

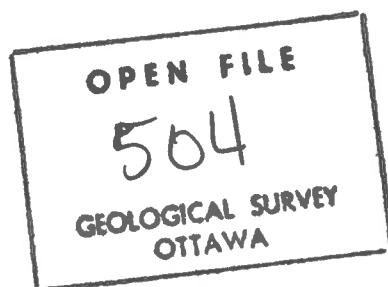
*Report on a Brief Search for Data  
Relevant to Cable Crossing between  
Grand Manan Island and Campobello  
Island and between Deer Island  
and Campobello Island*

*by*

Alan Ruffman

Submitted to

New Brunswick Electric Power Commission  
Fredericton, New Brunswick



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Halifax, Nova Scotia  
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In response to a call from Mr. C. Gallant on May 21, 1975 and a confirmation call on May 22, 1975, Mr. Alan Ruffman undertook a search at Bedford Institute of Oceanography and in various library sources. The information searched for falls under 4 broad categories:

- a. bathymetry
- b. marine geology
- c. physical oceanography
- d. fisheries

The results of the search were reported in detail at a meeting at N.B.E.P.C. Service Center, Fredericton, New Brunswick on May 29, 1975. The findings are reviewed briefly below and an annotated bibliography attached.

a. Bathymetry

Mr. Ruffman spoke with Mr. Ross Douglas at Bedford Institute of Oceanography. All data along this coast from almost Lorneville to the Maine border is in the order of 25 years old and it appears that none of the raw bathymetry sounding rolls are available. Charts D7 or L-4011 and L(D7)4340 cover the general area (Can. Hydro. Serv., 1972 and 1966b) especially Grand Manan Channel and Owen Basin.

Charts 4343 and 4373 are more specific to Head Harbour Passage and Friar Roads. (Can. Hyd. Serv., 1966a and 1972b).

Only 2 "field sheets" were found at Bedford Institute though Chart 4340 gives some indication, another showing more detailed data in Herring Bay, Campobello Island, must exist. A "field sheet" shows the digitized values of depth transcribed on to a map. The spacing of values along any track depends upon the roughness and upon the spacing. If the bottom is flat or slopes are even, the digitized values or "inked soundings" are widely spaced. If the bottom is steep or rough, the scale of the map limits the number of soundings possible to display even though the data is continuous along a line. A description of the two field sheets #1850 and #1983 appears below:

Field Sheet 1850  
Friar Roads, Campobello Island, N.B.  
 4 in = 1 mi. Mr. G.E. Lowe and Assist. 1948  
 Polyconic projection  
 Soundings in feet  
 44°52'00"N to 44°57'00"N  
 66°55'00"W to 67°00'00"W

Closely spaced lines run NW-SE between Deer Island and Campobello Island and on both sides of the intervening small Indian Island. Navigation was well controlled with 4 stations on Deer Island, 5 on the small island and 3 or 4 more on Campobello Island.

Line spacing was about 1/16 to 1/10 of a mile. The data could easily be contoured at an even 10 ft spacing to give gradients. Navigation was by sextant but will be accurate.

The sounding rolls are not available, having been thrown out some years ago. Indeed, all the data along this coast is very old data and generally unavailable.

Field Sheet 1983

Grand Manan, northern sheet

D.A. Charles and assistants, 1949

Scale 2" = 1 naut. mile at Lat. 44°37'00"

Polyconic Projection

Soundings in fathoms

44°45'00"N to 44°58'30"N

66°34'00"W to 66°57'00"W

Sounding lines run east-west between Campobello Island and the Wolves and the shoal to the south. The east-west lines are at a wide spacing of about ½ n.m. and continue south to the southernmost end of Campobello. From the south end of Campobello and West Quoddy Light lines run NW-SE over to Grand Manan Island but again at a very wide spacing of about ½ n.m. There are no detailed lines off the east, west or south coast of Campobello Island. However, the northwest and northeast coast of Grand Manan have very detailed bathymetry lines about 1/16 n.m. apart (400-500 ft). The lines run up to 2½ n.m. from shore into depths of 50-60 fm. Field Sheet 1983 extends from Swallow Tail on the east of Grand Manan around Northern Head and south to the small bay (Dark Harbour)

With a bay mouth bar on the western coast. Navigation was by sextant. The records are not available

There are also two American charts available in the area; Charts #303 and 801 (National Ocean Survey, unknown). There is also one line of detailed bathymetry run down Grand Manan Passage in 1971 on the HUDSON 71-014 cruise but it is not known yet if there was any seismic penetration along this line.

b. Marine Geology

A map of the surficial geology of the Bay of Fundy has been prepared by Mr. Gordon Fader and Brian MacLean of the Atlantic Geoscience Centre of the Bedford Institute of Oceanography. Their map leaves Grand Manan Channel blank because of a lack of data. Likewise, the south end of Grand Manan Island in the area of the shoals is blank. Their data approaches Owen Basin and indicates a fairly fine to medium-grained sediment in this area.

The American government has produced a number of maps of bottom sediment type (Schlee, 1973) and their maps indicate 2 or 3 samples in the area of Grand Manan Channel. They interpret the area to be sandy or silty on their maps. The exact positions or exact size analyses of the samples is not known. No samples from Canadian or American sources

are known in Friar Roads or Head Harbour Passage.

The only other source of geological data may be in Neish and Perkins (1973a, b) if their original field notes can be recovered. They had 12 diving stations between Dark Harbour and Whale Cove on Grand Manan Island, 5 stations between Liberty Point and Eastern Head including Herring Bay on Campobello Island and 7 stations in Head Harbour Passage area. Cummings (1965) gives the details of the bedrock geology.

Magnetic maps are available from airborne data but no other geophysical information is known including marine seismic information.

#### c. Physical Oceanography

Mr. Don Lawrence of the Coastal Oceanography Section of the Atlantic Oceanographic Laboratory was interviewed at Bedford Institute of Oceanography. A number of reports of the the International Passamaquoddy Engineering Board (1950) and more importantly, of the International Passamaquoddy Fisheries Board (1959a,b; 1963) are pertinent to the various cable crossings. The reference (1959a) contains 6 papers (Appendix 1). The paper by F.D. Forgeron deals with one station (#14) in Grand Manan Channel and 2 stations (#13, #3) in Friar Roads and North Head Passage and outlines temperature and salinity. J.R. Chevrier's paper deals with drift bottle experiments in Grand Manan Passage and North Head Passage.

W.D. Forrester wrote of current measurements and had a station between Indian Island and Deer Island, another between Indian Island and Campobello (#55 and #54). Two more stations were in North Head Passage (#58 and #57). Three stations were straddling the U.S.-Canada boundary in Grand Manan Channel (#19, 20 and 21). Hourly vector diagrams are given over a whole tidal cycle, with both direction and magnitude indicated at 3 levels of the water column (surface, mid-water, bottom) and this report is probably the most complete data available on currents. Trites and MacGregor's paper adds a little additional data that may be relevant to the Indian Island area in Friar Roads. Bumpus reviews the surface circulation. Appendix 2 reviews the content of all the papers in the 1963 publication of Passamaquoddy reprints.

As a result of the application by the Pittston Company for an oil refinery at Eastport a series of public hearings were held. This resulted in the assembling of a team within the Federal Department of the Environment to review the potential hazards of such a development. This resulted in a publication (Trites, 1974) which consisted of a series of 9 publications (Appendix 3). A number of these were built upon earlier Passamaquoddy papers. The first paper by Loucks, Trites, Drinkwater and Lawrence discussed the results of 3 additional stations in Friar Roads and Head Harbour Passage. These were shallow stations at 5 and 15 metres and were not bottom stations.

d. Fisheries

No data was gathered. It would be desirable to know where the groundfish and scallop fishing areas are located and the type of equipment used. Scallop dragging operations may well endanger a cable if not buried. The Otter boards of bottom trawling operations may not damage a cable but should be reviewed.\*

The third paper in Trites (1974) reviews some of the fishing areas around Grand Manan. Biologists at the Fisheries Research Board in St. Andrews, New Brunswick and at Dartmouth or Halifax may have more precise data as to fishing areas and equipment used.

\* Otter trawls examined in Halifax do not have rollers and appear to this observer to be quite heavy and potentially dangerous to a cable.



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(Annotated Bibliography)

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Dept. Envir., Chart 4343, Scale 1:19,200, soundings in fathoms.

- Covers Friar Roads and south end of Head Harbour Passage.

Canadian Hydrographic Service. 1966b. Grand Manan. Can.

Dept. Envir., Chart L(D7) 4340, Mercator Projection, Natural Scale 1:60,000, soundings in fathoms.

- Covers Grand Manan Island, Grand Manan Channel, North Harbour Passage and Machias Seal Island.

Canadian Hydrographic Service. 1972a. Approaches to the Bay

of Fundy. Can. Dept. Envir., Chart D7-4011 or L-4011, Mercator Projection, Natural Scale 1:300,000, soundings in fathoms.

- General chart of entrance to Bay of Fundy, Chart indicates a severe paucity of bathymetric data around Grand Manan and Campobello Islands. This lack applies to both the Canadian and American sections of Grand Manan Channel.

Canadian Hydrographic Service. 1972b. Campobello Island.

Can. Dept. Envir., Chart 4373, Mercator Projection, Natural Scale 1:36,400, soundings in fathoms.

- Covers from West Quoddy Head up to Passamaquoddy Bay including Friar Roads and Head Harbour Passage. More detailed soundings shown in Herring Cove than shown on field sheet 1850.

Cumming, L.M. 1965. Geology of the Passamaquoddy Bay Region, Charlotte County, New Brunswick. Geol. Surv. Can., Paper 65-29, 36 p. plus 2 maps in pocket.

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International Passamaquoddy Fisheries Board. 1959a. Report to International Joint Commission. Appendix 1, Oceanography, studies in physical oceanography for the Passamaquoddy Power Project by D.F. Bumpus, J.R. Chevrier, F.D. Forgeron, W.D. Forester, D.G. MacGregor and R.W. Trites. Ottawa and Washington.

- Series of six papers. Those by Forgeron, Forrester and Bumpus pertinent. Good data on currents. Also data on Lepreau wind velocities. No marine geological data.

International Passamaquoddy Fisheries Board. 1959b. Report to International Joint Commission, Appendix IV. Economics Canada by W.F. Doucet, Ottawa and Washington. 79 pp. plus Appendices.

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- A collection of 65 papers. No marine geology.

Jones, H. 1929. Passamaquoddy Bay, New Brunswick, Canada Maine, United States, a consideration of some of the hydrophysical effects of the proposed power development (based on conditions of the summer session). North Am. Comm. on Fishery Investigations, Ottawa. 28 p. plus illus.

National Ocean Survey. Unknown. West Quoddy Head to Cross Island. Nat. Oceanic & Atmospheric Admin., Rockville, Md., Chart No. 303, Scale 1:40,000, Price \$1.50 Am.

- Covers south end of Campobello Island and Grand Manan Channel including very southwest end of Grand Manan Island and Machias Seal Island.

National Ocean Survey. Unknown. Calais to West Quoddy Head plus Eastport Harbour insert. Nat. Oceanic & Atmospheric Administration, Rockville, Md., Chart No. 801, scale 1:40,000 (Eastport Harbour inset at 1:5,000), Price \$1.50 Am.

- Covers Friar Roads and Head Harbour Passage as well as all of Campobello Island.

Neish, I.C. and T.R. Perkins. 1973a. The distribution of kelp and other commercially useful marine algae in Charlotte County, New Brunswick. Report to N.B. Dept. Fish. and Envir. by Applied Marine Research Ltd, Ref. AMR, 73-3A, Halifax, N.S., 46 p.

- Number of stations off west coast of Grand Manan and off southeast coast of Campobello Island.

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- Statistical analyses and geologic interpretation of marine samples. Data extends into Grand Manan Channel at the entrance to the Bay of Fundy.

Trites, R.W. (ed.). 1974. Summary of physical, biological, socio-economic and other factors relevant to potential oil spills in the Passamaquoddy Region of the Bay of Fundy. Fish. Res. Bd. Can., Tech. Rept. No. 428, 229 p.

- A report done for the Pittston Oil Refinery hearings at Eastport, Maine. Report done for New Brunswick government to present. Canadian government took no formal part. Virtually no marine geology - some reference to Pleistocene geology.

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- Processed data of computer printout plus profiles of gravity and magnetics. One line runs between

Grand Manan Island and mainland down the axis  
of Grand Manan Passage.

## APPENDIX 1



INTERNATIONAL PASSAMAQUODDY  
FISHERIES BOARD

Report

to

INTERNATIONAL JOINT COMMISSION

OTTAWA, ONTARIO  
WASHINGTON, D. C.

Appendix I Oceanography

STUDIES IN PHYSICAL OCEANOGRAPHY  
FOR THE PASSAMAQUODDY POWER PROJECT

by

D. F. Bumpus, J. R. Chevrier, F. D. Forgeron,  
W. D. Forrester, D. G. MacGregor, and R. W. Trites

October 1959

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## APPENDIX 2

SCIENTIFIC REPORTS

INTERNATIONAL PASSAMAQUODDY

FISHERIES BOARD

1956-59

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### APPENDIX 3

FISHERIES RESEARCH BOARD OF CANADA

TECHNICAL REPORT NO. 428

SUMMARY OF PHYSICAL, BIOLOGICAL, SOCIO-ECONOMIC  
AND OTHER FACTORS RELEVANT TO POTENTIAL OIL SPILLS  
IN THE PASSAMAQUODDY REGION OF THE BAY OF FUNDY

Department of the Environment

Halifax, N.S.

Dartmouth, N.S.

St. Andrews, N.B.

Ottawa, Ont.

Canada

March 1974

## FOREWORD

The rapidly growing demand for oil in North America has resulted in the development of major oil terminals serviced by tankers in ever increasing size and number. Despite increased awareness of the hazards involved, improved safety standards, etc., accidents do and will continue to take place resulting in oil spilled into the sea. To those faced with the task of deciding where oil terminals are to be built and how they are to be operated, it is essential to have knowledge not only of the potential benefits to be derived from such developments but also the potential risks associated with the endeavour. The risk of accidents, and the subsequent escape of oil poses threats to many of the coastal resources, activities, and amenities in the immediate vicinity of a terminal or grounding. Moreover, because of the mobility of oil in the sea, even those several hundred miles from the scene may be placed in jeopardy.

Earlier this year the Pittston Company submitted to the Maine Board of Environmental Protection a proposal to locate a major oil refinery and marine terminal development on Moose Island, Eastport, Maine. This proposal has brought clearly into focus the need for both Americans and Canadians to recognize the potential benefits and liabilities associated with such a development. This report has been assembled by a team within the Department of Environment in order to provide a concise summary of a number of the physical, biological and Canadian socio-economic factors relevant to potential oil spills in the Passamaquoddy Region of the Bay of Fundy. By outlining and identifying these factors, it is our hope that those persons and agencies who have collective responsibility for presentation and consideration of a full and comprehensive view relating to the proposed developments at Eastport will be in a better position to do so. Additionally, some aspects of this report can be used more broadly since they are applicable to the considerations of tanker terminal siting in general.

R. W. Trites

12 December 1973

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SUMMARY OF PHYSICAL, BIOLOGICAL, SOCIO-ECONOMIC  
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OF THE PASSAMAQUODDY REGION OF THE BAY OF FUNDY

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PHYSICAL OCEANOGRAPHIC CHARACTERISTICS

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