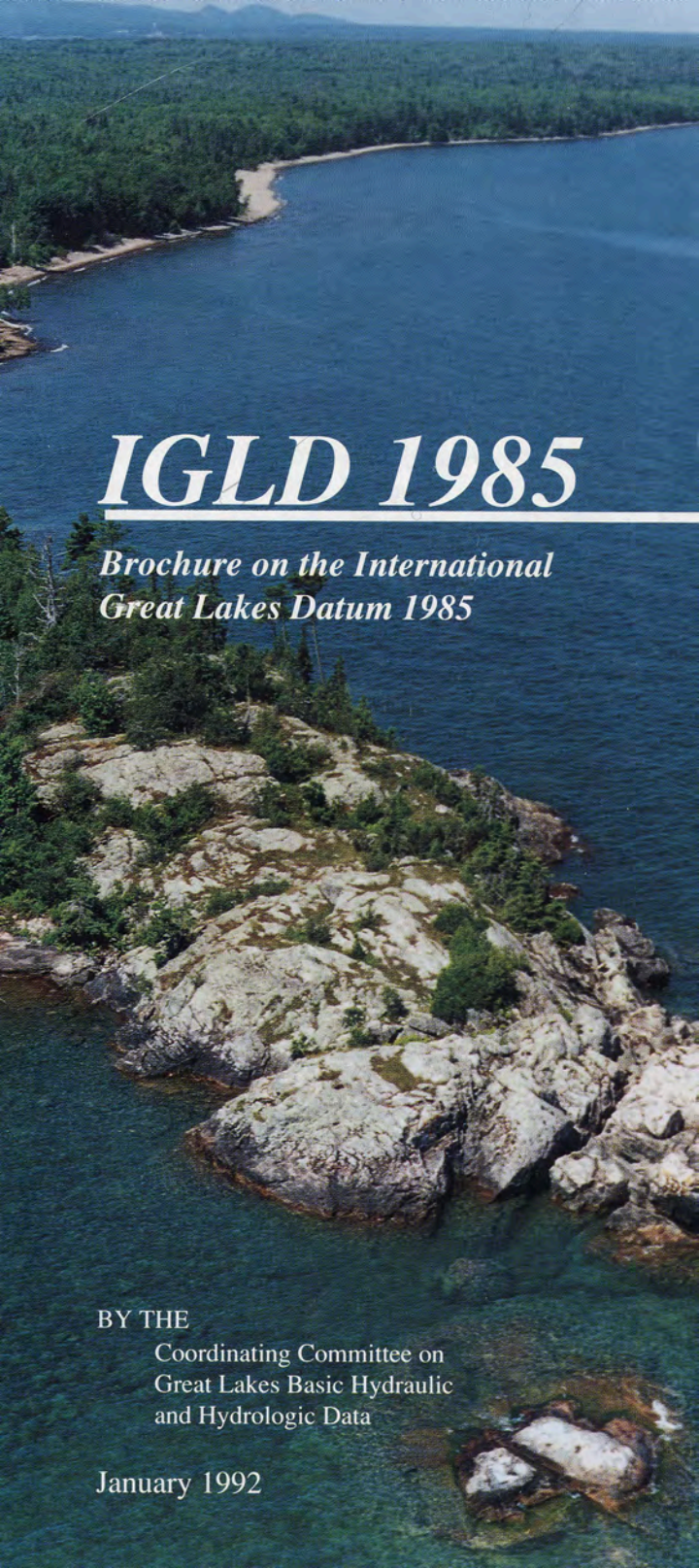

IGLD 1985

Brochure on the International Great Lakes Datum 1985

BY THE
Coordinating Committee on
Great Lakes Basic Hydraulic
and Hydrologic Data

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What is IGLD 1985?

Because of movement of the earth's crust, the "datum" or elevation reference system used to define water levels within the Great Lakes-St. Lawrence River system must be adjusted every 25 to 35 years. The current datum is known as the International Great Lakes Datum, 1955 (IGLD 1955). This brochure briefly explains the development and impacts of a revision to this datum, to be known as the International Great Lakes Datum, 1985 (IGLD 1985). The date, 1985, is the central year of the period 1982-1988 during which water level information was collected for preparing the datum revision.

Why is a revised datum required?

The Great Lakes-St. Lawrence River system, one of the world's greatest fresh water resources, is shared by the United States and Canada. The harmonious use of these waters requires international coordination of many aspects of their management. The most basic requirement for coordinated management is a common elevation reference or "datum", by which water levels can be measured.

The first common datum between the United States and Canada was IGLD 1955. This datum was established by geodetic levelling (a precise form of surveying) performed from the Atlantic Ocean, inland up the St. Lawrence River, and thereafter, to each lake along the connecting channels (the Niagara, Detroit, St. Clair, and St. Marys Rivers). The geodetic levelling process established numerous bench marks (fixed land points or monuments) with very accurate elevations. These elevations were then transferred via levelling to water level gauges strategically located along shorelines and waterways. The Datums of 1903 and 1935, previously in use, were abandoned during the late 1950s and early 1960s in favor of the IGLD 1955. This occurred because the successful implementation and use of IGLD 1955 as the single vertical reference for both countries provided more correct hydraulic measurements of Great Lakes-St. Lawrence River water levels.

At the time IGLD 1955 was established, it was recognized that this common datum would have to be periodically revised due to isostatic rebound, sometimes referred to as crustal movement. Isostatic rebound is the gradual rising or "bouncing back" of the earth's crust from the weight of the glaciers that covered the Great Lakes-St. Lawrence River region during the last ice age.

This movement is very gradual and has been occuring since the retreat of the glaciers. Figure 1 shows the estimated rate of vertical movement for the Great Lakes-St. Lawrence River system. From this figure, it can be seen that the rate of rebound is not uniform across the basin. This movement causes bench marks to shift, not only with respect to the initial reference point at the Atlantic Ocean, but relative to each other as well. Some bench marks may also have shifted due to local effects such as ground subsidence caused by mining or the weight of associated structures, or through accidental damage. New surveying technology and adjustment techniques also make it desirable to revise the datum.

As part of the datum revision, a new reference zero point location (the point to which all other elevations are referenced) was established. The new reference zero point of IGLD 1985 is located at Rimouski, Québec. The concept of the reference zero point is illustrated in Figure 2. IGLD 1985 also increases the number and accuracy of bench marks located throughout the Great Lakes region.

The new 1985 datum establishes a set of elevations consistent with one another for surveys taken within the time span 1982-1988. The key word, consistent, defined as being within geodetic levelling tolerances (a specified degree of accuracy), allows the Canadian and United States governments to authorize the continued use of the common datum by their respective agencies.

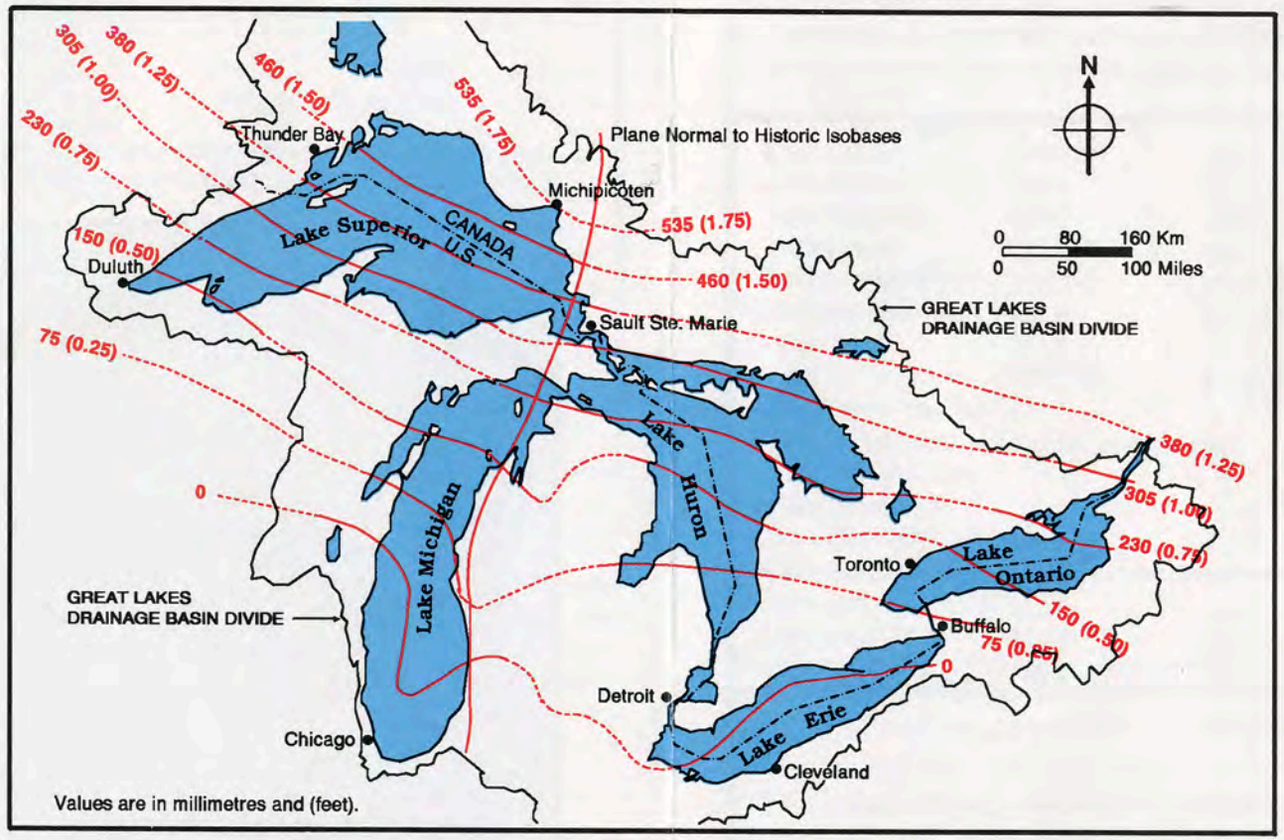

Figure 1. Vertical movement rates per century for the Great Lakes - St. Lawrence River Basin (adapted from Clark and Persoage, 1970, Larsen 1987). For example, Michipicoten, Ontario is rising relative to Chicago, Illinois at a rate of approximately 535 mm (1.75 feet) per 100 years.

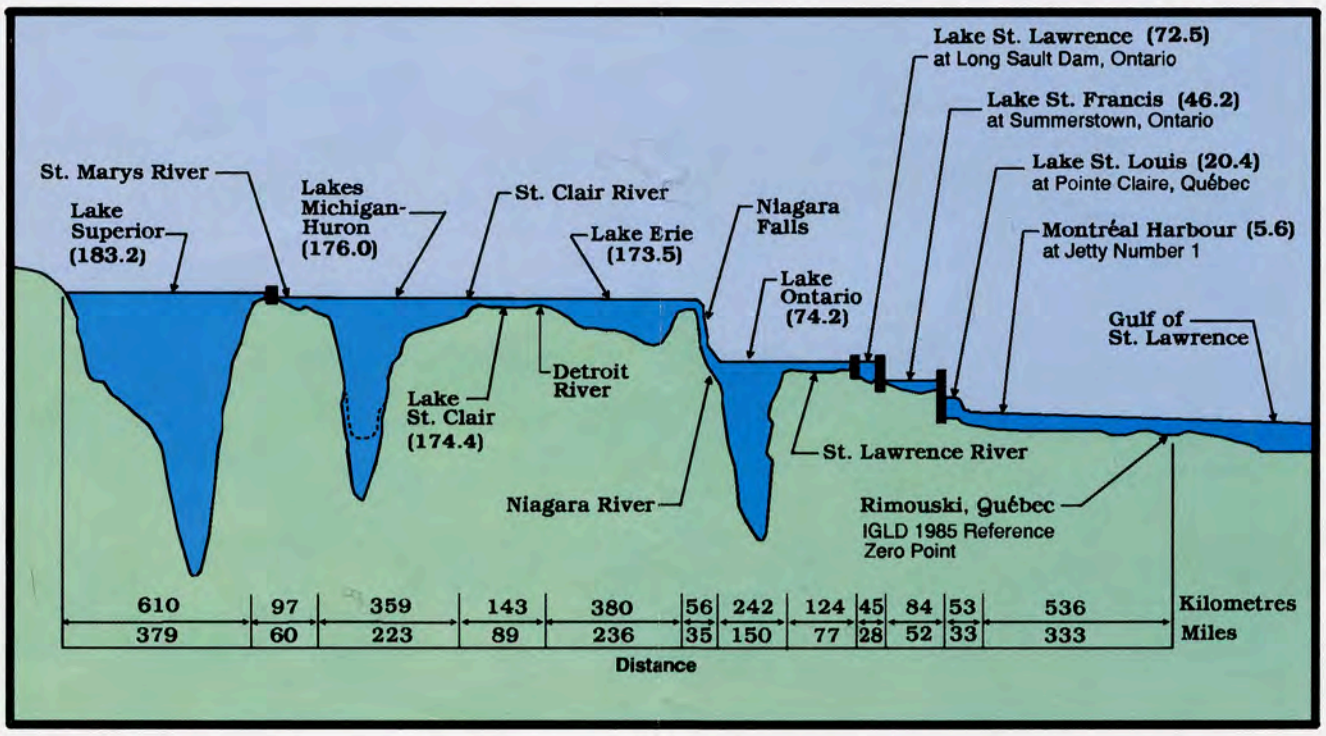

Figure 2. The reference zero point for IGLD 1985 at Rimouski, Québec is shown in its vertical and horizontal relationship to the Great Lakes - St. Lawrence River System. Low water datums for the lakes are shown in (metres). See Table III for IGLD 1985 and 1955 low water datums in both metres and feet.

Who is revising the datum?

The establishment and revision of this common datum for the United States and Canada is being performed under the auspices of the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. This Committee was formed in 1953 to establish a basis for development and acceptance of data dealing with many aspects of the management of the Great Lakes-St. Lawrence River system. Representatives from various United States and Canadian federal government agencies constitute the Coordinating Committee and its subcommittees, with their agencies providing the resources to perform the required work. Approximately one and a half million dollars in resources has been expended by the National Oceanic and Atmospheric Administration, the United States Army Corps of Engineers, the Canadian Hydrographic Service, and the Geodetic Survey of Canada for the development of IGLD 1985.

The method for establishing IGLD 1985, agreed to by the Coordinating Committee, paved the way for a more precise datum and created a time-saving and state-of-the-art method for future datum evaluations. In addition, the work on IGLD 1985 in the Great Lakes was integrated with the effort for a common international datum in Canada, the United States, and Mexico. This common datum will be referred to as the North American Vertical Datum, 1988 (NAVD 1988). This unification of efforts reduced the cost and work required in establishing IGLD 1985, provided a check on the accuracy of the work, and established a conversion between the two datums.

What will IGLD 1985 change?

The most significant change between IGLD 1955 and IGLD 1985 will be in the elevations assigned to water levels. This is a result of bench mark elevation changes due to adjustments for crustal movement, more accurate measurement of elevation differences, a new reference zero point location, and an expanded geodetic network. Table I shows some of the key bench mark elevation changes between IGLD 1955 and IGLD 1985 for each of the Great Lakes.

The agencies responsible for the collection of Great Lakes-St. Lawrence River water levels, the Canadian Hydrographic Service and the National Ocean Service, will begin reporting water levels referenced to IGLD 1985 upon its implementation. For a period of time, these agencies will also provide conversion factors for the water level data so that the public can relate the two datums. This change will also be reflected in the monthly water level bulletins published by the United States Army Corps of Engineers and the Canadian Hydrographic Service.

IGLD 1985 will not change water levels established for Canadian zoning restrictions or water levels established for federal flood insurance purposes in the United States. These levels are referenced to the Canadian Geodetic Datum, and the National Geodetic Vertical Datum 1929 (NGVD 1929). However, elevations referenced to these datums will be reassigned when NAVD 1988 is implemented. Elevations at common bench marks between NAVD 1988 and IGLD 1985 will be available from the responsible agencies listed on the back of this brochure.

The limits of jurisdiction under Section 10 of the Rivers and Harbors Act for projects in the United States will not physically change in extent, but will be reassigned elevations

Table I Key bench mark elevation changes between IGLD 1955 and IGLD 1985.

Bench Mark Elevations in Metres

Location	BM	IGLD 55	IGLD 85
Lake Superior			
Marquette	NO 11	188.612	188.957
Thunder Bay	346-E	184.893	185.321
Lake Michigan			
Calumet Harbor	COM	177.795	178.065
Lake Huron			
Harbor Beach	HURON	177.363	177.577
Goderich	72 U 108	184.080	184.277
Lake St. Clair			
St. Clair Sh.	FOOD	176.778	176.970
Belle River	BELLE 1-61	176.399	176.606
Lake Erie			
Fairport	FLAG	175.743	175.918
Pt. Colborne	71 U 032	175.754	175.921
Lake Ontario			
Oswego	LAKE	77.329	77.487
Kingston	75 U 502	76.469	76.649
St. Lawrence River			
Montréal Harbour at Jetty No. 1	MOKE 6	13.205*	13.299*
Rimouski	1250G	6.263	6.273

Bench Mark Elevations in Feet

Location	BM	IGLD 55	IGLD 85
Lake Superior			
Marquette	NO 11	618.805	619.938
Thunder Bay	346-E	606.604	608.009
Lake Michigan			
Calumet Harbor	COM	583.318	584.203
Lake Huron			
Harbor Beach	HURON	581.901	582.602
Goderich	72 U 108	603.937	604.583
Lake St. Clair			
St. Clair Sh.	FOOD	579.982	580.610
Belle River	BELLE 1-61	578.737	579.416
Lake Erie			
Fairport	FLAG	576.585	577.159
Pt. Colborne	71 U 032	576.621	577.169
Lake Ontario			
Oswego	LAKE	253.705	254.222
Kingston	75 U 502	250.883	251.473
St Lawrence River			
Montréal Harbour at Jetty No. 1	MOKE 6	43.323*	43.632*
Rimouski	1250G	20.548	20.581

*Preliminary, subject to change

referenced to IGLD 1985. The limits of Section 10 jurisdiction on the Great Lakes are defined as the Ordinary High Water Mark (OHWM). Table II shows the Corps of Engineers OHWM for each lake in both IGLD 1955 and IGLD 1985. New applications for permits submitted to the United States Army Corps of Engineers under Section 10 should reference water levels on any drawings to IGLD 1985.

The low water datum (or chart datum) on Great Lakes-St. Lawrence River navigation charts will be changed from IGLD 1955 to IGLD 1985. The soundings (or water depths) shown

Table II Corps of Engineers Ordinary High Water Mark for IGLD 1955 and IGLD 1985.

Ordinary High Water Mark in Metres

	IGLD 55	IGLD 85
Lake Superior	183.5	183.8
Lake Michigan	177.0	177.2
Lake Huron	177.0	177.2
Lake St. Clair	175.4	175.6
Lake Erie	174.6	174.8
Lake Ontario	75.2	75.4

Ordinary High Water Mark in Feet

	IGLD 55	IGLD 85
Lake Superior	602.0	603.1
Lake Michigan	580.8	581.5
Lake Huron	580.8	581.5
Lake St. Clair	575.7	576.3
Lake Erie	572.8	573.4
Lake Ontario	246.8	247.3

on United States and Canadian Great Lakes navigation charts will not require modification. Navigators need not buy new charts immediately, but should note the new low water datum on their existing charts. New charts reflecting the revised low water datum will be printed over the next several years according to the existing printing schedule of the responsible agencies. Table III shows the low water datum for each lake referenced to IGLD 1955 and IGLD 1985.

The methods of regulating Lake Superior and Lake Ontario outflows will not be affected by the implementation of IGLD 1985. The range of levels within which the lakes are regulated will be assigned new elevations, but the ranges will remain the same with respect to their position with the shoreline and charting depths.

Table III Low water (chart) datum for IGLD 1955 and IGLD 1985.

Low Water Datum in Metres

	IGLD 55	IGLD 85
Lake Superior	182.9	183.2
Lake Michigan	175.8	176.0
Lake Huron	175.8	176.0
Lake St. Clair	174.2	174.4
Lake Erie	173.3	173.5
Lake Ontario	74.0	74.2
Lake St. Lawrence at Long Sault Dam, Ontario	72.4	72.5
Lake St. Francis at Summerstown, Ont.	46.1	46.2
Lake St. Louis at Pointe Claire, Que.	20.3	20.4
Montréal Harbour at Jetty Number 1	5.5	5.6

Low Water Datum in Feet

	IGLD 55	IGLD 85
Lake Superior	600.0	601.1
Lake Michigan	576.8	577.5
Lake Huron	576.8	577.5
Lake St. Clair	571.7	572.3
Lake Erie	568.6	569.2
Lake Ontario	242.8	243.3
Lake St. Lawrence at Long Sault Dam, Ontario	237.5	237.9
Lake St. Francis at Summerstown, Ont.	151.4	151.6
Lake St. Louis at Pointe Claire, Que.	66.5	66.9
Montréal Harbour at Jetty Number 1	18.0	18.4

When will IGLD 1985 be implemented?

The implementation and publication of IGLD 1985 will occur in January, 1992. This revised datum should be acceptable for general use in the Great Lakes-St. Lawrence River system for at least 25 years. Additional information concerning IGLD 1985 can be obtained from the agencies listed on the back of this brochure.