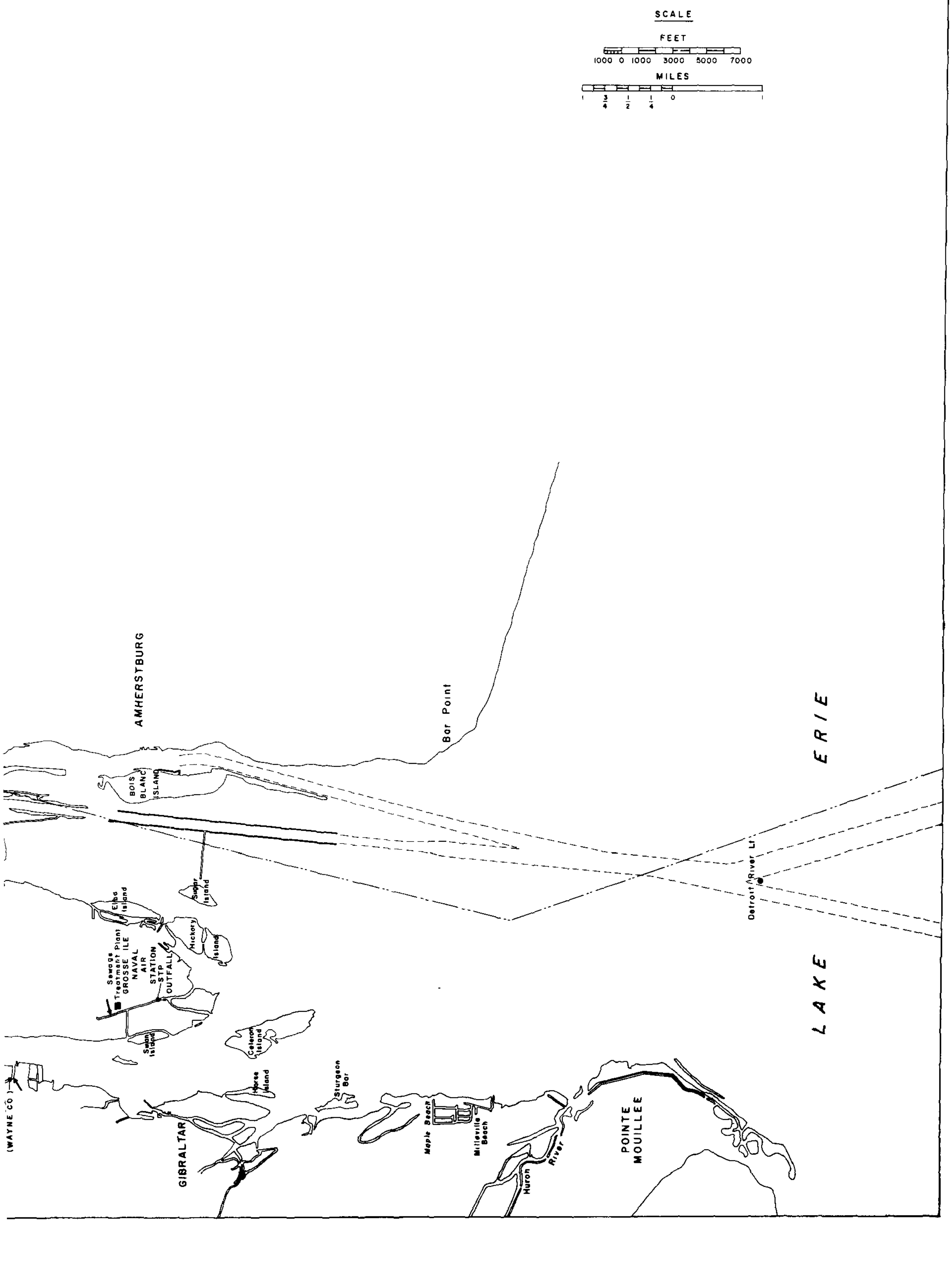
FIGURE 7-II

DETROIT RIVER–LAKE ERIE PROJECT

DOMESTIC WATER INTAKES
SEWAGE PLANT OUTFALLS
COMBINED SEWER OVERFLOWS

U.S. WATERS–DETROIT RIVER

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



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Detailed Notes for Columns:

Column 1 - Community

Communities which serve one or more additional communities are preceded by an asterisk.

Column 3 - Estimated Population Served (1963)

This is the estimated total number of people served by the facility shown in Column 6 - Source of Supply. The number enclosed in parentheses indicates the people are served by some other facility.

Column 4 - Number of Accounts

This number represents the total number of accounts served by the facility.

Column 5 - Number of Meters

This number represents the total number of meters used in the water system.

Column 6 - Source of Supply

The following are the abbreviations used and for what they stand:

W.C.M.W.A. - Wayne County Metropolitan Water Authority.

W.C.M.W.S. - Wayne County Metropolitan Water Supply.

Column 7 - Rated Capacity

This figure is the maximum rated capacity (in MGD) on the basis of design, where possible.

Column 8 - Average Daily Output

This column contains the average daily output of the system during 1962 or the latest year of record if not otherwise noted.

Column 9 - Treatment

Where the treatment is extensive, or one or more symbols identifying the general type or function of the plant precede those used to identify the particular treatment plant or method. In general, a plant is not classified as a "purification plant" unless filters having fine granular material (sand or anthracite) are used.

Principal treatment features; identified by capitalized letters, are further described by lower case letters following them. In general, the symbols are arranged in the order in which treatment occurs. Combination units performing more than one function in a single structure are denoted by enclosing the appropriate symbols in parentheses. Enclosures in brackets indicate parallel or alternate operation.

Treatment methods are coded as follows:

Type of Plant

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P - Purification

H - Softening

I - Iron or manganese removal

Treatment or Device

A - Aeration

Ac.. contact beds or trays, coke or other material

Am.. patented aerator

As.. spray aerator

At.. overflow trays cascade or other splash aerator

Ao.. other type aerator

Af. forced draft aerator

C - Chemical dosage for coagulation or softening

Ca.. alum

Ci.. iron salts

Cl.. lime

Cs.. soda ash

Ct. activated silica

Co. other coagulant

D - Disinfection

Dc. chlorine gas

Dd. dechlorination

Dh.. hypochlorites

Ds.. free residual chlorine

Dx.. chlorine dioxide

Dz.. ozone

Do. other means

F - Filters

Fa.. anthrafilt

Fe.. roughing or contact

Fd.. diatomaceous earth

Fg.. gravity (slow)

Fp.. pressure

Fr.. gravity (rapid)

Fs.. sand

Fz.. zeolite

Fm.. micro strainers

K - Chemical dosage for corrosion correction or water stabilization

Kc.. phosphate compounds

Kg.. chlorine gas

Kh.. hypochlorite

Ko.. sodium silicate

Kp.. alkali feed for pH adjustment

M - Mixing device or tank

Ma .. air agitation

Mb .. baffle mix

Mh .. hydraulic (standing wave flume)

Mi .. injection or pump suction

Mp .. slow mechanical mix

Ms .. patented sludge blanket

Mt .. rapid mechanical mix

(MtpsSv) .. "Liquon Reactor"; "Accelator"; or "Precipitator"

N - Ammoniation

Nc .. ammonium compound

Ng - ammonia gas

R - Recarbonation

S - Sedimentation

Sb .. basins, baffled (other than inlet or outlet)

Sc .. covered basins (other than housed)

Sm - mechanical sludge removal

So .. open basin (may be in plant building)

Sv - upflow cylindrical tanks

(MtpsSv) ., "Liquon Reactor"; Accelator"; or "Precipitator"

T - Chemical taste and odor control

Tc .. activated carbon

Td .. chlorine dioxide

Ts - sulfur dioxide

Tz - ozone

To - other

V - Fluoride adjustment

Va .. hydrofluosilicic acid

Vs - sodium silicofluoride

Vt - sodium fluoride

Ve - ammonium silicofluoride

Vo - other fluorides

V .. fluoride reduction

$V_{1.2}$- 1.2 ppm natural fluor

The major municipal sewage treatment facilities discharging into waters within the Project's study area are tabulated in Table 9-II. Smaller public systems are operated for the express purpose of serving subdivisions or housing areas. The majority of these smaller facilities are located within Grosse Ile Township. Figures 6-II and 7-II represent the location of the municipal water intakes in relation to domestic waste treatment plants and outfalls in both the Detroit River and Lake Erie.

Key to symbols Table 9-II:

B - Sludge beds
Bo .. Open

C - Settling tanks
Cm .. Mechanically equipped
Cp .. Plain, hopper bottom or intermittently drained for cleaning

D - Digester, separate sludge
Df .. With floating cover
Dh .. Gas used in heating
Dr .. Heated
Ds .. Gas storage in separate holder
Dt .. Stage digestion

E - Chlorination
Ec .. With contact tank
Eg .. By chlorine gas

G - Grit chambers
Gl .. Without continuous removal mechanism
Gm .. With continuous removal mechanism

H - Sludge storage tanks

S - Screens
Sc .. Comminutor
Sl .. Bar rack, hand cleaned
Sm .. Mechanically cleaned

V - Mechanical sludge dewatering
Vv .. Rotary vacuum filter

X - Sludge disposal
Xn .. incinerated

Z - Sludge conditioning
Zi .. Chemicals used, iron salt
Zl .. Chemicals used, lime
Zy .. Elutriation

TABLE 9-II. DOMESTIC WASTE TREATMENT AND DISPOSAL

Location of Plant	Population Served	Number of Political Subdivisions Served	Average Flow(MGD)	Treatment* Facilities	Point of Discharge
Belle Isle	450(est.)	1	0.3	Cp X Gh	Detroit River
Detroit	2,782,000	50	548	Sm Gm Eg (Dfrh Zy Zil)	Detroit River
Flat Rock	4,700	1	0.8	Sh Gm Eg X	Huron River
Grosse Ile (Wayne Co.)	700(est.)	1	0.35	Cm Eg C X	Detroit River
Monroe	22,000	1	6.0	Sc Gm Cm Eg C Dfrtsh Bo	Raisin River
Riverview (New)	8,000(est.)	1	1.0(est.)	Cp Egc Gm H Sm X	Detroit River (Trenton Channel)
Rockwood	2,000	1	0.26	Sh Cm Eg X	Huron River
Trenton (Wayne Co.)	20,000	3	2.25	Sm Cm Eg C	Detroit River (Trenton Channel) (Elizabeth Park Canal)
Trenton (New)	20,000	3	2.25(est.)	Cp Eg C Gm H Sch Vv Xn Zcil	Detroit River (Trenton Channel) (Elizabeth Park Canal)
Wyandotte (Wayne Co.)	275,000	10	25	Sc Gm Cm Eg C H Vv Xn Zil	Detroit River (Trenton Channel)

*See Key to Symbols which follows

Table 10-II and Figure 7-II give the location of all the stormwater overflows which may have a significant effect on the Detroit River. In most cases the overflows are located by the names of the streets to which they are nearest. The outfalls are listed from upstream to downstream.

TABLE 10-II. STORMWATER OVERFLOW LOCATIONS

CITY OF DETROIT

Location	No. and Size	Receiving Water
Fox Creek	2 - 10'0"x10'0"	Fox Creek
	1- 12'0"	
Conners Creek	3 - 18'6"x21'9"	Conners Creek
	3 - 14'0"x14'0"	
Fischer	1 - 13'9"	Detroit River
Iroquois	6 - 4'8"	"
E. Grand Blvd.	1 - 11'0"	"
Helen	1 - 9'0"	"
Mt. Elliott	4 - 5'0"	"
Lieb	2 - 10'0"x10'6"	"
Adair	1 - 5'0"	"
Jos. Campau	3 - 6'0"x8'8"	"
Chene	2 - 3'8"	"
Dubois	2 - 5'0"x4'9"	"
	1 - 4'9"	
St. Aubin	1 - 5'0"	"
Orleans	1 - 3'0"	"
Hastings	1 - 5'0"	"
St. Antoine	1 - 5'0"	"
Beaubien	1 - 3'0"	"
Brush	1 - 2'6"x3'0"	"
Randolph	1 - 8'0"	"
Bates	1 - 13'6"	"
Woodward	2 - 6'8"	"
	1 - 8'0"	
Griswold	1 - 7'0"	"
Cass	2 - 4'0"x5'0"	"
First	2 - 10'0"x10'6"	"
Second	1 - 4'9 1/2"x5'7" arch	"
	1 - 5'0"x5'7" arch	"
Third	3 - 4'0" arches	"
Brooklyn	1 - 2'0"	"
S. of Tenth	2 - 5'0"	"
Twelfth	2 - 4'0"	"
Fourteenth	2 - 4'3"	"
Eighteenth	2 - 5'3"	"
Twenty-first	1 - 4'6"x6'0" oval	"
Twenty-fourth	1 - 8'0"	"
W. Grand Blvd.	1 - 3'0"	"
Swain	1 - 3'0"	"
Scotten	2 - 4'8"	"
McKinstry	2 - 4'6"	"
Summit	3 - 7'6"x8'8"	"
Ferdinand	2 - 4'6"	"
Morrell	4 - 5'0"	"

CITY OF DETROIT--Continued

Location	No. and Size	Receiving Water
Junction	1 - 13'0"	Detroit River
Campbell	1 - 6'6"	"
	1 - 6'2"	"
	1 - 6'3"	"
Dragoon	1 - 10'6"	"
Schroeder	2 - 5'3"	"
	1 - 6'10"	"
Fort Cutoff & Dearborn Ave.	6 - 4'6"x4'0" F. Gates	Rouge River
Flora & Reisener	2 - 1'0" F. Gates	"
Pulaski	1 - 5'0"	"
	1 - 6'6"	"
Dearborn Ave.	1 - 5'9"	"
Gary	2 - 3'0"	"
Anderson	1 - 3'0"	"

CITY OF DEARBORN

Location	No. and Size	Receiving Water
Westwood	1 - 2'6"	L. Rouge River
Silvery Lane	1 - 3'0"	"
1000' W. of Telegraph	1 - 8'0"	"
Telegraph	1 - 8'0"	"
	1 - 7'6"	
1000' E. of Telegraph	1 - 1'0"	"
Outer Drive	1 - 4'0"	"
	1 - 10'0"	
Reginald	1 - 9'6"	"
Military	1 - 6'3"	"
Monroe	1 - 2'6"	"
Willoway	1 - 4'6"	"
750' E. of East End of Garrison	1 - 4'9"	"
2000' W. of Southfield Road	1 - 11'6"	Rouge River
2000' E. of Southfield Road	1 - 12'0"	"
2500' E. of Southfield Road	1 - 10'0"x12'9"	"
N. Dearborn Road & Rotunda Drive	1 - 5'0"x10'0"	"
Ford Motor Company	1 - 10'0"x12'6"	"
Boat Slip	1 - 10'0"x11'6"	"
	1 - 10'0"x11'0"	"

CITY OF RIVER ROUGE

Location	No. and Size	Receiving Water
Jefferson	1 - 6'0"	Rouge River

CITY OF ECORSE

Location	No. and Size	Receiving Water
Southfield	1 - 4'0"	Detroit River

CITIES OF ALLEN PARK AND LINCOLN PARK

Location	No. and Size	Receiving Water
White	1 - 5'6"	Ecorse River
Farnham	1 - 5'6"	"
Near Junction of	2 - 9'0"x9'0"	"
S. Branch	1 - 5'6"	

CITY OF WYANDOTTE

Location	No. and Size	Receiving Water
Perry	1 - 3'6"	Detroit River
Superior Blvd.	1 - 3'0"	"
	2 - 4'0"	
Orange	1 - 3'0"	Trenton Channel
Ludington	1 - 3'0"	"

CITY OF RIVERVIEW

Location	No. and Size	Receiving Water
Pennsalt Chemical Company property	1 - 4'0"x4'0"	Trenton Channel
Sibley	1 - 3'6"	"

CITY OF TRENTON

Location	No. and Size	Receiving Water
Elm	1 - 4'6"	Trenton Channel
Elizabeth	1 - 2'6"	Elizabeth Park Canal
S. of Detroit Edison Co.	Unknown	" " "

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SECTION III

POPULATION AND MANUFACTURING TRENDS

INTRODUCTION

In an urban and highly industrialized region such as the Detroit metropolitan area, lakes and rivers are not only objects of beauty and recreation, but are crucial to maintaining high levels of productivity and prosperity. Vast quantities of water are consumed daily by cities, to wash and nourish their citizens, and by industries, to cool their machines and process their goods. Approximately 3,582,850,000 gallons of water per day are used for industrial purposes alone in the Detroit area. Since industrial and population expansion is almost a sure thing in Detroit, it is also probable that demands for water will increase. Pollution, then, is not only a destruction of natural beauty but an economic debit, for it cuts down the supply of water that is useful. In this section the probability of a need for increased quantities of clean water will be demonstrated, in a general way, by estimates of projected population and manufacturing growth in the Detroit area.

The State of Michigan is part of the large industrial complex of the United States known as the "manufacturing belt." The belt or "strip" comprises portions of the three Middle Atlantic States of New Jersey, New York, and Pennsylvania and of the five East North Central States of Illinois, Indiana, Michigan, Ohio, and Wisconsin. Michigan is particularly closely tied to the group of East North Central States, and a description of manufacturing and population trends on these five states is included here, as a context in which to place the Detroit Project area. For the purposes of this section, "the Project area" includes Macomb, Monroe, Oakland, and Wayne counties. The Detroit Standard Metropolitan Statistical Area (DSMSA) includes only Macomb, Oakland, and Wayne Counties; Monroe County has been added because of its contiguity to Lake Erie.

INDUSTRIAL PRODUCTIVITY

Regional Trends

Table I-III indicates the trends in value added by total manufacture in the five-state region of Illinois, Indiana, Michigan, Ohio, and Wisconsin.

(Table I-III is as follows.)

TABLE 1-III. VALUE ADDED BY TOTAL MANUFACTURE FOR ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN
1939 - 1962
DOLLAR AMOUNTS IN MILLIONS

State	1939 Value Added	1939 %N	1947 Value Added	1947 %N	1954 Value Added	1954 %N
Illinois	2201.6	8.986	6683.1	8.995	9663.8	8.232
Indiana	970.2	3.960	2970.0	3.997	4632.0	3.945
Michigan	1798.4	7.340	5200.1	6.999	8707.2	7.417
Ohio	2125.5	8.675	6358.0	8.558	10154.4	8.650
Wisconsin	686.6	2.802	2171.8	2.923	3198.2	2.724
Total	7782.3	31.763	23383.0	31.472	36355.6	30.968

State	1958 Value Added	1958 %N	1960 Value Added	1960 %N	1962 Value Added	1962 %N
Illinois	11664.1	8.256	12652.6	7.751	12670.9	7.624
Indiana	5478.1	3.877	6259.8	3.834	7094.0	3.956
Michigan	8363.6	5.920	10864.7	6.656	11969.3	6.675
Ohio	11472.5	8.120	13841.8	8.479	14577.7	8.129
Wisconsin	3959.5	2.802	4680.3	2.867	5100.2	2.844
Total	40937.8	28.975	48299.2	29.587	51412.1	29.228

%N = Percent of Nation

Note: Dollar values have not been adjusted for price change.

Source: 1939 Census of Manufactures; Census of Manufactures, Volume III, Area Statistics, P 148-49 (for 1947 and 1954); 1958 Census of Manufactures, Area Reports for Illinois, Indiana, Michigan, Ohio, and Wisconsin; 1960 Annual Survey of Manufactures, Part 3 - East North Central Area Report. 1962 Annual Survey of Manufactures, Part 3 - East North Central Area Report.

As a percent of the nation's total, the five-state region declined slightly but steadily from 1939 to 1958. The 1958 five-state total of value added by manufacture as a percent of the nation was about 29 as compared with about 31.4 percent in 1947. From 1958 to 1962 the percentage share of the nation increased slightly again and, of course, actual dollar value greatly and steadily increased since 1939, though at a little less than the national rate.

Project Area Trends

Manufacturing in Michigan and in the Detroit area is characterized by heavy concentration in durable goods production (automobiles, industrial machinery, etc.). When the national economy enters a recession, durable goods always suffer a greater contraction of their market than do nondurable goods. Accordingly Detroit, because of its heavy dependence on such manufacture, experience widespread fluctuations in its local economy.

Manufacturing in the Detroit area is further characterized by heavy concentration in a single industry, namely, motor vehicle production. In recent decades, however, the automobile industry has been responsible for a decreasing proportion of total manufacturing employment in the area, i.e. some diversification of the manufacturing economy is occurring. The future may see industries which are heavy users of water playing a larger role in Detroit's economy. These are: food and foodstuffs processing; paper and allied products manufacturing; chemicals manufacturing; petroleum and coal processing; and primary metals manufacturing. Trends in value added by manufacture for heavy water-using industries are shown in Table 2-III (data for Monroe County were not available and it was not included in the Table).

(Table 2-III is as follows.)

TABLE 2-III. INDUSTRIAL TRENDS OF DETROIT STANDARD METROPOLITAN STATISTICAL AREA, 1947-1962 FOR WATER USING INDUSTRIES (VALUE ADDED BY MANUFACTURE) DOLLAR AMOUNTS IN MILLIONS

	1947			1954			1958		
	Value Added	%A	%N	Value Added	%A	%N	Value Added	%A	%N
Food and Kindred Products	120.5	5.574	1.434	213.6	7.762	1.857	256.5	5.954	1.465
Paper and Allied Products	23.0	2.964	.789	37.9	3.302	.818	38.6	2.772	.676
Chemicals and Allied Products	123.7	9.079	2.326	219.1	10.124	2.294	240.8	8.741	1.962
Petroleum and Coal Products	35.3	8.194	1.772	27.6	4.439	1.231	29.1	5.499	1.155
Primary Metal Industries	275.3	11.400	4.802	469.5	12.123	4.742	432.8	9.975	3.708
Total	577.8			967.7			997.8		

	1960			1962	
	Value Added	%A	%N	Value Added	%N
Food and Kindred Products	279.9	5.806	1.423	313.4	1.748
Paper and Allied Products	N/A	-	N/A	N/A	-
Chemicals and Allied Products	277.3	8.849	1.928	268.3	1.496
Petroleum and Coal Products	N/A	-	N/A	N/A	-
Primary Metal Industries	673.0	12.501	5.054	711.3	3.967
Total	N/A			N/A	

N/A = Not available.
%A = Percent of five-state area.
%N = Percent of Nation.

Note: Dollar figures have not been adjusted for price changes.

Source: U.S. Census of Manufactures for years shown, except 1960 and 1962, which are from U.S. Annual Survey of Manufactures.

Table 2-III indicates that the Detroit SMSA's share of the nation's total held relatively constant from 1947 to 1954, declined sharply from 1954 to 1958, regained a large part of the loss by 1960, and turned downward again in 1962. The large concentration of durable-goods industries in the Detroit area, as mentioned earlier, is the major cause of this wide fluctuation. The primary metals industry, a large water-user, showed a sharp increase in activity between 1938 and 1960.

Table 3-III shows value added for all manufacture in the Project area broken down by county. The trend was down from 1939 to 1947, relatively constant from 1947 to 1958, and down sharply from 1954 to 1958, During 1962, value added by manufacture in the four-county Project area totaled approximately 6.1 billion - almost 4 per cent of the nation's total, 51.0 of Michigan's total, and 11.6 per cent of the five-state total.

(Table 3-III follows.)

TABLE 3-III. VALUE ADDED BY MANUFACTURE IN COUNTIES OF THE DETROIT RIVER-LAKE ERIE PROJECT AREA, 1939 - 1962
DOLLAR AMOUNTS IN MILLIONS

County	1939 Value Added	1939 %A	1939 %N	1947 Value Added	1947 %A	1947 %N	1954 Value Added	1954 %A	1954 %N
Macomb	20.0	1.81	.081	106.4	3.60	.142	281.2	5.88	.239
Monroe	13.6	1.23	.055	44.6	1.51	.061	68.0	1.42	.058
Oakland	64.0	5.80	.261	261.5	8.84	.351	532.0	11.14	.453
Wayne	1004.6	91.16	4.100	2544.8	86.05	3.426	3900.0	81.56	3.322
Total	1102.2		4.497	2957.3		3.980	4781.2		4.072

County	1958 Value Added	1958 %A	1958 %N	1960 Value Added	1960 %A	1960 %N	1962 Value Added	1962 %A	1962 %N
Macomb	486.4	11.13	.344	577.3	10.07	.353	655.2	10.80	.365
Monroe	58.1	1.33	.041	67.9	1.19	.041	75.3	1.24	.042
Oakland	538.8	12.33	.382	866.4	15.12	.530	1007.7	16.63	.562
Wayne	3287.2	75.21	2.327	4219.9	73.62	2.585	4320.0	71.31	2.404
Total	4370.5		3.094	5731.5		3.509	6058.2		3.373

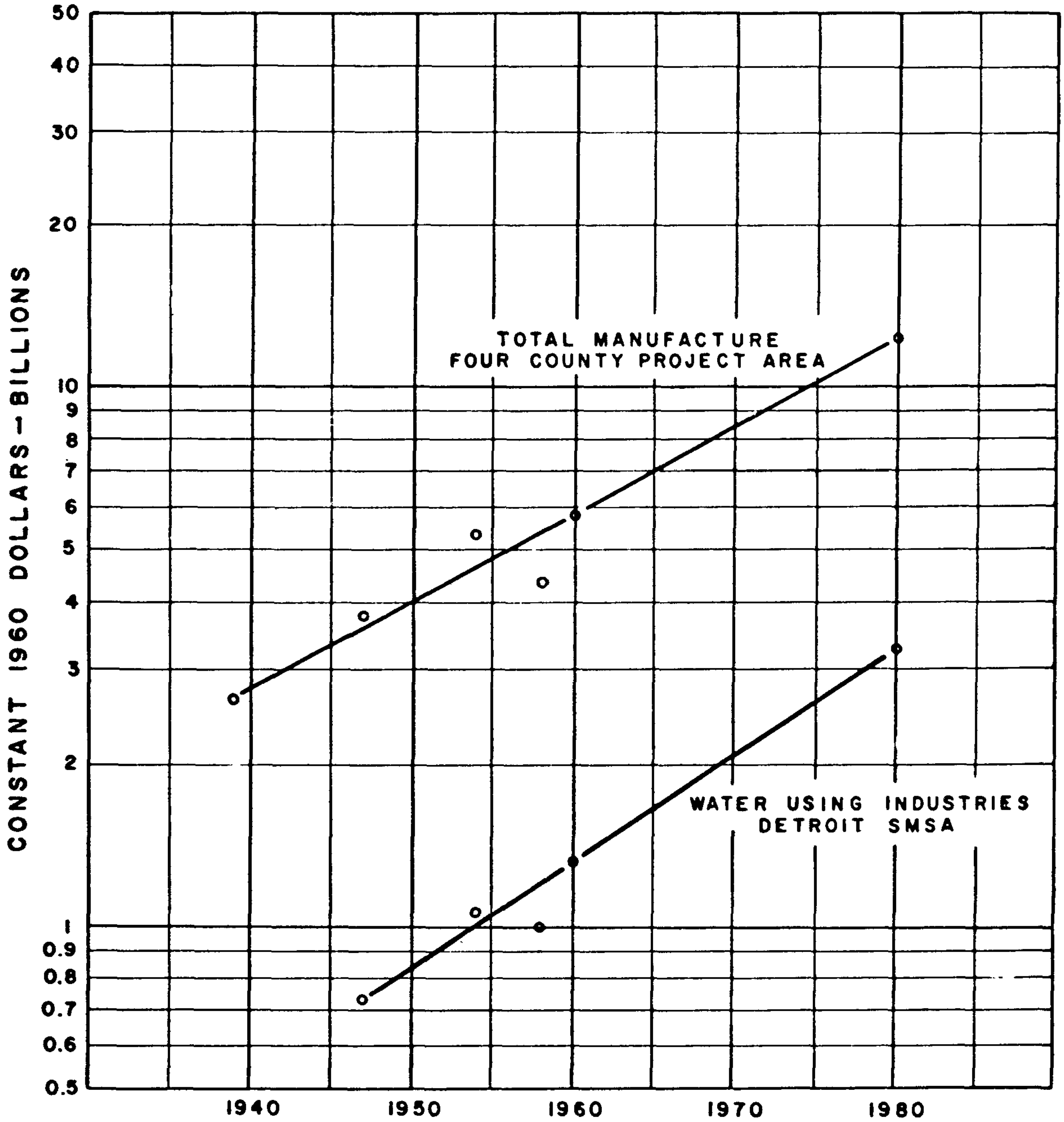
%A = Percent of Project area
%N = Percent of Nation

Source: U.S. Census of Manufactures for years shown, except 1960 and 1962, which are from U.S. Annual Survey of Manufactures.

Dollar figures indicating value added by total manufacturing (Table 3-III) and by major water-using industries (Table 2-III) were converted to 1960 constant dollars by use of the wholesale price index (1947-49-100). On the basis of 1960 dollars as a measure of industrial activity, all manufacturing output doubled between 1939 and 1960, and output of the major water-using industries increased by 80 per cent between 1947 and 1960. The growth rate of all manufacturing in the area from 1939 to 1960 was 3 3/4 per cent, annually compounded. The growth rate of the major water-using industries from 1947 to 1960 was 4 3/4 per cent annually compounded. Although little room for new industries is available on the Detroit waterfront, there is evidence that future industrial growth will be as great as previously and that means of obtaining necessary water will be found. Using compound growth rates it is anticipated that total manufacturing in the area will double in value added and that major water-using manufacture will increase by 150 per cent between 1960 and 1980. (See Figure 1-III and Table 8-III)

(Figure 1-III and Table 8-III follow)

FIGURE I-III



DETROIT RIVER-LAKE ERIE PROJECT

TRENDS IN VALUE ADDED BY MANUFACTURE IN PROJECT AREA 1939-1980

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

TABLE 8-III. SUMMARY OF POPULATION AND MANUFACTURING GROWTH TRENDS IN DETROIT RIVER-LAKE ERIE PROJECT AREA

Year	Population
1910	646,690
1940	2,435,849
1950	3,091,863
1960	3,863,750
1980	5,475,000

Year	Value Added by Total Manufacture *
1939	$2,630,000,000
1947	$3,640,000,000
1954	$5,181,000,000
1958	$4,381,000,000
1960	$5,731,000,000
1980	$12,000,000,000

Year	Value Added by Water-Using Industries *
1947	$717,000,000
1954	$1,049,000,000
1958	$1,000,000,000
1960	$1,298,000,000
1980	$3,234,000,000

* In constant 1960 dollars

Richard D. Vaughan

POPULATION GROWTH

Regional Trends

The total five-state population showed little change from 1940 to 1960 as a percent of the nation's population, from 3.9% to 4.3%. All five states, of course, had actual increases in population.

The trend in total manufacturing employment in the five-state area was greatly similar to that in total manufacturing value added, that is, an increase in percent of the nation from 1939 to 1954, a decline from 1954 to 1958, and recovery thereafter (see Table 4-III).

(Table 4-III follows)

TABLE 4-III. TOTAL MANUFACTURING EMPLOYMENT OF ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN
1939 - 1962

State	1939 Mfg. Empl. (000)	1939 %N	1947 Mfg. Empl. (000)	1947 %N	1954 Mfg. Empl. (000)	1954 %N
Illinois	759.7	7.538	1186.1	7.756	1222.4	7.580
Indiana	340.6	3.378	548.3	3.584	587.3	3.642
Michigan	621.2	6.163	975.5	6.376	1056.5	6.551
Ohio	735.3	7.296	1194.3	7.809	1292.6	8.015
Wisconsin	254.6	2.526	405.9	2.655	439.2	2.737
Total	2711.4	26.901	4310.1	28.180	4598.0	28.525

State	1958 Mfg. Empl. (000)	1958 %N	1960 Mfg. Empl. (000)	1960 %N	1962 Mfg. Empl. (000)	1962 %N
Illinois	1186.8	7.406	1208.8	7.227	1194.1	
Indiana	550.9	3.437	588.0	3.515	596.7	
Michigan	880.4	5.494	964.0	5.763	936.6	
Ohio	1196.1	7.464	1265.6	7.566	1222.6	
Wisconsin	438.6	2.737	465.8	2.784	469.7	
Total	4252.8	26.538	4492.2	26.855	4419.7	

%N = Percent of Nation

Source: 1939 Census of Manufactures; **Census of Manufactures, Volume III, Area Statistics, P 48-49** (for 1947 and 1954); 1953 Census of Manufactures, Area Reports for Illinois, Indiana, Michigan, Ohio, and Wisconsin; 1960 Annual Survey of Manufactures, Part 3 - East North Central Area Report. 1962 Annual Survey of Manufactures, Part 3 - East North Central Area Report.

Richard D. Vaughan

Project Area Trends

Manufacturing employment in the study area has declined since 1947 both actually and as a percent of the nation. The percentage dropped from 3.7 in 1947 to 2.6 in 1960. This decline is by no means associated with a decline in production, however, for automation in durable goods manufacture has probably accounted for a large part of the drop in employment. (See Table 6-III).

Table 7-III shows an increase in the total population of the Project area from 2.4 million in 1940 to 3 million in 1950 and 3.9 million in 1960. Although slowing down in its growth rate, the Project area grew more rapidly than the national rate throughout the two decades. By 1980 it is projected that the population of the Project area will reach 5.5 million, which would represent an increase of 41.5 percent since 1960.

Population of the four-county area as of April 1, 1963, is 3,989,000, distributed as follows: Macomb County 473,000; Monroe County 109,000; Oakland County 735,000; Wayne County 2,672,000. The 1980 projections are : Total 5,475,000; Macomb 800,000; Monroe 175,000; Oakland 1,200,000; Wayne 3,300,000.

(Tables 5-III, 6-III, 7-III, and Figure 2-III follow.)

TABLE 5-III. POPULATION OF ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN 1940 - 1960

State	1940		1950		1960	
	Population (000)	%N	Population (000)	%N	Population (000)	%N
Illinois	7897.2	5.977	8712.2	5.743	10081.2	5.621
Indiana	3427.8	2.594	3934.2	2.593	4662.5	2.600
Michigan	5256.1	3.978	6371.8	4.200	7823.2	4.362
Ohio	6907.6	5.228	7946.6	5.239	9706.4	5.411
Wisconsin	3137.6	2.375	3434.6	2.264	3951.8	2.203
Total	26626.3	20.152	30399.4	20.039	36225.1	20.197

%N = Percent of Nation's total population.

Source: U.S. Bureau of the Census population reports for years shown.

TABLE 6-III. TOTAL MANUFACTURING EMPLOYMENT IN COUNTIES OF DETROIT RIVER-LAKE ERIE PROJECT AREA, 1939 - 1960

	1939			1947			1954		
	Manufacturing Employment			Manufacturing Employment			Manufacturing Employment		
County	Number	%A	%N	Number	%A	%N	Number	%A	%N
Macomb	4512	1.34	.044	14843	2.63	.096	35120	6.42	.217
Monroe	4244	1.26	.041	6820	1.22	.044	8655	1.59	.053
Oakland	16133	4.80	.158	44566	7.90	.291	57624	10.54	.357
Wayne	311332	92.60	3.085	497832	88.25	3.257	310756	75.57	1.939
Total	336221		3.328	564061		3.688	412155		2.566

	1958			1960		
	Manufacturing Employment			Manufacturing Employment		
County	Number	%A	%N	Number	%A	%N
Macomb	46757	11.37	.292	47570	10.77	.284
Monroe	6150	1.50	.038	5864	1.33	.035
Oakland	47522	11.56	.296	55959	12.67	.334
Wayne	310756	75.57	1.939	332433	75.23	1.987
	411185		2.565	441826		2.640

%A = Percent of Project area
%N = Percent of Nation.

Source: U.S. Census of Manufactures for years shown, except 1960, which is from U.S. Annual Survey of Manufactures.

TABLE 7-III. POPULATION OF COUNTIES OF DETROIT RIVER-LAKE ERIE PROJECT AREA, 1910, 1940, 1950, 1960, 1980
(WITH PERCENT INCREASE FROM PRECEDING DECADE)

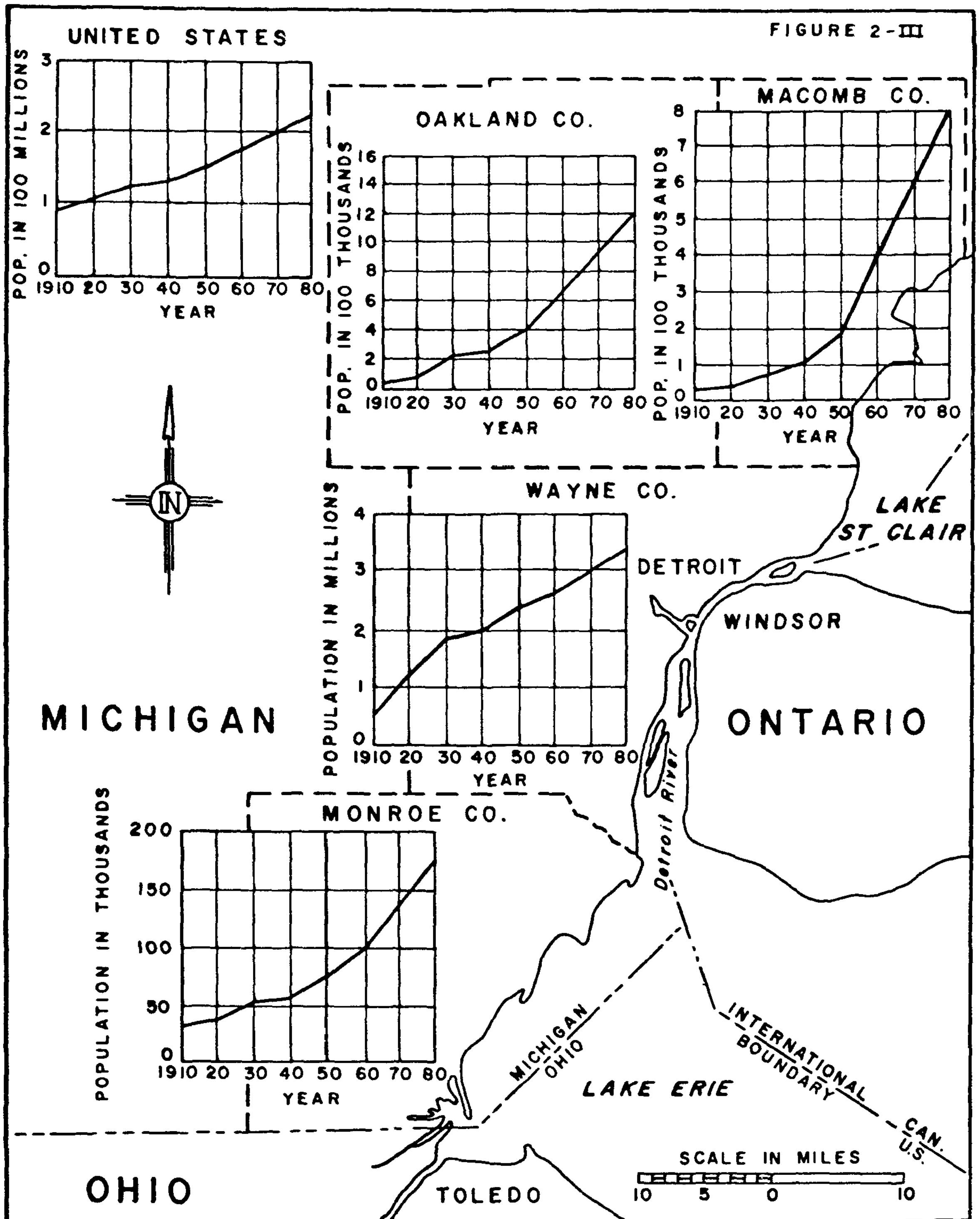
County	Persons Per Sq. Mile, 1960	1910 Total	1910 %A	1940 Total	1940 % Incr.	1940 %A	1950 Total	1950 % Incr.	1950 %A
Macomb	843.7	32,606	5.04	107,638	39.5	4.42	184,961	71.8	5.98
Monroe	179.9	32,917	5.09	58,620	11.7	2.41	75,666	29.1	2.45
Oakland	787.1	49,576	7.67	254,068	20.3	10.43	396,001	55.9	12.81
Wayne	4,392.6	531,591	82.20	2,015,623	6.7	82.74	2,435,235	20.8	78.76
Total		646,690		2,435,949			3,091,863		

County	1960 Total	1960 % Incr.	1960 %A	1980 Total	1980 % Incr.(1)	1980 %A
Macomb	405,804	119.4	10.50	800,000	48.61	14.61
Monroe	101,120	33.6	2.62	175,000	36.5	3.21
Oakland	690,529	74.3	17.87	1,200,000	36.9	21.91
Wayne	2,666,297	9.5	69.01	3,300,000	11.9	60.27
Total	3,863,750			5,475,000		

(1) Average percent increase per decade since 1960.

%A = Percent of Project area.

Source: Populations for the years 1910 - 1960, from U.S. Department of Commerce, Bureau of the Census; 1980 projections for Macomb, Monroe, Oakland, and Wayne Counties from "1970 and 1980 Population Projections," Detroit Metropolitan Area, Regional Planning Commission, Population and Housing Committee, February 1963.



DETROIT RIVER-LAKE ERIE PROJECT

POPULATION TRENDS IN FOUR COUNTY PROJECT AREA

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

Richard D. Vaughan

CONCLUSIONS

1. Between 1960 and 1980 major water-using industries in the four-county Project area expected to increase in value added by manufacture by 150%, While this increase is not directly applicable to increased water use, it is reasonable to assume that demand for industrial water will increase significantly.

2. Between 1960 and 1980 the population of the Project area is expected to increase 40% from 3.9 million to 5.5 million. This growth should greatly increase the demand for municipal water.

3. The predicted rate of industrial growth is greater than the predicted rate of population increase. Consequently, industrial waste discharges will probably increase more than municipal sewage discharges.

4. Unless effective pollution control is achieved, the increased burden of waste discharges on the Detroit River and adjacent Lake Erie will degrade the water resources of the Detroit area still further. At the same time, increased demand for clean water for all uses - industrial, municipal, and recreational - will accelerate the economic costs of pollution.

Richard D. Vaughan

SECTION IV

INVESTIGATION OF FEDERAL ACTIVITIES

INTRODUCTION

Under authority granted by Congress in the Federal Water Pollution Control Act, Section 9, agencies of the Federal Government are requested to cooperate with the Public Health Service in preventing and controlling water pollution from Federal installations, buildings, and properties. It becomes the task of the Public Health Service in an enforcement action to inspect all Federal activities in the study area and to summarize the findings and recommendations in the report to the conferees.

The information included in this section contains the results of the investigations of Federal activities within the study area. Detailed studies were made of three operations within the study area because of the increased possibility that these may have a significant bearing upon the water quality. Also included is a summary of waste disposal practices of other Federal installations located on the study waters.

NAVAL AIR STATION, GROSSE ILE, MICHIGAN

The U. S. Naval Air Station at Grosse Ile is located at the southern end of Grosse Ile Township. This station, which is comprised of approximately 600 acres, functions now as a "Weekend Warrior" center for men from five surrounding states. These men are part of twenty-five squadrons. The base has all of the facilities normally found in any municipality, such as cafeterias, housing, repair shops, recreation facilities, and other like items. Because of this, the station is quite comparable to a small city during parts of the day and days of the week.

The Naval Air Station, being a reserve training base, undergoes great fluctuations in population from day to day. The normal work week on the station is from Wednesday through Sunday contrasted with Monday through Friday for a normal community. The population on Saturday and Sunday is the largest and changes every weekend because of the different squadrons being trained.

Two significant waste sources originate from the daily routines of the base personnel. One is the domestic wastes which are discharged through an Imhoff tank and the other is the washings from the cleaning of aircraft. The treated wastes from the base sewerage facilities and the untreated wastes from aircraft washing operations are discharged into Frenchman Creek, an embayed tributary to the Detroit River. The net flow of this receiving stream is virtually zero. Its only movement of water is caused by the rising and falling of Lake Erie. Water uses observed on the stream, which is less than two miles long, were recreation and boating with one yacht club being present; esthetic enjoyment; and waste disposal from the aircraft washings, sewage treatment plant effluent, stormwater discharge; and numerous septic tank-tile field drains.

Surveys were performed on these two major waste sources by Project personnel. The treatment plant was studied from January 22 through February 12, 1963, and the washing operation during the period September 6 through September 22, 1963.

Since these surveys were conducted, it has been learned that the U. S. Department of Defense has declared that the station will be closed and all operations transferred to Selfridge Air Force Base by September 1, 1967. The edict came during the month of April, 1964, and stated that effective immediately operations would be gradually phased out so that the transfer would be complete by September 1967. Furthermore, all plans for long-range improvements and repairs of existing facilities would be re-evaluated based on the recent declaration. This decision unquestionably affected the conclusions and recommendations the Public Health Service would make regarding future sewerage and sewage treatment needs.

The township of Grosse Ile is, at this time, preparing to construct an island-wide sewerage facility consisting of a separate sanitary collection system and sewage treatment plant. Any future development of the property at the Naval Air Station, whether it be for Federal purposes or otherwise, should seriously consider tying into the proposed sewerage system of the island.

SEWERAGE AND SEWAGE TREATMENT FACILITIES

The station has a separate storm sewer system covering most of the area and a sanitary system of the combined type. The stormwater entering the sanitary sewers is, however, a small percentage of the total rainfall.

The stormwater system empties into Frenchman Creek through outfalls lying 1,200 feet and 2,500 feet south of Groh Road (the main thoroughfare through the base) as well as at the same point that the sewage plant effluent enters the creek. The sanitary sewage enters the station sewage treatment plant through two principal lines of 15 and 24-inch diameter.

There are four septic tank systems located on the base, two of which are in use. One tank, which actually under strict definition is a cesspool, serves a water closet at the boat house while the other is in the middle of the landing field south of the aircraft parking ramp.

The sewage from the station is subjected to primary treatment in an Imhoff Tank built during World War II to serve a design population of about 5,000. The original plans specified secondary sewage treatment by means of two standard rate trickling filters used in conjunction with the Imhoff Tank. The trickling filters were never constructed so the plant, at this time, has only the Imhoff Tank, chlorination during the recreation season, and sludge drying beds.

During the survey period, the population served by the treatment plant averaged 988 and varied from a low of 512 on a Monday to a high of 1,814 on a Saturday.

The outfall line from the plant is approximately 3,000 feet of 24-inch pipe which runs parallel to the west runway of the airfield and then to a headwall on Frenchman Creek.

The sludge from the Imhoff Tank is hydraulically forced from the tank twice a year and placed upon sludge drying beds south of the plant. Ultimate disposal of the bed is by burial.

The plant has no method of measuring the flow either into or from the plant, and because of this, no operating records are kept, with the exception of a maintenance log.

The plant also has no facilities for analyses other than residual chlorine; however, during the chlorination season samples are sent to the Michigan Department of Health for bacterial analyses.

FLOW MEASUREMENTS

To measure the incoming sewage, it was necessary to divert all sewage over a sharp crested V-notch weir into the channel containing the plant comminutor. The liquid level in the crested stilling basin behind the weir was measured and recorded by means of a portable vertical drum-type liquid level recorder.

Automatic flow measurement began on January 22 and continued until February 15. The period of low flow was during the dormant hours from 2400 to 0600. The peak hours, as expected, were in the morning, with a declining trend generally exhibited from 1200 to 2400. The maximum flow was obtained on Saturday, January 26, when 260,000 gallons of sewage passed through the plant, and the minimum occurred on January 31 and 135,000 gallons were treated.

The detention time of the sewage in the Imhoff Tank was calculated to determine the limits defined by the maximum and minimum instantaneous flows. Under the assumption that the entire sludge compartment was filled and no short circuiting occurred, a minimum detention time of 2 hours and 8 minutes was calculated with the maximum flow of 315 gallons per minute; a detention time of 10 hours was obtained with the minimum flow of 65 gallons per minute.

The surface loading rate was determined under varying flow conditions to show the range of loadings that the plant experiences. It was learned that, under the conditions found during the minimum day of recorded flow within the study period, the tank was loaded at the low rate of 147 gallons per square foot per day (gsfd), whereas, when the flow figures for the maximum day's flow were used, the loading was 273 gsfd. The condition of having the highest recorded instantaneous flow continue throughout the day was calculated and it was learned that the loading would then be only 495 gsfd; all of these values are well under the recommended surface loading of 600 gsfd, indicating the underloaded condition of this plant.

SAMPLING PROCEDURE

All samples collected during the test period were taken at intervals throughout the day and night and then composited on a basis proportional to the flow at the time the sample was taken. The influent samples were taken as the sewage flowed over the weir, while all effluent samples were collected from a manhole in the outfall sewer just outside of the plant. On some occasions, samples were collected from the interceptor sewers, outfall, and downstream from the outfall pool. All collected samples were iced down until composited to limit any bacterial action.

(Table 1-IV follows.)

Laboratory Determinations

The summary results of the chemical analyses of samples collected are shown in Table 1-IV.

TABLE 1-IV. SUMMARY RESULTS OF LABORATORY ANALYSES - SEWAGE TREATMENT PLANT-GROSSE ILE NAVAL AIR STATION

		Influent			Effluent		
		Maximum	Minimum	Mean	Maximum	Minimum	Mean
pH		7.7	6.8	7.4	8.1	7.3	7.5
Susp. Solids	mg/l	108	14	59	51	21	31
Total Solids	mg/l	730	440	574	670	520	555
Cond.	μmhos	330	155	242	285	170	235
Alkalinity	mg/l	197	146	174	210	176	188
Chlorides	mg/l	146	28	52	100	23	55
Phenols	ug/l	232	16	78	81	19	49
BOD	mg/l	192	31	94	97	37	56

	Influent Value	Effluent Value
Total Coliform/100 ml	5,100,000	7,100,000
Fecal Coliform/100 ml	-	6,400,000
Fecal Streptococcus/100 ml	82,000	71,000

The results of the chemical analyses of the sewage, for the most part, indicate that the influent sewage is of weak strength. This is indicated by the analyses of total and suspended solids, BOD, and chlorides.

The plant efficiency indicated a BOD removal of 40 percent and a suspended solids reduction of 47 percent. The removals are somewhat indicative of Imhoff Tank treatment. The removals on individual days, however, are variable in several of the analyses.

BIOLOGICAL INVESTIGATION

The biological investigation of the station's outfall pool and receiving waters was performed on February 5, 1963.

In general, it was observed that below the outfall, whitish-gray strands of "sewage fungus" covered the rocks and twigs forming "streamers" in the current. In spots the stream bed was blanketed with felt-like brownish mats of this material. A definite putrescent-type odor, primarily hydrogen sulfide, was observed near the outfall; however, bottled samples of the water a short distance downstream also emitted a strong hydrogen sulfide odor immediately after collection.

The findings indicate that Frenchman Creek is in a septic condition at least from shortly above the station outfall to well below this point. The dense population of ciliate protozoans, restricted almost to a single species; the heavy incidence of Spharotilus, Beggiatoa, and other sewage bacteria; the prevalence of fungi coupled with the absence of plankton and all invertebrates, with the exception of tubificid worms and nematodes, leads to the conclusion that the stream is grossly polluted. Only those organisms are present which can tolerate heavy organic pollution and low oxygen potentials. This short stream provides only one zone of existence--the polysaprobic. Such chemical and microbiological data available support the conclusion that the stream is too polluted, not long enough, and lacking a positive movement of water toward its mouth to provide a transition to a mesosaprobic environment.

CONCLUSIONS

1. Frenchman Creek, the receiving stream for the effluent from this plant, is grossly polluted.

2. This pollution is primarily caused by wastes originating on the Grosse Ile Naval Air Station.

3. Inadequate waste treatment facilities at the boat dock cause a hazardous situation to water users in this immediate vicinity.

4. Numerous homes, boat wells, and a yacht

club have been built along the polluted Frenchman Creek since the construction of the sewage treatment plant.

5. Bacterial concentrations in the effluent from the sewage treatment plant are excessively high, representing a health hazard to those using the water in Frenchman Creek.

6. The results of data collected during this survey indicate plant performance indicative of an Imhoff tank receiving weak sewage, although operation is not as uniform or consistent as desired.

RECOMMENDATIONS

In order to achieve more uniform and consistently satisfactory results from this installation, the following are recommended:

1. Scrape sloping sides of sedimentation chamber daily to keep divisional slots between this chamber and digestion chambers open.

2. Reverse the direction of sewage flow every two weeks to distribute the sludge load in the digestion chamber as evenly as possible.

3. Break up the scum in gas vents by soaking it semi-weekly, or more frequently with water under pressure.

4. Make monthly observations of sludge level at three or more points in the digestion compartment.

Maintain at least 18 inches between the top of sludge layer in digestion chamber and the bottom of the divisional slot.

5. Withdraw sludge more frequently and in smaller quantities in the warmer months rather than at longer intervals in large quantities.

6. Maintain a better operating record which would include the following items:

a. Settleable solids in raw sewage and tank effluent (daily)

b. Dates and conditions of skimming and cleaning the flowing-through compartment, removing scum, cleaning of slots, and reversal of influent.

c. Dates of sludge removal, and volume (approximate cubic feet) of sludge removed.

d. Depth of sludge.

e. pH of sludge (at least monthly).

f. Chlorination records.

g. Total coliform concentrations in effluent.

7. During the entire year, very precise and strict control be exercised over the plant effluent by maintaining continuous chlorination of the treated wastes so that the geometric mean of the effluent coliform densities does not exceed 2,400 organisms per 100 ml.

8. Replacement of the outmoded septic tank installation at the boat dock with a treatment unit of the "Aerobic Digestion" design, manufactured for individual householders. A 1,000-gallon unit with overflow to an added 200-gallon chlorination tank with chlorination is recommended.

9. These recommendations are based upon the assumption that the U. S. Naval Air Station at Grosse Ile will be closed on or before September 1, 1967. If this is not the case, one of two alternatives is further recommended.

a. Connection to the municipal sewage collection and treatment system proposed for construction at Grosse Ile in the immediate future.

b. Enlargement of the present naval facilities to include secondary treatment as proposed in the original plans.

AIRCRAFT WASHING OPERATIONS, NAVAL AIR STATION

Each of 41 aircraft assigned to the station is washed, including the engines, once every two weeks using two different detergents--Keolite and Turco. Each month 825 gallons of Keolite and 200 gallons of Turco are used. The chemical constituents in the detergents are not known. Usually, washing operations last approximately three hours per day. As another possible source of pollution, the hangar decks are also washed approximately every two weeks. Water for aircraft and hangar deck washing is supplied from the City of Detroit water system. Waste engine oil from the aircraft is disposed in a dumping ground located adjacent to the east runway. The waste oil is then used to control dust on the road to the boat house.

(Table 2-IV follows)

Laboratory Determinations

The results of the laboratory analyses of samples collected are shown on Table 2-IV.

TABLE 2-IV. RESULTS OF LABORATORY ANALYSES - AIRCRAFT WASHING WASTES GROSSE ILE NAVAL AIR STATION

Date 1963	Time	Temp.	pH	Phenol µg/l	Alk. mg/l	Cl. mg/l	Susp. Sol. mg/l	Total Sol. mg/l	Oil & Grease mg/l	Cond. µmhos	Coli. MF/100ml
9/9	10	19.0									30,000
9/10	9	19.0	8.1	2	214	57	2		7	656	L100,000
9/11	9	19.5	8.0						1	900	13,000
9/11	13	20.0	8.0						0		900
9/22	16			4			20	840	195		6,000
Average			8.0	3	214	57	11	840	51	778	30,000

Oil - based upon recommended design flow of 35,000 gpd.

$$.035 \text{ mgd.} \times 8.34 \frac{\text{lbs}}{\text{gal}} \times 51 \text{ mg/l} = \text{average daily discharge of oil} = 14.9 \text{ lbs. of oil/day}$$

Flow Measurements and Sampling Procedures

The wastes from aircraft washing operations drain to Frenchman Creek through a 36" storm sewer approximately 1,200 feet south of Groh Road.

The 36" drain to Frenchman Creek was gaged continuously for the period from September 6 to September 11, 1963, using a 90° V-notch weir and a L&S Type F water level recorder. Flow volumes are recorded in Table 3-IV.

TABLE 3-IV. FLOW MEASUREMENTS - AIRCRAFT WASTES GROSSE ILE NAVAL AIR STATION

Date 1963	Average Daily Discharge (gpd)	Discharge Rate During Hours of Aircraft Washing Operations (gpd)
9/6	17,900	30,800
9/7	20,300	78,000
9/8	10,500	13,800
9/9	16,400	24,600
9/10	14,900	16,900
9/11	17,100	24,500

Five bacteriological and four chemical grab samples were collected during the period of the survey from the water that passed over the weir.

Richard D. Vaughan

OBSERVATIONS

1. The 36" drain emptying into Frenchman Creek approximately 2,500 feet south of Groh Road was observed during a heavy rainstorm to determine whether the wastes from aircraft washing could possibly get out through this outfall. It had been learned earlier that this sewer had possibly caved in and was blocked off. It did not contain any rainwater and, as a result, would not contain any wastes from aircraft washings.

2. A heavy scum of oil collected behind the baffle at the flow-measuring station. This was the result of a gradual accumulation of floating oil from aircraft washing.

3. Several times, private citizens living along Frenchman Creek have observed heavy oil slicks over the entire creek. It is believed that this is the result of promiscuous dumping of oil in the drain sewer and not the gradual accumulation from aircraft washing. Nevertheless, at all times, a visible light oil sheen was apparent on the water surface.

CONCLUSIONS

1. The waste disposal facilities for engine oil are satisfactory.

2. Closer control should be followed to prevent

promiscuous dumping of waste engine oil into sewers.

3. Except for oil, the waste effluent from aircraft washing operations appear to be of satisfactory quality to protect present water uses in Frenchman Creek. The bacteria concentrations are no more than would be expected from ordinary land drainage.

4. The 36" drain located 1,400 feet downstream from the drain under study appears to be abandoned and blocked off, thus preventing any aircraft washings from reaching Frenchman Creek through this outlet.

5. At first glance, the washings did not appear to contain much oil. However, a considerable amount of oil did accumulate behind the baffle at the flow-measuring set-up and the laboratory analysis also showed oil to be excessive in the waste discharge. Established recommended maximum concentrations of oil in waste effluents should not exceed 15 mg/l.[1] The average effluent concentration of oil from the plane washing operations is 51 mg/l. The discharge of 14.9 lbs. of oil per day to the creek imparted a definite visible sheen of oil on the water surface discoloring and coating the hulls of boats moored in the area.

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[1] "Report of the International Joint Commission United States and Canada on the Pollution of Boundary Waters," Washington-Ottawa, page 18, 1951.

Richard D. Vaughan

RECOMMENDATIONS

Untreated wastes from aircraft washing operations should not be admitted to domestic sewage treatment plants[2]; therefore, it is recommended that treatment be provided to prevent damage to present water uses in Frenchman Creek from oil wastes.

An oil separator should be installed similar in design to that recommended by the American Petroleum Institute.[3] This treatment device provides a mechanism for breaking any emulsions and includes flotation and skimming to adequately dispose of the oil wastes. It is guaranteed by the manufacturer to produce an effluent with not over 15 mg/l of oil and possibly can be obtained as a "Package" plant.

Accordingly, the following preliminary design factors should be considered:

1. A flash mix with the addition of calcium chloride in amounts of approximately 15 lbs. per 1,000 gallons of waste to break the oil-water emulsion.

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[2]"Disposal of Airplane Wash waters." United States Department of Health, Education, and Welfare, Public Health Service, Robert A. Taft, Sanitary Engineering Center, Cincinnati, Ohio, December, 1955.

[3]"Manual on Disposal of Refinery Wastes," American Petroleum Institute, Division of Refining, 1271 Avenue of the Americas, New York, New York, 7th Edition, 1963.

2. Design flow of 35,000 gpd.

3. Detention time of one hour.

4. Flow-through velocity not to exceed 2 feet per minute.

5. A minimum depth to width ratio of 0.3.

Upon treatment by the gravity oil-water separator, the effluent can then be satisfactorily discharged to Frenchman Creek.

U.S. CORPS OF ENGINEERS MAINTENANCE DREDGING OPERATIONS, ROUGE AND RAISIN RIVERS

Past associations between the Public Health Service and the Corps of Engineers regarding maintenance dredging revealed that the primary responsibility for water pollution control is not with the Corps of Engineers who, in accordance with Congressional instructions, are maintaining a facility of general benefit to the public and of special benefit to the industries using the rivers and harbors for commercial traffic. The primary responsibility lies with the municipalities and industries occupying the banks of the rivers and harbors and discharging inadequately treated sewage and industrial wastes into the streams. Furthermore, the Public Health Service agrees that, in general, the present maintenance dredging operation procedure on the Rouge and Raisin Rivers constitutes an acceptable means of disposing of dredge material. (See U. S. Public Health Service report entitled "Special Studies U.S. Hopper Dredge Savannah Operations, Detroit River, March 21, 1949.")

On October 3, 1963, two engineers from the Detroit River - Lake Erie Project, Public Health Service, observed dredging operations on the Raisin River aboard the U. S. Army Engineer Hopper Dredge Lyman. On October 24, 1963, dredging operations were observed aboard the U.S. Army Engineer Hopper Dredge Hains operating on the Rouge River. The purpose of the inspections was to ascertain whether the proper precautionary measures are taken by the Corps of Engineers to minimize damage to water quality from dredging operations and to recommend corrective measures if warranted.

The following observations were made during these inspection trips:

RAISIN RIVER DREDGING OPERATIONS - U.S. ARMY ENGINEER HOPPER DREDGE LYMAN

During loading operations, a large area of turbid water was observed. Because of the wind and heavy sea conditions, it was impossible to tell which way this material was drifting from the harbor area. On the way to the dumping grounds in Lake Erie, there was no sign of the material leaking from the dredge, and after the material was dumped, no floating debris was seen except garbage that was thrown overboard on the dumping grounds. It has been customary to dump garbage on the designated dumping grounds, but at no other place. Garbage is kept aboard the dredge while in harbor, and while proceeding from harbor to harbor. Also, there were no sanitary facilities aboard the dredge except for the common marine toilet. There was no treatment of waste or chlorination.

During the dredging operations, no problems were observed, except for the turbid water created by the hydraulic pumping of material into the hoppers and the overflow of turbid water from the hoppers while loading operations were underway. Another area of turbid water was observed at the dumping grounds when the material was dumped from the bottom of the dredge, but no turbid water was observed to result from previous operations on the dumping grounds which had taken place about one hour before.

ROUGE RIVER DREDGING - U.S. ARMY ENGINEER HOPPER DREDGE HAINS

The area immediately surrounding the dredge during loading operations was very turbid due to agitation of the bottom material and overflow from the hoppers. While traveling down the Detroit River, a trail of turbid water was noted behind the ship. No reasonable explanation was given of why this occurred except to say that it could not be helped. It was noted, however, that considerable difficulty is experienced in the dredging of material from the Rouge River due to the characteristics of the sludge. Tire rims, wood pulp, tin cans, bottles, etc., are difficult to pump; thus creating problems with the pumps and valves. No pollution problems were encountered in the piping of the material from the hoppers to the Grassy Island disposal site in the Detroit River. However, this operation should be carefully and continually observed to see that no excessive leaks occur in the connecting joint to the ship or in the pipe to the disposal site.

Waste disposal practices observed aboard ship consisted of the following:

(a) Trash is incinerated on board.

(b) The garbage is macerated in a garbage grinder and cannot be incinerated, such as tin cans and bottles, is disposed of by hand carrying by the cook's mate to the diked area inside the Grassy Island dumping grounds.

The results of our sampling program and investigations did not disclose any apparent damage to water uses from the present dredging methods. Surveillance activities, to unfold any new developments or to determine with more assurance our present position, will continue.

Richard D. Vaughan

RECOMMENDATIONS

The recommendations of the Public Health Service for closer control of water quality in maintenance dredging operations are outlined as follows:

1. The hopper dredges discontinue disposing of the ship's trash and garbage at the Raisin River Dumping grounds.

2. Install aboard ship suitable treatment units to adequately dispose of all sanitary wastes including trash, garbage, and human excreta.

3. Closer control be exercised to minimize the loss of dredge material from the hoppers while proceeding to the dumping grounds.

4. A vigorous attempt be made by the Corps of Engineers to reduce the amount of dredging with action leading to reduction of discharge of settleable material by increasing the charges to polluters for removing the material commensurate with the damages to water uses incurred. It is believed that it was not the intent of Congress that such dredging operations should provide a method of disposal of solid material deposited by individuals or corporations in navigable streams. It is desirable not only that dredged channels be maintained but that every means possible be taken to keep the cost of such maintenance to a minimum.

To put the recommendations into effect as soon as possible, a visit was made to the office of the District Engineer to discuss the findings of the investigations.

The District Engineer agreed to take steps to see that the recommendations be put into effect. He reiterated that the Corps of Engineers does charge the polluters for removing the material commensurate with the damages to water uses incurred and that the Corps of Engineers does not have any statutory authority to prevent the original discharge of the material to the navigable waterway. He also stressed the responsibility of the Corps of Engineers to enforce Federal legislation relative to discharge of waste materials from vessels into navigable waters.

WASTE DISPOSAL PRACTICES OF OTHER FEDERAL INSTALLATIONS IN THE STUDY WATERS

The information for this phase of the study is summarized in Table 4-IV.

(Table 4-IV follows.)

TABLE 4-IV. SEWAGE DISPOSAL PRACTICES AT FEDERAL INSTALLATIONS[1]

Name	City	Department	Domestic Sewage gal/day	Domestic Sewage % treated	Type of Treatment
Naval Reserve Training Center	Detroit	Navy	9,521	100	Discharge to municipal sewers
Belle Isle Coast Guard Station	Detroit	Treasury	1,610	100	" " " "
Detroit Coast Guard Base	Detroit	Treasury	2,520	100	" " " "
Fort Wayne	Detroit	Army	75,000	100	" " " "
Nike Site 26D	Detroit (Belle Isle)	Army	5,000(est)	100	" " " "
Detroit River Light	Unincorporated	Treasury	350	0	Direct discharge to Lake Erie
U.S. Public Health Service Hospital	Detroit	HEW	42,500	100	Discharge to municipal sewers
Naval Air Station	Grosse Ile	Navy	85,000	100	Imhoff Tank with discharge to surface water and chlorination during summer
			15,000[2]		

1. Information obtained from Volume 23 of the "Waste Water Disposal Practices at Federal Installations." December 31, 1960.
2. Untreated wastes from aircraft washing operations discharged to surface waters.

In order that all Federal installations in the study area be on an equal basis regardless of the degree of pollution occurring from each one, it is recommanded that the Coast Guard Station at the Detroit River Light install a macerator-chlorinator type device similar to that placed aboard motor launches and in design to that manufactured by the Carlson Company of Mutuchen, Massachusetts. There remains a possibility, though remote, that bathers, fishermen, or even personnel of the station could come in contact with fecal matter originating from the Lighthouse.

The Federal Government should be expected to lead the way in proper waste disposal practices.

Richard D. Vaughan

SECTION V

PRESENTATION OF RESULTS:

DETROIT RIVER

DESCRIPTION OF WATER QUALITY

Bacteriological

High total coliform densities, especially when accompanied by high fecal coliform concentrations, indicate the presence of human or animal wastes which may contain pathogenic organisms capable of causing enteric diseases in humans. The presence of these organisms above acceptable levels is considered a threat to the health and welfare of those who use this water for domestic water supply and recreation purposes.

At the head of the Detroit River average total coliform densities were approximately the same during wet and dry conditions throughout the range. At all locations from just below Belle Isle to the mouth of the Detroit River average total coliform concentrations near the United States shore during wet conditions were 5 to 10 times higher than corresponding values during dry weather. At some locations the difference between the two values became less pronounced in the middle of the River, and very little difference between wet and dry conditions was noted at locations near the Canadian shore.

Bacteriological densities at the head of the Detroit Rover do not prohibit any water uses. During dry weather, the Detroit River is of a satisfactory bacteriological quality as far as the mouth of the Rouge River. These judgments are based upon the widely used standard for safe recreation--a maximum of 1,000 organisms per 100 ml--and the IJC objective of 2,400 organisms per 100 ml. During or following rainfall of sufficient intensity to cause overflow of combined sewers, however, the Detroit River below Belle Isle and above the Rouge River is polluted to the extent that it cannot be safely used for recreational purposes. During rainfall periods IJC objectives are regularly exceeded near the United States shore.

Conners Creek, the Rouge River, and the Ecorse River are also polluted by storm-caused overflows from combined sewers to the degree that they should not be used for recreational or domestic water supply purposes.

Below the Rouge River and the outfall from the Detroit Sewage Treatment Plant, pollution, in the United States section of the River (particularly near the United States shore), is constantly such that these waters should not be used for recrational purposes or domestic water supply. The high bacterial levels during weat and dry conditions indicate a serious health hazard to potential users of these waters. This seriously polluted zone extends to the mouth of the River and, under dry conditions, eastward from the United States shore a distance varying from 500 to 10,000 feet. During wet conditions the entire United States portion of the Detroit River below the Rouge River is bacteriologically polluted to the extent of interference with recreational use and domestic water supply. These characterizations are based on geometric mean coliform densities, which exceed IJC objectives and recreational standards, and on high fecal coliform densities which constitute a large percentage of the total count.

Statistical study of the bacteriological data reveals that below the headwaters of the Detroit River two distinct log normal populations exist, one during dry weather and one during or following significant rainfall, and thus coliform densities are described in terms of wet and dry conditions. ^t the headwaters coliform densities were very low, with little difference between wet or dry. The densities ranged from approximately 100 organisms per 100 ml near the Michigan shore to 15 organisms per 100 ml near the International Boundary. Further downstream at the north end of Belle Isle the coliform densities increased to 260 organisms per 100 ml during dry conditions and 680 per 100 ml during wet conditions. Gradual increase in coliform density during dry weather was noted at downstream stations with values of approximately 500 organisms per 100 ml. Wet weather values of approximately 7,000 organisms per 100 ml were noted at this location.

Below the Rouge River the average dry weather conditions during the survey approximated 4,000 organisms per 100 ml near the United States shore, while values during wet conditions rose to an average of 81,000 organisms per 100 ml. Further downstream average coliform densities stayed at these high levels.

In the Trenton Channel, lower coliform results were noted along the west shore. At the mouth of the Detroit River, the average total coliform density during dry conditions was 5,900 organisms per 100 ml near the Michigan shore. These results are summarized in Figure 1-V. This figure also shows the consistently lower coliform densities in the middle of the River, with higher values at each shore.

(Figure 1-V follows.)

FIGURE I-V

DETROIT RIVER-LAKE ERIE PROJECT

DRY & WET GEOMETRIC MEAN COLIFORM CONCENTRATIONS

DETROIT RIVER

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

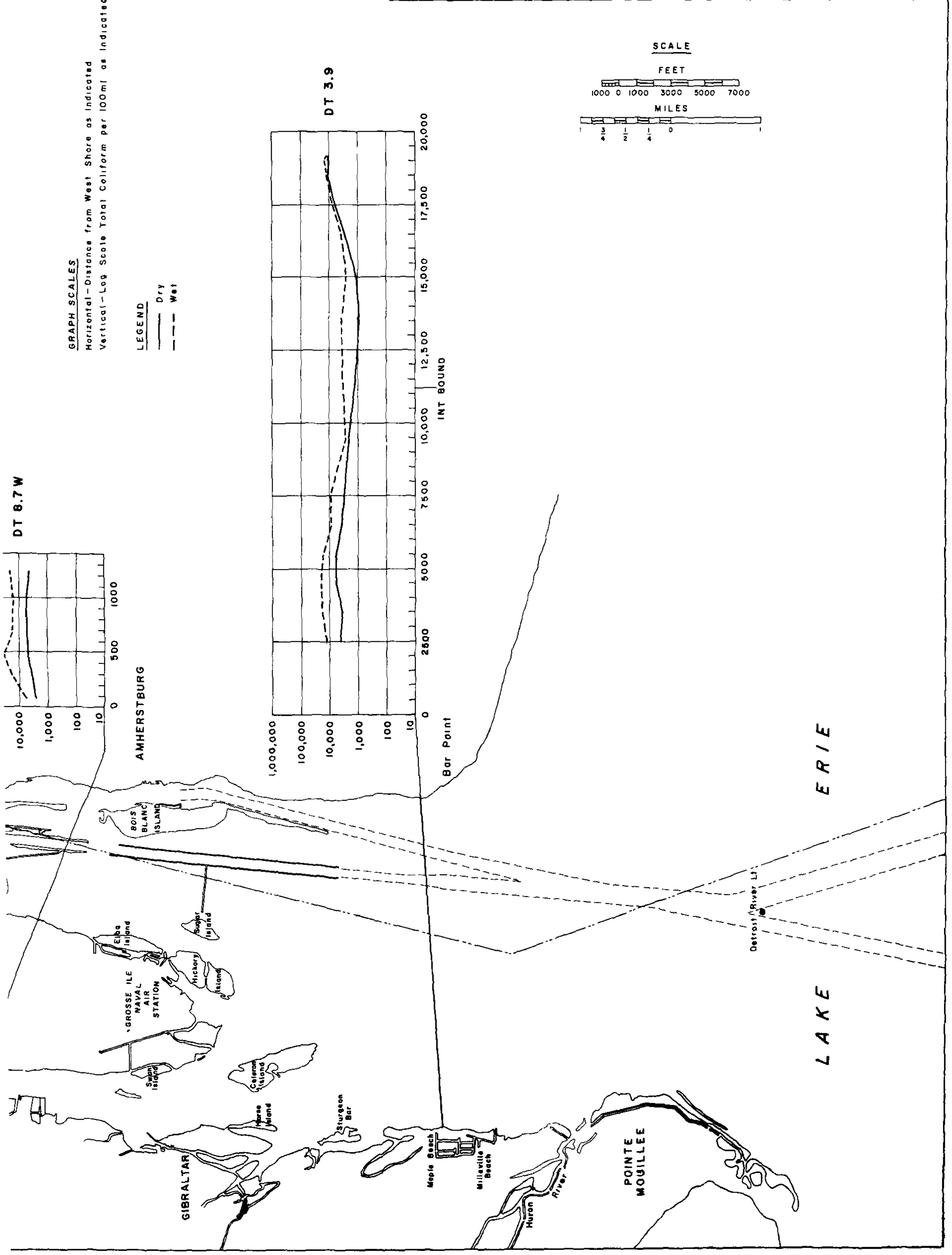


Figure 2-V shows, on a map of the Detroit River, zones of geometric mean total coliform densities during wet conditions as well as location of domestic water intakes, domestic waste outfalls, and combined sewer overflows. Four zones, with limits of less than 1,000; 1,000-2,400; 2,400-5,000; and greater than 5,000 coliform organisms per 100 ml are shown. From the head of the Detroit River to Belle Isle the water is predominantly in the first zone, representing average values less than 1,000 organisms per 100 ml. From Belle Isle to the Rouge River the middle of the River remains in this clean water zone, while both United States and Canadian shores indicate bacterial pollution in all of the remaining zones. Below the Rouge River, almost all the water is greater than 2,400 organisms and most greater than 5,000 organisms per 100 ml.

(Figure 2-V follows)

FIGURE 2-V

DETROIT RIVER-LAKE ERIE PROJECT

ZONES OF GEOMETRIC MEAN COLIFORM CONCENTRATIONS WET CONDITIONS

DETROIT RIVER

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

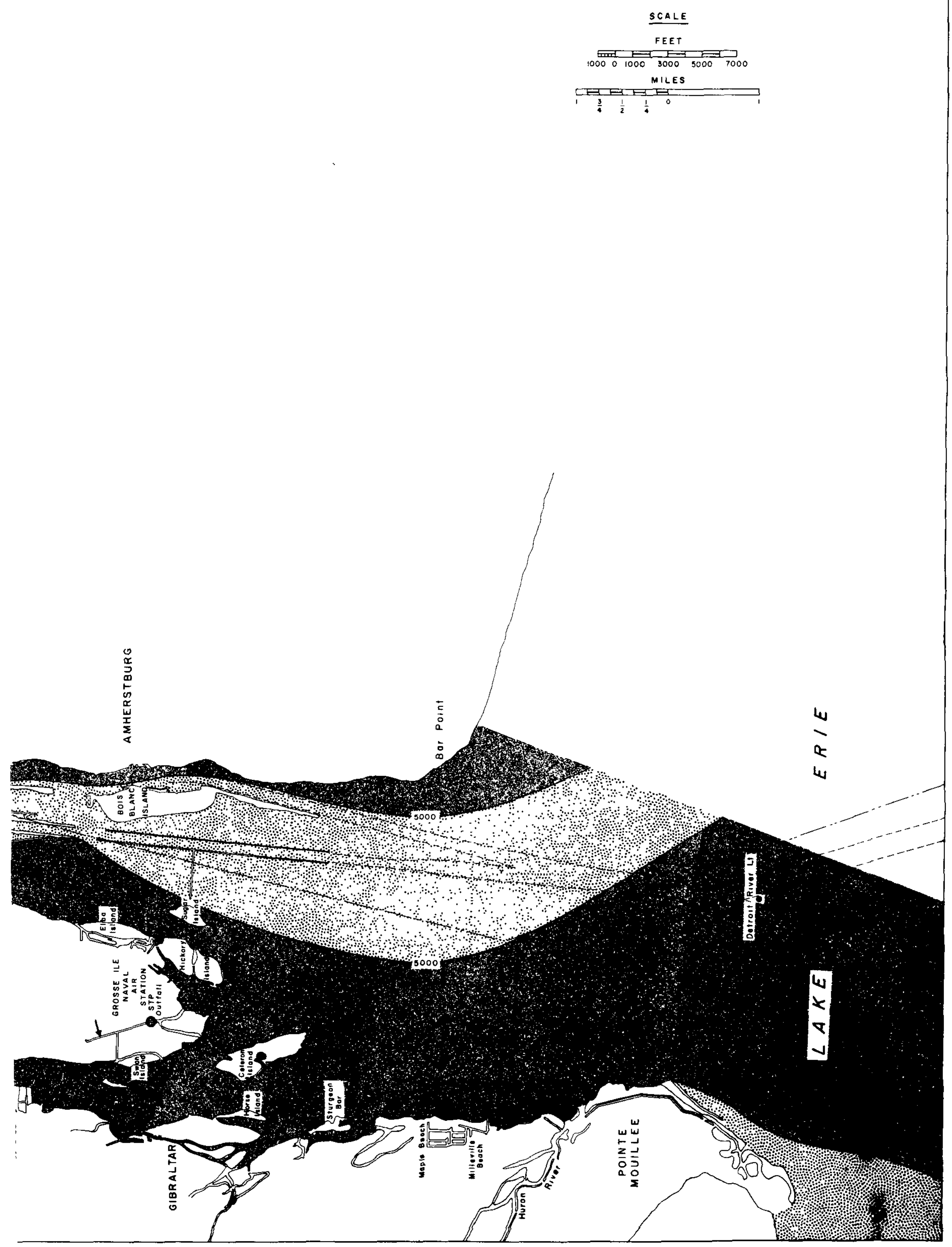


Figure 3-V shows the total coliform densities under dry conditions. The first zone, representing water under 1,000 organisms per 100 ml, extends to the old channel of the Rouge River and then in the middle of the Detroit River to Grosse Ile. From this point downstream the clean water zone is almost entirely in Canadian waters. Downstream from the Rouge River adjacent to the United States shore the values are greater than 2,400 organisms per 100 ml except for a small area near the Grosse Ile toll bridge. From Grosse Ile to the mouth, all United States waters are in the zones representing average values of 2,400-5,000 or greater than 5,000 total coliform organisms per 100 ml under dry or wet conditions.

(Figure 3-V follows)

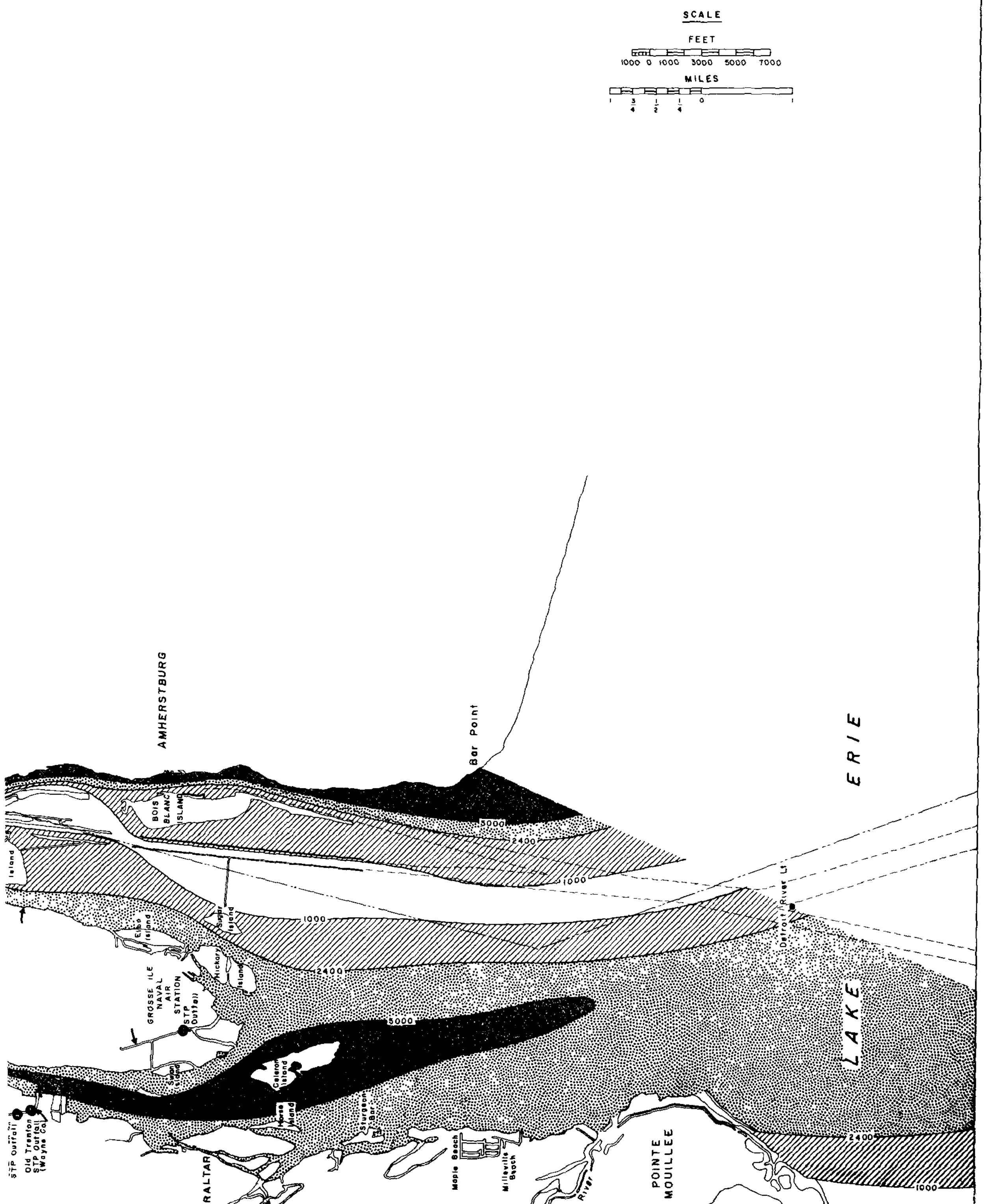
FIGURE 3-V

DETROIT RIVER–LAKE ERIE PROJECT

ZONES OF GEOMETRIC MEAN COLIFORM CONCENTRATIONS DRY CONDITIONS

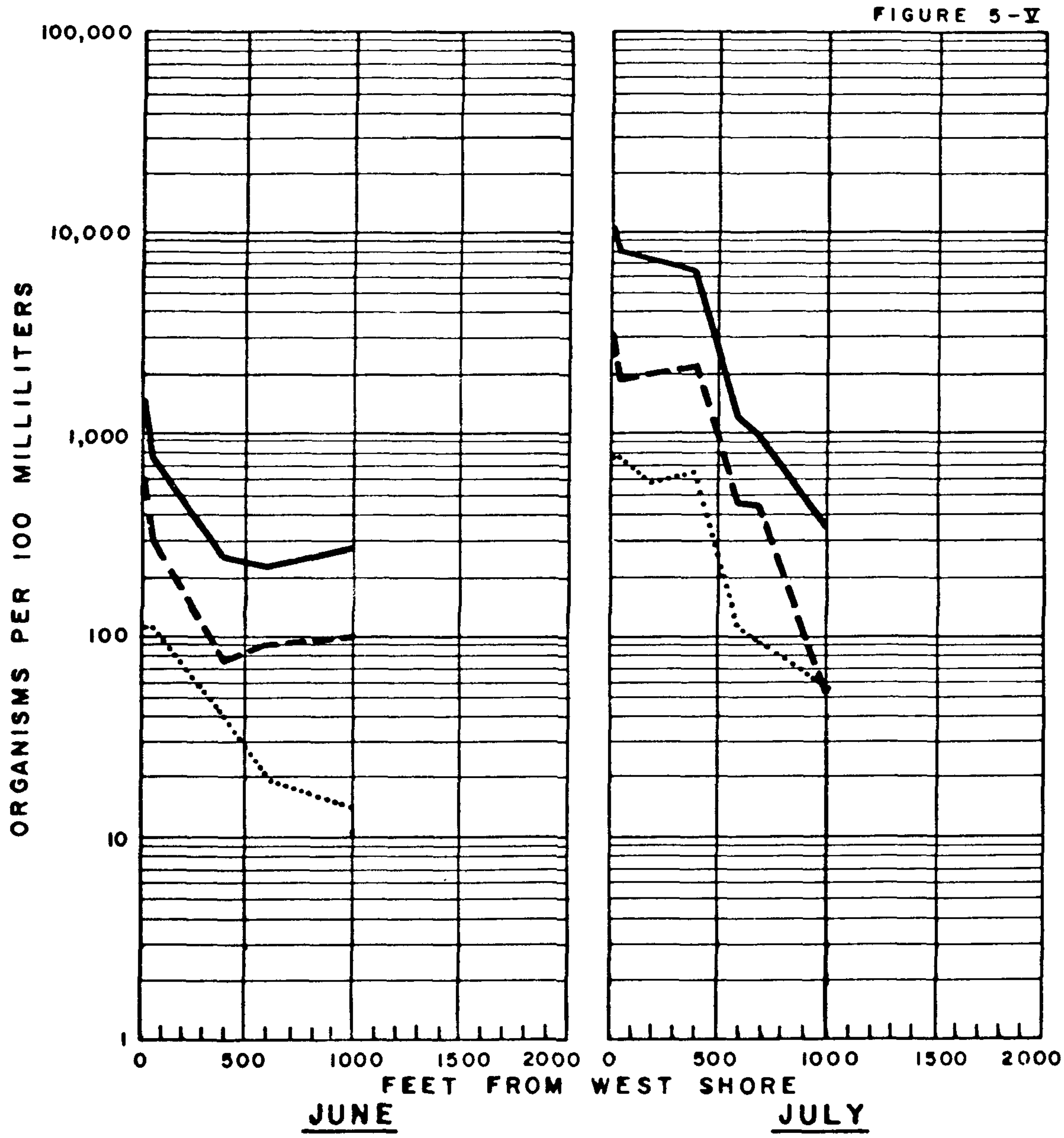
DETROIT RIVER

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



Fecal coliform and fecal streptococcus determinations were made on routine samples and during intensive surveys on the River. Fecal coliform values during the study ranged from 30 to 90 per cent with higher values ovserved below the Rouge River during wet conditions. This was especially evident during an intensive survey performed in July, 1963, when almost two inches of rain fell in a 10-day period. At the mouth of the River the fecal coliform densities ranged from 30 to 65 per cent. Fecal streptococci were observed in densities less than either fecal or total coliform organisms. This was especially so during wet conditions. The relationship between total coliform, fecal coliform and fecal streptococcus densities at selected stations during dry and wet conditions is shown in Figures 5-V through 8-V.

(Figures 5-V through 8-V follow.)



LEGEND

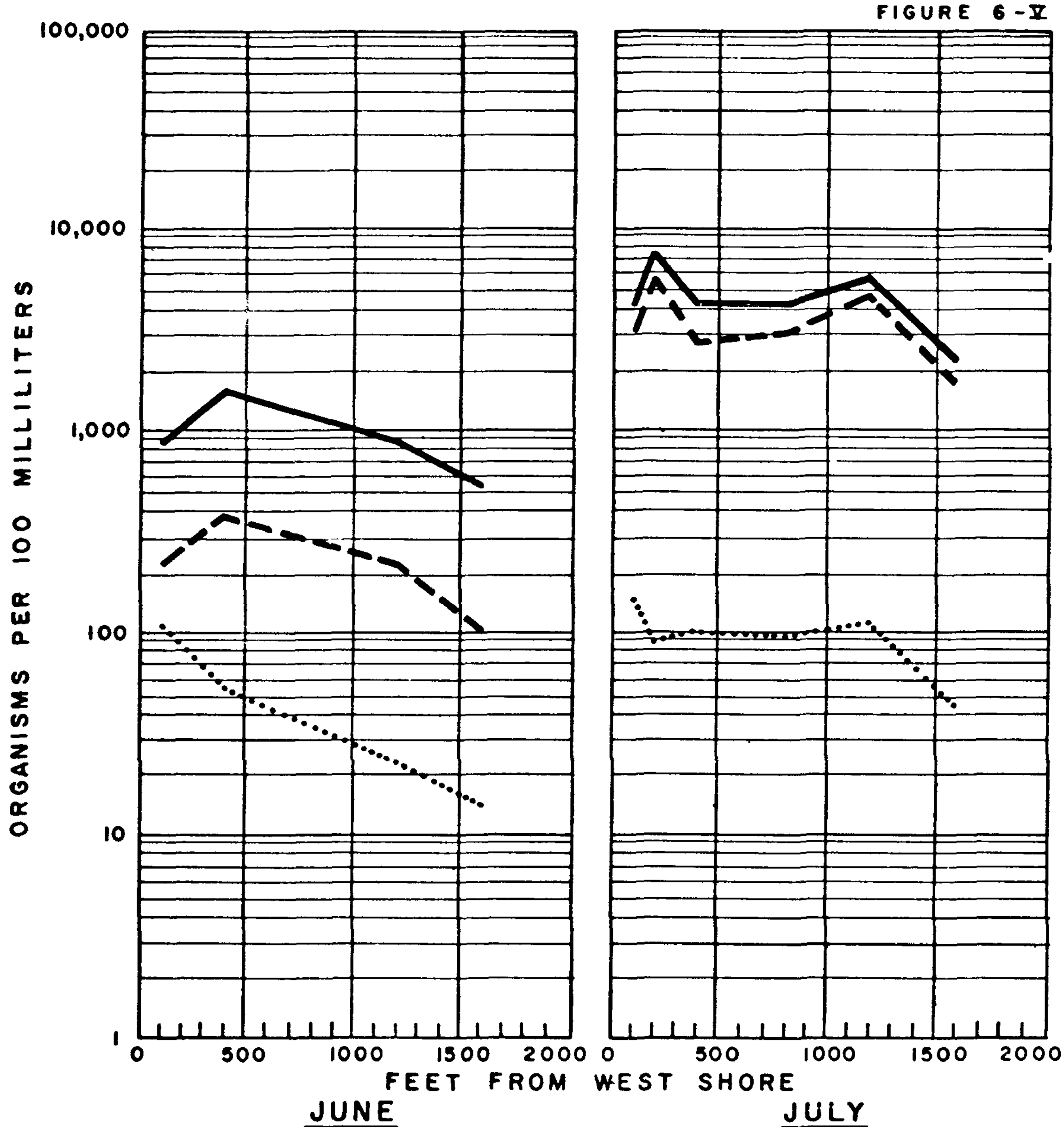
TOTAL COLIFORM
FECAL COLIFORM
FECAL STREPTOCOCCI
ALL VALUES GEOMETRIC MEANS

DETROIT RIVER–LAKE ERIE PROJECT

TOTAL COLIFORM, FECAL COLIFORM & FECAL STREPTOCOCCI
JUNE & JULY 1963 INTENSIVE SURVEYS
RANGE DT 20.6

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

FIGURE 6-V



LEGEND

TOTAL COLIFORM

FECAL COLIFORM

FECAL STREPTOCOCCI

ALL VALUES GEOMETRIC MEANS

DETROIT RIVER-LAKE ERIE PROJECT

TOTAL COLIFORM, FECAL COLIFORM & FECAL STREPTOCOCCI

JUNE & JULY 1963 INTENSIVE SURVEYS

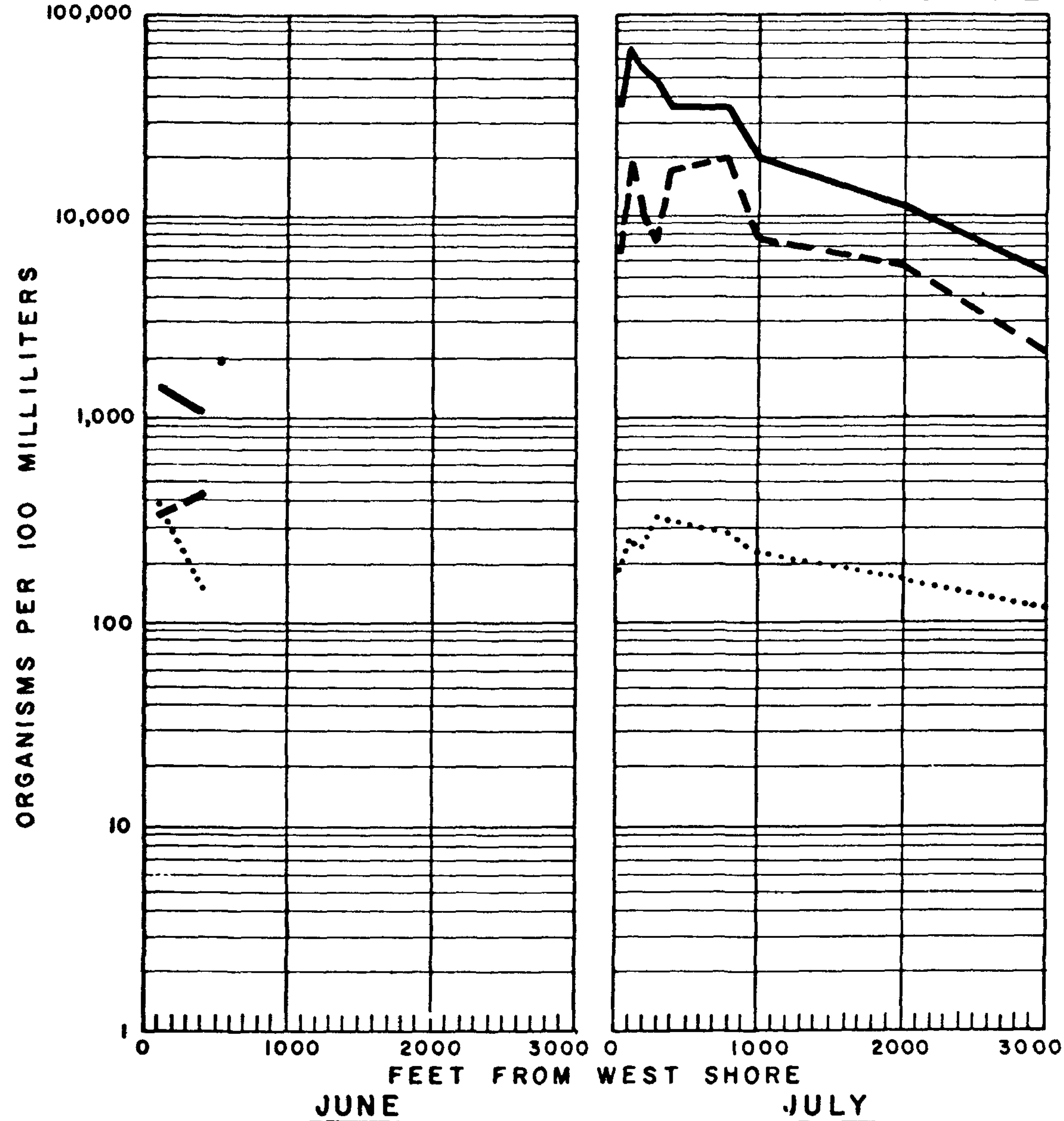
RANGE DT17.4W

U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE

PUBLIC HEALTH SERVICE

REGION V GROSSE ILE, MICHIGAN

FIGURE 7-V



LEGEND

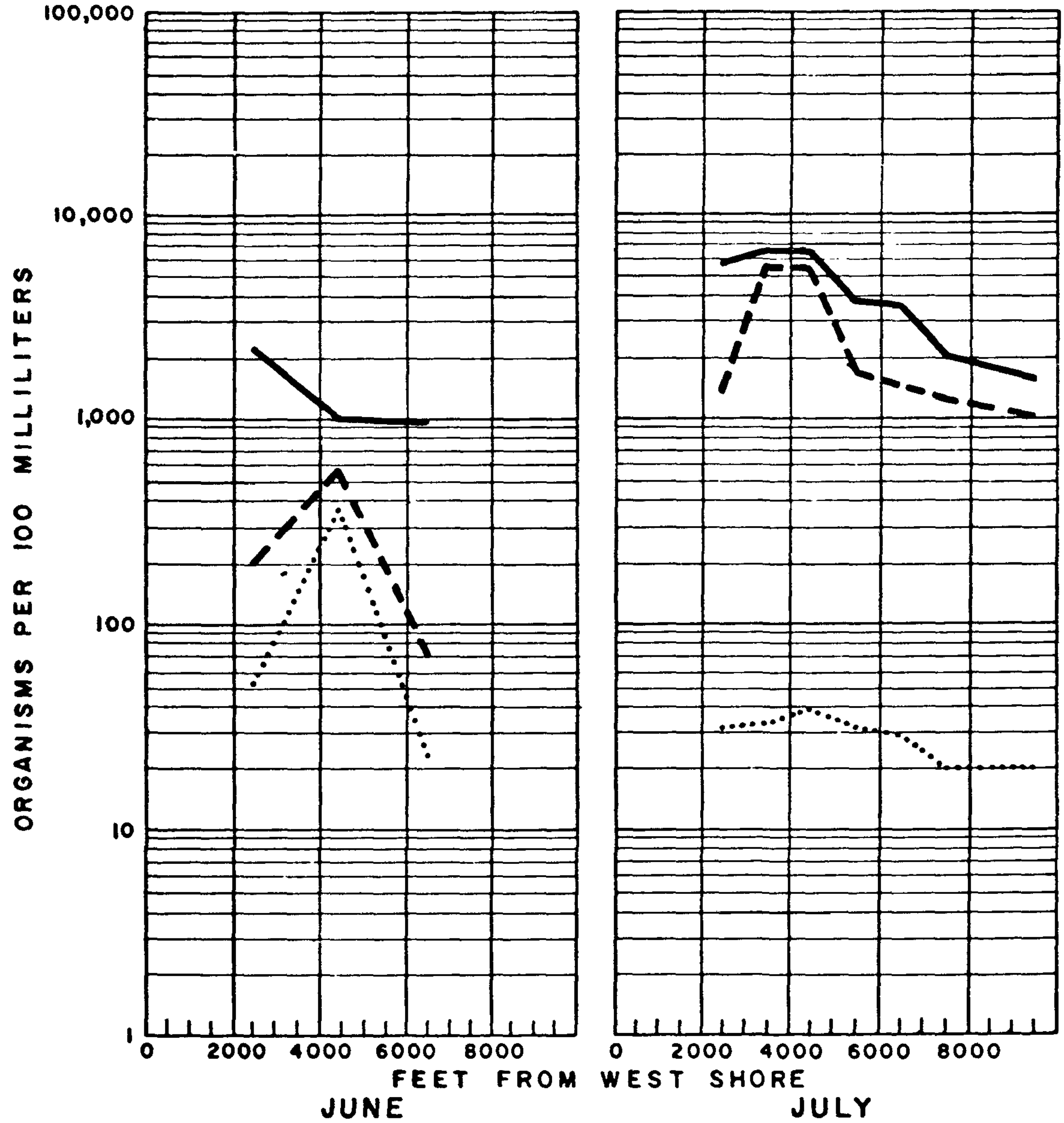
TOTAL COLIFORM
FECAL COLIFORM
FECAL STREPTOCOCCI
ALL VALUES GEOMETRIC MEANS

DETROIT RIVER—LAKE ERIE PROJECT

TOTAL COLIFORM, FECAL COLIFORM & FECAL STREPTOCOCCI
JUNE & JULY 1963 INTENSIVE SURVEYS
RANGE DT14.6W

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

FIGURE 8-V



LEGEND

TOTAL COLIFORM
FECAL COLIFORM
FECAL STREPTOCOCCI
ALL VALUES GEOMETRIC MEANS

DETROIT RIVER-LAKE ERIE PROJECT

TOTAL COLIFORM, FECAL COLIFORM & FECAL STREPTOCOCCI
JUNE & JULY 1963 INTENSIVE SURVEYS
RANGE DT 3.9

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

Conners Creek was regularly sampled because of its significance as the receiving stream for combined overflows from the Conner gravity system sewers of the City of Detroit. The geometric mean total coliform densities were 25,000 organisms per 100 ml at the two stations sampled during dry conditions and 260,000 organisms per 100 ml during wet conditions. Fecal coliform values averaged 40 per cent of the total. Fecal streptococcus densities were low at Conners Creek, with average densities of 460 and 500 organisms per 100 ml at the two locations.

The Rouge River, the major tributary of the Detroit River, was observed to have a geometric mean of 18,000 total coliform organisms per 100 ml during dry conditions. During wet conditions the average density was 150,000 organisms per 100 ml. A considerable improvement was noted in 1963 as compared with 1962 sampling results. Average fecal streptococcus densities were 810 organisms per 100 ml. The fecal coliform density at this point was 40 per cent of the total coliform density.

The Ecorse River showed a geometric mean total coliform density of 62,000 organisms per 100 ml during dry conditions, with average values in excess of 1,000,000 total coliform organisms per 100 ml during wet conditions. Fecal streptococcus results averaged 5,900 organisms per 100 ml, with fecal coliform 45 per cent of the total densities.

Monguagon Creek, in the lower River, averaged 420 coliform organisms per 100 ml during the survey, with correspondingly low fecal coliform results.

Table 1-V lists maximum observed bacteriological values and expected 95 per cent levels at key ranges in the Detroit River and its tributaries. (The 95 per cent values represent levels which can be expected to be exceeded 5 per cent of the time and not to be exceeded 95 per cent of the time.) The table shows a maximum value of 4,900 total coliform organisms per 100 ml at the head of the Detroit River, increasing to 770,000 organisms per 100 ml below the Rouge River and 430,000 organisms per 100 ml at the mouth of the River. The 95 per cent levels at these same locations during dry conditions are 3,900, 84,000, and 260,000 total coliform organisms per 100 ml respectively. During wet conditions the corresponding values are 15,000, 16,000,000, and 11,000,000 total coliform organisms per 100 ml.

Table 1-V also shows the expected variation or standard error of the mean coliform densities computed for ranges in the Detroit River during dry and wet conditions. This table shows a wide spread in the 95 per cent values during wet conditions and a relatively small variation

from the mean during dry weather. The table also shows a narrow range of expected variation in the mean value, indicating reliable estimates of this statistic. For example, the true mean coliform value at the head of the Detroit River during dry conditions can be estimated to lie within the limits of 74 and 170 organisms per 100 ml with 95 per cent confidence. The extreme variation in the 5 per cent and 95 per cent tolerance limits for coliform values at certain stations is attributable to a relatively small sample size encountered during wet conditions compared to the number of samples collected during dry conditions.

(Table 1-V follows, consisting of five pages.)

TABLE 1-V. TOTAL COLIFORM DENSITIES SUMMARY STATISTICS
WET AND DRY CONDITIONS

Range	Maximum Value	DRY Geo. Mean	DRY Geo.Mean + 2 SE_A	DRY Geo.Mean - 2 SE_A	DRY Tolerance Limit Upper (95%)	DRY Tolerance Limit Lower (5%)	WET Geo. Mean	WET Geo.Mean + 2 SE_A	WET Geo.Mean - 2 SE_A	WET Tolerance Limit Upper (95%)	WET Tolerance Limit Lower (5%)
DT 30.8W											
100'	710	110	170	74	3,900	3	130	230	70	6,600	2
300'	700	68	100	45	3,300	1	87	160	48	15,000	< 1
500'	300	42	64	28	870	2	37	73	19	5,200	< 1
1,000'	200	24	37	16	570	1	22	41	12	10,000	< 1
2,500'	130	15	23	10	500	< 1	19	34	10	5,100	< 1
DT 30.7E											
500'*	100	15	34	7	360	< 1	67	130	35	5,000	< 1
850'*	1,100	40	95	17	3,300	< 1	58	120	28	140,000	< 1
980'*	86,000	1,300	3,100	530	570,000	3	1,200	2,500	570	750,000	2
DT 28.4W											
100'	40,000	260	400	170	16,000	4	680	2,200	220	**	
300'	6,700	61	95	39	3,700	< 1	210	670	66		
700'	2,600	40	62	26	1,300	1	130	460	35		
1,300'	360	38	60	24	1,100	1	53	170	17		
DT 26.8W[a]											
52'	3,500	300	490	180	7,300	12					
169'	4,200	260	420	160	6,400	10					
292'	570	91	150	57	2,100	4					
421'	930	49	80	31	2,200	1	Insufficient wet data to compute results				
689'	140	24	38	15	490	1					
1,094'	270	11	17	7	190	< 1					
1,478'	140	10	17	6	340	< 1					
1,903'	420	11	18	7	250	< 1					

a - sampled 11-19-62 through 4-10-63 only.
* - Canadian stations
** - Insufficient data to determine tolerance limits

TABLE 1-V. TOTAL COLIFORM DENSITIES - SUMMARY STATISTICS WET AND DRY CONDITIONS - Continued

	DRY						WET					
Range	Maximum Value	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Tolerance Limit Upper (95%)	Tolerance Limit Lower (5%)	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Tolerance Limit Upper (95%)	Tolerance Limit Lower (5%)
DT 25.7											
50'	390,000	1,200	2,100	630	43,000	31	7,100	17,000	3,000	**	
100'	540,000	530	980	290	9,800	29	2,300	5,000	1,100		
300'	780,000	240	460	150	4,900	12	680	1,600	290		
600'	20,000	72	130	39	2,900	2	150	330	70		
2,000'	310	26	48	14	490	1	54	130	23		
3,400'	120,000	1,300	2,500	720	270,000	7	7,900	21,000	3,000		
DT 20.6											
5'	32,000	530	810	340	5,200	54	3,600	29,000	580	**	
50'	310,000	580	890	380	5,600	61	4,800	30,000	770		
200'	270,000	560	860	360	4,600	69	6,600	42,000	1,100		
400'	220,000	250	380	170	2,700	24	6,700	42,000	1,100		
600'	12,000	130	200	87	2,300	8	1,100	6,700	170		
700'	120,000	130	200	81	1,600	10	1,800	8,600	360		
1,000'	100,000	120	180	76	2,700	5	510	2,800	94		
1,500'	70,000	270	420	170	11,000	6	810	4,000	170		
1,800'	51,000	1,000	1,700	660	31,000	35	1,500	9,600	240		
2,000'	44,000	4,300	6,900	2,700	60,000	310	7,300	36,000	1,500		
2,300'	85,000	14,000	22,000	8,700	470,000	420	26,000	140,000	4,700		
DT 19.0											
100'	440,000	3,800	8,200	1,700			54,000	540,000	5,300		
200'	750,000	4,300	9,400	2,000			80,000	820,000	7,900		
300'	860,000	3,600	7,800	1,600			82,000	830,000	8,100	**	
400'	750,000	3,300	7,200	1,500	**		75,000	760,000	7,400		
800'	890,000	240	510	110			9,500	96,000	930		
1,000'	700,000	160	350	74			8,400	85,000	830		
1,500'	100	67	220	21							
2,000'	400	140	440	43							
2,200'	300	130	490	36							

TABLE 1-V. TOTAL COLIFORM DENSITIES SUMMARY STATISTICS
WET AND DRY CONDITIONS - Continued

		DRY					WET				
					Tolerance Limit					Tolerance Limit	
Range	Maximum Value	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Upper (95%)	Lower (5%)	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Upper (95%)	Lower (5%)
DT 19.0 cont.											
2,300'	1,800	560	1,800	180							
2,400'	10,000	2,300	7,400	720							
2,500'	18,000	4,900	16,000	1,500							
DT 17.4W											
100'	250,000	3,300	4,900	2,200	51,000	210	19,000	38,000	9,600	2,100,000	170
200'	450,000	4,400	6,700	3,000	56,000	350	18,000	37,000	8,400	13,000,000	23
400'	140,000	3,500	5,200	2,300	36,000	340	15,000	30,000	7,500	2,000,000	110
800'	310,000	2,700	4,100	1,800	33,000	230	13,000	27,000	6,100	4,000,000	41
1,200'	300,000	1,000	1,600	700	54,000	20	5,000	10,000	2,500	4,900,000	6
1,600'	19,000	590	880	390	14,000	24	2,500	5,100	1,300	2,000,000	3
2,200'*	17,000	390	600	260	9,600	16	650	1,400	310	390,000	1
DT 17.0E											
400'*	28,000	3,200	4,700	2,100	73,000	140	8,200	14,000	4,800	340,000	190
700'*	41,000	9,500	14,000	6,400	100,000	870	13,000	30,000	7,400	130,000	1,300
900'*	110,000	21,000	32,000	14,000	170,000	2,600	23,000	40,000	14,000	500,000	1,100
DT 14.6W											
20'	630,000	4,200	5,900	3,000	84,000	210	59,000	94,000	37,000	16,000,000	220
100'	770,000	4,900	6,800	3,500	42,000	560	47,000	75,000	30,000	13,000,000	170
200'	620,000	3,800	5,400	2,700	60,000	250	50,000	80,000	32,000	6,300,000	400
300'	480,000	3,800	5,600	2,700	46,000	330	31,000	49,000	20,000	6,000,000	160
400'	520,000	3,700	5,200	2,700	38,000	360	41,000	67,000	25,000	6,300,000	270
800'	440,000	2,800	3,100	1,600	33,000	140	36,000	57,000	22,000	12,000,000	110
1,000'	380,000	2,100	3,000	1,500	30,000	140	26,000	42,000	17,000	3,700,000	190
2,000'	200,000	1,500	2,200	1,100	49,000	48	16,000	25,000	10,000	3,300,000	77
3,000'	55,000	650	940	460	37,000	12	7,200	11,000	4,500	790,000	65

TABLE 1-V. TOTAL COLIFORM DENSITIES - SUMMARY STATISTICS
WET AND DRY CONDITIONS – Continued

		DRY					WET				
					Tolerance Limit					Tolerance Limit	
Range	Maximum Value	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Upper (95%)	Lower (5%)	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Upper (95%)	Lower (5%)
DT 12.0W											
122'	14,000	2,100	3,400	1,300	170,000	27	2,100	4,900	890	350,000	10
322'	110,000	4,000	6,400	2,400	93,000	170	10,000	29,000	3,600	1,300,000	83
670'	340,000	6,100	9,800	3,800	190,000	200	11,000	25,000	4,600	730,000	160
DT 9.6W											
100'	50,000	2,900	4,500	1,900			23,000	39,000	10,000		
300'	60,000	5,600	8,600	3,600			16,000	27,000	9,800	**	**
500'	60,000	5,900	9,200	3,800			13,000	22,000	7,800		
900'	33,000	4,800	7,500	3,100			6,600	11,000	3,900		
DT 9.3E											
500'	67,000	3,000	3,900	2,300	43,000	210	10,000	15,000	7,000	1,300,000	80
1,200'	66,000	2,200	2,900	1,700	180,000	27	10,000	15,000	6,700	990,000	100
2,000'	63,000	2,800	3,700	2,200	110,000	75	7,100	10,000	4,800	320,000	160
3,000'	53,000	1,900	2,500	1,500	67,000	57	6,100	9,000	4,200	190,000	190
4,000'*	40,000	1,300	2,100	810	97,000	17	2,500			49,000,000	< 1
4,500'*	23,000	670	1,200	460	19,000	30	2,800	**	**	440,000	18
5,000'*	37,000	3,200	5,100	2,000	100,000	100	6,400			610,000	66
5,600'*	80,000	12,000	19,000	7,500	370,000	390	16,000			500,000	540
DT 8.7W											
80'	61,000	2,700	3,700	2,000	54,000	140	5,900	9,000	3,800	420,000	82
280'	100,000	3,500	4,500	2,500	76,000	150	16,000	**	**	170,000	1,600
480'	550,000	4,900	6,600	3,700	110,000	230	33,000			880,000	1,300
680'	380,000	5,400	7,200	4,000	89,000	320	17,000	27,000	11,000	2,800,000	110
980'	450,000	5,500	7,400	4,100	85,000	360	15,000	22,000	9,400	1,000,000	210
1,240'	230,000	4,300	5,800	3,200	110,000	170	19,000	**	**	910,000	410

TABLE 1-V. TOTAL COLIFORM DENSITIES - SUMMARY STATISTICS
WET AND DRY CONDITIONS – Continued

	DRY						WET				
Range	Maximum Value	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Upper (95%)	Lower (5%)	Geo. Mean	Geo.Mean + 2 SE_A	Geo.Mean - 2 SE_A	Tolerance Limit Upper (95%)	Tolerance Limit Lower (5%)
DT 3.9											
2,500'	94,000	4,100	6,600	2,500	250,000	68	13,000	26,000	7,000	270,000	670
3,500'	410,000	3,600	6,000	2,200	170,000	77	18,000	33,000	9,400	2,300,000	130
4,500'	330,000	5,900	9,500	3,600	180,000	200	20,000	38,000	11,000	2,700,000	160
5,500'	200,000	5,900	9,600	3,600	180,000	190	16,000	32,000	8,500	2,000,000	140
6,500'	320,000	3,800	6,200	2,400	210,000	70	8,900	27,000	4,600	11,000,000	7
7,500'	300,000	3,000	5,000	1,800	260,000	34	9,500	18,000	5,100	8,400,000	11
9,500'	110,000	2,000	3,300	1,200	120,000	33	2,700	5,000	1,400	1,200,000	6
11,500'*	80,000	1,200	2,000	690	31,000	45	3,300	6,200	1,700	1,900,000	6
13,500'*	47,000	920	1,600	530	38,000	22	3,600	6,800	1,900	760,000	17
15,000'*	73,000	1,100	1,900	630	38,000	31	2,300	4,500	1,200	810,000	6
16,500'*	58,000	2,800	4,800	1,600	130,000	61	3,700	6,900	2,000	1,800,000	8
17,500'*	54,000	6,500	11,000	3,800	90,000	470	7,500	14,000	4,000	290,000	190
18,500'*	42,000	11,000	19,000	6,200	97,000	1,200	12,000	23,000	6,400	180,000	830
19,000'*	51,000	11,000	19,000	6,100	95,000	1,200	15,000	27,000	7,700	290,000	730
19,300'*	39,000	11,000	19,000	6,000	100,000	1,100	12,000	24,000	6,100	260,000	555

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