

# **History of Water Level Gauges**

## **Lower Great Lakes and International Section of the St. Lawrence River**

by

**The Coordinating Committee**

on

**Great Lakes Basic Hydraulic and Hydrologic Data**

**March 1987**

**HISTORY OF WATER LEVEL GAUGES**

**LOWER GREAT LAKES**

**AND**

**INTERNATIONAL SECTION OF THE**

**ST. LAWRENCE RIVER**

HISTORY OF WATER LEVEL GAUGES

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ST. LAWRENCE RIVER

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HISTORY OF WATER LEVEL GAUGES  
LOWER GREAT LAKES  
AND  
INTERNATIONAL SECTION OF THE  
ST. LAWRENCE RIVER

INTRODUCTION

Requirement for internationally coordinated hydraulic and hydrologic data. The Great Lakes-St. Lawrence River system extends southerly and easterly from the headwaters of tributary streams in northern Minnesota and western Ontario some 2,000 miles to the Gulf of St. Lawrence in the Atlantic Ocean. The system drains a great interior basin of more than 295,000 square miles to the outlet of Lake Ontario, reaches almost halfway across the North American continent, and borders upon eight states of the United States and two provinces of Canada. This vast series of lakes and rivers is shared by the United States and Canada. The joint use of these waters poses numerous international problems in the solution of which the two countries need coordinated basic data.

Prior to 1953, data pertaining to the hydraulic and hydrologic factors of the Great Lakes and St. Lawrence River were collected and compiled independently by the responsible federal agencies in Canada and the United States, with only superficial and informal correlation of some of the data. As a consequence, the data in many instances were developed on different bases and datum planes and were divergent in many respects. This situation resulted in a large volume of study and evaluation by each country of the data used by the other in the solutions of international problems.

Establishment of international study. The quantity and scope of the international problems were greatly increased by the advent of extremely high lake levels in 1952 and by the imminent power and navigation development in the St. Lawrence River system. Recognizing that continued independent development of the basic data was illogical under the circumstances and that early agreement upon the hydraulic and hydrologic factors was of paramount importance, the Corps of Engineers, United States Army, and the Departments of Transport, Mines and Technical Surveys, and Resources and Development, Canada, opened negotiations early in 1953 for the purpose of establishing a basis for development and acceptance by both countries of identical data. The negotiations culminated in a meeting of representatives of the interested agencies at Ottawa on 7 May 1953.

At the meeting, the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data was formed to study the problem and to establish a basis of procedure. This Committee was established advisory to the agencies of the United States and Canada who are charged with the responsibility for collecting and compiling the Great Lakes hydraulic and hydrologic data. The Committee was constituted as follows:

CANADA

T. M. Patterson  
Water Resources Division  
Department of Resources  
and Development  
Chairman

J. E. R. Ross  
Geodetic Survey of Canada  
Department of Mines and  
Technical Surveys

D. M. Ripley  
Special Projects Branch  
Department of Transport

UNITED STATE

G. A. Hathaway  
Corps of Engineers  
Department of the Army  
Chairman

E. W. Nelson  
Corps of Engineers  
Department of the Army

W. T. Laidly  
Corps of Engineers  
Department of the Army

The present membership of the Coordinating Committee is as follows:

CANADA

D. F. Witherspoon  
Inland Waters Directorate  
Environmental Conservation Service  
Ontario Region, Environment Canada  
Chairman

B. J. Tait  
Ocean and Aquatic Sciences  
Fisheries and Oceans, Canada

P. P. Yee  
Inland Waters Directorate  
Environmental Conservation Service  
Ontario Region, Environment Canada  
Secretary

UNITED STATES

D. J. Leonard  
Corps of Engineers  
Department of the Army  
Chairman

P. C. Morris  
National Oceanic and Atmospheric  
Administration  
Department of Commerce

R. E. Wilshaw  
Corps of Engineers  
Department of the Army  
Secretary

Messrs. C. M. Cross, A. T. Prince, R. H. Smith, and W. D. Forrester have also served as Canadian members of the Committee while Messrs. L. D. Kirshner, F. F. Snyder, H. F. Lawhead, F. A. Blust, B. G. DeCooke, and C. I. Thurlow have served as United States members of the Committee.

Four working groups, designated the River Flow Subcommittee, the Vertical Control Subcommittee, the Lake Levels Subcommittee, and the Physical Data Subcommittee, were formed to assist the Coordinating Committee in its work. These subcommittees were directed to conduct the required technical studies through collaboration of the appropriate agencies of Canada and the United States. In September 1969, the Vertical Control and the Lake Levels Subcommittees were combined into one body known as the Vertical Control-Water Levels

Subcommittee. The Subcommittee was normally composed of three members from Canada and three from the United States. The following persons served as members at various times during the progress of the work reported herein:

CANADA

G. C. Dohler  
L. P. Robertson  
B. E. Russell  
E. A. MacDonald  
J. M. Mirakami  
M. H. Quast  
B. J. Tait  
F. W. Young  
R. Gareau  
D. A. St. Jacques

UNITED STATES

B. G. De Cooke  
C. F. Feldscher  
C. F. Ellingwood  
R. M. Berry  
D. R. Rondy  
H. A. Lippincott  
R. E. Wilshaw  
C. T. Whalen

Authority. The Committee instructed its Vertical Control-Water Level Subcommittee to prepare a report in detail on all gauges used in obtaining water levels of Lakes Erie and Ontario, and their outflow channels.

Purpose and Scope. The purpose of this report is to document the history of the operation of water level gauges on the lower two Great Lakes and their outflow rivers. Detailed information about the water levels available is given for each gauging station. This report supercedes and updates information on water level gauges published earlier in two volumes by the Coordinating Committee.

Acknowledgements. The Coordinating Committee acknowledges and expresses its appreciation of the cooperation received from the Canadian Hydrographic Service, Department of Fisheries and Oceans; the Water Survey of Canada, Department of the Environment; the Detroit District, U. S. Army Corps of Engineers and the National Ocean Survey, (National Ocean Survey reorganized as National Ocean Service in November 1982) National Oceanic and Atmospheric Administration of the United States. The information used in compiling this report has been taken from the files of the two principal agencies concerned, the Canadian Hydrographic Service and the National Ocean Survey. The operation and records of Great Lakes water level gauging stations were transferred from the United States Lake Survey (U.S.L.S.), U.S. Army Corps of Engineers, to the National Ocean Survey in October 1970. The individual efforts of Robert A. Mace, Frank M. Sullivan, James S. Moore, Leonard T. Schutze, and Harry A. Lippincott are gratefully acknowledged by the Committee in researching and compiling the information in this report. In addition, the Committee is particularly grateful to Brenda S. Vostreys for typing revisions of the manuscript.

## PRESENTATION OF DATA

Presented herein are the histories of all Canadian and United States gauging stations that the Committee considered have provided useful water level data on the lower Great Lakes, the International Section of the St. Lawrence River and the Niagara River for various periods of time through December 1982. For each station the following data are given:

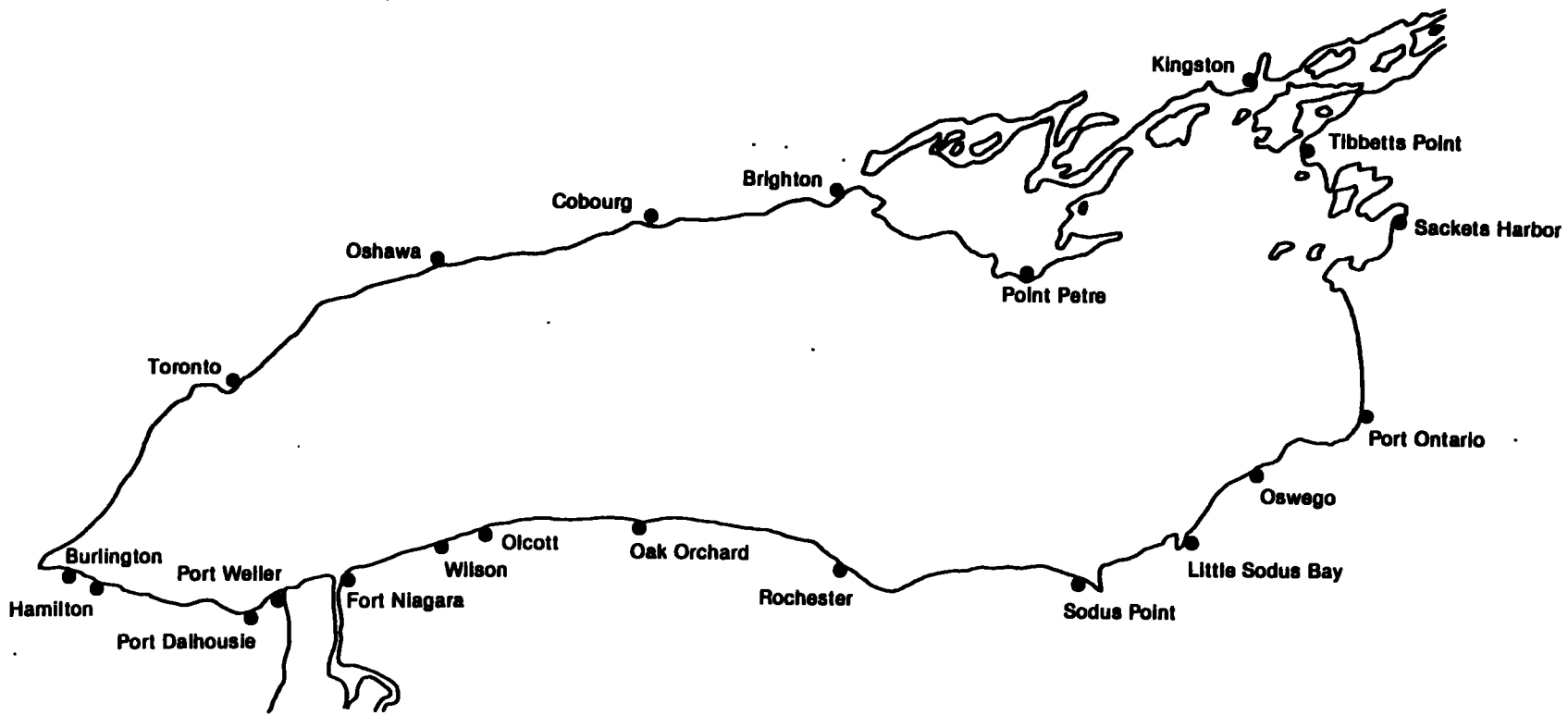
1. A comprehensive statement as to how datums were established.
2. A chronological table listing the period when water level observations were made, the controlling bench mark and its elevation, the type of record, and the abbreviation for the operating agency during each observation period. See Plates for the periods of operation of water level gauging stations. The following agency abbreviations have been used in the text.

C.H.S.	- Canadian Hydrographic Service
D.W.C.	- Deep Waterways Commission
D. of R. and C.	- Department of Railways and Canals
D.O.T.	- Department of Transport
D.P.W.	- Department of Public Works
D.W.P.B.	- Dominion Water and Power Bureau
W.R.B.	- Water Resources Branch
O.P. Co.	- Ontario Power Company
H.E.P.C.O.	- Hydro-Electric Power Commission of Ontario
O.H.E.	- Ontario Hydro-Electric
P.A.S.N.Y.	- Power Authority of the State of New York
Shipldg. Co.	- Kingston Shipbuilding Company
T.H.C.	- Toronto Harbour Commission
L.C.A.	- Lake Carriers Association
U.S.C. & G.S.	- United States Coast and Geodetic Survey
U.S.E.O.	- United States Engineering Office
U.S.L.S.	- United States Lake Survey
N.O.S.	- National Ocean Service

3. Elevation of the controlling bench mark on International Great Lakes Datum, IGLD (1955). Elevations in this publication are shown in the measurement unit accepted during each period of water level observations. The conversion to the equivalent customary or metric unit is shown in parenthesis. National and agency policies in the United States and Canada for conversion to the exclusive use of the metric unit are different. At present, United States policy is to plan increasing use and to coordinate the voluntary conversion to the metric system. Canada policy was to investigate, plan, schedule and implement a metric conversion program to be completed by 1980. This target date was achieved.

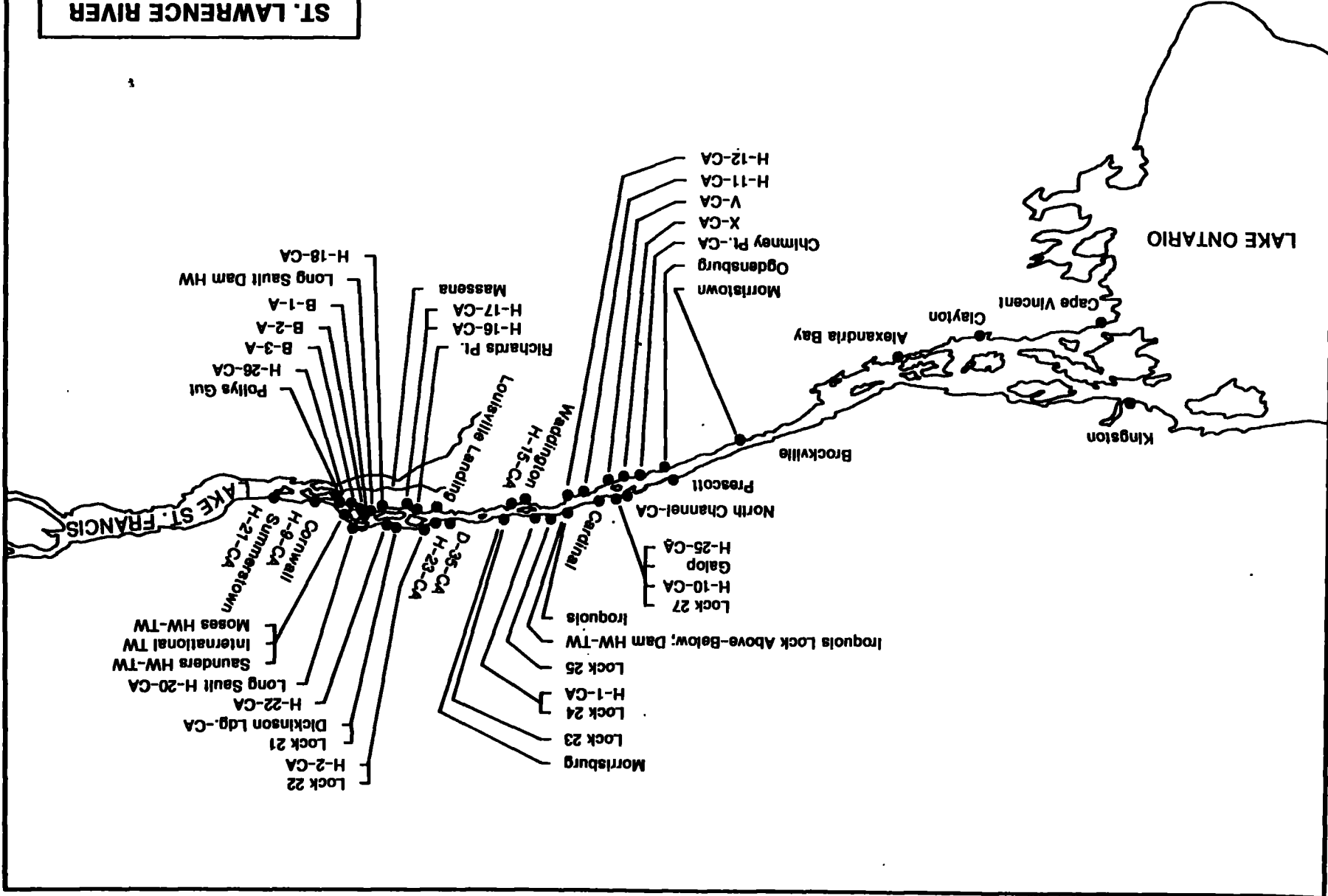
4. Description and location of the gauging station sites for which adequate information is available. See Plates 1-4 for general location and Plates 30-165 for detailed location.

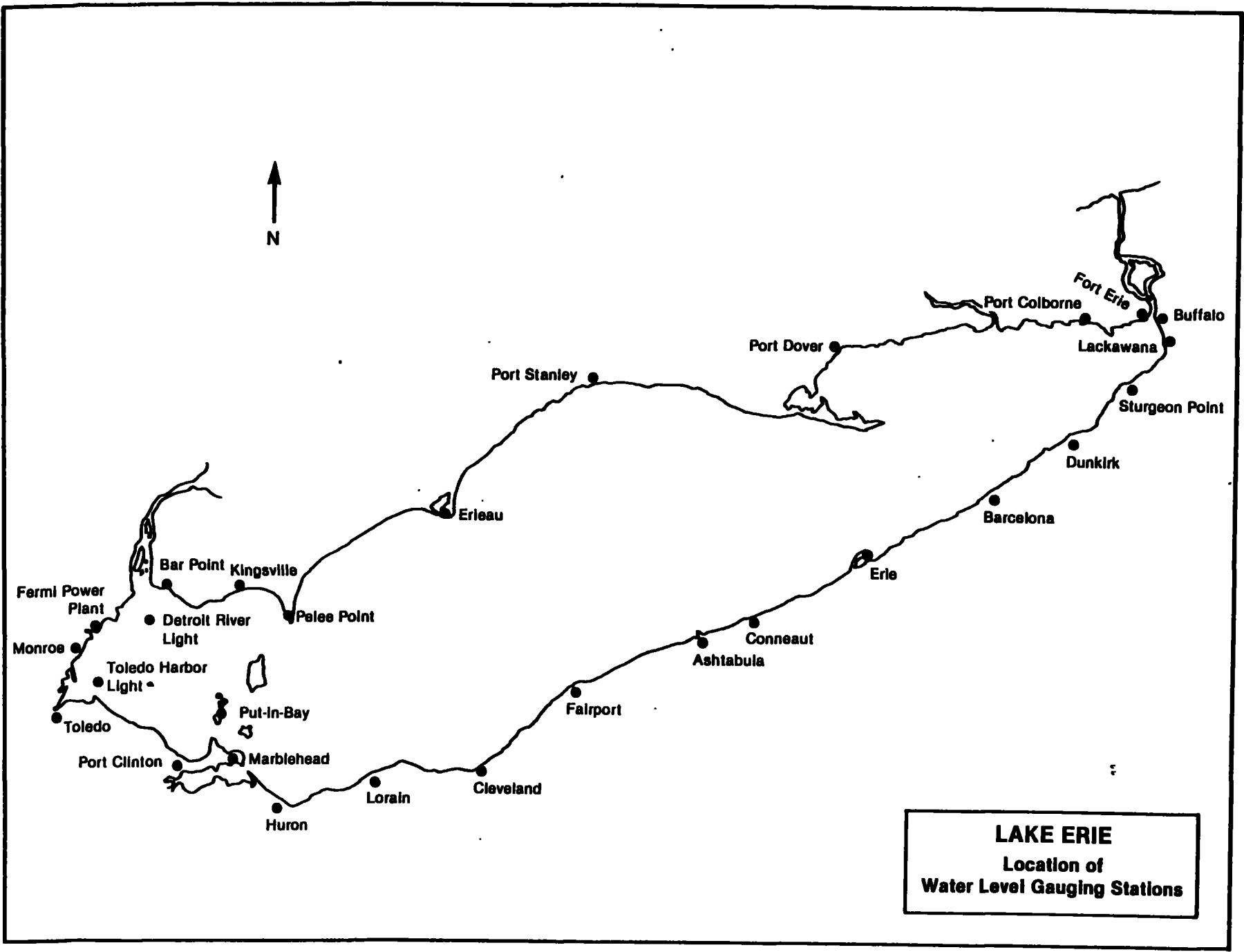
For more detailed information regarding these gauges and their records consult the Canadian Hydrographic Service in Ottawa, Ontario, for gauges in Canada, and the National Ocean Service in Rockville, Maryland, for gauges in the United States.



**LAKE ONTARIO**  
Location of  
Water Level Gauging Stations

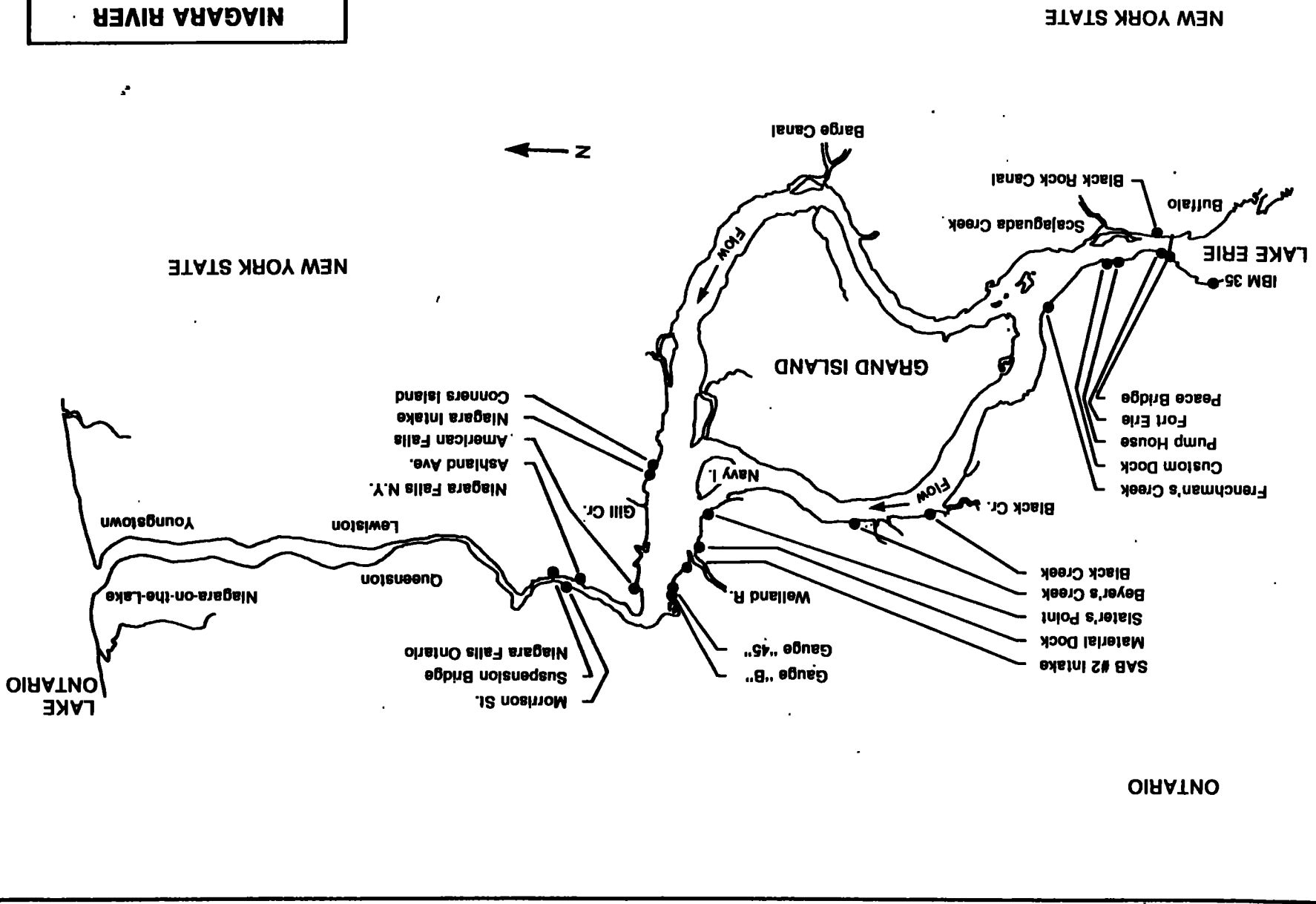
**ST. LAWRENCE RIVER**  
**Location of**  
**Water Level Gauging Stations**





**LAKE ERIE**  
**Location of**  
**Water Level Gauging Stations**

**NIAGARA RIVER**  
**Location of**  
**Water Level Gauging Stations**



WATER LEVEL RECORDS PRIOR TO 1860

1815 1820 1825 1830 1835 1840 1845 1850 1855 1860

PORT COLBORNE, ONTARIO

MONROE, MICHIGAN

CLEVELAND, OHIO

ERIE, PENNSYLVANIA

11

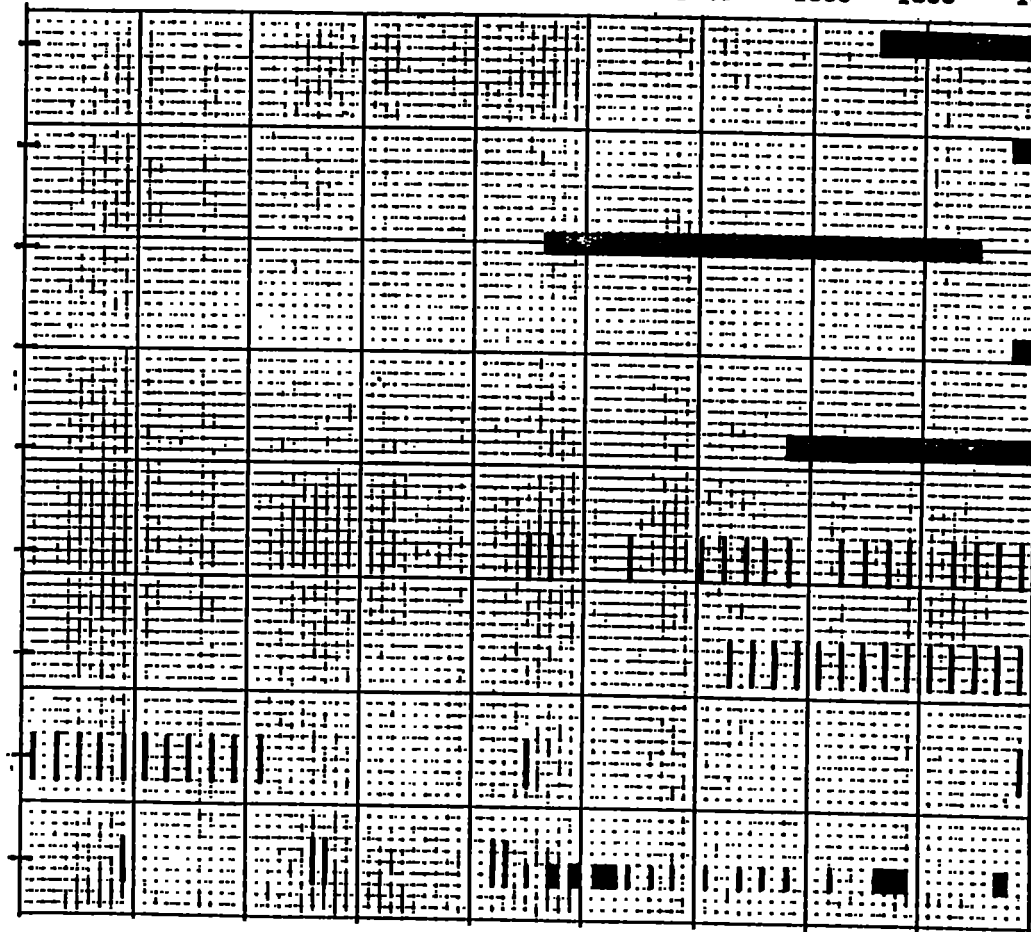
PORT DALHOUSIE, ONTARIO

OSWEGO, NEW YORK

ROCHESTER, NEW YORK

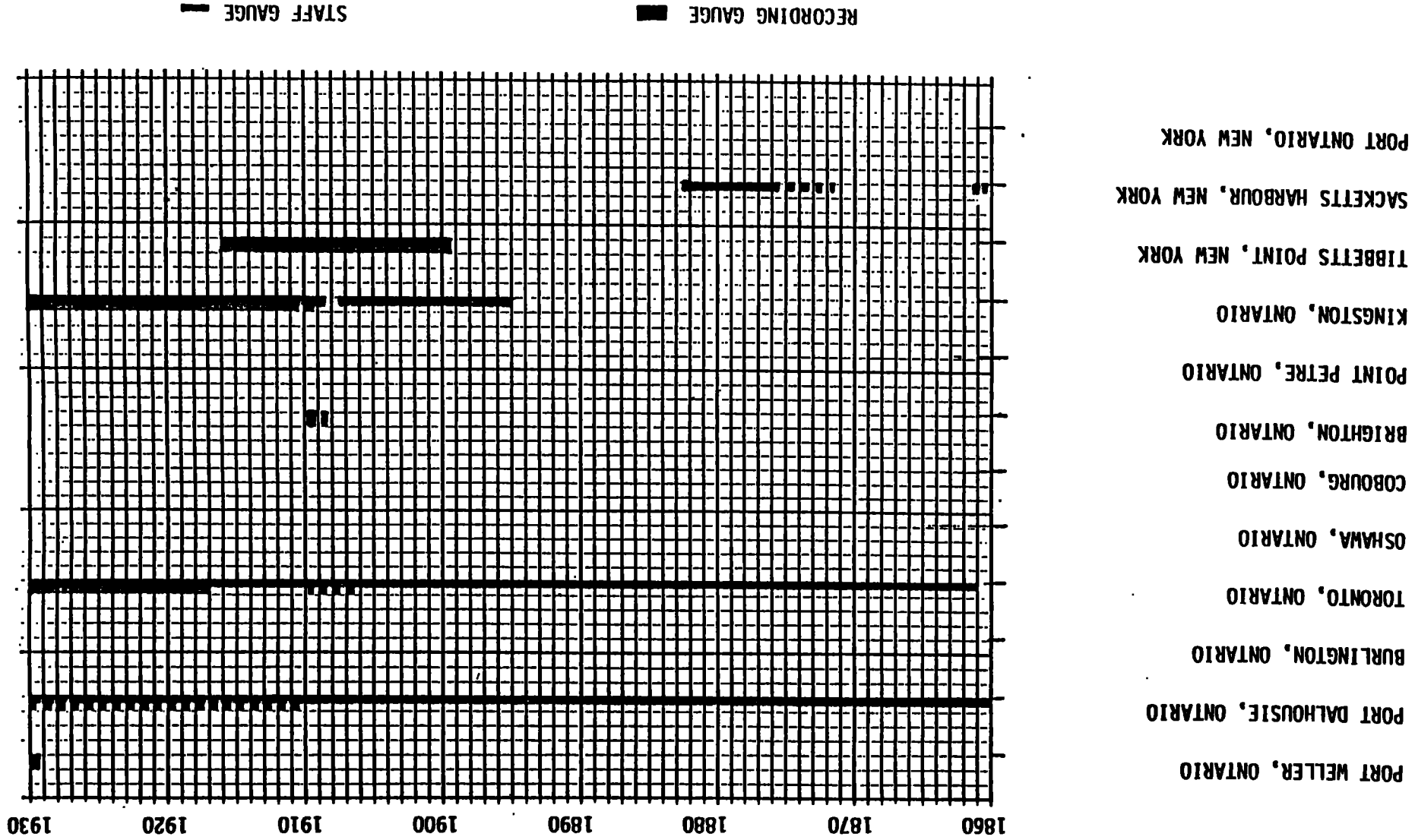
FORT NIAGARA, NEW YORK

BUFFALO, NEW YORK



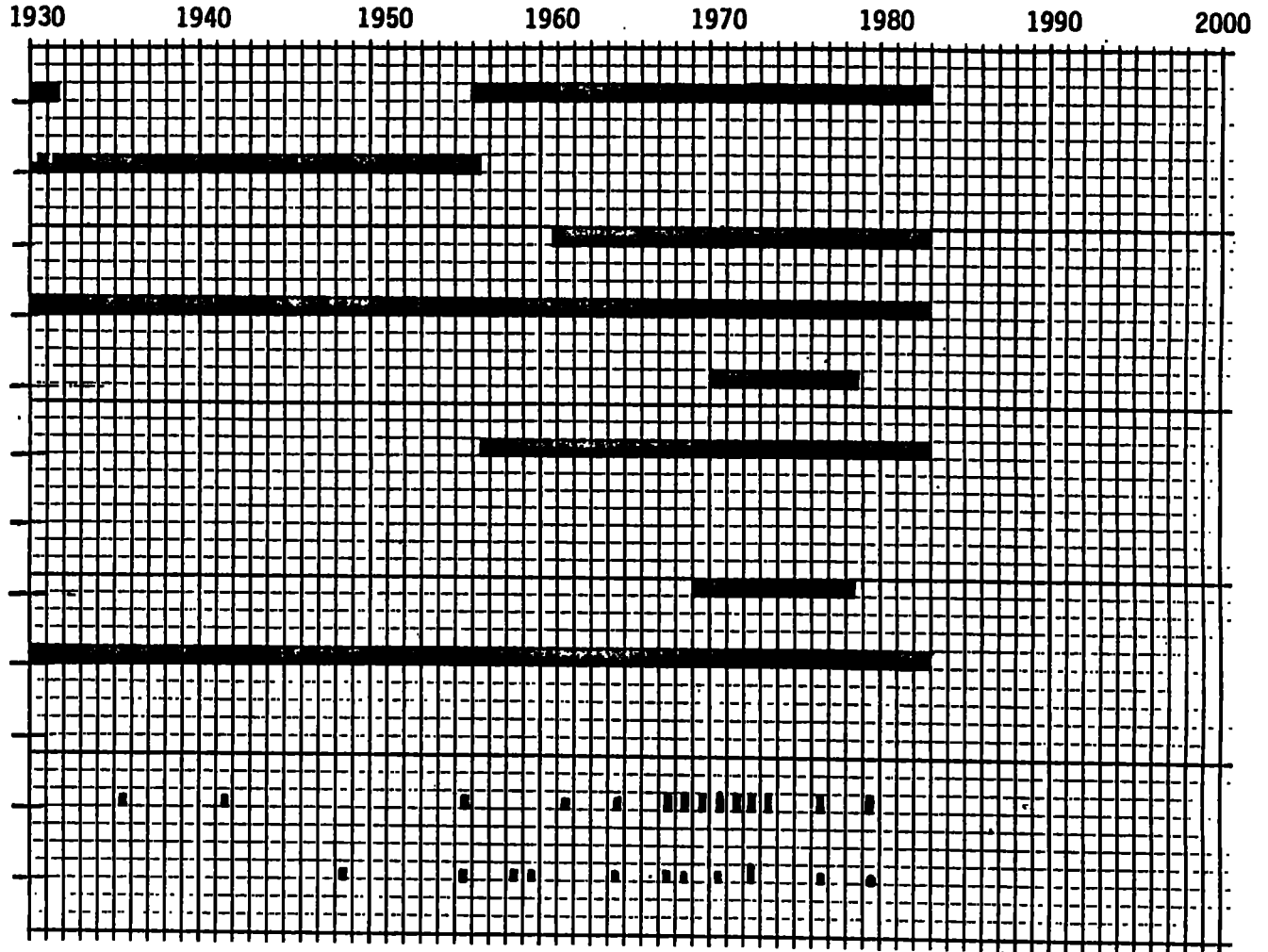
FEWER THAN ONE READING PER DAY 

GENERALLY ONE OR MORE READINGS PER DAY 



LAKE ONTARIO  
WATER LEVEL RECORDS 1860-1930

LAKE ONTARIO  
WATER LEVEL RECORDS 1930- TO DATE



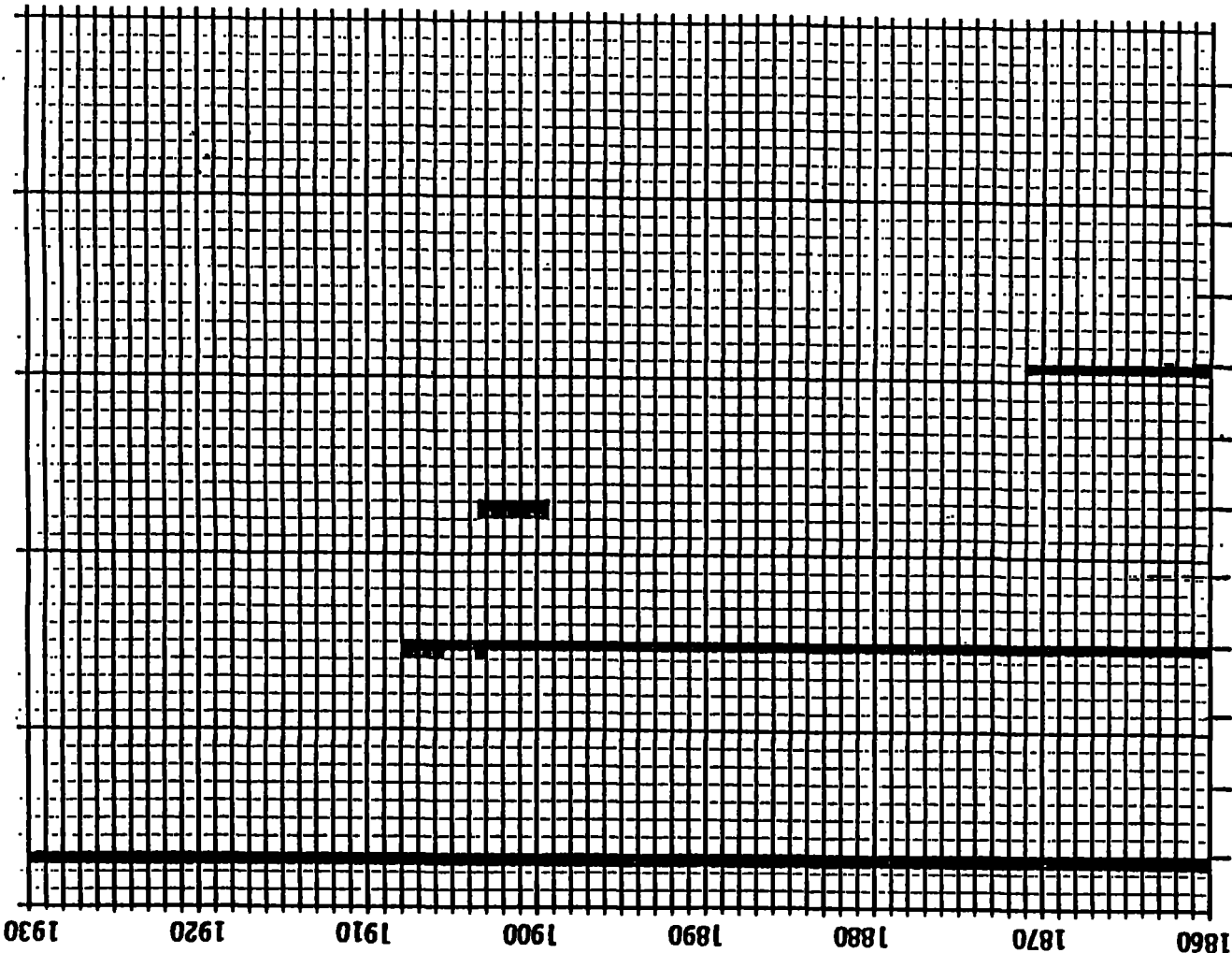
RECORDING GAUGE

STAFF GAUGE

13

LAKE ONTARIO

WATER LEVEL RECORDS 1860-1930

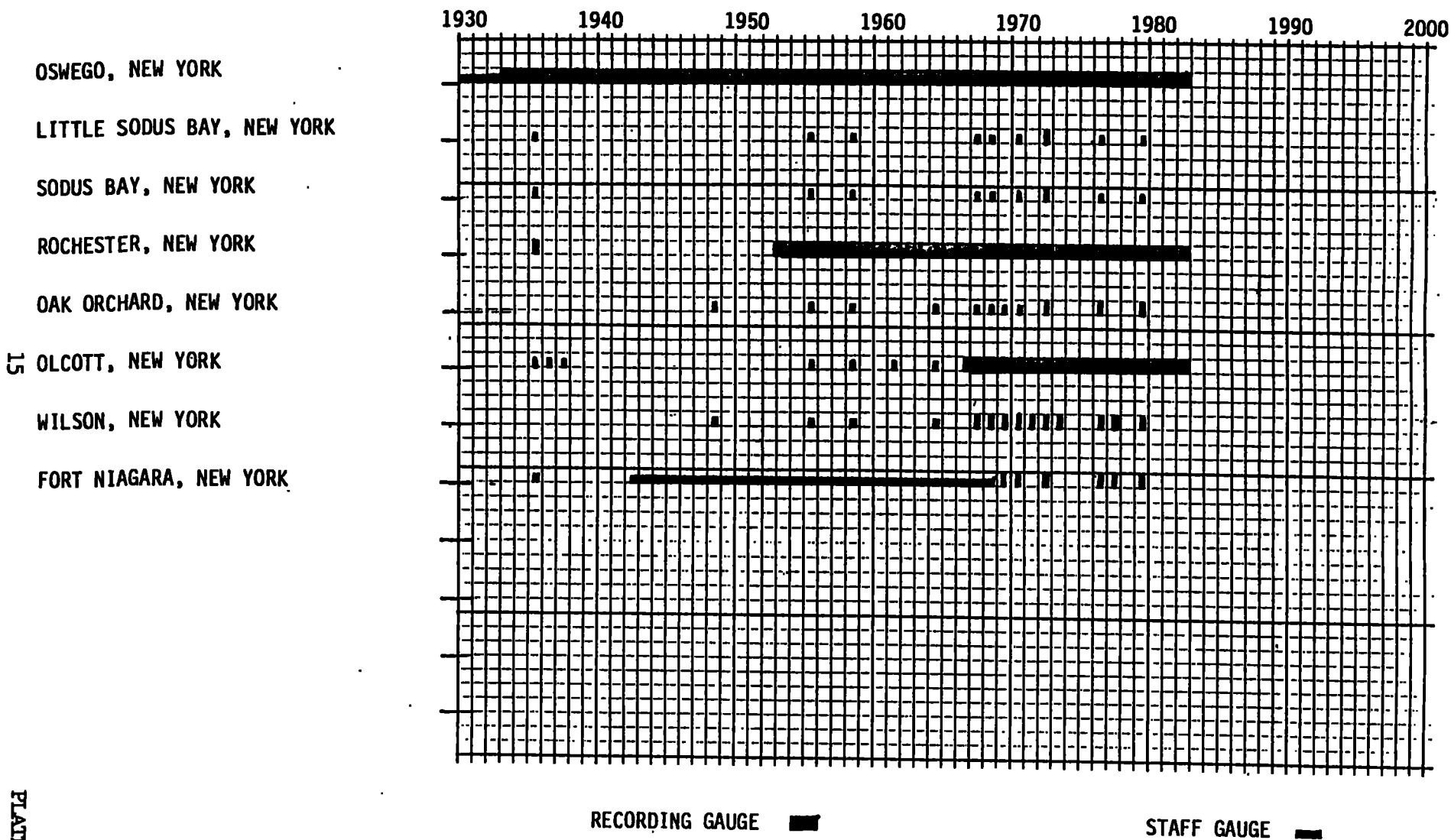


OSWEGO, NEW YORK  
 LITTLE SODUS BAY, NEW YORK  
 SODUS BAY, NEW YORK  
 ROCHESTER, NEW YORK  
 OAK ORCHARD, NEW YORK  
 OLCOTT, NEW YORK  
 WILSON, NEW YORK  
 FORT NIAGARA, NEW YORK

RECORDING GAUGE

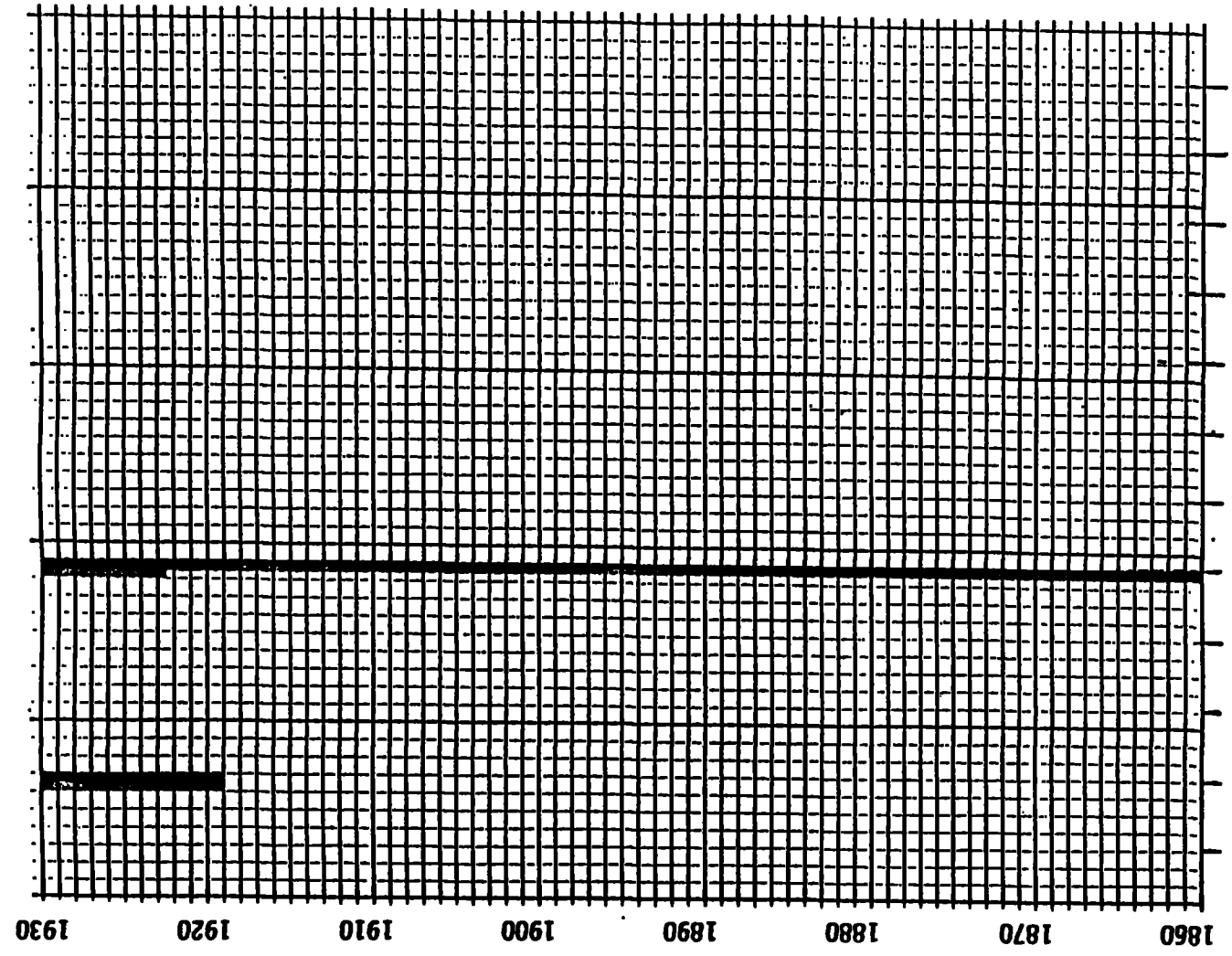
STAFF GAUGE

**LAKE ONTARIO**  
**WATER LEVEL RECORDS 1930- TO DATE**



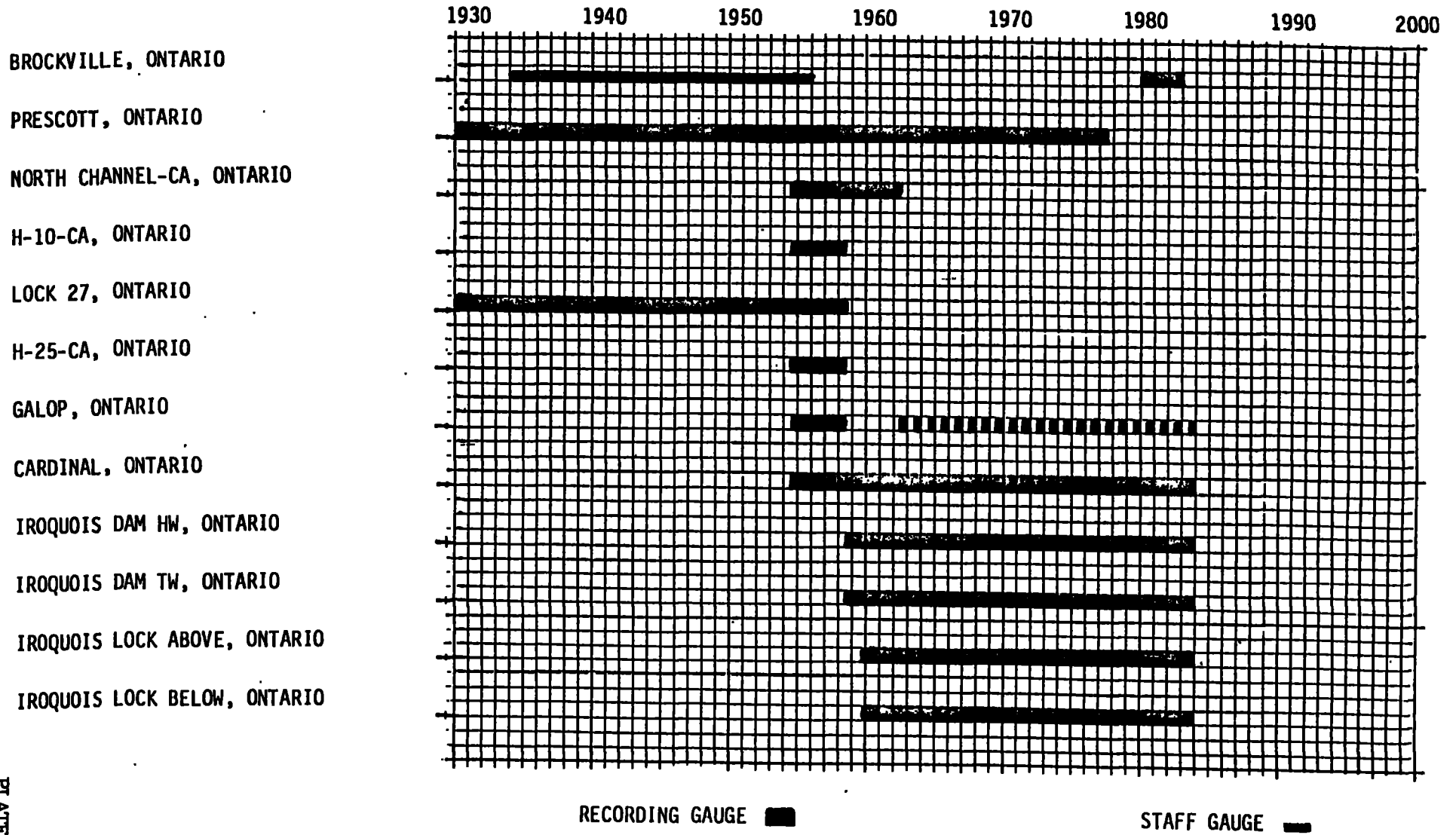
ST. LAWRENCE RIVER

WATER LEVEL RECORDS 1860-1930



- BROCKVILLE, ONTARIO
- PRESCOTT, ONTARIO
- NORTH CHANNEL-CA, ONTARIO
- H-10-CA, ONTARIO
- LOCK 27, ONTARIO
- H-25-CA, ONTARIO
- GALOP, ONTARIO
- CARDINAL, ONTARIO
- IROQUOIS DAM HM, ONTARIO
- IROQUOIS DAM TM, ONTARIO
- IROQUOIS LOCK ABOVE, ONTARIO
- IROQUOIS LOCK BELOW, ONTARIO

**ST. LAWRENCE RIVER**  
**WATER LEVEL RECORDS 1930 - TO DATE**

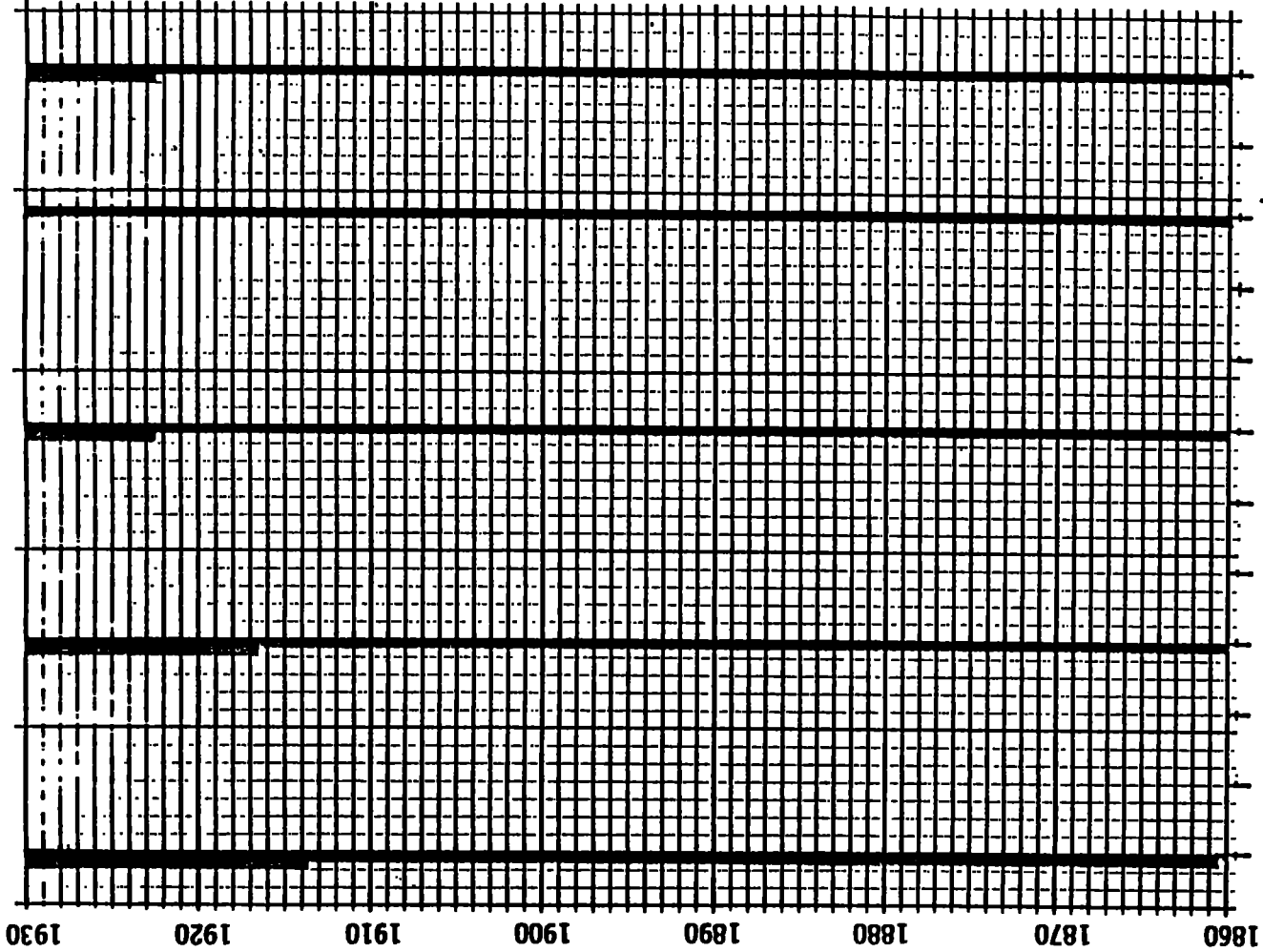


17

PLATE 11

ST. LAWRENCE RIVER

WATER LEVEL RECORDS 1860-1930

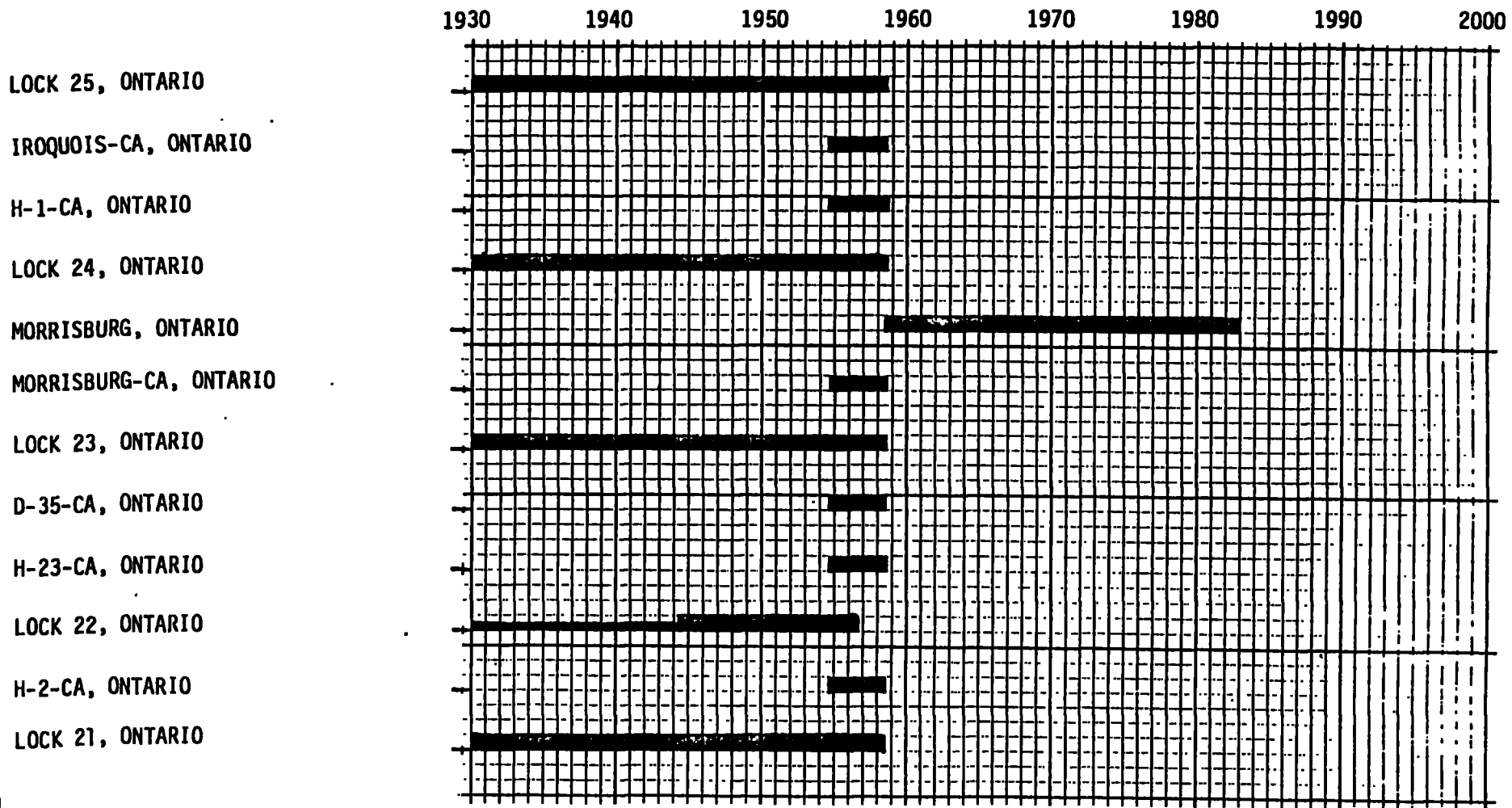


LOCK 25, ONTARIO  
IROQUOIS-CA, ONTARIO  
H-1-CA, ONTARIO  
LOCK 24, ONTARIO  
MORRISBURG, ONTARIO  
MORRISBURG-CA, ONTARIO  
LOCK 23, ONTARIO  
D-35-CA, ONTARIO  
H-23-CA, ONTARIO  
LOCK 22, ONTARIO  
H-2-CA, ONTARIO  
LOCK 21, ONTARIO

STAFF GAUGE

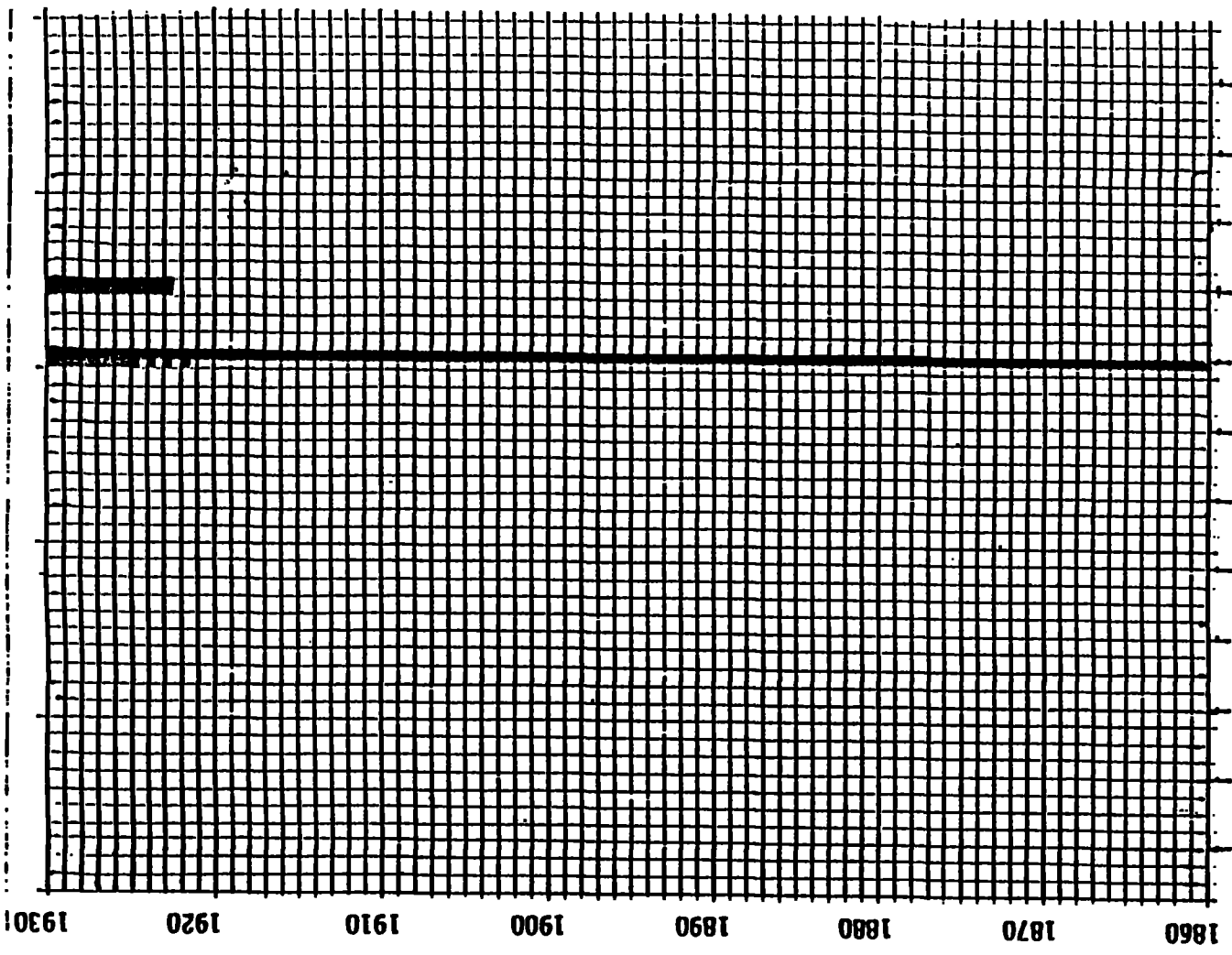
RECORDING GAUGE

**ST. LAWRENCE RIVER**  
**WATER LEVEL RECORDS 1930- TO DATE**



RECORDING GAUGE

STAFF GAUGE



1860 1870 1880 1890 1900 1910 1920 1930

WATER LEVEL RECORDS 1860-1930

ST. LAWRENCE RIVER

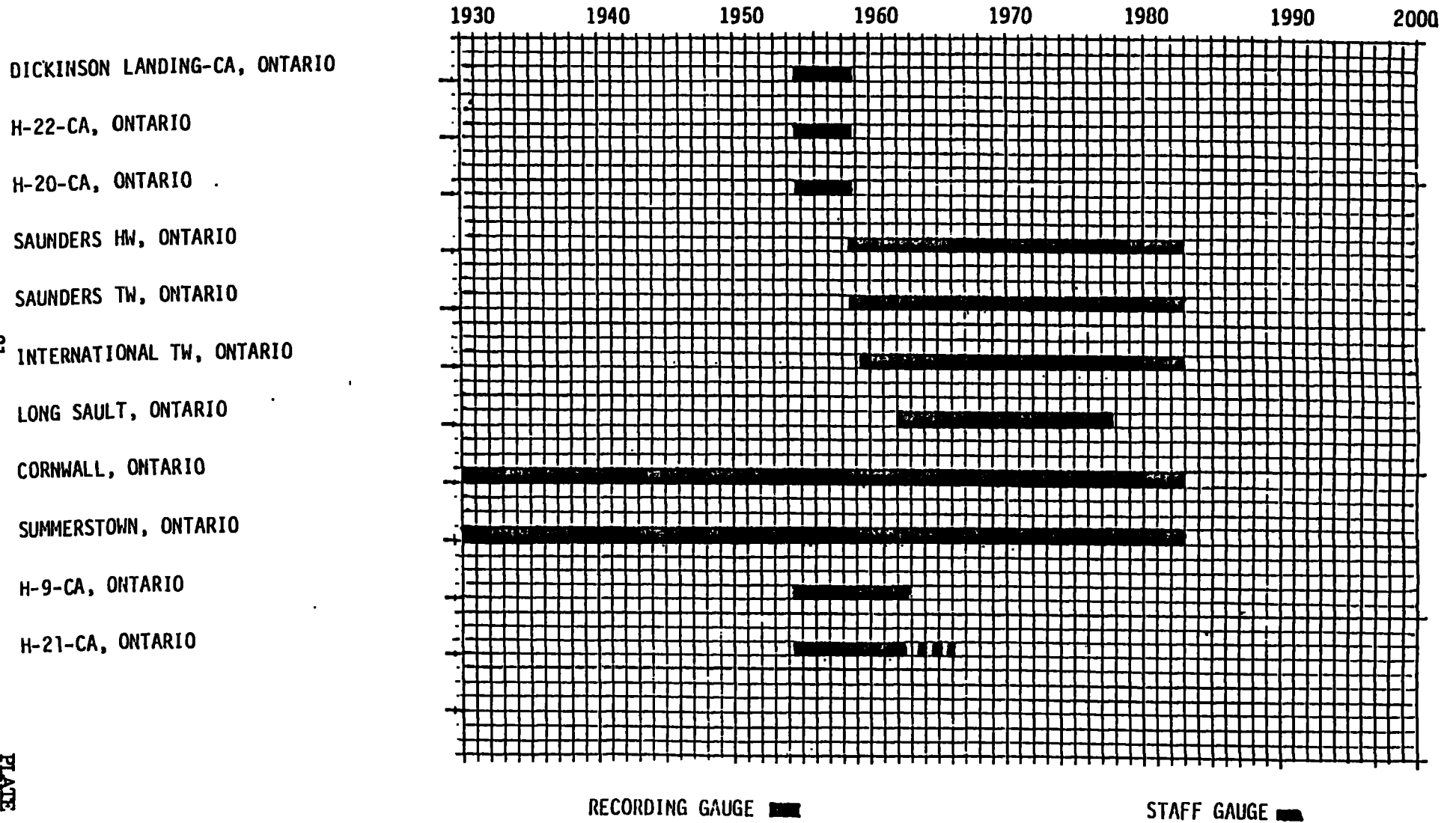
STAFF GAUGE

RECORDING GAUGE

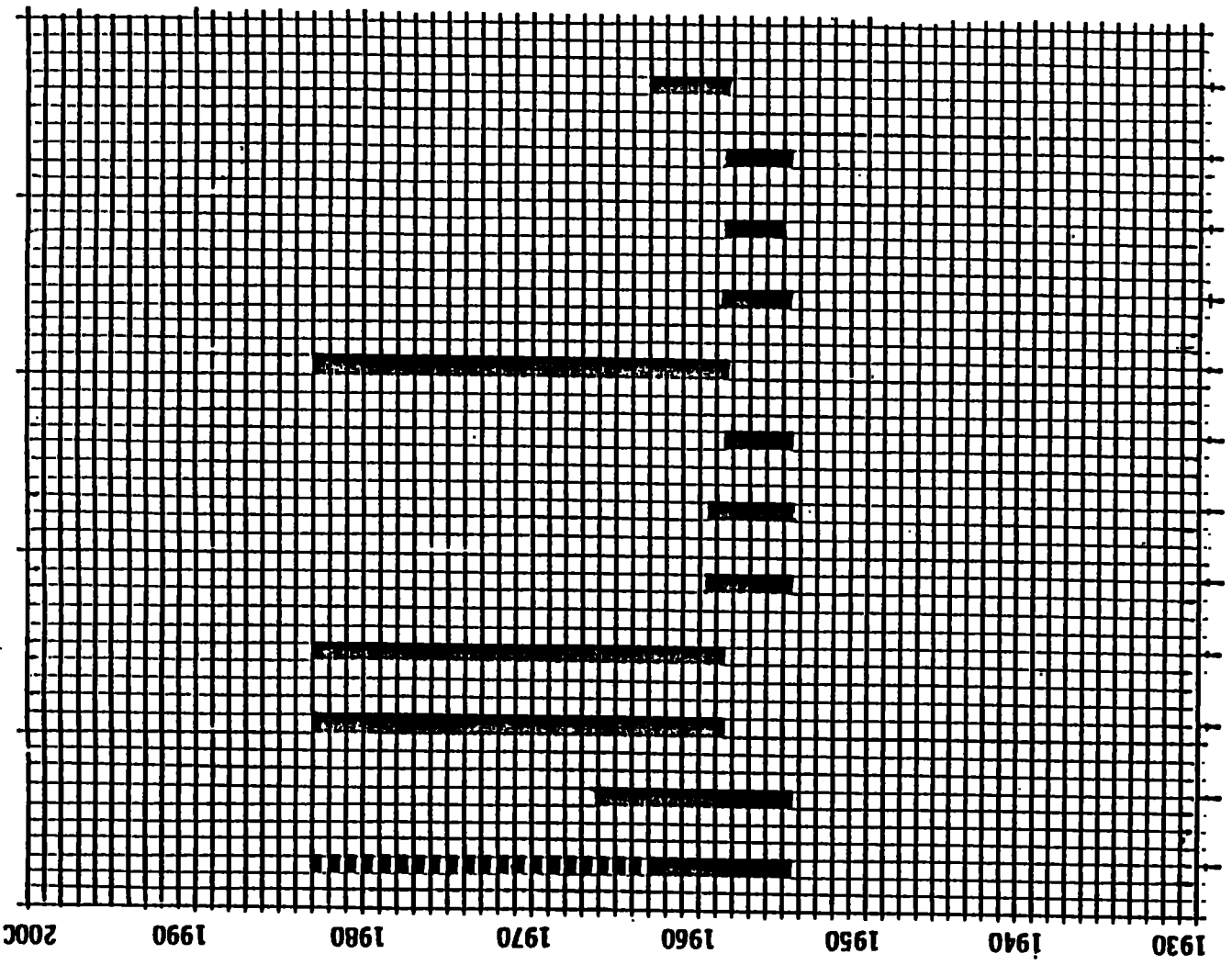
- DICKINSON LANDING-CA, ONTARIO
- H-22-CA, ONTARIO
- H-20-CA, ONTARIO
- SAUNDERS HM, ONTARIO
- SAUNDERS TW, ONTARIO
- INTERNATIONAL TW, ONTARIO
- LONG SAULT, ONTARIO
- CORNWALL, ONTARIO
- SUMMERSTOWN, ONTARIO
- H-9-CA, ONTARIO
- H-21-CA, ONTARIO

ST. LAWRENCE RIVER

WATER LEVEL RECORDS 1930 - TO DATE



21



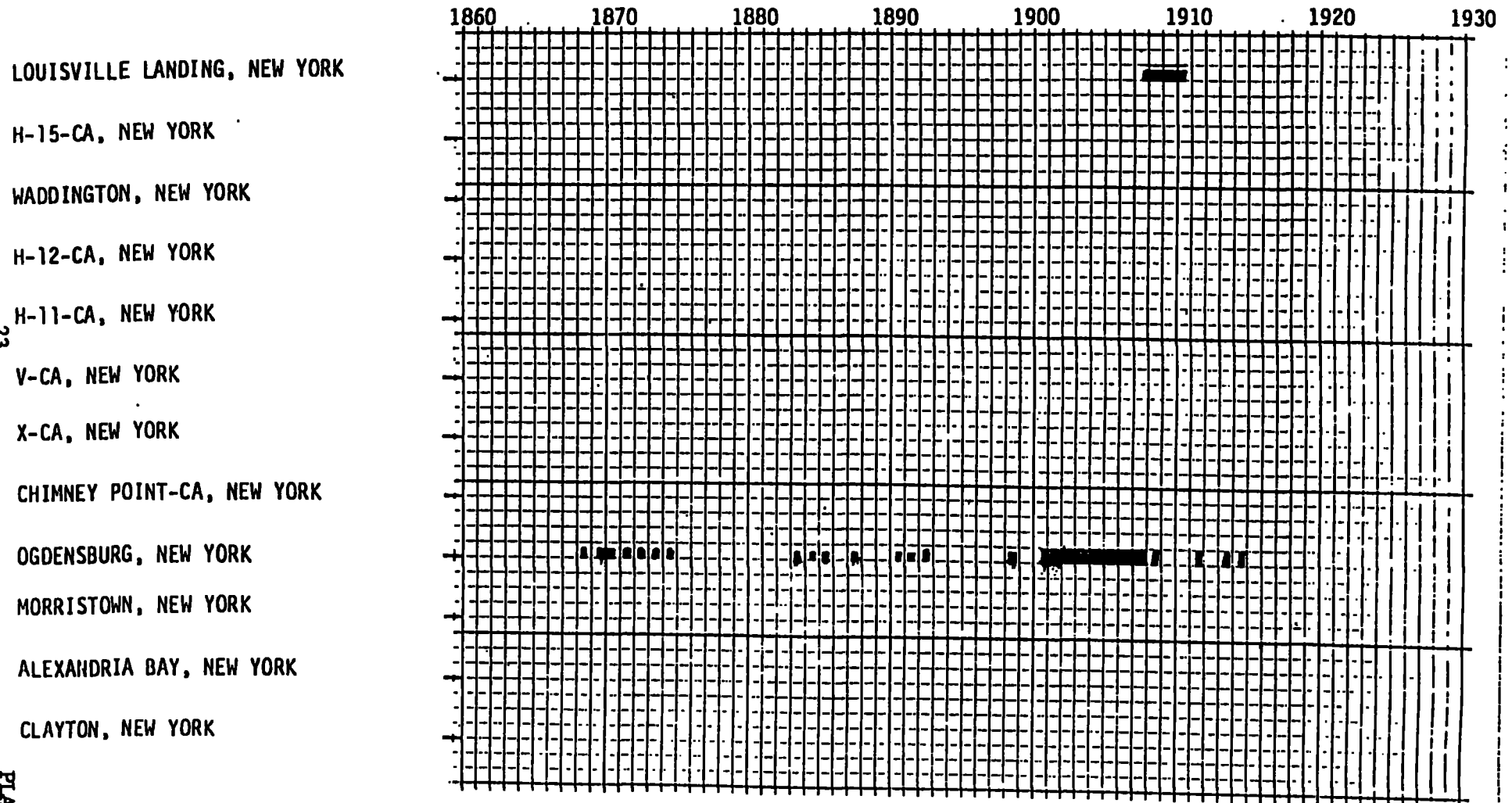
ST. LAWRENCE RIVER  
 WATER LEVEL RECORDS 1930 - TO DATE


— STAFF GAUGE

■ RECORDING GAUGE

- RICHARDS POINT, NEW YORK
- H-16-CA, NEW YORK
- H-17-CA, NEW YORK
- H-18-CA, NEW YORK
- LONG SAULT DAM HM, NEW YORK
- B-1-A, NEW YORK
- B-2-A, NEW YORK
- B-3-A, NEW YORK
- MOSES HM, NEW YORK
- MOSES TM, NEW YORK
- H-26-CA, NEW YORK
- POLLYS GUT, NEW YORK

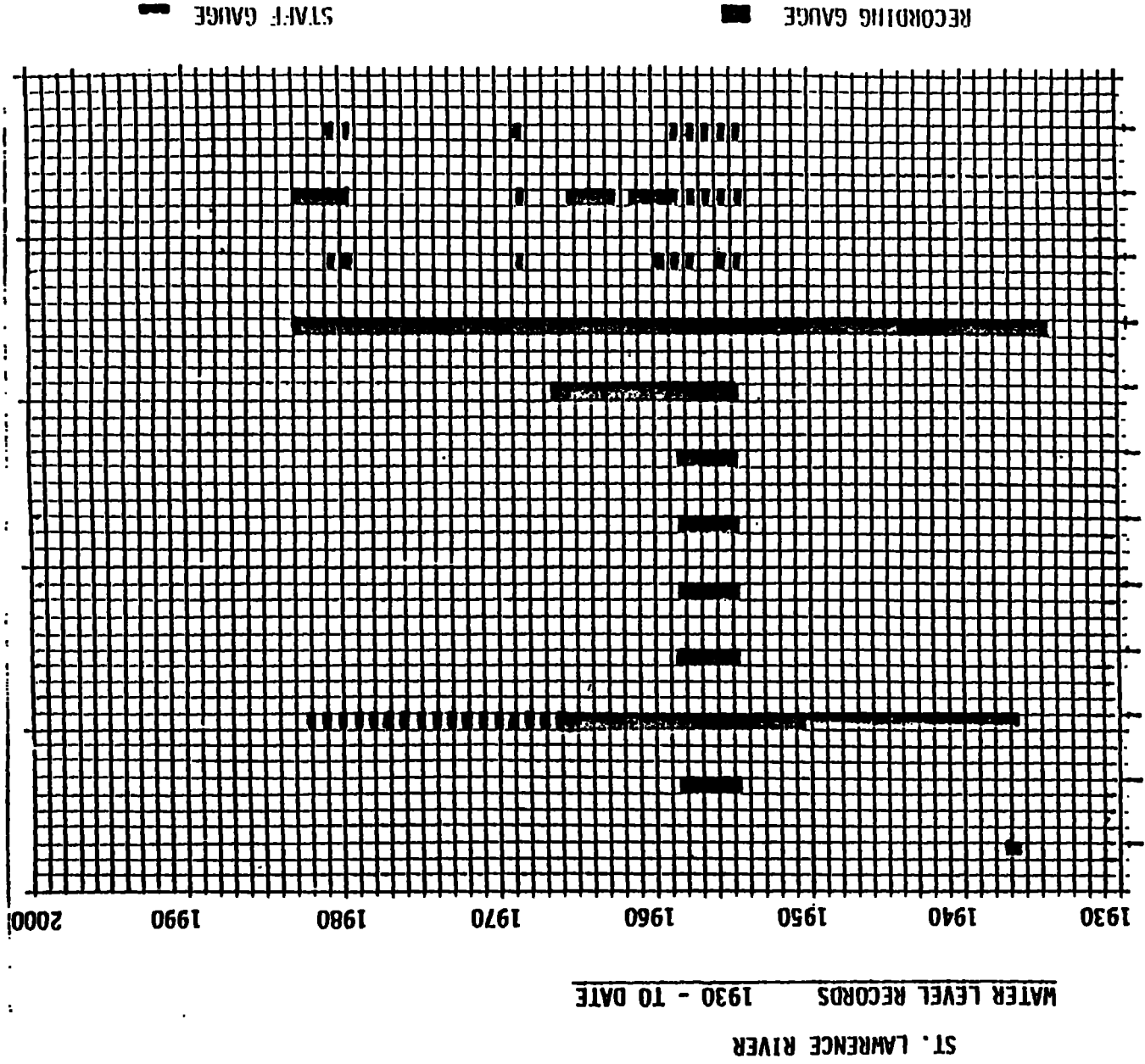
ST. LAWRENCE RIVER  
WATER LEVEL RECORDS 1860-1930



RECORDING GAUGE 

STAFF GAUGE 

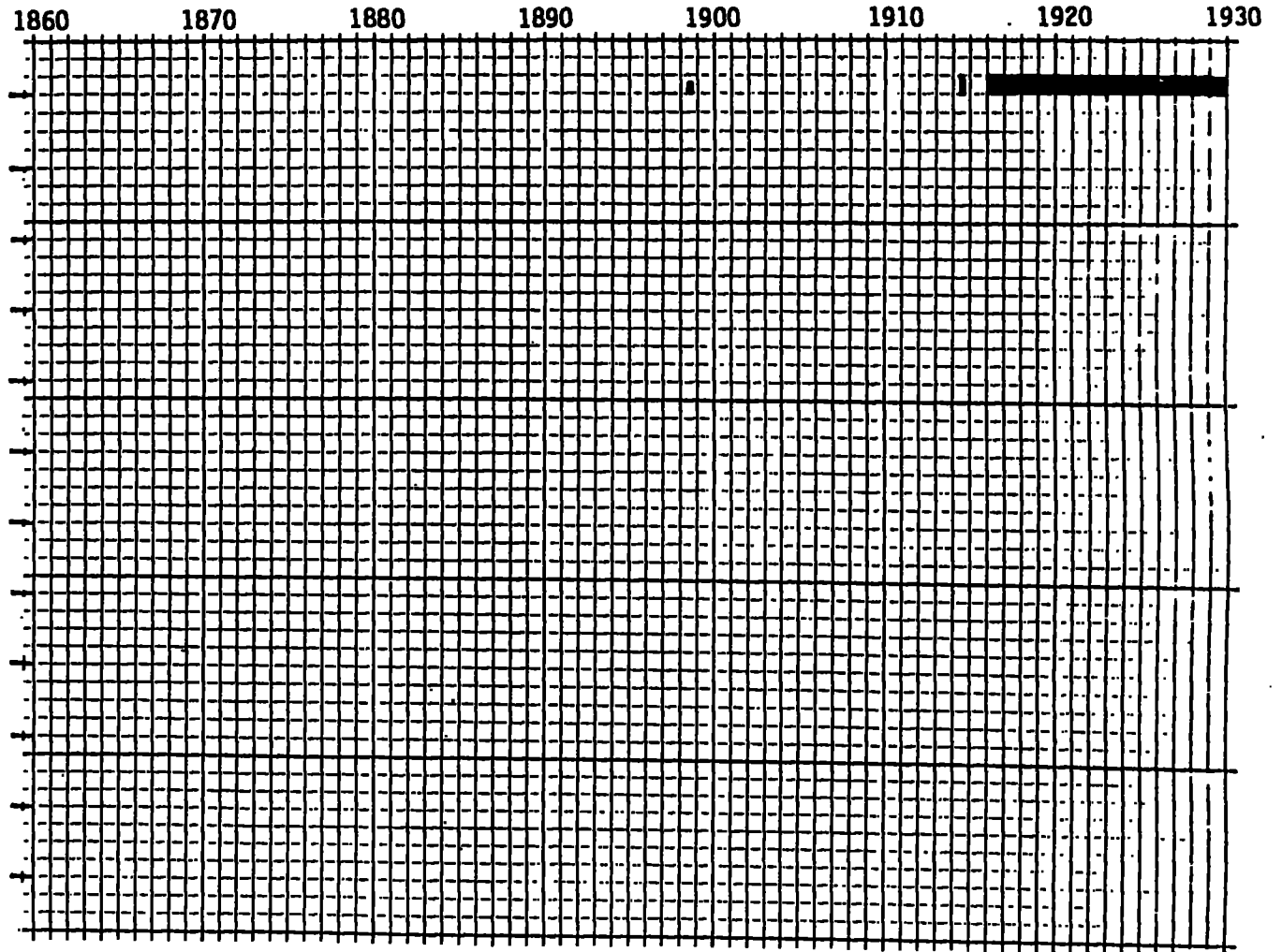
23



LOUISVILLE LANDING, NEW YORK  
H-15-CA, NEW YORK  
WADDINGTON, NEW YORK  
H-12-CA, NEW YORK  
H-11-CA, NEW YORK  
V-CA, NEW YORK  
X-CA, NEW YORK  
CHINNEY POINT-CA, NEW YORK  
OGDENSBURG, NEW YORK  
MORRISTOWN, NEW YORK  
ALEXANDRIA BAY, NEW YORK  
CLAYTON, NEW YORK

ST. LAWRENCE RIVER  
WATER LEVEL RECORDS 1860-1930

CAPE VINCENT, NEW YORK

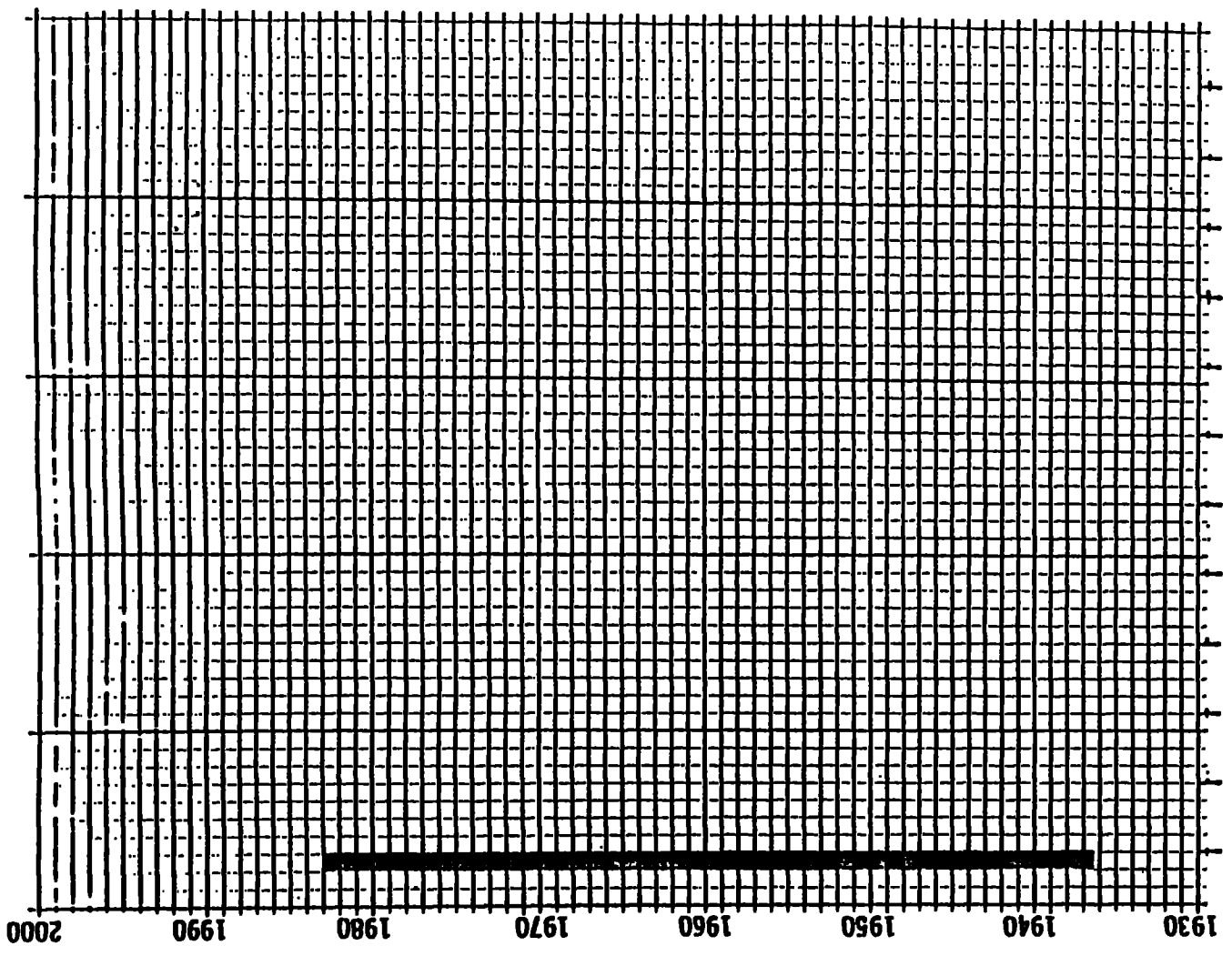


RECORDING GAUGE 

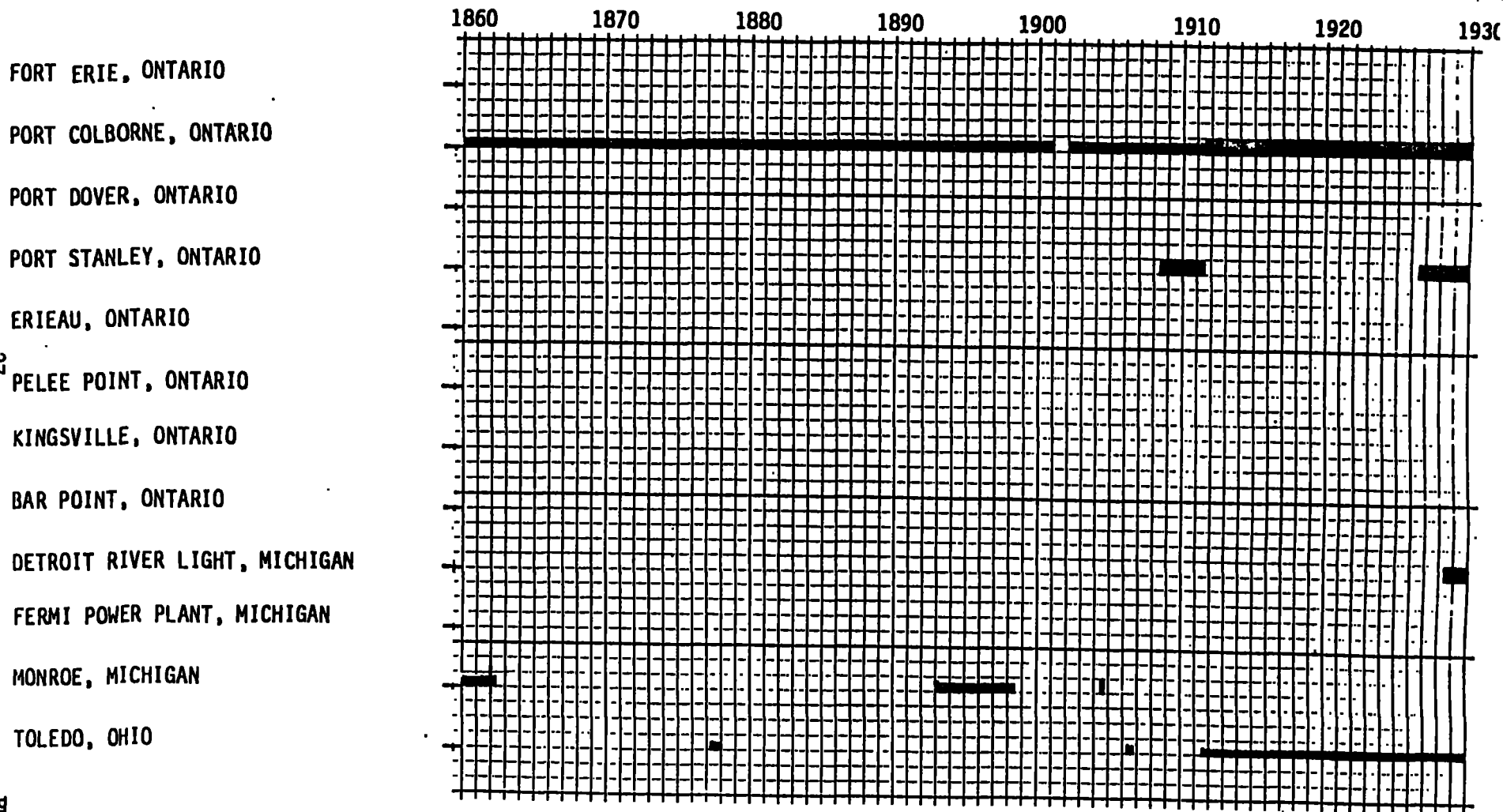
STAFF GAUGE 

CAPE VINCENT, NEW YORK

ST. LAWRENCE RIVER  
WATER LEVEL RECORDS 1930-TO DATE



**LAKE ERIE**  
**WATER LEVEL RECORDS 1860-1930**



27

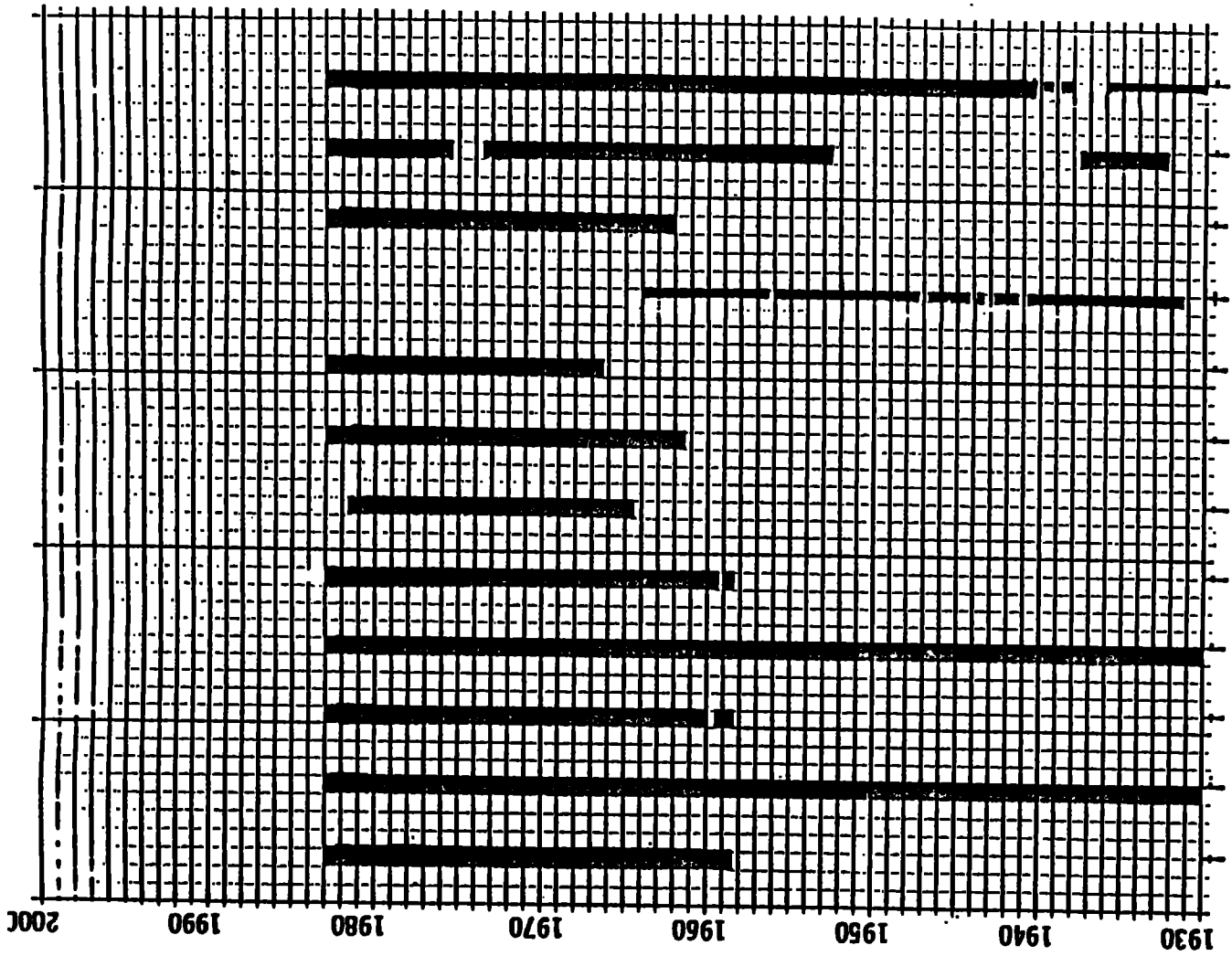
RECORDING GAUGE

STAFF GAUGE

TOLEDO, OHIO  
 MONROE, MICHIGAN  
 FERMIL POWER PLANT, MICHIGAN  
 DETROIT RIVER LIGHT, MICHIGAN  
 BAR POINT, ONTARIO  
 KINGSVILLE, ONTARIO  
 PELEE POINT, ONTARIO  
 ERIEAU, ONTARIO  
 PORT STANLEY, ONTARIO  
 PORT DOVER, ONTARIO  
 PORT COLBORNE, ONTARIO  
 FORT ERIE, ONTARIO

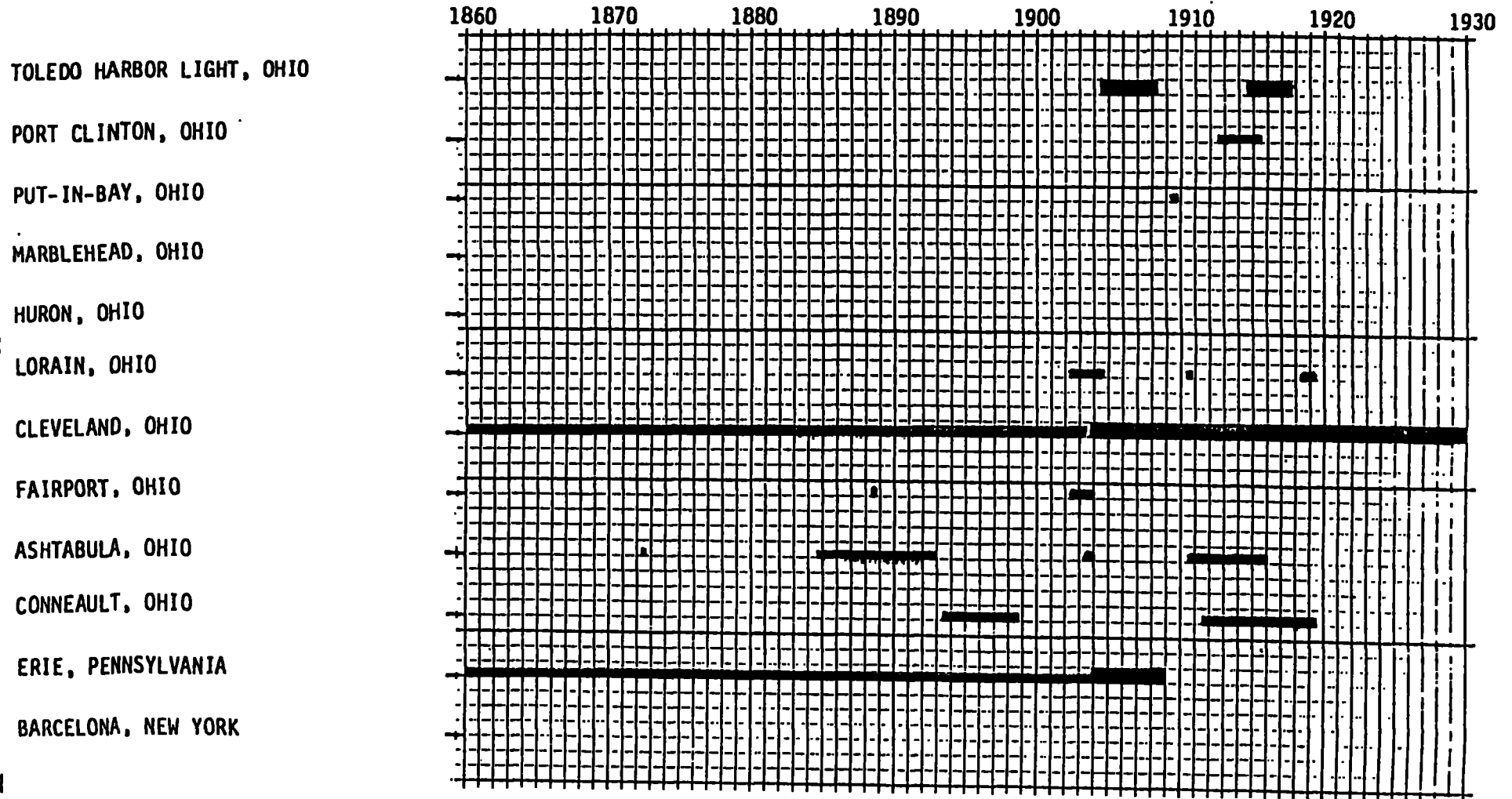
28

LAKE ERIE  
 WATER LEVEL RECORDS 1930: TO DATE



LAKE ERIE

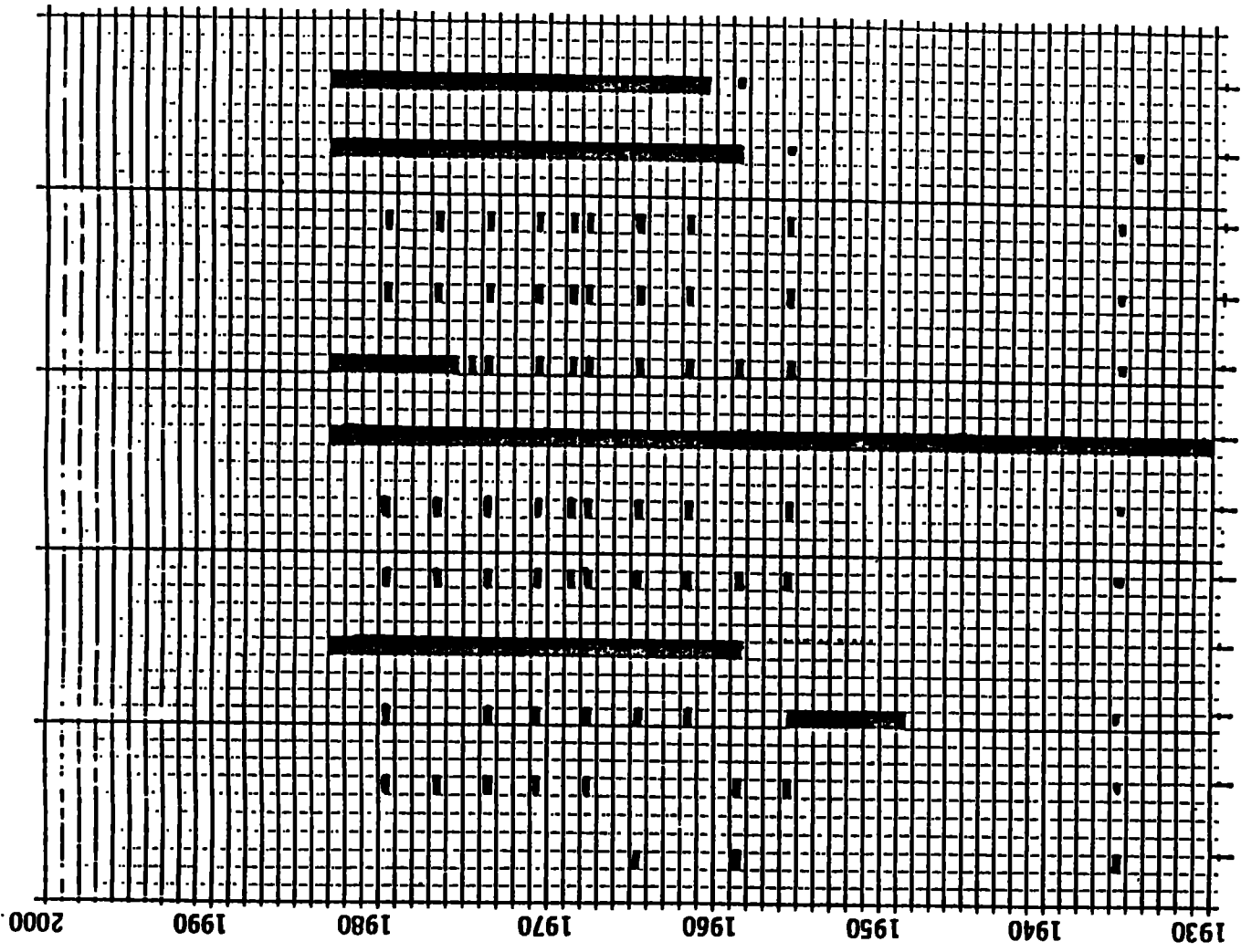
WATER LEVEL RECORDS 1860-1930



29

RECORDING GAUGE

STAFF GAUGE



WATER LEVEL RECORDS 1930- TO DATE

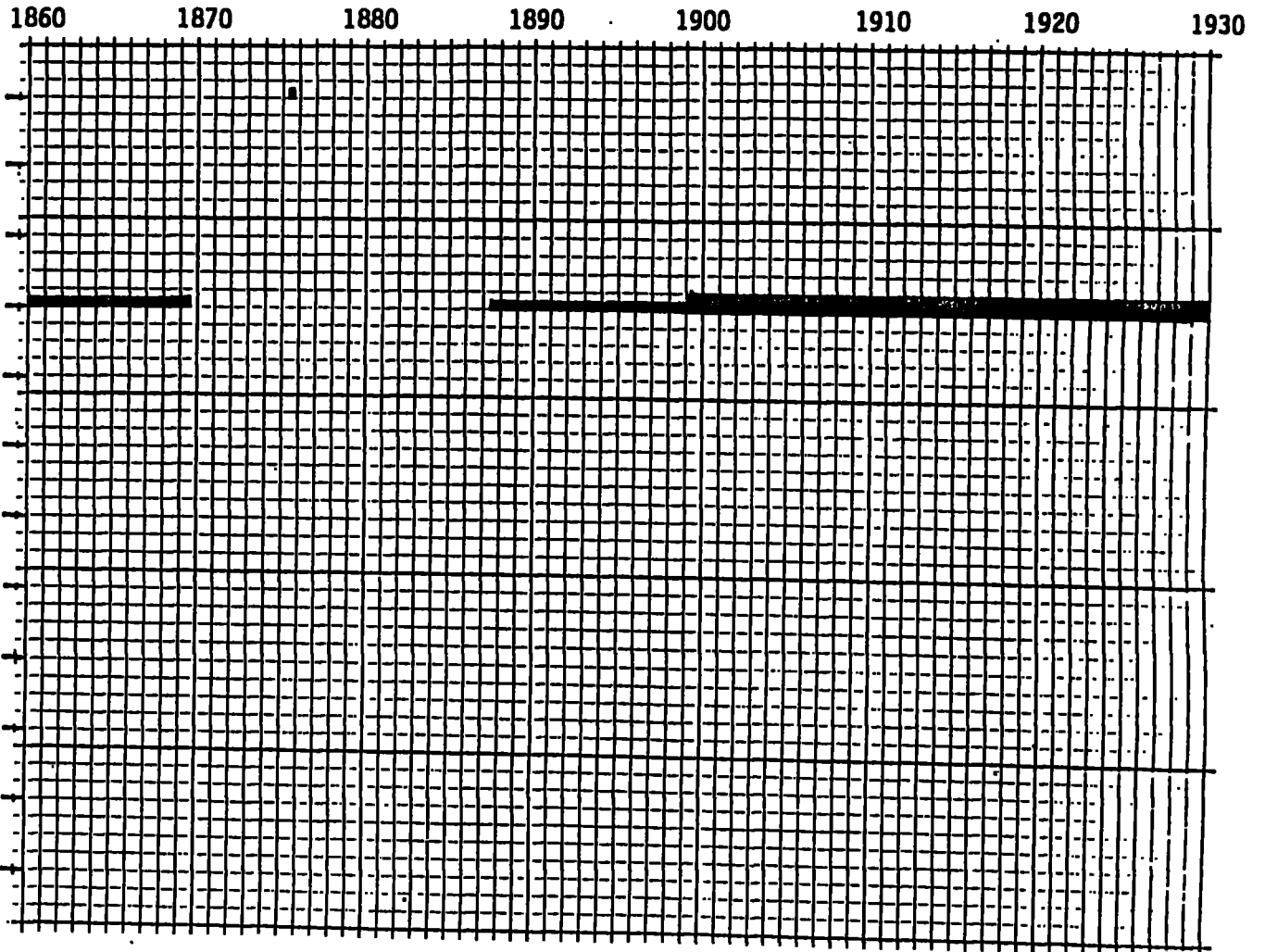
LAKE ERIE

RECORDING GAUGE ■ STAFF GAUGE ■

- TOLEDO HARBOR LIGHT, OHIO
- PORT CLINTON, OHIO
- PUT-IN-BAY, OHIO
- MARBLEHEAD, OHIO
- HURON, OHIO
- LORAIN, OHIO
- CLEVELAND, OHIO
- FAIRPORT, OHIO
- ASHTABULA, OHIO
- CONNEAULT, OHIO
- ERIE, PENNSYLVANIA
- BARCELONA, NEW YORK

LAKE ERIE

WATER LEVEL RECORDS 1860-1930



DUNKIRK, NEW YORK

STURGEON POINT, NEW YORK

LACKAWANNA, NEW YORK

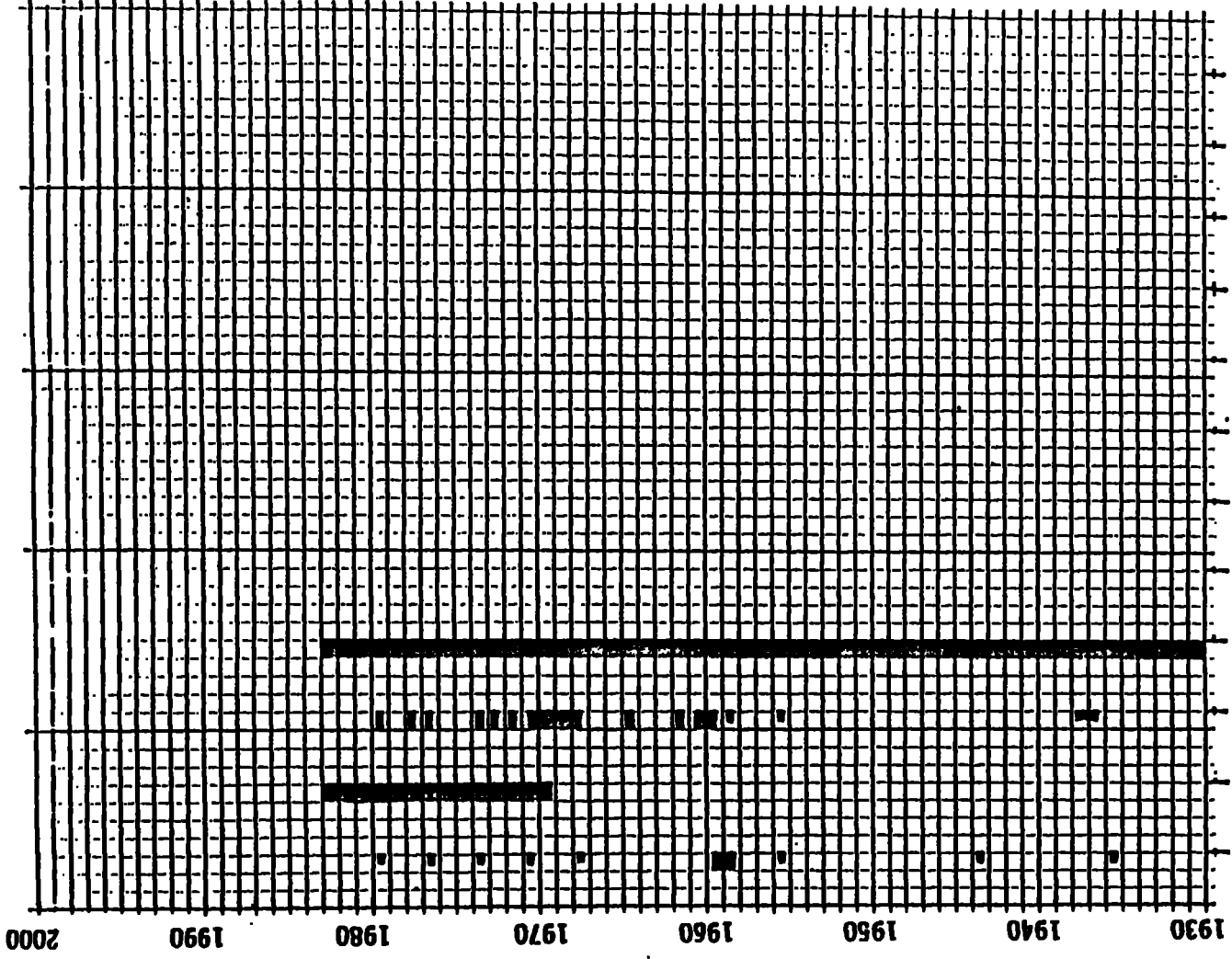
BUFFALO, NEW YORK

31

RECORDING GAUGE ■

STAFF GAUGE ■

DUNKIRK, NEW YORK  
 STURGEON POINT, NEW YORK  
 LACKAWANNA, NEW YORK  
 BUFFALO, NEW YORK

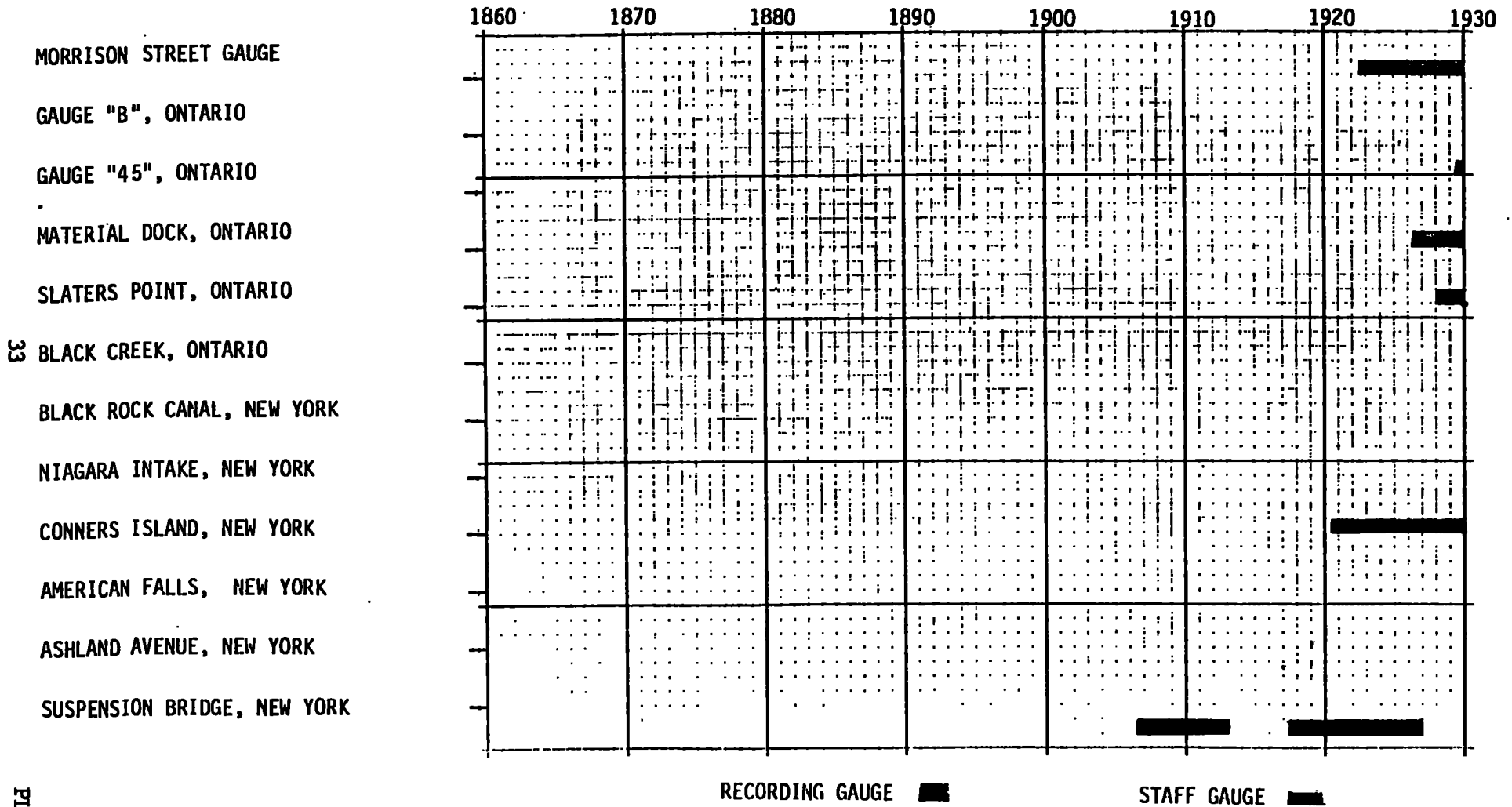


LAKE ERIE  
 WATER LEVEL RECORDS 1930- TO DATE

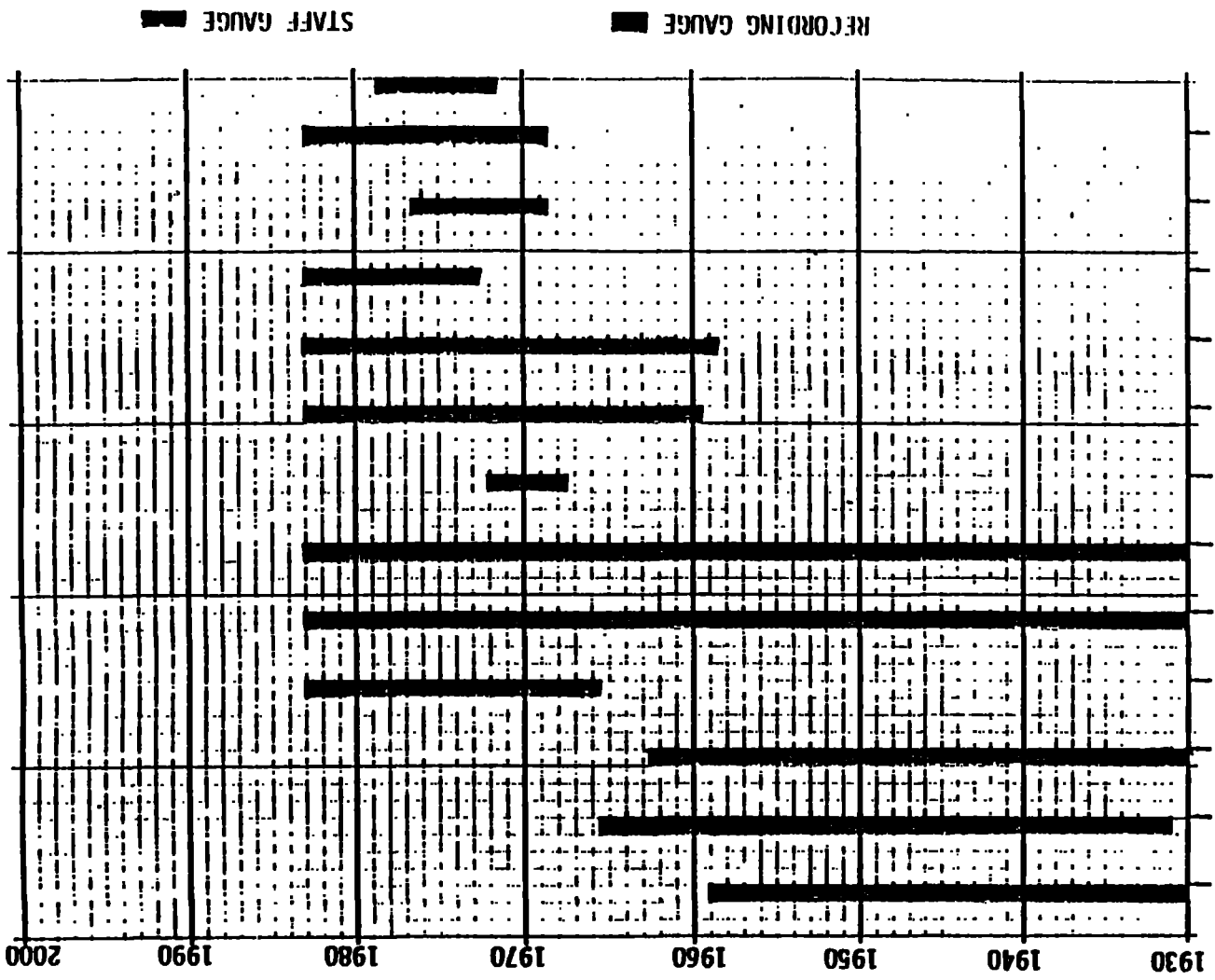
RECORDING GAUGE  
 STAFF GAUGE

NIAGARA RIVER

WATER LEVEL RECORDS 1860-1930



- MORRISON STREET GAUGE, ONTARIO
- GAUGE "B", ONTARIO
- GAUGE "45", ONTARIO
- SAB #2 INTAKE, ONTARIO
- MATERIAL DOCK, ONTARIO
- SLATERS POINT, ONTARIO
- BAYERS CREEK, ONTARIO
- BLACK CREEK, ONTARIO
- FRENCHMANS CREEK, ONTARIO
- CUSTOM DOCK, ONTARIO
- PUMP HOUSE, ONTARIO
- PEACE BRIDGE BELOW, ONTARIO
- PEACE BRIDGE ABOVE, ONTARIO



WATER LEVEL RECORDS 1930 - TO DATE

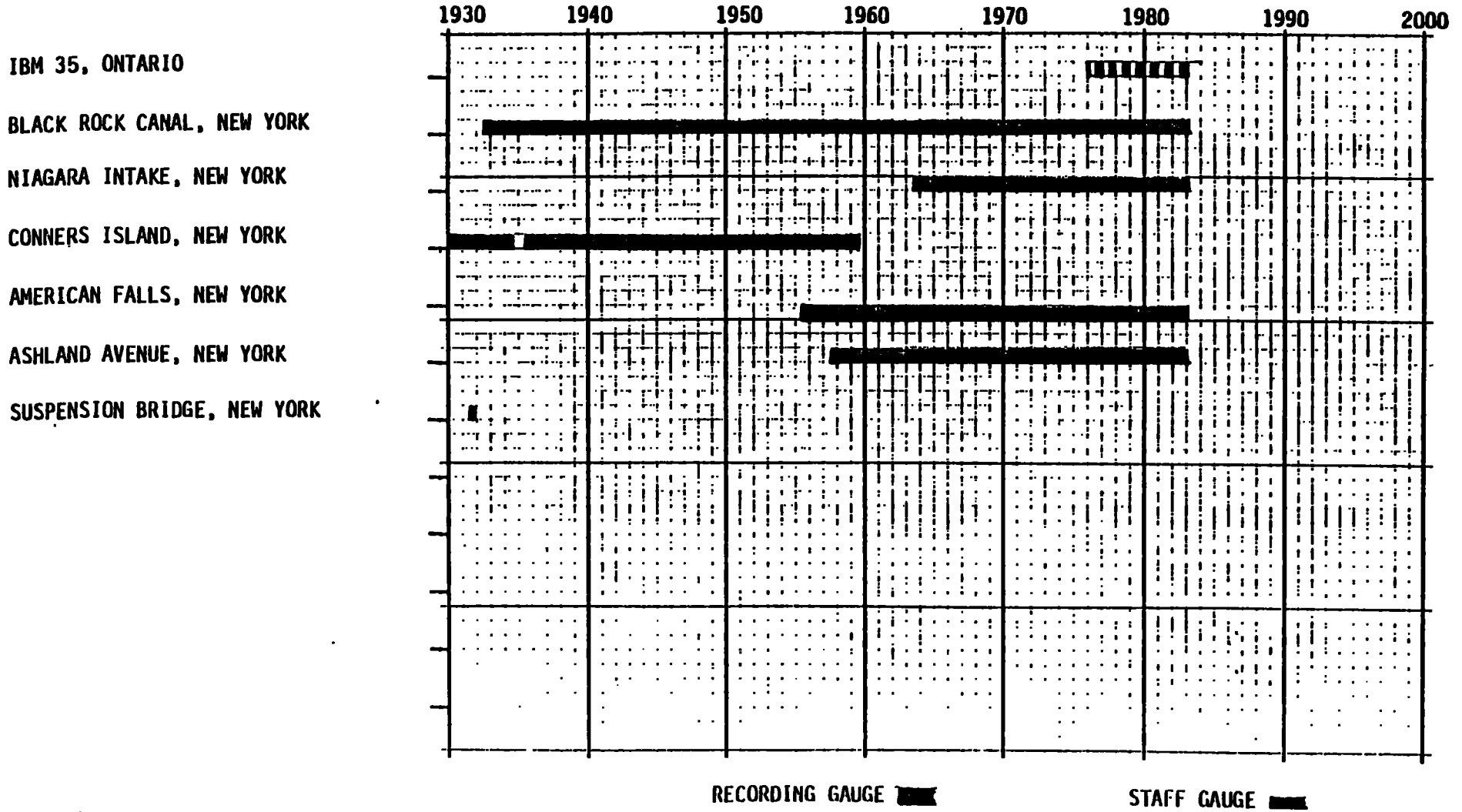
NIAGARA RIVER

RECORDING GAUGE

STAFF GAUGE

NIAGARA RIVER

WATER LEVEL RECORDS 1930 - TO DATE



35

## GAUGE HISTORY

### Port Weller, Ontario

Elevations at Port Weller on 1903 Datum as used from 1929 to 1931 depend on B.M. "MMDVI" at elevation 295.038 feet (89.928 meters) based on a comparison of float gauge readings for 1929 with water surface elevations at Port Dalhousie. The 1903 Datum as used from 1956 to 1959 depend on B.M. "MMDVI" at elevation 295.104 feet (89.948 meters) derived by adding 0.384 feet to the published Geodetic Survey of Canada elevation of B.M. "MMDVI." This correction of 0.384 feet is taken to be the same as that used at Port Dalhousie which was determined by water level transfer from Kingston 1914-1917. Elevations at Port Weller on 1903 Datum as used from October 1959 to July 1965 depend on B.M. "MMDVI" at elevation 295.053 feet (89.932 meters). This elevation was derived by adding 0.318 feet to the published Geodetic Survey of Canada elevation of B.M. "MMDVI". IGLD (1955) elevations at Port Weller depend on B.M. "MMDVI" at elevation 293.844 feet (89.564 meters) as published in Appendix A, Establishment of International Great Lakes Datum published in September 1961 by the Coordinating Committee.

#### CHRONOLOGICAL TABLE

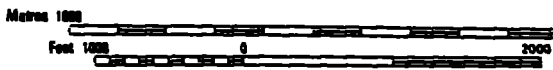
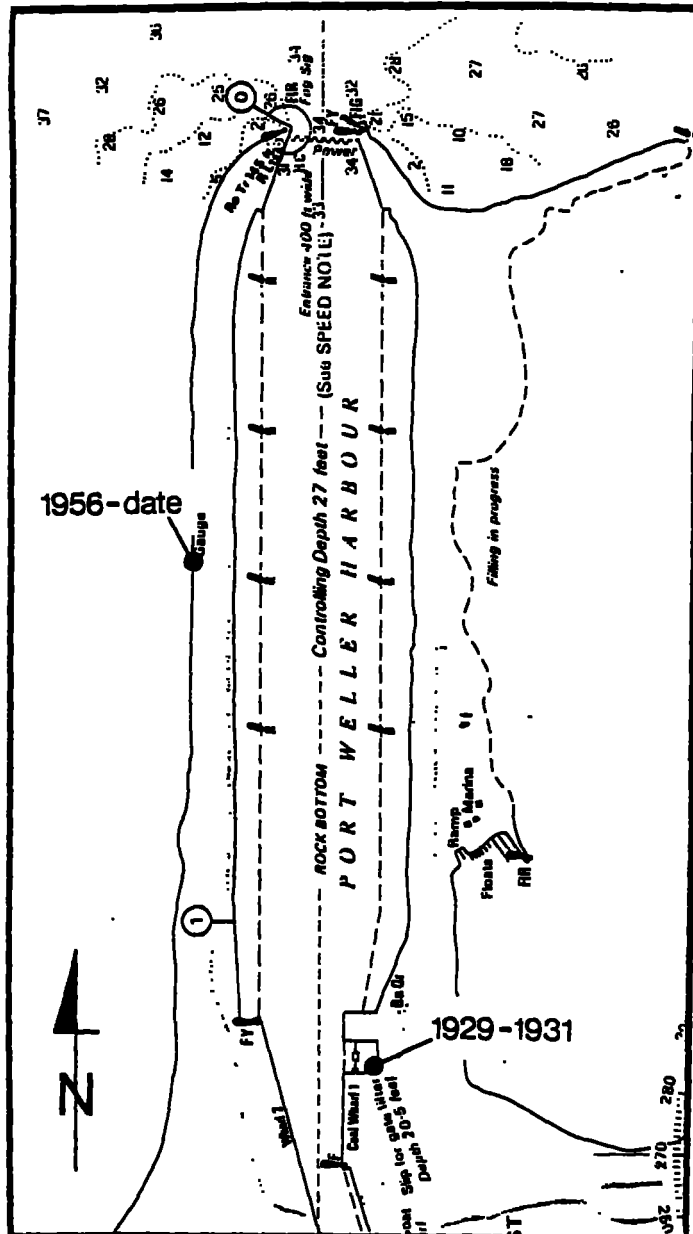
PERIOD	CONTROLLING BENCH MARK	IGLD (1955) ELEVATION	TYPE OF RECORD	AGENCY
Aug 1929-Oct 1931	MMDVI	293.829 feet (89.559 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Jan 1956-Oct 1959	MMDVI	293.895 feet (89.579 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Nov 1959-Jun 1961	MMDVI	293.844 feet (89.564 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Jul 1961-Jul 1965	MMDVI	293.844 feet (89.564 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Aug 1965-May 1971	H.S.3	257.392 feet (78.452 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Jun 1971-Sep 1976	3526	288.161 feet (87.831 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Oct 1975-Date	H.S.3	78.452 meters (257.392 feet)	Recording Gauge, Hourly Scalings	C.H.S.

NOTE: Analogue recording gauges used before 1970. Since that date, digital recording gauges have been used. Telemetering service was installed at Port Weller in May 1979.

Gauging Station Sites (see Plate 30, page 39):

(a) August 1929-October 1931: A recording gauge located over a special well in Section 15-E of the east-pier of the new Welland Ship Canal. Section 15-E is at the southeast corner of the storage basin.

(b) November 1956-Date: A recording gauge was located over a new concrete well near the lightkeeper's house on the west side of the new Welland Ship Canal.



WATER LEVEL GAUGE LOCATION  
 PORT WELLES, ONTARIO  
 1929-DATE

1982

## GAUGE HISTORY

### Port Dalhousie, Ontario

Elevations at Port Dalhousie on 1903 Datum depend on B.M. "MMDIII" and "Lower Sill of Old Lock #1" at elevations 263.402 feet (80.285 meters) and 232.79 feet (70.954 meters) respectively. Elevations at Port Dalhousie also depend on leveling from B.M. "C" at elevation 257.635 feet (78.527 meters) in 1920 and 1927. IGLD (1955) elevations at Port Dalhousie depend on B.M. "MMDIII" at elevation 262.149 feet (79.903 meters) as published in Appendix A, Establishment of International Great Lakes Datum published in September 1961 by the coordinating committee.

#### CHRONOLOGICAL TABLE

PERIOD	CONTROLLING BENCH MARK	IGLD (1955) ELEVATION	TYPE OF RECORD	AGENCY
Jun 1849-May 1910	LOWER SILL OF OLD LOCK #1	231.537 feet (70.572 meters)	Staff Gauge, Once Daily	D. of R. and C.
Jun 1910-Nov 1910	MMDIII	262.149 feet (79.903 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Dec 1910-May 1911	LOWER SILL OF OLD LOCK #1	231.537 feet (70.572 meters)	Staff Gauge, Once Daily	D. of R. and C.
Jun 1911-Nov 1911	MMDIII	262.149 feet (79.903 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Dec 1911-May 1912	LOWER SILL OF OLD LOCK #1	231.537 feet (70.572 meters)	Staff Gauge, Once Daily	D. of R. and C.
Jun 1912-Dec 1912	MMDIII	262.149 feet (79.903 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Jan 1913-May 1913	LOWER SILL OF OLD LOCK #1	231.537 feet (70.572 meters)	Staff Gauge, Once Daily	D. of R. and C.
Recording gauge operated June-December and staff gauge operated January-May until May 1917				
Jun 1917-Nov 1917	MMDIII	262.149 feet (79.903 meters)	Recording Gauge, Hourly Scalings	C.H.S.
Dec 1917-May 1918	LOWER SILL OF OLD LOCK #1	231.537 feet (70.572 meters)	Staff Gauge, Once Daily	D. of R. and C.

