



CENTRAL REGION

*// SHORE PROPERTY STUDIES and INVENTORY
of the GREAT LAKES and
ST. LAWRENCE RIVER*

**CANADIAN HYDROGRAPHIC SERVICE
MARINE SCIENCES BRANCH
DEPARTMENT OF THE ENVIRONMENT**

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SHORE PROPERTY STUDIES AND INVENTORY
OF THE
GREAT LAKES AND ST. LAWRENCE RIVER

by
W. S. HARAS

MARINE SCIENCES BRANCH
CENTRAL REGION
1972

CANADA CENTRE FOR INLAND WATERS
BURLINGTON, ONTARIO.

Before any sound planning can be considered, it should be based on a thorough knowledge of the present state of the resource at hand. No more compelling example can be found, than in the study, planning and defining of acceptable uses of Canadian shoreline areas. To fulfill this objective, an extensive shoreline inventory must be undertaken and regularly updated. This is the prime objective of Shoreline Property Studies of the Canadian Hydrographic Service, Central Region, Marine Sciences Branch, Department of Environment.

These studies had their beginnings in 1964 when, during a period of critical low levels on the Great Lakes, the International Joint Commission established the International Great Lakes Levels Board. The Board and its Working Committee and five Sub-committees on regulation, shore property, navigation, power and regulatory works, undertook through appropriate federal, provincial and state agencies in the two countries, the necessary technical investigations and surveys. A five year program for this purpose was subsequently developed by the Board and approved by the Commission, as a basis of co-ordinated investigation. The shore property interests for Canada were the responsibility of the Department of Public Works, who through specially organized task forces, one for each of the Great Lakes and St. Lawrence River, carried out a field survey of some 6,400 miles of the national shoreline, collecting extensive physical and economic data.

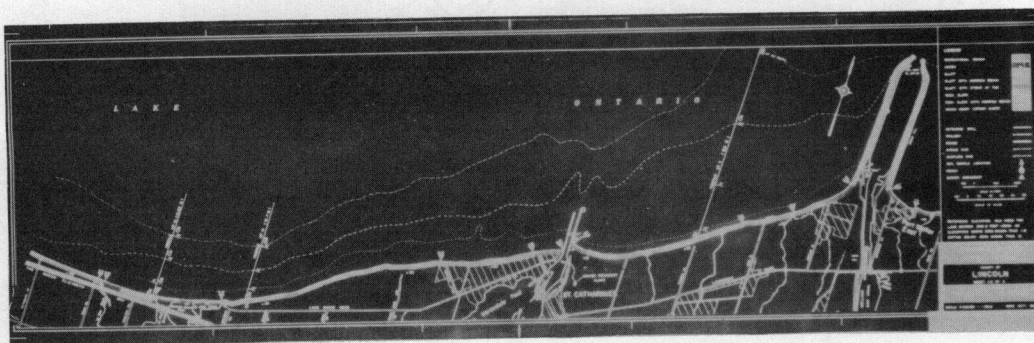
The information was compiled and evaluated to determine to what extent the various shore property interests were affected by variations in lake levels. At the end of the five year program, this data was transferred to the

Canadian Hydrographic Service in Burlington.

The shorelands being considered in the framework study are the first properties located on the waterfront, and include the land, water and land beneath the water to a depth of 30 feet. A generalized classification of land use is extended for approximately one-half mile beyond the riparian ownership. This is taken into consideration, when planning for the waterfront zone, as many of the influences affecting the development of shoreline, have their origins further inland.

In an effort to make this information readily available as shoreline inventory, a strip map system has been initiated on a scale of 1:15840 - 1/4 of a mile to an inch.

STRIP MAP SHOWING TYPICAL PHYSICAL CHARACTERISTICS



On a county basis, the following items were identified:

A. Shoreline Physical Characteristics (8 types):

1. Recreational beach

Minimum 20 feet wide sandy beach extending gradually to a 6 foot depth, being developed or having potential for development of recreational activities.

Lake Ontario - Athol Bay Beach



2. Marsh

Wetland of significant area, providing natural habitat for waterfowl, aquatic fur-bearing animals and spawning grounds for various species of fish, with no greater depth of water than required for an aquatic and semi-aquatic plant communities (usually 6 foot depth). Dependent on shoreline configuration it is divided into seven categories:

A. SHALLOW SLOPING BEACHES

Lake Ontario - Presqu'ile Bay



B. OPEN BAY

Lake Ontario -
Wolfe Island



C. RIVER DELTA

Lake Ontario -
Hay Bay



D. RESTRICTED DRAINAGE
OUTLET

Lake Ontario -
Lynde Creek Estuary



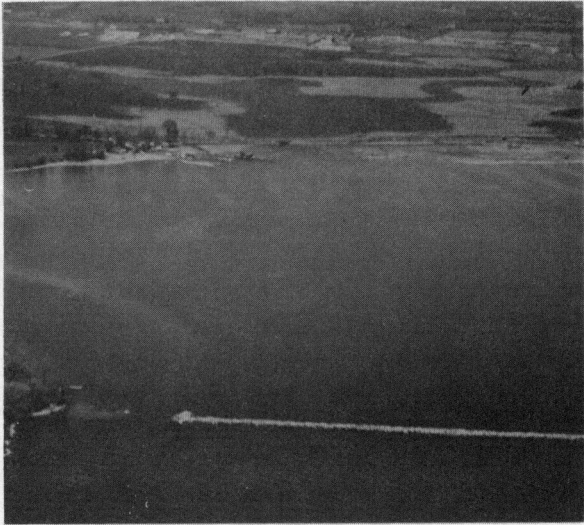
E. LAKE CONNECTED
INLAND MARSH

Lake Ontario -
Amherst Island



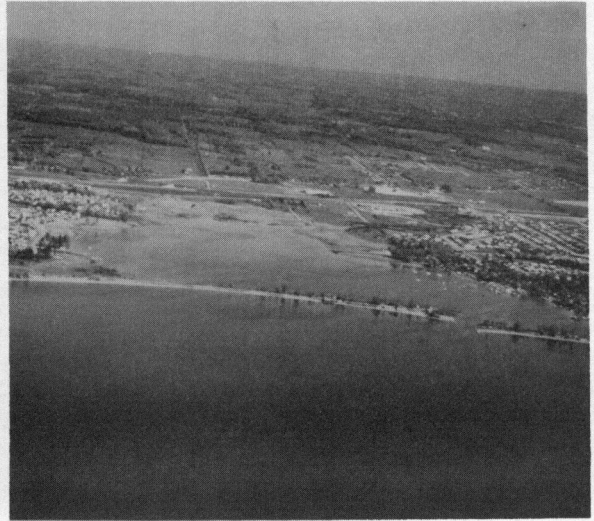
F. PROTECTED SHORELINES
(DYKE)

Lake Ontario -
Catarauqui Bay



G. MAN-MADE NAVIGATION
CHANNEL CONNECTING
ESTUARIES AND RIVER
DELTA

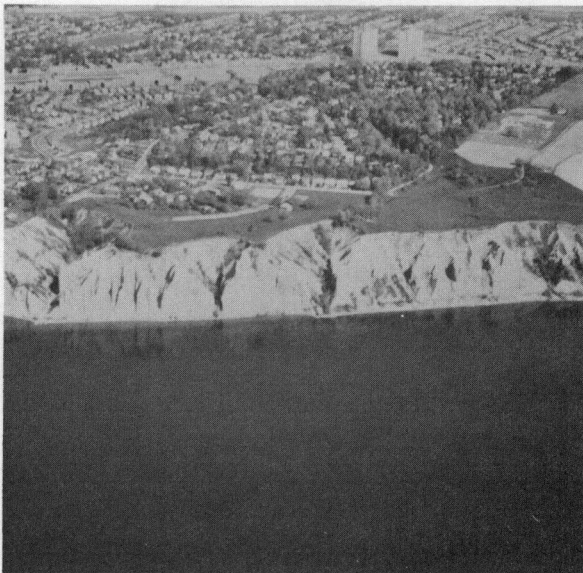
Lake Ontario -
Frenchman's Bay



3. Bluff

High, steep bank usually consisting of
erodible material 20 feet higher with no
beach at the toe.

Lake Ontario -
Scarborough Bluffs



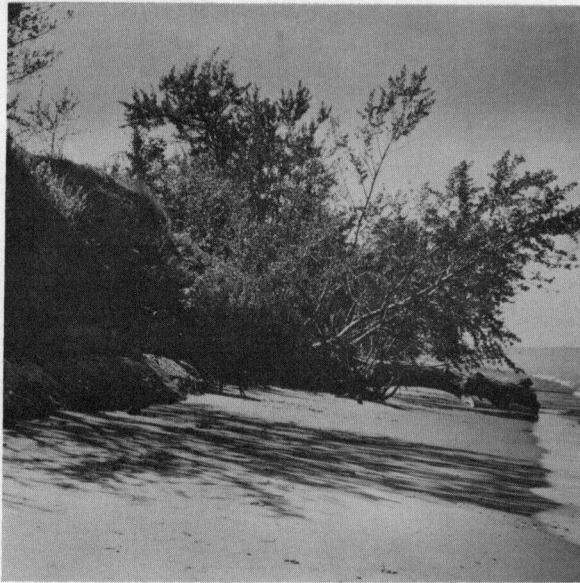
Lake Ontario - Lincoln
County



4. Bluff with narrow beach

High, steep bank usually consisting of erodible material 20 feet or higher with narrow (5' - 10') beach.

Lake Huron - Lambton County



5. Bluff with stone at the toe

High, steep bank usually consisting of erodible material 20 feet or higher with large boulders at the toe.

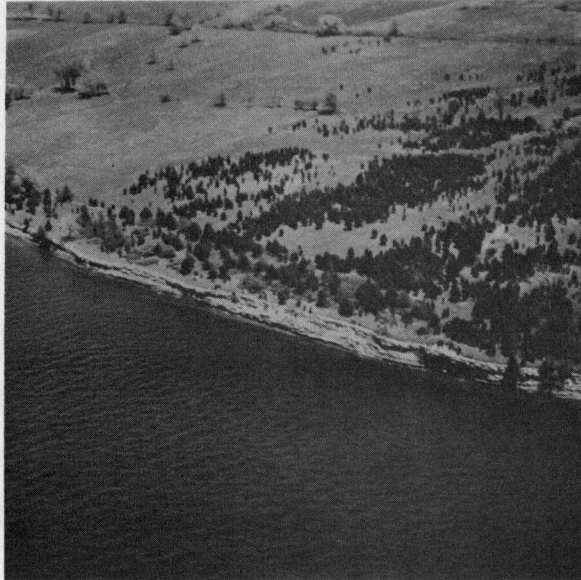
Lake Ontario - Lincoln County



6. Rock slope

Bedrock outcrop or rock protected shore with no beach.

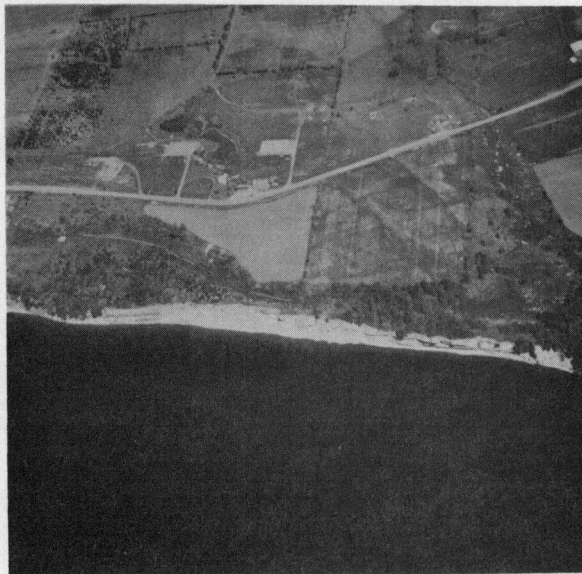
Lake Ontario - Amherst Island



7. Rock slope with narrow beach

Bedrock outcrop or rock protected shore with narrow 5 to 10 foot wide sandy or gravelly beach.

Lake Ontario - Cape Versey



8. Beach scarp (stony slope)

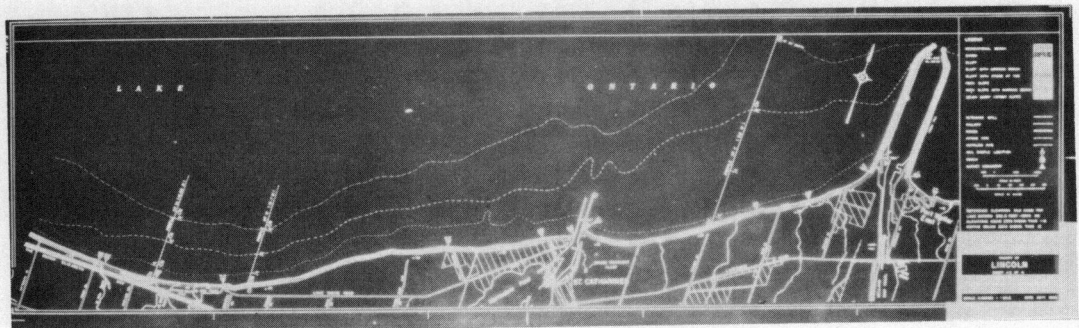
Low, up to 15 foot bank mostly grass covered with sandy, gravelly or stony beach.

Lake Ontario - Amherst Island



B. Shoreline Mileage:

Shoreline mileage is in statute miles, measured on a county basis, starting at the inflow and progressing towards the outflow end of the county.



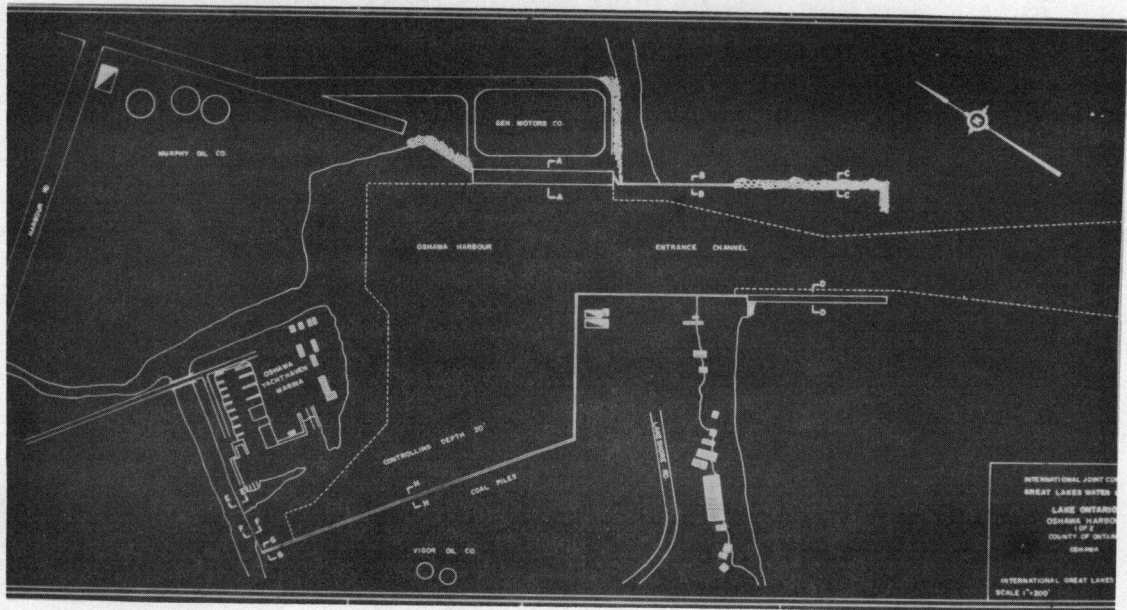
C. Location of Harbours and Marinas, Water Intakes and Sewer Outfalls Dams and Electric Power Generating Stations and other Major Marine Structures:

Plans of harbours and marinas and cross sections of major marine structures on an enlarged scale supplement the general information contained in the strip maps.

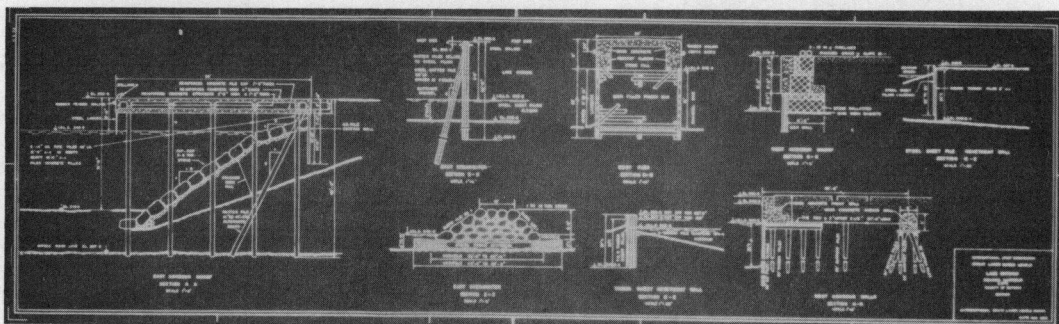


Lake Ontario - Oshawa Harbour

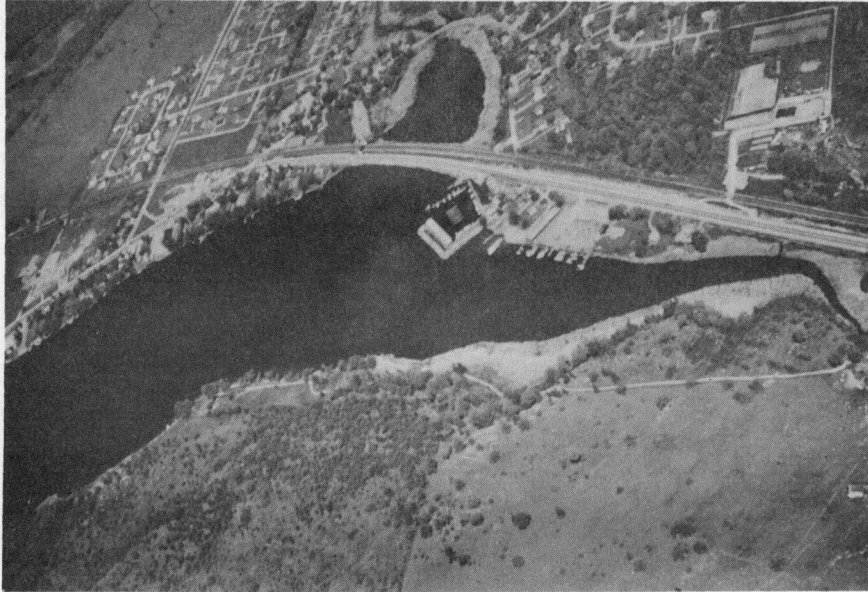
Plan



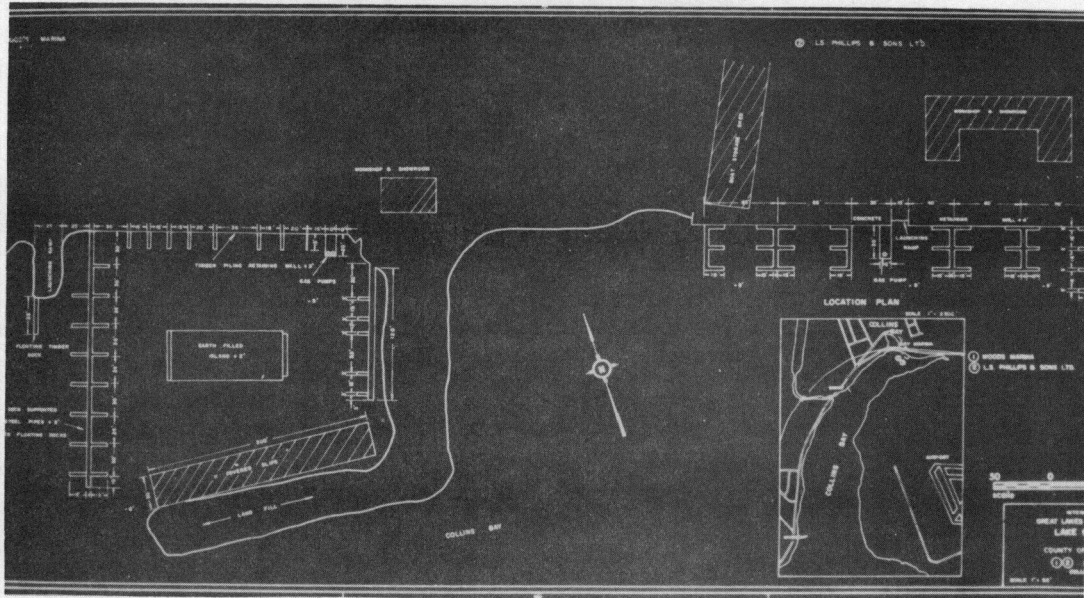
Cross Sections



Lake Ontario - Wood's Marina, Collins Bay



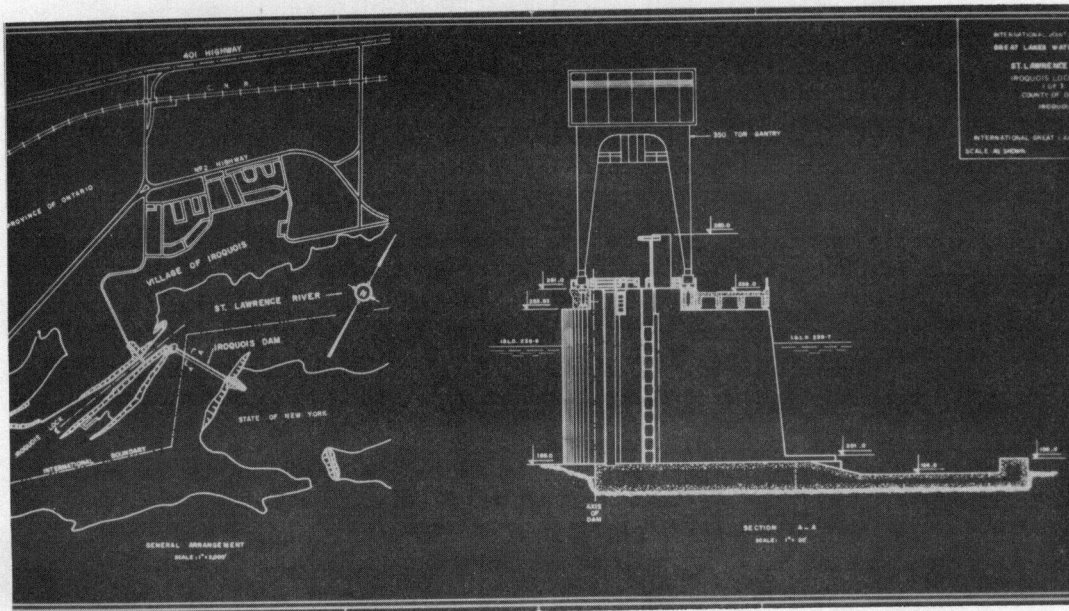
Plan



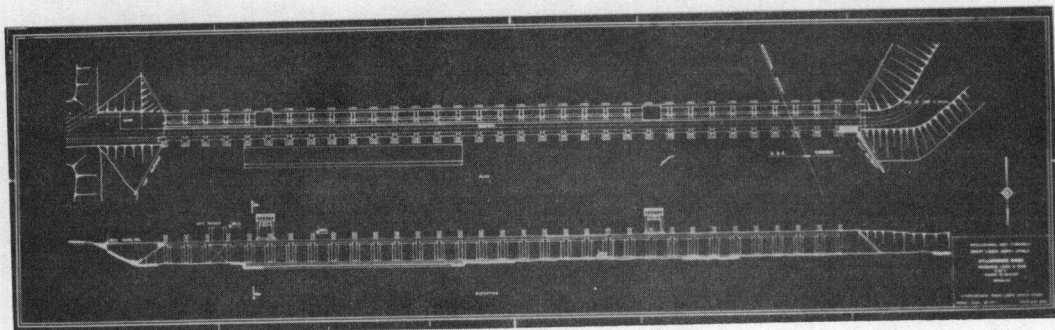
WATER INTAKES AND SEWER OUTFALLS



ST. LAWRENCE RIVER - IROQUOIS DAM Location Plan and Cross Section



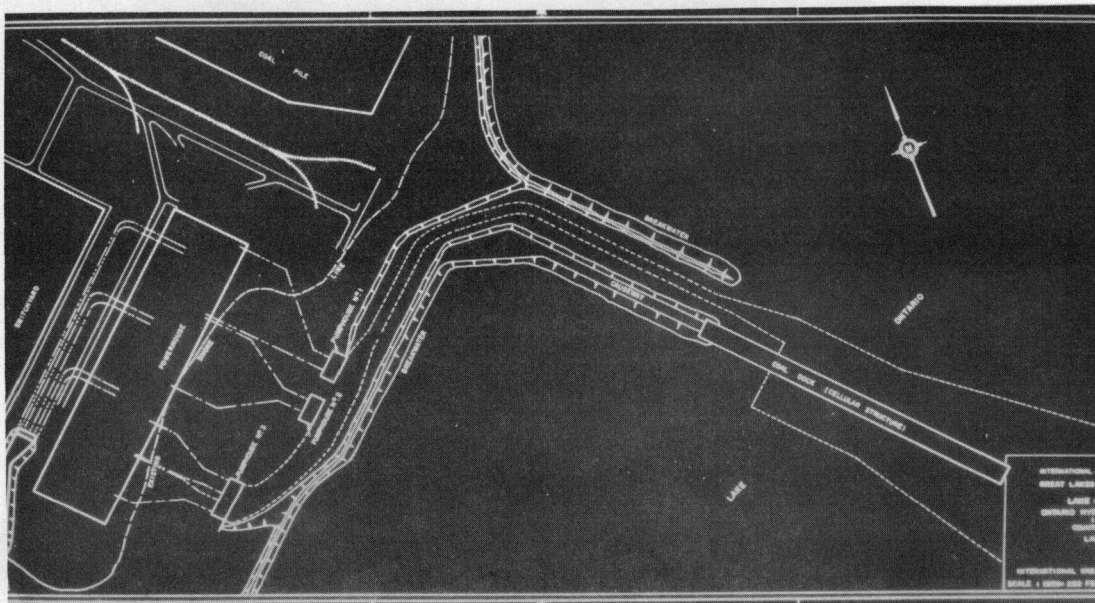
Plan and Elevation



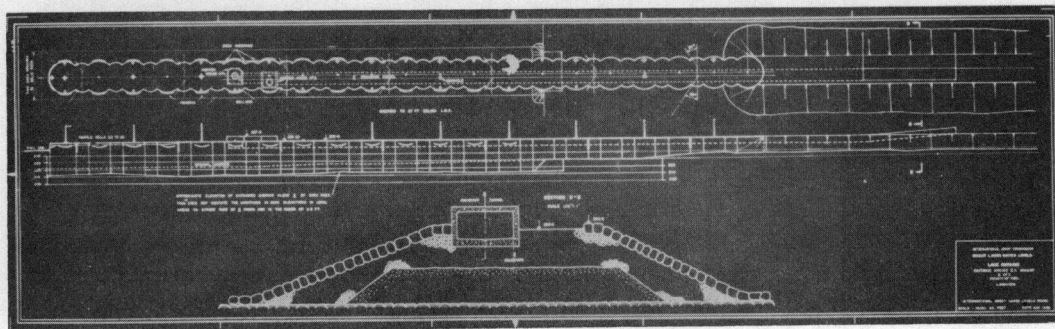


Lake Ontario
Lakeview Electric
Power Generating
Station

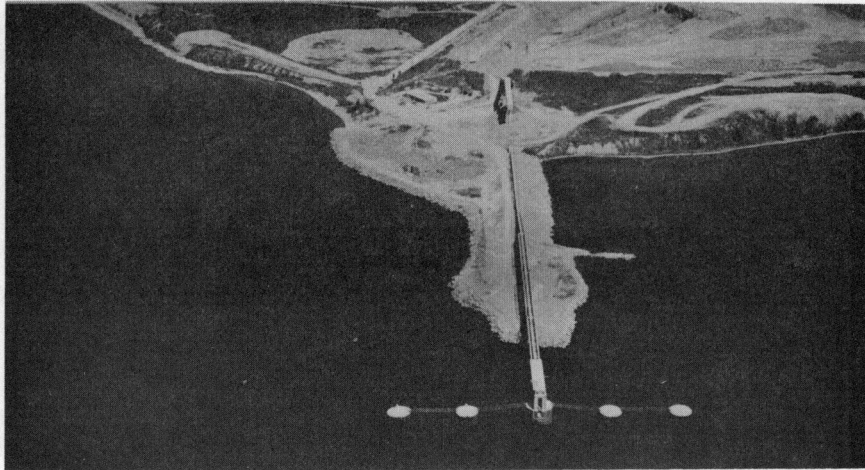
Plan



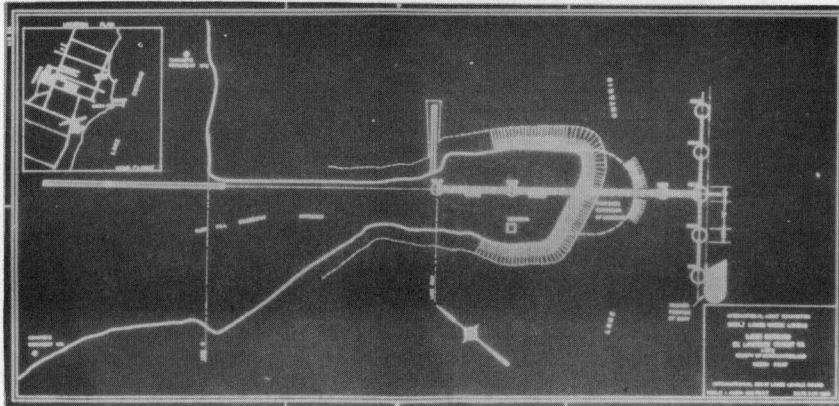
Plan, Elevation, and Cross Section



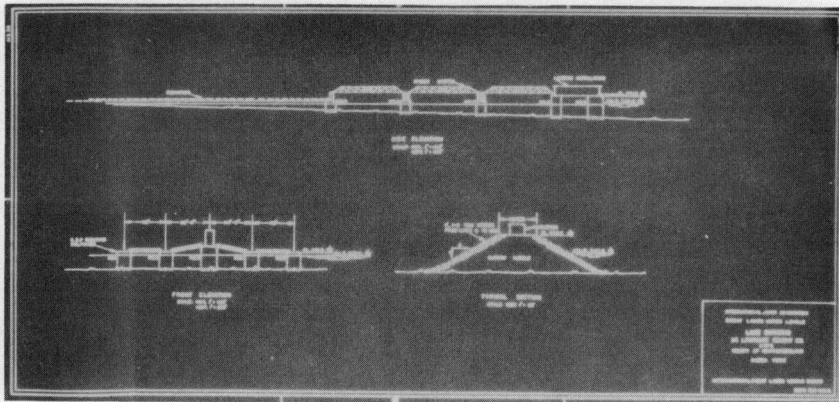
Lake Ontario - St. Lawrence Cement Company
Ogden Point



Plan

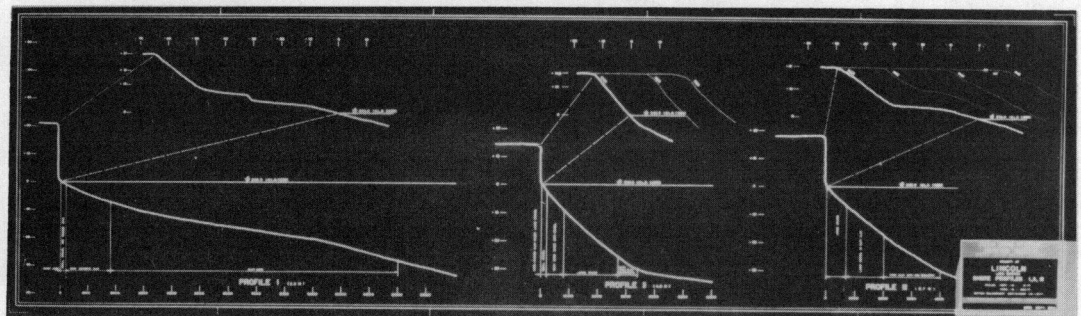
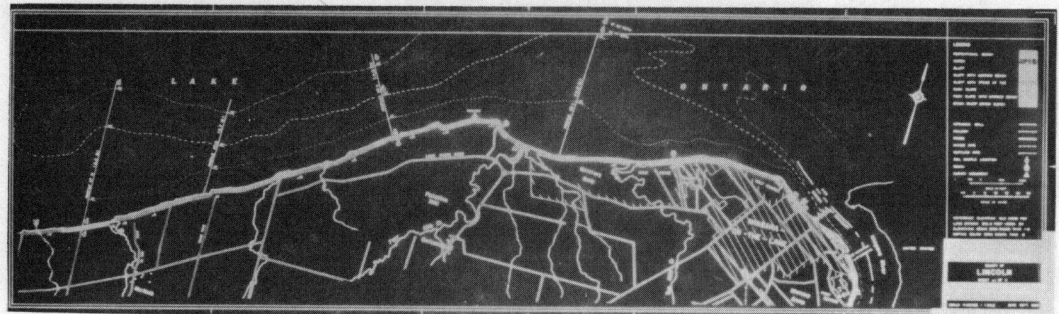


Elevations and Cross Section



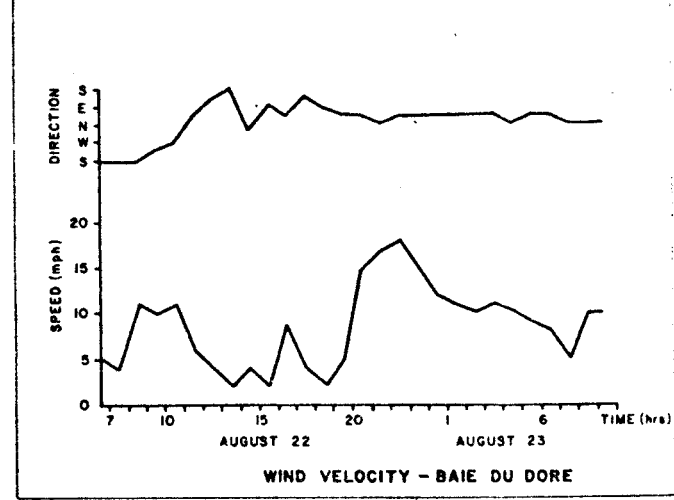
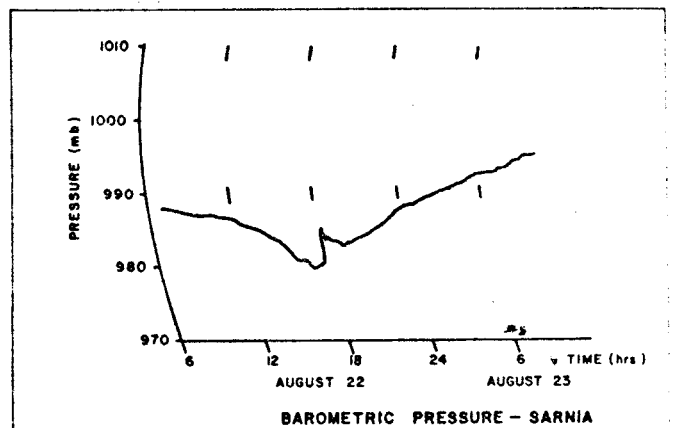
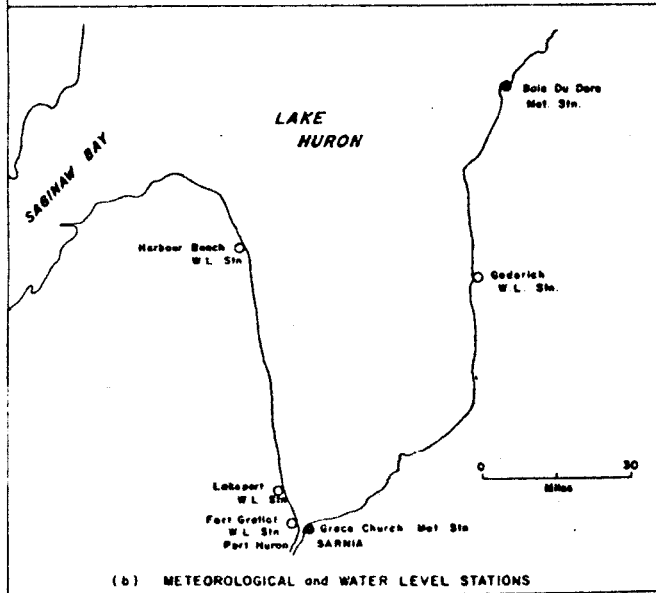
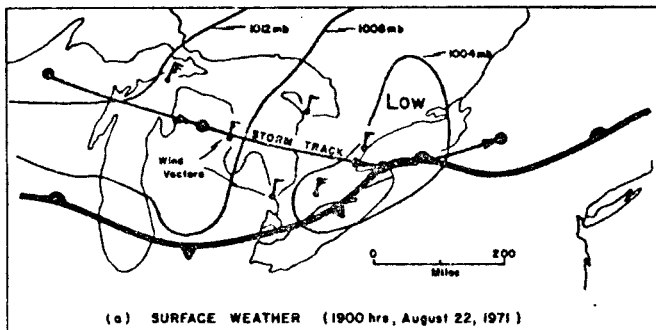
D. Typical Shore Profiles (Erosion History Where Applicable):

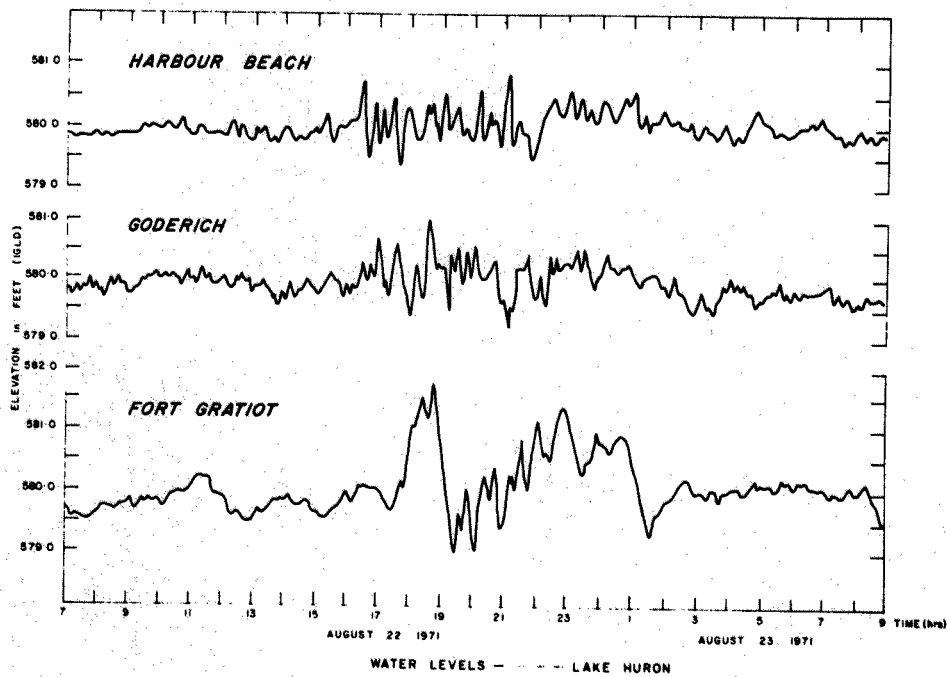
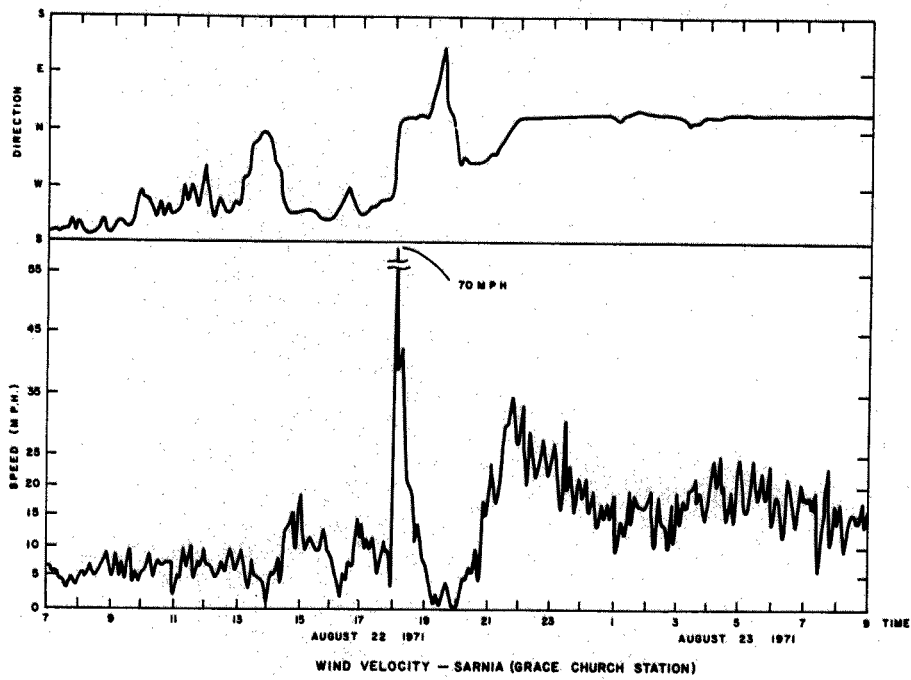
A detailed onshore and offshore profile is established for the length of shore it is representative of, and is placed at mid point or close to it.



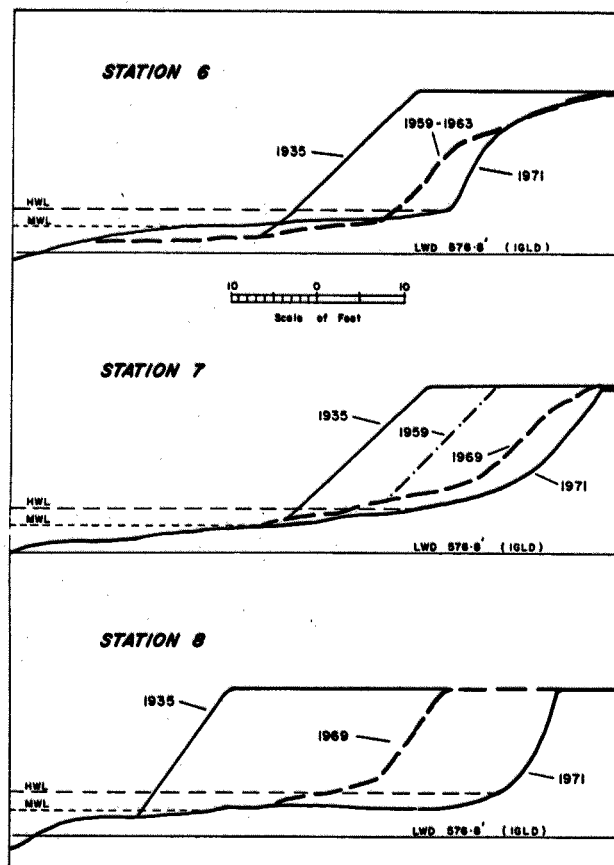
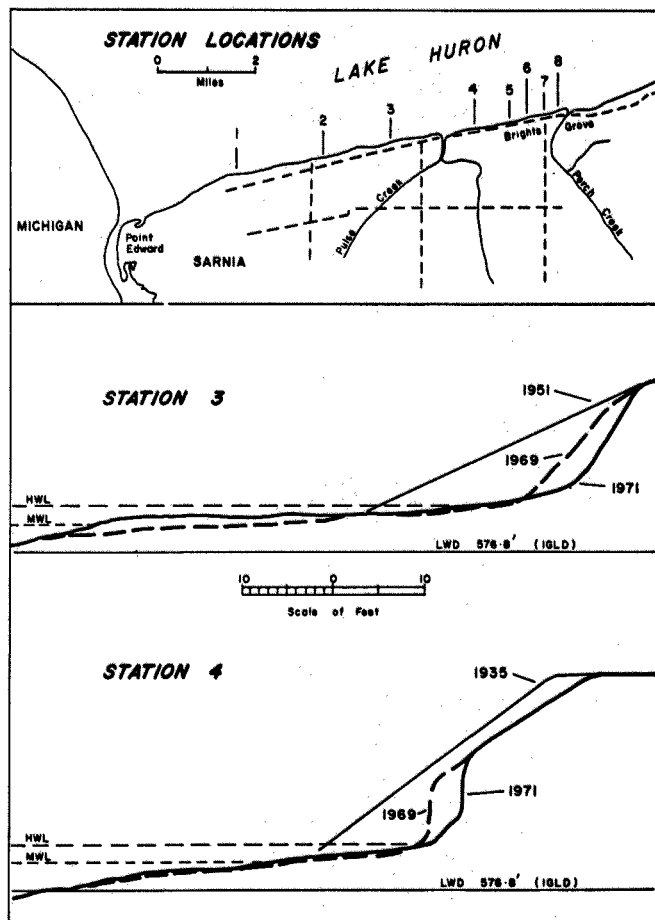
This enables the recording of changes and definition of the main causes attributed to erosion or accretion throughout the years. An example of this is where the horizontal extent and severity of the damage of the Lake Huron Storm Surge of August 22, 1971 was made possible, mainly because the quantitative measurements of the erosion and accretion were available. A rather short lived storm where

the breaking of wind generated surface waves - on the order of 5 to 10 seconds and 5 to 10 feet - was mainly responsible in conjunction with the rise in water level for the erosive scouring of the onshore beach. (N.G. Freeman and W. S. Haras, "A STUDY OF THE LAKE HURON STORM SURGE OF AUGUST 22, 1971", Can. Hyd. Service, MSB, DOE)





EROSION STATION LOCATIONS and PROFILES



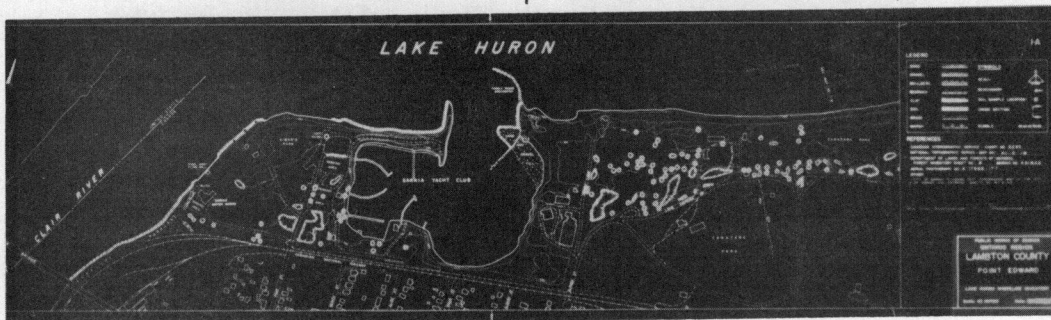
EROSION & ACCRETION APPROXIMATE VALUES

REACH NO.	MILES	EROSION STATION	EROSION		ACCRETION		SOIL SAMPLES MECHANICAL ANALYSIS		
			CU/YD/YD	CU/YD	CU/YD/YD	CU/YD	% SAND	% GRAVEL	% CLAY
A	1.60	0	1.1	3,100	0	0	99	1	
B	1.25		1.8 ^E	4,000	1.5 ^E	3,300	92	6	2
C	.91		0.	0	0	0	100		
D	3.15	3	3.5	19,400	3.0	16,600	100		
E	.81	4	1.3	1,800	1.1	1,600			
F	.78	6 7	4.3 10.4	10,200	4.0 0	2,700	81	19	
G	.47	8	25.0	20,700	0	0	100		
TOTAL	8.97			59,200		24,200			

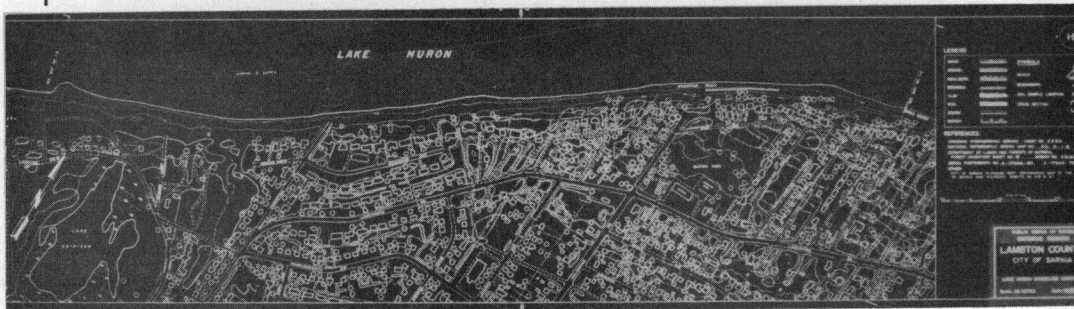
E - ESTIMATED BY COMPARISON WITH REACH D

REACHES WHERE EROSION AND ACCRETION OCCURRED DURING
STORM SURGE OF AUGUST 22, 1971

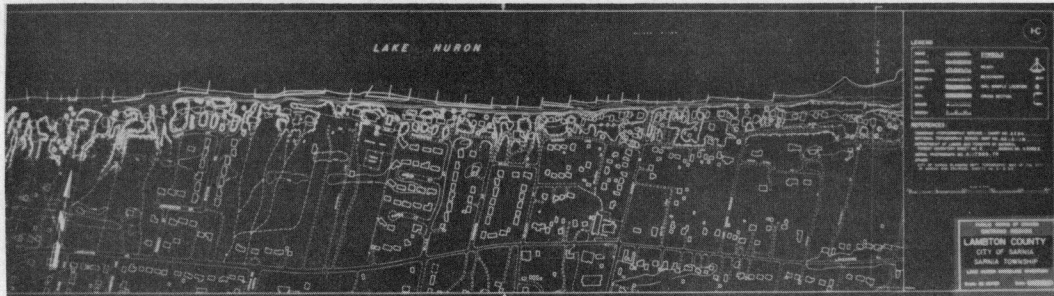
← Reach A →



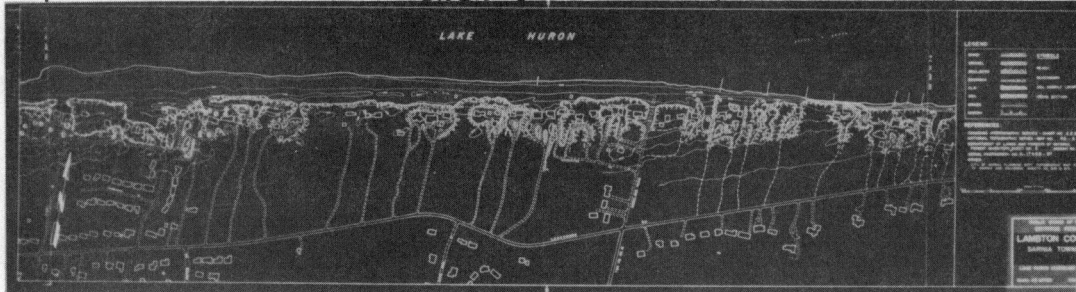
← Reach A →



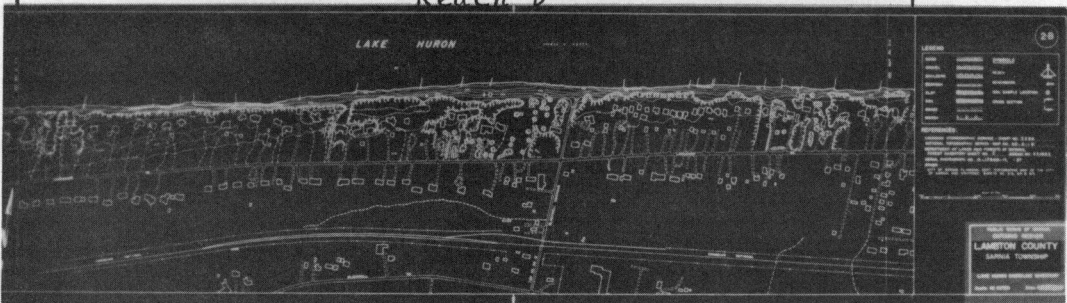
← Reach B →



Reach C



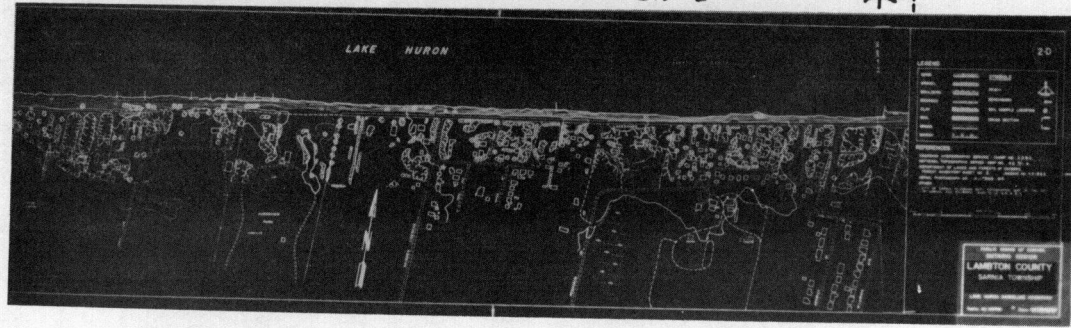
Reach D



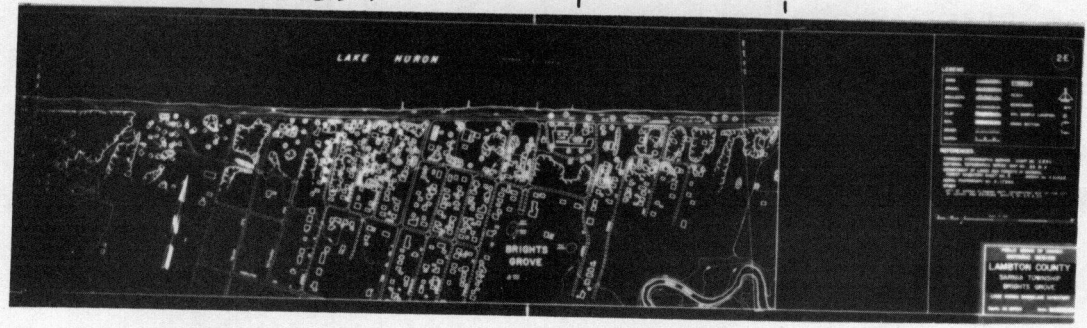
Reach D



Reach E



Reach F



Reach G



STORM DAMAGE EFFECTS:

Wind Damage



*Concrete walk undermined
and collapsed by wave
action*



Scouring



Scalloping



E. EXISTING LAND USE:



The following categories were applied to classification of present land use:

1. *Industrial*

*Lake Ontario -
Hamilton Harbour*



*Lake Ontario -
Canada Cement, Picton Bay*



2. *Commercial*

Lake Ontario - Collins Bay



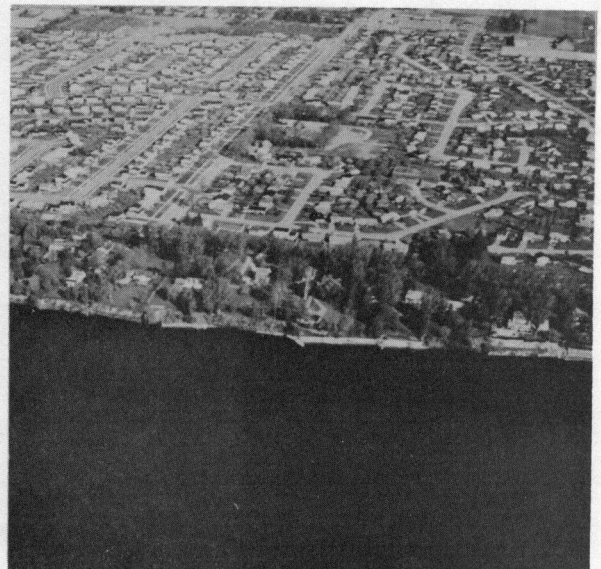
3. *Residential - Seasonal*

*Lake Ontario -
Brighton Township*



4. *Residential - Permanent*

Lake Ontario - Toronto



5. *Agricultural or Silvicultural*

*Lake Ontario -
Durham County*



*Lake Ontario -
Northumberland County*



6. *Wildlife Wet Habitat*

Lake Ontario - Amherst Island



7. *Recreational Parks
Federal, Provincial and Municipal*

Lake Ontario - Darlington Provincial Park



8. *Undeveloped*

Lake Ontario - Prince Edward County



Not all the information collected could be utilized in the production of strip maps. The land market value, the number of boats used for sport fishing, the number of swimmers on a given beach, or the amount of ice build-up on lake shore, as an example, is valuable information in itself and as such is being stored and catalogued. However, it becomes important as input to future trends in the development of land on the water front.

These vital statistics of lakeshore, for instance, are in demand not only by all levels of government and professional consultants, but by the public at large who is increasingly aware of the need to preserve our environment. This is evident from the number and nature of requests for such information. For example, how far should the building set-back be to allow for a 50 year erosion; what are the causes and best methods to prevent, most economically, further deterioration of existing shore protection; what is the soil composition of a given reach of shoreline and also the wave run-up at the existing and maximum water levels; where are the most likely locations of offshore gravel and sand deposits in the areas of up to 50 feet of water, etc. To adequately answer such inquiries and since shores of any lake or river are not static but dynamic, a definitive knowledge of the state of change should be ascertained.

The intervals of time between revisions greatly depend on the rate of change. Consequently the remote areas with rocky shoreline would require less attention,

than urban regions of greater population density and/or reaches of readily erodible shore, where annual inspection is mandatory. The present interest and demand in shore property development should not alone justify the recording of shoreline inventory, but it should also be maintained for the sake of the record itself.

The broader approach to these studies is being developed in conjunction with the Lakes Management Research Section.

It is hoped to extend the collection and presentation of information by the addition of data on land values and ownership. The Lakes Management Research Section has begun also to experiment with alternatives to the present strip map display of information and of the co-ordination of the shoreline studies with other land use surveys. Should funds and personnel permit a pilot study of attitudes towards management of the Lake Ontario shoreline in the zone between Oshawa and Niagara-on-the-Lake will be undertaken. A preliminary design for this study has been prepared by the Political Science Department, McMaster University.

The original analysis of the shoreline of Lake Erie done at the University of Western Ontario last summer will probably be repeated for Lake Huron - Georgian Bay this year should financial answers allow.

Some of these studies are relatively removed from the survey of shoreline area, but it is this survey that is the foundation of these derivative and analytical studies.

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Haras, W. S.

Shore property studies
and inventory of the
Great Lakes and St. Law...

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