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Surficial Geology of the Abegweit Passage Area of Northumberland Strait, Gulf of St. Lawrence

GSC Open File #2087

by

Gordon B.J. Fader and Shawn Pecore

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Surficial Geology of the Abegweit Passage Area of Northumberland Strait, Gulf of St. Lawrence

by

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Introduction

In 1988 the Atlantic Geoscience Centre conducted marine geological-geophysical survey aboard the M.V. Navicula (Fader, 1988) in the Abegweit Passage area of the Northumberland Strait. The survey, centred on the proposed fixed link crossing between Jourimain Island, New Brunswick and Borden Point, Prince Edward Island, has identified the presence of dynamic seabed conditions and other seabed features not previously known. Earlier regional marine geological surveys in the 1970's identified the major surficial formations (Krank, 1971) but did not address the dynamics of seabed sediments. This study, however, was undertaken with high resolution seismic reflection profilers together with a 100 kHz sidescan sonar system and seabed samplers. The data indicate the presence of sand ribbons, sand waves, 2 and 3-dimensional megaripples, comet marks, and areas of boulders and outcropping bedrock. In the nearshore, linear depressions may represent present day ice scouring of the seabed. The widespread presence of bedforms suggests

that the seabed of the Abegweit Passage of Northumberland Strait is much more dynamic than previously thought. Seismic reflection information clearly defines the unconformity at the bedrock surface and provides thicknesses for the overlying surficial formations. The regional distribution of control, bathymetry, bedforms, seabed features, and surficial geology, including a crossection is presented in this open file. On enclosure 1 the dots on the track lines are fucidual marks.

Bedrock and Surficial Sediments

The bedrock geology of Northumberland Strait consists of Carboniferous and Permian sedimentary rocks which dip at two to four degrees to the northeast (see crossection). It is overlain by a glacial till formation, Pomquet Drift (Kranck, 1971), which ranges in thickness to 12.2 m. The surface of the till has been modified by a sea level transgression sea after glaciation and by strong present day currents which have developed the overlying Buctouche Sand and Gravel Formation. A modern sand deposit, Egmont Sand, consists of localized bodies of coarse to medium grained sand which is undergoing active transport and is developed into fields of sand waves and megaripples.

Bedforms

At the site of the proposed fixed link crossing between Jourimain Island and Point Borden, the southern third of the seabed is covered with sand ribbons which are current-parallel, thin bedforms of sand overlying gravel. Sand ribbons are thought to be generated in short-lived periods of intense flow. Associated with sand ribbons are comet marks (Werner

et al., 1980) which are boulder-induced, linear erosional scours common to current swept seabeds. The "tails" (as shown by the symbol on Enclosure 4) of the comet marks shows a regional sediment transport from west to east.

Areas of subdued megaripples and/or gravel waves, which have no measureable relief, occur close to Jourimain Island. They appear degraded.

Boulders, Till, and Scallop Fishing Marks

The presence of large boulders up to 3 m in diameter at the seabed suggests that they may be distributed throughout the subsurface till section. In the central part of the strait the seabed is covered with parallel sets of linear-curvilinear marks made by scallop fishing gear. An absence of boulders is characteristic of the same area and suggests that the boulders may have been removed by the fishing operation.

Ice Scour

Shallow linear scour depressions occur in the nearshore of both sides of the Abegweit Passage in water depths up to 11 m. They suggest present day erosion of the shallow seabed from grounded moving ice pressure ridge keels.

Acknowledgment

We thank the Captain and the crew of the M.V. Navicula, and the Program Support Division technicians of Atlantic Geoscience Centre for their

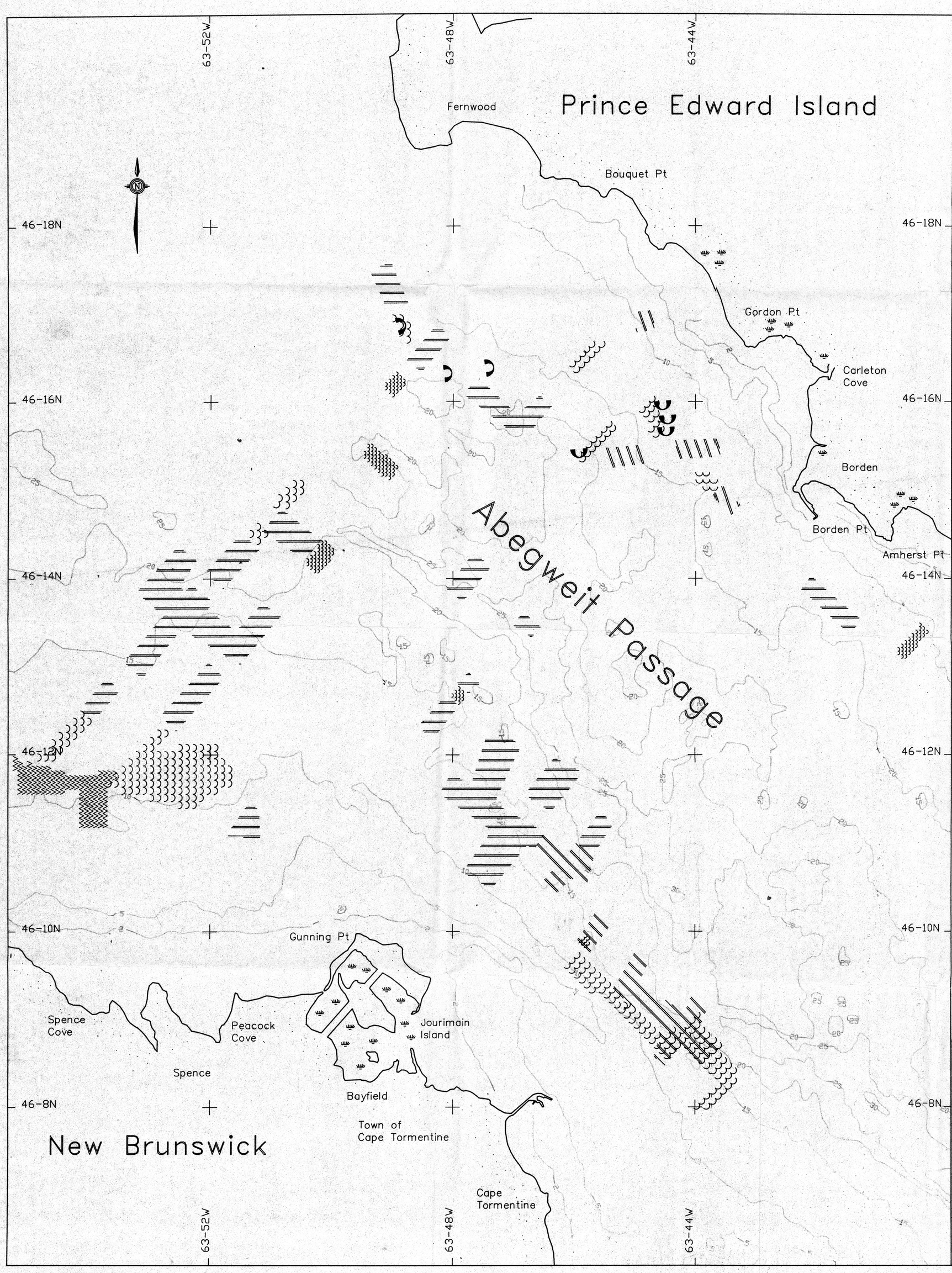
support during the cruise. We also thank the Canadian Hydrographic Service for providing bathymetric field sheets, and Earth and Ocean Research Ltd. for preparing the digitized maps. This open file was reviewed by R.D. Parrott and G. Sonnichsen.

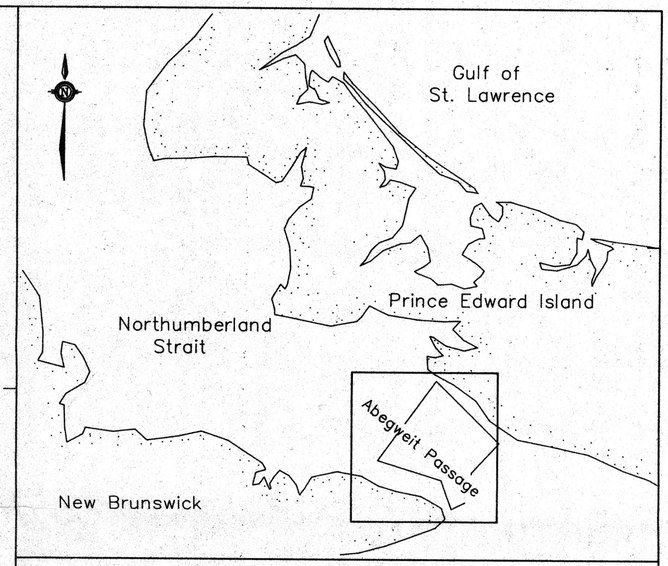
References

Fader, G.B.J. 1988. Cruise Report 88-018(D) Phase 6/7 M.V. Navicula Northumberland Strait - July 8-23, 1988. Geological Survey of Canada Open File # 1971, 31p.

Kranck, K. 1971. Surficial Geology of Northumberland Strait, Marine Science Paper 5. Geological Survey of Canada, Paper 71-53.

Werner, G.U., Koopmann B., and Stefanon, A. 1980. Field observations and flume experiments on the nature of comet marks. Sediment Geology: v.26, pp. 233-262.





LEGEND

Interpretation of bedforms along track

- Sand Ribbons (indicates approximate trend)
- Subdued megaripples (indicates approximate trend)
- 2-D megaripples (indicates approximate trend)
- 3-D megaripples (indicates approximate trend)
- Sandwaves (indicates approximate trend)

Classification from Amos and King, 1984.

Note:

Water depths in metres
Bathymetry contour interval 5 m in depths over 5 m
Bathymetry data obtained from CHS field sheets 1587 and 4608

SCALE
0 — 5
Km

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ABEGWEIT PASSAGE NORTHUMBERLAND STRAIT BEDFORMS

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PROJECTION : TRANSVERSE MERCATOR CM 63.8W		SCALE : 1 : 50,000
ENCLOSURE: 5	DRAWN BY: DJP	EOR PROJECT NO : 88-17

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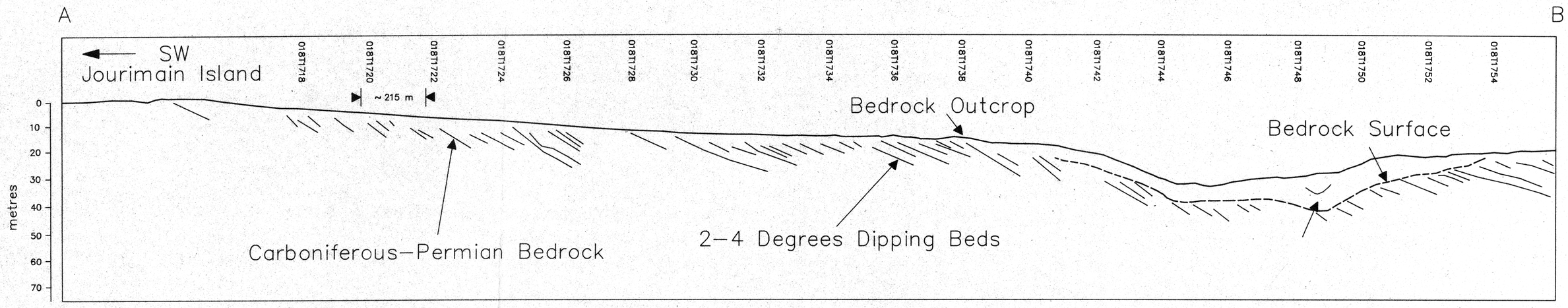

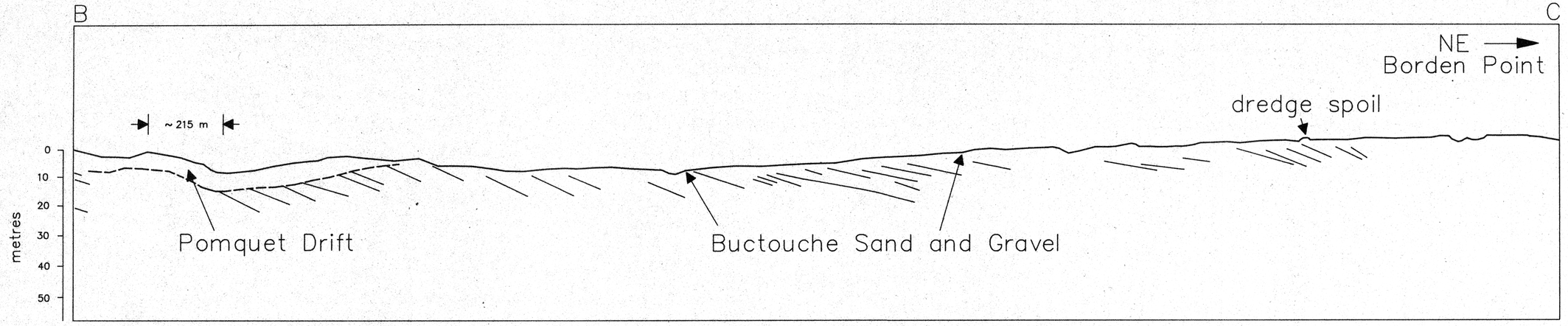

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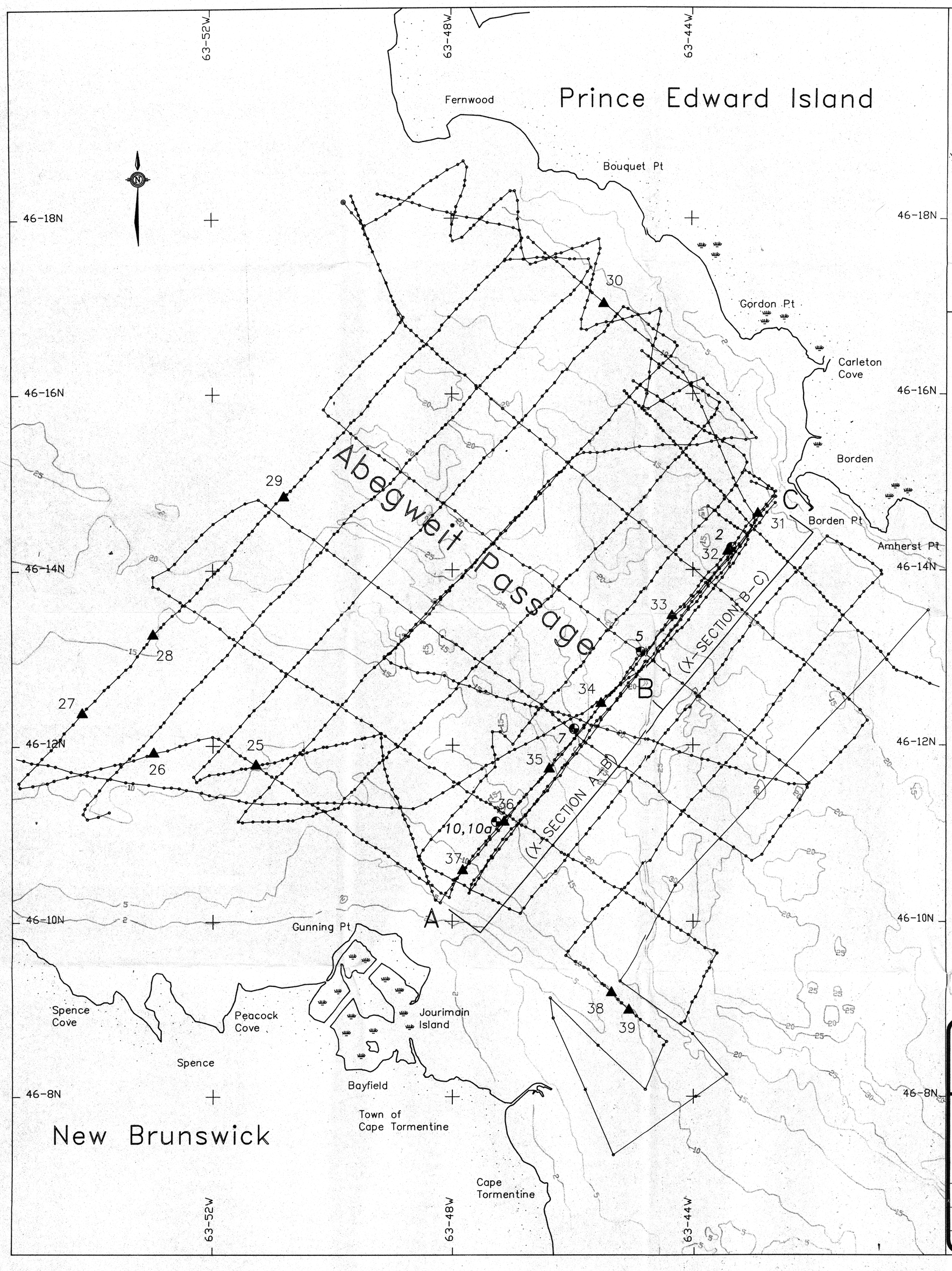

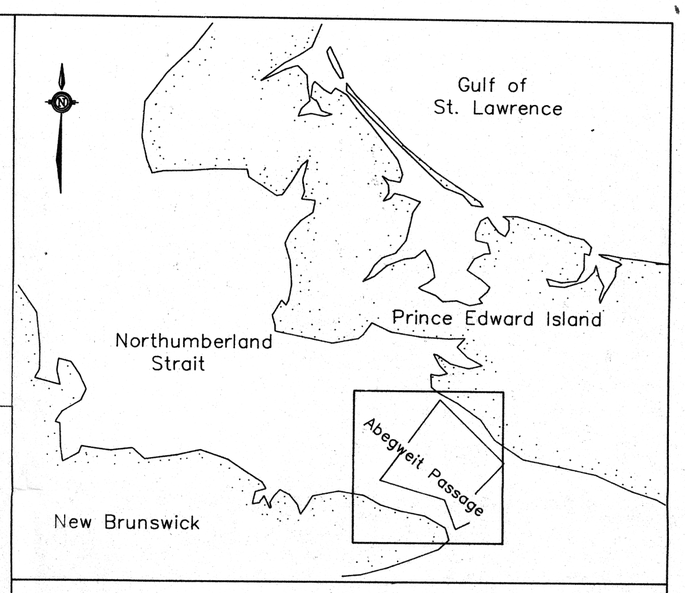

LEGEND

ship's track—sidescan sonar, high resolution seismic reflection, and echosounder.
—Cruise Navicula 88-018 (D) Phase 6 & 7

31 ▲ van Veen grab sample locations

5 borehole location
—PWC Project No. G062

Note:

Water depths in metres
Bathymetry contour interval 5 m in depths over 5 m
Bathymetry data obtained from CHS field sheets 1587 and 4608

SCALE
0 — 5
Km

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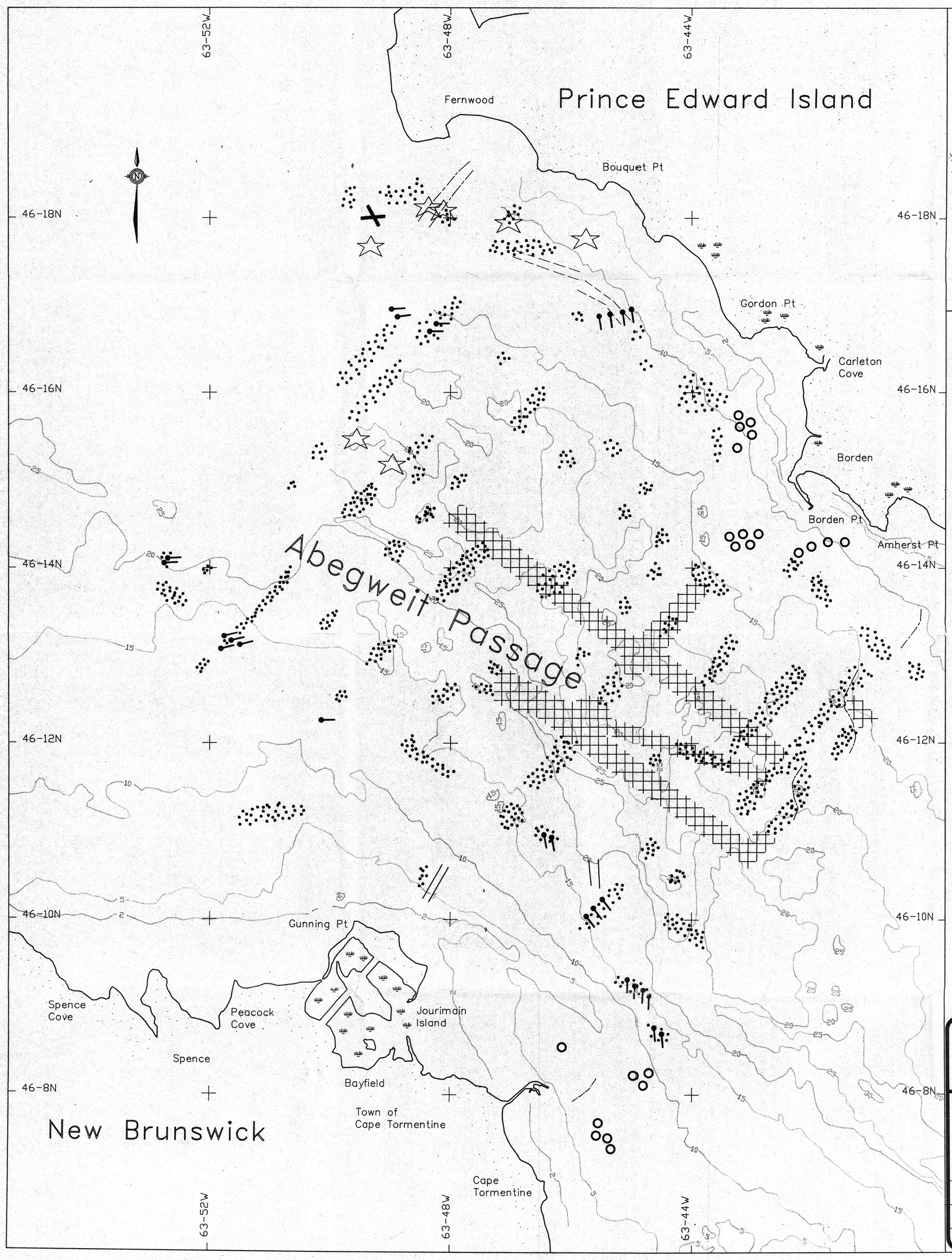

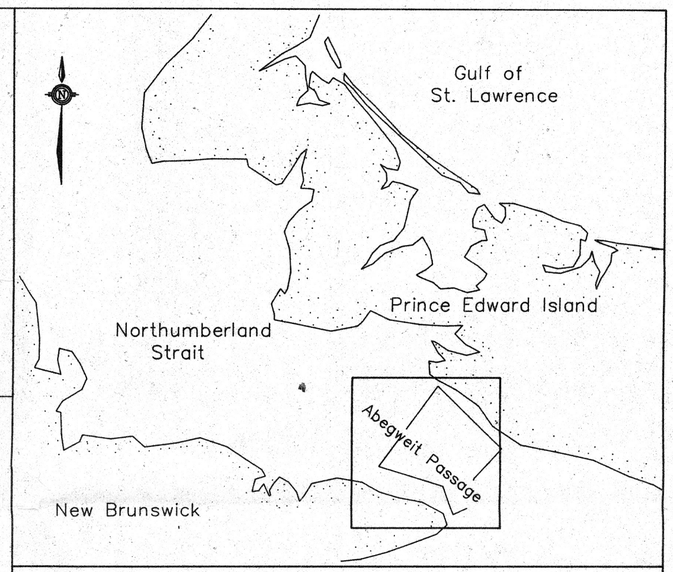

LEGEND

Interpreted seabed features along track

- Zone of boulders
- Comet marks (obstacle induced scour depressions)
- Dredge spoils
- Ice scours (short linear)
- Ice scours (long linear)
- Unknown scours (various shapes and orientations)
- Unknown scour (long linear)
- Scallop fishing gear marks
- Cables

Note:

Water depths in metres
Bathymetry contour interval 5 m in depths over 5 m
Bathymetry data obtained from CHS field sheets 1587 and 4608

SCALE

0 — 5

Km

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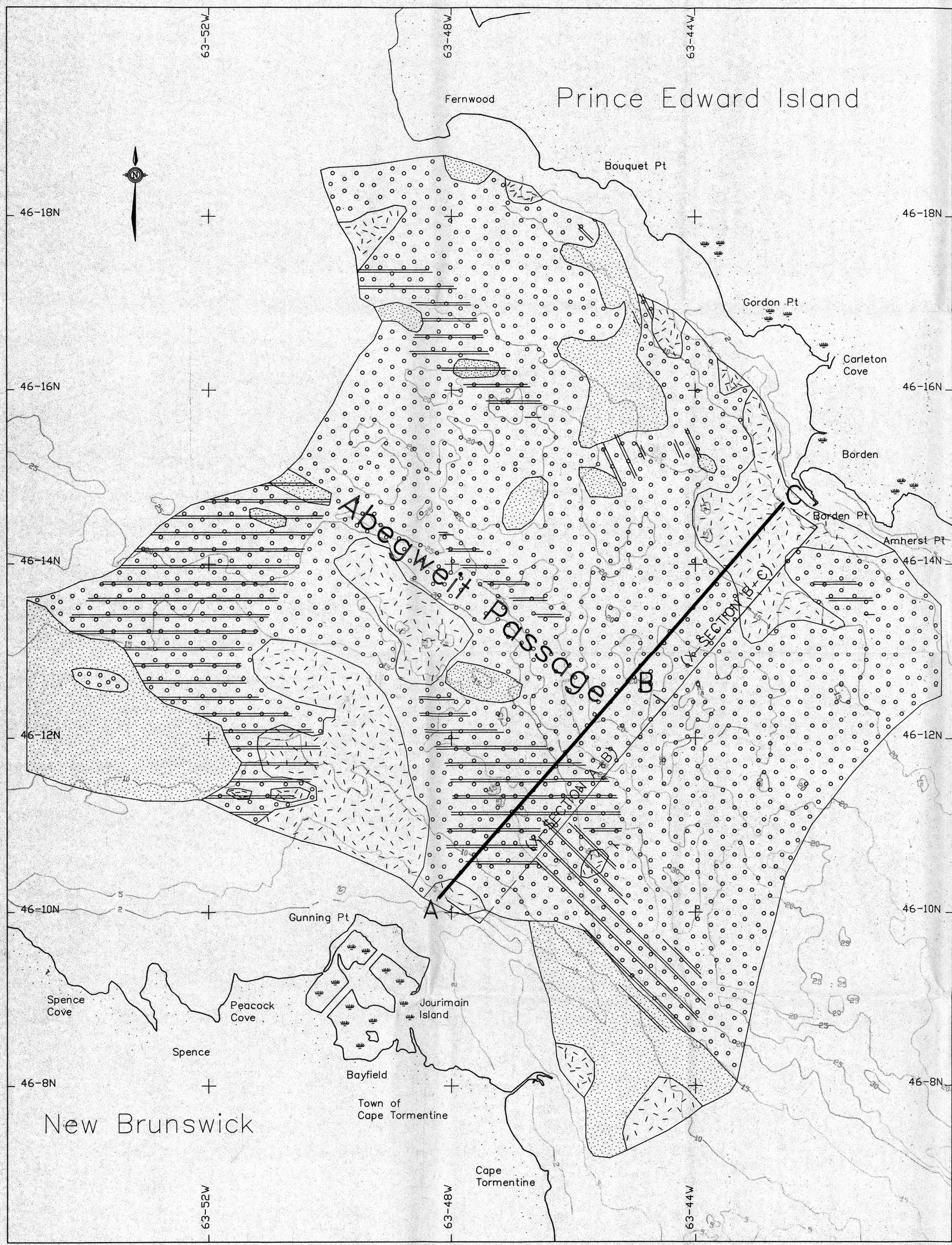

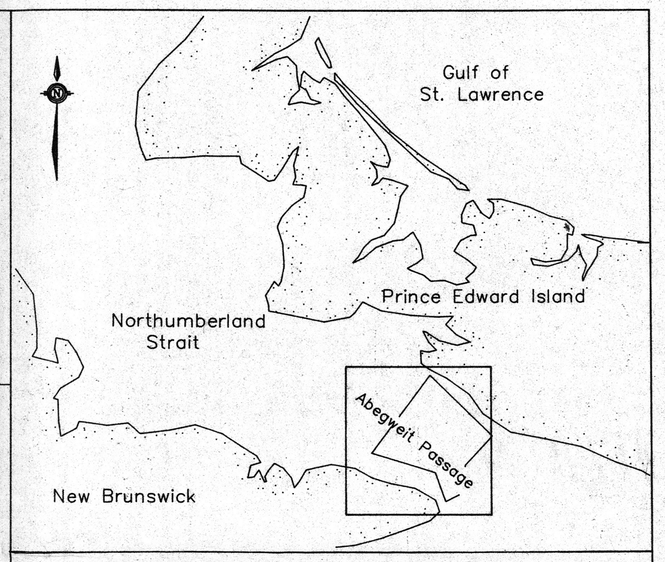

LEGEND

- **Sand** – well sorted, medium, with shell debris.
- **Gravel** – with minor sand, lag surface overlying glacial till and/or bedrock, with boulders.
- **Bedrock** – with patches of sand, gravel and boulders. Appears as ridges, ledges, and rough topography.
- **Sand Ribbons** – indicates approximate trend. Thin, parallel sand bedforms, occasionally with megaripples and sand waves.
- – location of seismic profile

Note:

Water depths in metres
Bathymetry contour interval 5 m in depths over 5 m
Bathymetry data obtained from CHS field sheets 1587 and 4608

SCALE
0 — 5
Km

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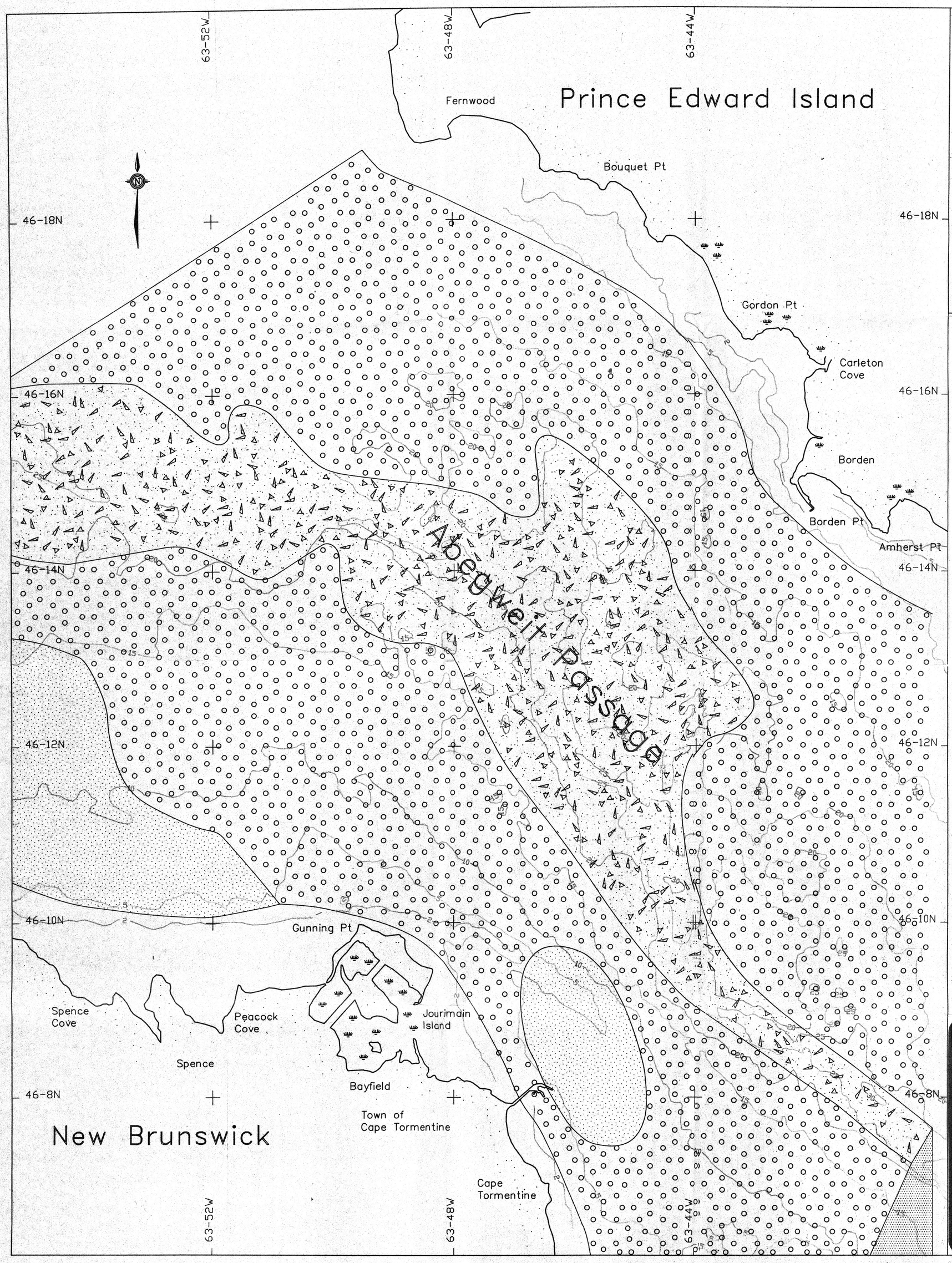

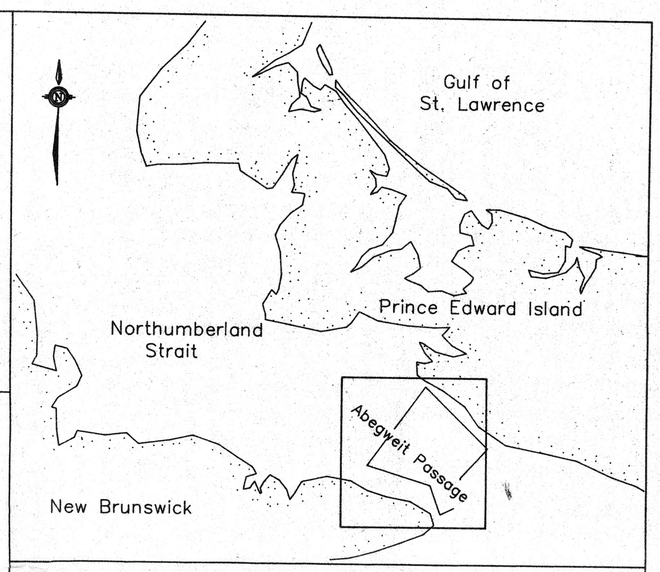

LEGEND

Pugwash Mud
muddy sand with 50–95% sand

Egmont Sand
well sorted medium–grained sand

Buctouche Sand and Gravel
mainly sandy gravel

Pomquet Drift
glacial till – surface modified

Note:

Water depths in metres
Bathymetry contour interval 5 m
in depths over 5 m
Bathymetry data obtained from
CHS field sheets 1587 and 4608

SCALE
0 5
Km

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NORTHUMBERLAND STRAIT
SURFICIAL GEOLOGY (KRANCK, 1971)

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