Bedford Institute of Oceanography
Institut océanographique de Bedford

Cruise Report 89026

Navicula operations in Placentia Bay, Newfoundland

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GENERAL INFORMATION

Cruise:	Navicula 89026	
Dates:	20 September - 18 October 1989	
Area of operations:	Placentia Bay, Newfoundland, including Argentia Harbour, Placentia Sound, Ship Harbour, Long Harbour, northern Placentia Bay, Mortier Bay, Great St. Lawrence Harbour, Little St. Lawrence Harbour.	
Agency:	Geological Survey of Canada (GSC) (Atlantic Geoscience Centre [AGC])	
Master:	J. Bray	
Senior Scientist:	J. Shaw	AGC
Scientific Staff:	D.L. Forbes	AGC
	B. Wile	AGC
	L. Johnston	AGC
	R. Sparkes	AGC
	M. Emory-Moore	C-CORE[1]
	P. Simpkin	IKB Technologies Ltd.

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OBJECTIVES

Cruise 89026 followed a successful mapping effort in southwest Newfoundland during 1988 (Forbes and Shaw, 1989) which was part of a GSC inner-shelf mapping initiative. The broad objective of cruise 89026 was to map parts of the Newfoundland inner-shelf, mainly in Placentia Bay. The specific objectives were:

1) To map the inner-shelf in northern Placentia Bay, in the vicinity of Arnolds Cove. A number of sites in this region have been selected by industry as possible locations for the construction and assembly of offshore oil production platforms. A regional survey would provide background environmental information for the increased industrial activity in the bay, and more particularly, would link the limited site surveys which have been conducted.

2) To conduct surveys offshore from Placentia, where a large beach-ridge plain is derived from erosion of glaciogenic sediments contained in adjacent coastal bluffs (Henderson, 1972; Shaw and Forbes, 1987; 1988; Shaw, in press). A knowledge of the inner-shelf Quaternary sediments in this vicinity would add to our general understanding of the evolution of the Newfoundland coast in the light of relative sea-level change and sediment supply.

3) To survey Long Harbour and, in conjunction with C-CORE, collect grab samples to be analysed for phosphorus and heavy metals by the latter. Long Harbour is the site of the recently defunct ERCO (Electric Reduction Company of Canada) phosphorus plant.

4) To map Mortier Bay and the adjacent inner shelf. This would provide the first inner shelf information in a region where the offshore surficial geology has been mapped (Fader et al, 1982).

5) To survey White Bear Bay, extending eastward the information base on the fjords of the south coast of Newfoundland (Forbes and Shaw, 1989). A knowledge of the Quaternary sediments in these fjords would improve our understanding of Late-Wisconsinan glaciation and the history of relative sea-level change.

SUMMARY OF ACCOMPLISHMENTS

A total of 30 days was alloted for the program, including 6 days for transit of Navicula to and from Newfoundland. However, bad weather, in particular persistent moderate and strong southwest winds, disrupted the planned program, and only 13.5 program sea days were logged. The locations of the survey areas are indicated in figure 1. The acoustic data collected include echogram bathymetry (402 km), sidescan sonar imagery (324 km), and shallow seismic reflection data (Bubble Pulser 402 km, Seistec 387 km). Navigation was by radar, with continuous logging of Loran-C coordinates. The sampling program produced 122 van Veen grab samples, 4 shore samples, and 18 gravity cores. In addition, bottom photographs were taken at several sample sites in Long Harbour.

CRUISE ORGANIZATION

It was intended that during the first part of the survey the vessel would be based at Argentia, and that subsequently it would be deployed from Arnolds Cove for surveys in the northern part of Placentia Bay. It would then move to Marystown for work in that area, and finally to Burgeo for surveys in White Bear Bay. However, weather considerations dictated the deployments. The vessel was initially based at Argentia. Because of persistant southwest winds, surveys were limited to Argentia Harbour, Placentia Sound and Ship Harbour. Navicula sailed to Arnolds Cove and completed surveys in northern Placentia Bay. Upon return to Argentia, a program of seismic surveys and grab sampling was accomplished in Long Harbour. Taking advantage of a few hours of slight winds, Navicula then sailed to Marystown. Surveys of Mortier Bay and the adjacent inner shelf were completed. Unable to make passage around the Burin Peninsula to Burgeo because of westerly gales, Navicula moved to St. Lawrence and the opportunity was taken to survey Great and Little St. Lawrence Harbours. Because of the delays, surveys in White Bear Bay were cancelled.

PRELIMINARY SCIENTIFIC RESULTS

Argentia Harbour, Placentia Sound and Ship Harbour (Figures 2-7):

The sampling program in this area yielded 24 grab samples (Tables 3 & 4) and 7 cores (Table 5). The track plot is shown in Figure 2 and sample locations are indicated on Figure 3. Figures 4-7 show seismic profiles at coring locations.

The stratigraphically-lowest acoustic unit in these inlets is characterised on seismic records by an absence of internal stratification and by a dense chaotic tone. This unit is provisionally interpreted as ice-contact sediment, possibly glacial diamict (till). It forms several broad ridges, of indeterminate thickness, which are located transverse to the long axes of the bays. The tops of the ridges form terraces, usually at a depth of ~17 m. It is unclear at this stage in the analysis whether the terraces are largely primary features, or whether they were formed by erosion. They may, for example, have been cut by wave action during a postglacial low stand of relative sea level. Further analysis of the data should resolve this question.

Seabed outcrops of the unit are typically masked by a thin veneer of coarse gravel with boulders. However, immediately north of the Argentia Peninsula the ice-contact sediment appears to be overlain by extensive areas of sand and fine gravel.

The basins between ridges contain an acoustically transparent unit with an onlapping basinfill-style of deposition. Where it is more than ~5 m thick it contains shallow gas (Figures 4 and 5, for example) which could not be penetrated by the seismic systems. Pockmarks were observed at one location (Figure 6). Grab samples and cores show that this acoustic unit is mud, almost certainly of postglacial age. Numerous lineations on the sea-bed in Argentia Harbour are interpreted as anchor drag marks.

Long Harbour (Figures 8,9):

The survey in Long Harbour was a co-operative venture with C-CORE to investigate the geochemistry of the bottom sediments in the vicinity of the ERCO phosphorus plant. This facility closed in 1989 after 20 years of operation. It is intended that some or all of the 48 grab samples which were collected in Long Harbour during this cruise (Tables 3 & 4) will be analysed for phosphorus and heavy mineral content. Pollution from the ERCO plant was responsible for severe fish mortalitity in Placentia Bay in the winter and spring of 1969. The report edited by Jangaard (1972) contains a series of papers which deal with various aspects of the pollution. Trites (1972) provides some information on the oceanography of the bay.

The two principal acoustic units occurring within Long Harbour are similar in character to those observed in the Argentia region (see above). However, in Long Harbour the ice-contact unit has a more irregular morphology, and ridges are not flat-topped. Sea-bed

outcrops have a veneer of coarse bouldery gravel. The intervening basins contain the second acoustic unit, postglacial mud with scattered pockets of shallow gas. Towards the head of the bay, the ridges of ice-contact sediment predominate at the seabed, and the intervening muddy basins are shallow (too shallow to contain gas) and restricted. A terrace with a lip at ~20 m depth at the head of the bay, in the vicinity of the phosphorus plant wharf, is tentatively interpreted as a fluvial delta, formed during a low stand of relative sea level.

Northern Placentia Bay (Figures 10-16):

This area (Figure 10) includes Come by Chance Harbour, North Harbour, and the narrow channel between Sound Island and the mainland. The coverage extends to about 11 km south of Arnolds Cove. The sampling program produced 30 grab samples (Tables 3 & 4) and 6 cores (Table 5). Seismic profiles of coring locations are shown in Figures 12-16.

This region, and indeed, Placentia Bay in general, has been the focus of oceanographical, biological and geological research in the past, some of it stimulated by the construction of the oil refinery at Come by Chance and the ERCO plant. A number of sources [Hodder et al (1972), Lawrence et al (1973), Willey (1976), and Canadian Hydrographic Service (1986)] show that currents generally flow inward on the eastern side and outward on the western side of the Bay. Stehman (1976) Willey (1976) and Slatt and Gardiner (1976) discuss various aspects of the surficial sediments in northern Placentia Bay. The implications of their conclusions will be discussed in a future report, when cores and grab samples collected on this cruise have been analysed.

While much of Eastern Channel is relatively shallow, a deep trough located along the east side of Long Island extends down to a depth of 350 m. The shallower areas, east of the trough and between Arnolds Cove and Sound Island, are almost devoid of Quaternary sediment cover. Only a thin veneer is present overlying bedrock. Surficial samples from these areas are predominantly mixtures of soft mud and sub-angular to sub-rounded gravel.

In contrast to the shallower parts of the area, the trough is partly filled by a complex sequence of acoustically stratified sediment, at least 100 m thick in places. Grab samples from the trough contain mud, with little or no gravel. Shallow gas is present in a narrow band aligned along the trough axis. The Seistec system was unable to penetrate the gas mask. However Bubble Pulser records show numerous prominent internal reflectors truncated at the sea bed. This is interpreted as evidence of current activity during sediment deposition.

Acoustically unstratified sediment, provisionally interpreted as ice-contact sediment (till), is observed close to shore, south of Arnolds Cove, and in Come By Chance Harbour. Bottom samples are gravelly in these areas. The edge of a terrace at the head of Come by Chance Harbour is located at depths of 14-22 m. In North Harbour, depressions between sea-bed outcrops of till contain gas-charged mud, probably postglacial in age. A terrace in the vicinity of Swift Current has a surficial sediment cover of

gravelly sand, with steep foreset beds (Figure 16). The edge of the terrace is at a depth of ~11 m. It is believed to be fluvial in origin, and may have formed during a postglacial low stand of relative sea level. The sediments in this presumed delta are likely derived from reworking of the raised delta deposits in this area (Tucker et al, 1982). A thin (2-4 m) draped unit with strong internal reflectors, seaward of the delta, is provisionally interpreted as pro-delta mud. At the toe of the delta it overlies a well-stratified unit at least 15 m thick. This may represent the late phase of glaciomarine sedimentation in the area.

Mortier Bay (Figures 17-19):

The track plot for this area is shown in Figure 17. The locations of 9 grab samples (Tables 3,4) and 2 cores (Table 5) are shown in Figure 18. Seismic profiles of the core locations are shown in Figure 19. Four shore samples were collected along the northeast coast of the bay (Figure 18, Tables 3, 4).

The traverse seaward of Mortier Bay reveals only thin Quaternary sediments overlying bedrock. Sediment is absent from the narrow mouth of the bay, where bedrock outcrops over most of the sea-bed. However, the inner bay is characterised by a very irregular bedrock topography, with stratified sediment in depressions. Much of the stratigraphy is masked by shallow gas. The edge of a wide, flat terrace in the vicinity of the Marystown docks is at a depth of ~20 m. The seaward limit of the feature is lobate. Anchor-drag marks are common in this area, and numerous small mounds on the sea-bed are interpreted as dredge spoils. A terrace at Spanish Room, on the east side of the bay, is at ~19 m depth.

During the collection of shore samples it was observed that beaches on the Spanish Room peninsula were covered with large amounts of garbage, especially plastic products. In addition, beach sediments were coated with an unidentified sticky substance. Items of garbage (including a rubber boot) were present in grab samples collected in the bay. These observations leave the impression that the bay is highly polluted.

Great and Little St. Lawrence Harbours (Figures 20-24):

The sampling program here (Figure 21) yielded 11 grab samples (Tables 3,4) and 3 cores (Table 5). Surficial sediments in these bays are generally sandy. Small patches of shallow gas are present in the sediments within Great St. Lawrence Harbour, where the sand is muddy in places. Of particular interest was the occurrence of contrasting stripes of sand and gravel on the shoreface at the harbour mouth. Such "zebra" patterns have been observed on steep slopes within St. George's Bay (Forbes and Shaw, 1989). Here it appears that the pattern is produced by ribbons of sand overlying gravel.

SUMMARY OF OPERATIONS

(all times Newfoundland Daylight Time, except where stated otherwise)

September 20 (day 263)

Navicula leaves BIO, en route for Newfoundland, puts into Sheet Harbour for repairs to broken exhaust manifold on the service generator. Additional problems with hydraulics systems and autopilot. Scientific and technical staff (Shaw, Sparkes, Johnstone and Wile) depart BIO at 14.00 ADT (Atlantic Daylight Time) in government vehicle, drive to North Sydney, board Newfoundland ferry which departs 23.30 ADT.

September 21 (day 264)

Staff arrive Port aux Basques 07.00, drive to Gander, arriving ca. 16.00. Navicula continues.

September 22 (day 265)

Staff depart Gander ca. 07.30, drive to St. John's. Shaw goes to Mobil offices and obtains track plots of surveys in northern Placentia Bay. Staff drive to Placentia. P. Simpkin calls to confirm that he has the Seistec system. Call to D.L. Forbes confirms that Navicula is in transit. Staff examine mooring facilities in Argentia harbour, Shaw examines glacial deposits on Argentia peninsula.

September 23 (day 266)

07.00 staff depart for St. John's. Shaw contacts P. Simpkin and arranges meeting, and contacts J. Dockrill regarding Navicula. Navicula arrives Argentia shortly after 08.00, just as severe weather associated with the remains of hurricane Hugo reaches the area. Staff meet Simpkin and transport parts of the Seistec seismic system to Argentia where they rendezvous with Navicula.

September 24 (day 267)

Thick fog and southerly gales prohibit surveys. Shaw examines glacial deposits at Point Verde. Technicians working with seismic equipment. A decision is made in the early afternoon to survey but the weather soon deteriorates further. Technician arrives from Ships Division to work on the vessel's autopilot.

September 25 (day 268)

Problems experienced with sidescan winch before departure. 09.20 Navicula departs wharf at Argentia and runs test lines, without sidescan. Afternoon R. Sparkes takes crew member to St. John's airport. Problems with winch hydraulics solved by 14.00. 14.10 depart wharf and run lines 1-8. Seismic systems are Bubble Pulser and Huntec 4425 Boomer with NSRF eel. P. Simpkin arrives at 17.00 as vessel returns to wharf. Simpkin and Wile install Seistec system. Technician from Ships Division works on autopilot.

September 26 (day 269)

Strong winds in the morning as Simpkin and AGC staff work on installing Seistec. 16.00 depart wharf and run lines 9-13, finishing ca. 18.30.

September 27 (day 270)

Storm force SE winds in morning. Shaw works on records. Wind strong westerly in afternoon. Shaw examines onshore glacial deposits at Ship Harbour, and coastal erosion at Argentia.

September 28 (day 271)

Vessel leaves wharf ca. 08.15. Strong westerly winds and occasional snow squalls. Sampling and coring in Argentia Harbour and Placentia Sound in the morning. Vessel returns to wharf at midday and Ships Division technician leaves. Afternoon, run seismic lines into Ship Harbour but records deteriorate in rough weather. Switch to sparker sound source for Seistec, then use sparker and NSRF eel.

September 29 (day 272)

Depart wharf ca. 08.15. With light south winds in the morning, run lines into Ship Harbour. By midday sea becoming rough as vessel is running southwest towards Argentia. Pull gear and begin coring and sampling as wind steadily increases in force.

September 30 (day 273)

Strong winds prohibit surveys. Oil changed on Navicula as AGC staff and ship's captain drive to Long Harbour to inspect possible mooring facilities.

October 1 (day 274)

Depart wharf ca. 08.15. With light winds forecast, Navicula sails out of Argentia Harbour with gear deployed. As the vessel turns north at Fox Island a heavy southerly swell and a sea generated by 25 kt winds (not forecast) make conditions unfavourable. Gear is recovered and vessel returns to Argentia Harbour/Placentia Sound to collect grab samples and cores. Seas become rough even within Placentia Sound. A decision is made to move to the head of the bay on October 2.

October 2 (day 275)

Navicula departs ca. 08.00. AGC staff depart Dunville 08.00, drive to Clarenville, check in at hotel, drive to Arnolds Cove to join Navicula. In the afternoon a series of lines is run in the area between Arnolds Cove and Long Island.

October 3 (day 276)

Navicula departs Arnolds Cove public wharf at ca. 08.30. Lines run all day in Come by Chance Harbour. Weather is fine although seas are noticably rougher by ca. 16.00.

October 4 (day 277)

Captain calls hotel at 07.30, reporting that weather is too severe for vessel to put to sea. Wile and Johnstone drive to vessel to collect charts and the spare autopilot. Wile and Sparkes take autopilot to Air Canada freight at Gander. Shaw and Johnstone work with records. In the afternoon Shaw (with Sparkes and Johnstone) examines coastal sections in the vicinity of Little Hearts Ease.

October 5 (day 278)

Navicula departs wharf at ca. 08.30 and runs lines between Long Island and mainland. Before noon a heavy southerly swell with superimposed sea makes transverse lines difficult, and a long line is run in a northerly direction. Gear is pulled at 16.30 in rough squally weather.

October 6 (day 279)

AGC staff report to Navicula at 08.30 but sea is too rough to proceed. They return to hotel and work on records, reports etc. Return to vessel at midday but southwest winds have increased in strength. Shaw, with other AGC staff, examines elevated late-glacial delta deposits at Pipers Hole.

October 7 (day 280)

In fine weather Navicula sails west from Arnolds Cove at ca. 08.30 and runs a series of lines as far west as Pipers Hole, and including Long Harbour. Gear is pulled at dusk.

October 8 (day 281)

Navicula departs wharf at ca. 08.30. Extensive sampling and coring in the area surveyed in the previous few days. In the morning grab samples are taken south of Arnolds Cove. This is followed by coring. The vessel then sails west and cores are taken in Pipers Hole. The coring gear is dismantled and more grab samples are taken, in Pipers Hole, North Harbour and Come by Chance Harbour. At dusk, after disembarkation of AGC staff, Navicula sails south to Argentia.

October 9 (day 282)

AGC staff depart Clarenville at 08.00, drive to Dunville, check in at motel. They continue to the public wharf at Argentia and Navicula departs at ca. 10.30. Gear is deployed just north of the Argentia peninsula, with the intention of running a series of shore-normal survey lines to the south, into Placentia Road and offshore from Point Verde. Because of a heavy southerly swell the decision is made to run a long line north into Long Harbour, and survey the latter area. Weather is reasonable for most of the survey but deteriorates later in the day, and the vessel experiences very strong east winds after making a port turn at Fox Island during the return trip.

October 10 (day 283)

Strong west winds in the morning prohibit surveys. Forbes flies from Dartmouth, arriving after noon in a rented vehicle. Sparkes leaves the party, returning the vehicle to St. John's. Continuing poor weather prohibits surveys later in the day.

October 11 (day 284)

Emory-Moore (C-CORE) arrives at motel ca. 07.30. Navicula moves from the barge to the main public wharf and the camera system is put aboard. The vesel departs shortly after 08.00 for Long Harbour. Gear is deployed and a short line run in Long Harbour. After the gear is pulled , the rest of the day is devoted to grab sampling, on a pattern suggested by Emory-Moore. Bottom camera is used at some stations. Weather is fine, probably the best day experienced so far at Argentia. Upon return to Argentia, the decision is made, based on a forecast of a calm night before strong winds on the following day, to direct Navicula to Marystown. The vessel departs, arriving at her destination before midnight.

October 12 (day 285)

AGC staff drive to Marystown and report to Navicula at the public wharf just after noon. Heavy rain and strong east winds. The captain has to move the vessel because it is touching bottom (after refuelling). A decision is made that even Mortier Bay is too rough to survey. Forbes, Shaw and Johnston drive down the Burin Peninsula to examine coastal sections at Grand Beach, Fortune and Wreck Cove.

October 13 (day 286)

Vessel departs public wharf shortly after 08.00, and a survey line is run seaward of the bay. With deteriorating weather forecast, the vessel continues the survey within the bay, finishing at dusk.

October 14 (day 287)

Navicula departs the public wharf shortly after 08.00 to collect cores and grab samples in Mortier Bay. Shortly after noon the vessel departs, en route for Burgeo. Unable to round the Burin due to strong westerlies, she puts into Great St. Lawrence Harbour. Forbes, Shaw, Johnston and Wile examine coastal sites, collect shore samples, and conduct beach surveys in Mortier Bay and surrounding region.

October 15 (day 288)

AGC staff drive south to Great St. Lawrence where Navicula is moored at the fish plant wharf, unable to make passage to Burin. Navicula has to wait until after departure of a large freighter loaded with fluorite before moving to the public wharf and embarking AGC staff. With strong westerly winds, a line is run out of Great St. Lawrence Harbour, turned east, and extended into Little St. Lawrence Harbour. Gear is pulled shortly after noon, and cores and grab samples collected. Gear is deployed once more, and a line run back to Great St. Lawrence Harbour. Heavy swell with superimposed wind waves prohibit surveys to seaward. After running cross lines in Great St. Lawrence harbour, cores and grab

samples are taken. Surveys finish at ca. 17.00. A decision is taken that this is the termination of the cruise, based on the knowledge that the vessel's earliest arrival at Burgeo would make the 17th the first working day, and that the vessel is scheduled to be free on that date. Gear is stowed for the return voyage.

October 16 (day 289)

Navicula departs Great St. Lawrence. AGC staff depart Marystown and drive to Cornerbrook, arriving ca. 16.00.

October 17 (day 290)

AGC staff depart Cornerbrook and drive to Stephenville airport, where Forbes leaves the party. The others continue to Port aux Basques, arriving shortly before 10.00. Navicula is moored at the public wharf, having arrived before dawn. The party embark on the ferry Caribou, arriving at North Sydney at ca. 17.00 ADT. They drive to Dartmouth, arriving ca. 22.00 ADT. Navicula delayed at Port aux Basques by bad weather.

October 18 (day 291)

Navicula departs Port aux Basques, arriving Sydney after dark.

TECHNICAL SUMMARY

Navigation

Navigation provided by radar (variable logging interval) was recorded in a navigation log designed for the cruise. The data were plotted in real time, giving the captain an accurate location in relation to proposed lines plotted on the chart. Loran-C positions (raw TD's and latitude/longtitude) were logged once per minute on a Corona personal computer located in the lab. A hard copy was printed once per minute. Signals were acquired on the 5930 chain with the master at Caribou, Maine, and secondary stations at Nantucket, Cape Race, and Fox Harbour.

During post-cruise plotting/processing it became apparent that the Loran TD's, when converted to latitudes and longitudes, were very inaccurate. The X signal (master) was subsequently removed, improving the accuracy considerably, but this still left a considerable shift in relation to radar. Because no calibrations for ASF (overland phase lag) corrections are available for the coastal area, the radar navigation will remain the navigation of choice for this cruise.

Bathymetry

Bathymetric data were obtained using a hull mounted transducer, permanently installed in the hull, and a 30-kHz Elac echosounder mounted on the bridge of Navicula. The data were recorded in analogue form on the display unit.

Inventory system

The field inventory system FINS was used to store and report records and tapes collected during the cruise. Computer hardware comprised a PC-2000-AT computer with a 640K floppy disk drive and a 20Mb hard disc operating at 14Mh. The printer used was a Hewlett Packard Thinkjet.

Automated graphic annotation

Sidescan and seismic records were automatically annotated at 5 minute intervals using Technical Survey Services model 312B-S/N 040 annotator. The time events were placed as follows:

Channel 1 - Klein 401T
Channel 2 - Seismic (NSRF eel, Seistec) 4800 ch 2
Channel 3 - Not used
Channel 4 - Seismic (Bubble pulser) 8700

Cassette Recorder

Data were recorded by a TEAC XR5000 multitrack VHS cassette recorder. Tape speed was 2.4 cm/s and tape duration 2 hr 52 min. The table below indicates the recording conditions.

Channel no.	Data
1	Seistec signal
2	Seistec trigger
3	Bubble pulser signal
4	Not used
5	Not used
6	Not used
7	Klein left signal
8	Not used
9	Klein right signal
10	Klein trigger
11	Bubble pulser trigger
12	Not used
13	ID CID code
14	Not used

Sidescan sonar

The towfish was a 422S-101FA model (100 kHz), fitted with a K-wing depressor. It was deployed using a Markey remote control hydraulic winch linked to the ship's hydraulic system. The winch would not operate initially. The problem was traced to a recent relocation of a valve on the ships' hydraulic circuit. This deprived the winch of pressurised fluid. The valve was moved to a new position and the winch became operable. However, the situation was judged to be unsatisfactory for several reasons. Firstly,inadvertent overclosure of the valve could have resulted in overheating of the vessel's hydraulics. Secondly, on several occasions the winch did

not respond to the controls. This could have resulted in loss of the sidescan fish. Data were recorded on a Klein 401T graphic recorder/transceiver. Range was 100 m and scale lines were marked every 15 m across the record, which was also annotated at 5 minute intervals.

Shallow seismic reflection systems: general comments

Two seismic systems were simultaneously used on the cruise, typically a Datasonics Bubble Pulser system, and a Seistec system. Two other configurations were used briefly. During 1989 surveys of Halifax Harbour it was found beneficial to synchronise all seismic equipment to the Klein 100kHz sidescan recorder. This was carried a step farther on cruise 89026 during which the seismic systems were keyed synchronously by the trigger of the sidescan system. The two systems were also fired in alternating order so as not to interfere with each other. The firing rate was set by dividing the sidescan trigger rate by 4, and alternating the resulting key between the two seismic systems so that either system was firing at a rate 1/8 that of the sidescan trigger. This arrangement involved isolation of the ORE Geopulse power supply from the seismic equipment so as to preclude out of sequence triggering. Because of the large voltages and high currents created within the power supply, one large combination isolation/power conditioner with a capacity of 240 V, 30 amp would be useful in future, to regulate and isolate the power supply.

Datasonics Bubble Pulser system

This consisted of a bubble pulser with transducer, mounted on a surface-towed surfboard with a BPS 530 power supply. The system was deployed from the stern of the vessel. The signal was received on a Datasonics hydrophone eel, processed in a Datasonics seismic receiver, and displayed on an EPC 8700 thermal graphic recorder. The latter produced a crisp, clear record. After some initial experimentation, the record was displayed on a 0.5 s sweep, with no delay. The system performed reliably and produced useful records, marred only by the ever-present ringing. It was able in some areas to penetrate shallow gas, and show reflectors in underlying sediments.

Seistec system

The Seistec system used on the cruise was owned by AGC, and was developed by IKB Technologies Limited of St. John's. P. Simpkin of IKB was contracted to bring the system into operation on the cruise. The system comprised a Seistec cone array and preamp, mounted on a surface-towed catamaran deployed from the vessel's stern. The preamp fed into an ORE Geopulse 5210A receiver and the data were displayed on an EPC 4800 graphic recorder. The sound source was a Huntec 4425 boomer mounted on the front of the catamaran. It was powered by an ORE Geopulse power supply set at one of three power levels, either 105, 175 or 350 joules. The NSRF eel was used briefly as a hydrophone.

The system was reliable. Not surprisingly, it was unable to

penetrate gas-charged sediments. It had to be monitored constantly, since pronounced changes in bathymetry demanded adjustments to gain and to TVG delay and rate. High resolution was obtained even in depths in excess of 300 m.

Alternative configurations of seismic systems

Two other systems were used briefly, as alternatives to Seistec. On the first day of operations, before Seistec was operational, the following configuration was used. A Huntec 4425 Boomer mounted on a surface-towed surfboard, powered by an ORE Geopulse power supply set at 105 joules output. The system also used an NSRF LT06 hydrophone eel and preamp, an ORE Geopulse receiver, and an EPC 4800 graphic recorder.

A second alternative to Seistec was deployed briefly. The receiving system was as above, an NSRF LT06 hydrophone eel and preamp, an ORE Geopulse receiver, and an EPC 4800 graphic recorder. The sound source consisted of an NSRF sparker powered by an ORE Geopulse power supply set at 105 joules. The system was not deployed sufficiently to assess properly, but the limited records are characterised by strong ringing.

Sampling

Sea-bed samples were collected using a van Veen grab sampler and a 3-m Alpine gravity corer. These operations went smoothly. However, core recovery was poor, even where penetration was complete. Removal of the valve from the core barrel did not result in any improvement in recovery.

Bottom photography

At a limited number of sites in Long Harbour a bottom photography system was deployed, and photographs taken immediately before grab sampling. This was done by disconnecting the van Veen bucket from the line and lowering the camera over the side. The Photosea 2000 camera and lighting were contained in a lightweight aluminum frame, and the system was easily handled.

Problems with systems

Mention has already been made of the winch hydraulic problems which had to be overcome. The only other problems encountered during the cruise were minor. A broken helix on the right hand side of the sidescan recorder was replaced. A wire snapped in the cable to the boomer, 8 cm from the connector on the boomer end of the cable. A wire also broke on the annotator external trigger input BNC. Finally, a problem involving the trigger divider box and the ORE Geopulse power supply was encountered. It was cured by isolating the box from the power supply, using the isolated output on the Geopulse receiver to drive the power supply. A technician from Ships Division worked on the ship's autopilot for several days.

General comments

Forbes and Shaw (1989) provide some general comments regarding seismic surveys using Navicula, and those comments could be echoed here. If the vessel were to be used with increasing frequency for seismic surveys, some improvements could be easily implemented. The limited space in the lab could be used better, especially if some of the recorders were to be wall-mounted. The provision of seats would reduce operator fatigue. Coring would be facilitated by the use of a pinger system to judge distance of the barrel from the seabed, and by the use of a marked cable.

Finally, it is likely that the program was run too late in the year. While poor sea conditions may be encountered year round in Newfoundland waters, they are more prevalent from October onwards. Coastal surveys using Navicula should not be attempted later than September.

ACKNOWLEDGEMENTS

As after previous cruises on Navicula it is a pleasure to note the high degree of seamanship displayed by the master and crew, their constant willingness to cooperate, and their positive attitude. These attributes were noted by all the scientific and technical staff, and to a very large degree ensured that, despite extremely poor weather, a large quantity of valuable data was gathered. R. Sparkes was kind enough to interrupt his schedule and participate in the cruise at short notice. We thank R.B. Taylor and D.L. Forbes for comments on draft versions of the manuscript.

LIST OF CHARTS

All charts listed here are published by the Canadian Hydrographic Service, Department of Fisheries and Oceans, Ottawa.

4587 Mortier Bay; September 1987 edition; scale 1:12,000.

4613 Argentia and Ship Harbours and Adjacent Anchorages; surveyed by the United States Navy, 1940-48. Sloped soundings from British Admiralty surveys of 1860 and 1874, with additional information by the Canadian Hydrographic Service to 1984; February 1986 edition; scale 1: 25,000.

4614 Argentia Harbour; surveyed by the United States Navy,

1940-48, with additional information by the Canadian Hydrographic Service to 1982; February 1987 edition; scale 1: 7,500.

4617 Red Island to Pinchgut Point; surveyed by L. Hunter and assistants, 1954; September 1989 edition; scale 1: 37,500.

4618 Head of Placentia Bay; surveyed by L. Hunter and assistants, 1954-74, September 1987 edition; scale 1:37,500.

4620 Come by Chance; surveyed by the Canadian Hydrographic Service, 1956-74, May 1989 edition; scale 1: 15,000.

4624 Long Island to St. Lawrence Harbours; surveyed by the Canadian Hydrographic Service, 1941, 1951-54, January 17 1986 edition; scale 1: 80,000.

4642 St. Lawrence and Lamaline Harbours; surveyed by G.E. Lowe and assistants, 1952-53, January 1961 edition, reprinted March 1978; scale 1:20,000.

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Appendix A

Sample and data tables

ATLANTIC GEOSCIENCE CENTRE
DATA SECTION
-FINS- REPORTING PACKAGE

TABLE 1

SEISMIC RECORDS

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
001	2681255	2682015	N.S.R.F.		SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	EPC 4800	AGC SYSTEM BOOMER
001	2681754	2682019	DATASONICS	1 - 8	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	EPC 8700	DATASONICS BUBBLE PULSER
002	2691951	2692157	DATASONICS	9 - 13	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND	EPC 8700	DATASONICS BUBBLE PULSER
003	2711748	2712005	DATASONICS	14 - 20	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	EPC 8700	DATASONICS BUBBLE PULSER
004	2721155	2721440	DATASONICS	21 - 29	SINGLE	SHIP HARBOUR	EPC 8700	DATASONICS BUBBLE PULSER
005	2741150	2741236	DATASONICS	30	SINGLE	OFF THE ENTRANCE TO ARGENTIA HARBOUR	EPC 8700	DATASONICS BUBBLE PULSER
006	2751555	2752142	DATASONICS	31 - 38	SINGLE	ARNOLD'S COVE AND THE EAST CHANNEL	EPC 8700	DATASONICS BUBBLE PULSER
007	2761220	2762002	DATASONICS	39 - 53	SINGLE	ARNOLD'S COVE, EAST CHNL, COME BY CHANCE	EPC 8700	DATASONICS BUBBLE PULSER
008	2781221	2781955	DATASONICS	54 - 65	SINGLE	EAST CHANNEL AND OUTER COME BY CHANCE	EPC 8700	DATASONICS BUBBLE PULSER
009	2801156	2802140	DATASONICS	66 - 83	SINGLE	COME BY CHANCE	EPC 8700	DATASONICS BUBBLE PULSER
010	2821335	2821925	DATASONICS	84 - 98	SINGLE	LONG HARBOUR	EPC 8700	DATASONICS BUBBLE PULSER
010	2841230	2841309	DATASONICS	99	SINGLE	LONG HARBOUR (ST. CROIX BAY)	EPC 8700	DATASONICS BUBBLE PULSER
011	2861206	2862135	DATASONICS	100 - 118	SINGLE	MORTIER BAY (MARYSTOWN)	EPC 8700	DATASONICS BUBBLE PULSER
012	2881350	2881900	DATASONICS	119 - 134	SINGLE	LESSER AND GREATER ST. LAWRENCE HBRS.	EPC 8700	DATASONICS BUBBLE PULSER
001	2691945	2692157	CONE ARRAY	9 - 13	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND	EPC 4800	SEISTEC BOOMER
002	2711748	2712020	CONE ARRAY	14 - 20	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	EPC 4800	SEISTEC BOOMER
003	2721150	2721440	CONE ARRAY	21 - 29	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	EPC 4800	SEISTEC BOOMER

ATLANTIC GEOSCIENCE CENTRE
DATA SECTION
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TABLE 1

SEISMIC RECORDS

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
004	2741150	2741236	CONE ARRAY	30	SINGLE	OFF THE ENTRANCE TO ARGENTIA HARBOUR	EPC 4800	SEISTEC BOOMER
005	2751555	2752142	CONE ARRAY	31 - 38	SINGLE	ARNOLD'S COVE AND EASTERN CHANNEL.	EPC 4800	SEISTEC BOOMER
006	2761223	2762002	CONE ARRAY	39 - 53	SINGLE	ARNOLD'S COVE, EAST CHNL, COME BY CHANCE	EPC 4800	SEISTEC BOOMER
007	2781220	2781955	CONE ARRAY	54 - 65	SINGLE	EAST CHANNEL AND OUTER COME BY CHANCE	EPC 4800	SEISTEC BOOMER
008	2801156	2802140	CONE ARRAY	66 - 83	SINGLE	COME BY CHANCE	EPC 4800	SEISTEC BOOMER
009	2821335	2821925	CONE ARRAY	84 - 98	SINGLE	LONG HARBOUR	EPC 4800	SEISTEC BOOMER
010	2841230	2841309	CONE ARRAY	99	SINGLE	LONG HARBOUR (ST. CROIX BAY)	EPC 4800	SEISTEC BOOMER
011	2861206	2862135	CONE ARRAY	100 - 118	SINGLE	MORTIER BAY (MARYSTOWN)	EPC 4800	SEISTEC BOOMER
012	2881350	2881900	CONE ARRAY	119 - 134	SINGLE	LESSER AND GREATER ST. LAWRENCE HBRS.	EPC 4800	SEISTEC BOOMER

ATLANTIC GEOSCIENCE CENTRE
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TABLE 2

SIDESCAN RECORDS

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SIDESCAN SYSTEM
001	2681743	2682019	1 - 8	SINGLE	ARGENTIA HARBOUR AND PLACENTIS SOUND.	KLEIN 401T	KLEIN (100 KHZ)
002	2691945	2692157	9 - 13	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	KLEIN 401T	KLEIN (100 KHZ)
003	2711748	2712005	14 - 20	SINGLE	ARGENTIA HARBOUR AND PLACENTIA SOUND.	KLEIN 401T	KLEIN (100 KHZ)
004	2721150	2721440	21 - 29	SINGLE	SHIP HARBOUR	KLEIN 401T	KLEIN (100 KHZ)
005	2741148	2741236	30	SINGLE	OFF THE ENTRANCE TO ARGENTIA HARBOUR	KLEIN 401T	KLEIN (100 KHZ)
006	2751600	2751826	31 - 34	SINGLE	ARNOLD'S COVE AND THE EAST CHANNEL	KLEIN 401T	KLEIN (100 KHZ)
007	2751837	2752143	35 - 38	SINGLE	ARNOLD'S COVE AND THE EAST CHANNEL	KLEIN 401T	KLEIN (100 KHZ)
008	2761220	2761639	39 - 47	SINGLE	ARNOLD'S COVE, EAST CHANNEL AND COME BY	KLEIN 401T	KLEIN (100 KHZ)
009	2761841	2762002	48 - 53	SINGLE	ARNOLD'S COVE AND EAST CHANNEL	KLEIN 401T	KLEIN (100 KHZ)
010	2781221	2781955	54 64 - 65	SINGLE	EAST CHANNEL AND OUTER LIMITS OF COME	KLEIN 401T	KLEIN (100 KHZ)
011	2801312	2801449	67 - 69	SINGLE	COME BY CHANCE	KLEIN 401T	KLEIN (100 KHZ)
012	2801525	2801912	70 - 80	SINGLE	COME BY CHANCE	KLEIN 401T	KLEIN (100 KHZ)
013	2801913	2802152	80 - 83	SINGLE	COME BY CHANCE	KLEIN 401T	KLEIN (100 KHZ)
014	2821335	2821742	84 - 92	SINGLE	LONG HARBOUR	KLEIN 401T	KLEIN (100 KHZ)
015	2821743	2821925	93 - 98	SINGLE	LONG HARBOUR	KLEIN 401T	KLEIN (100 KHZ)
016	2841230	2841309	94	SINGLE	LONG HARBOUR (ST. CROIX BAY)	KLEIN 401T	KLEIN (100 KHZ)
017	2861206	2861551	100 - 102	SINGLE	MORTIER BAY (MARYSTOWN)	KLEIN 401T	KLEIN (100 KHZ)
018	2861553	2861958	102 - 112	SINGLE	MORTIER BAY (MARYSTOWN)	KLEIN 401T	KLEIN (100 KHZ)
019	2861959	2862135	113 - 118	SINGLE	MORTIER BAY (MARYSTOWN)	KLEIN 401T	KLEIN (100 KHZ)

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TABLE 2

SIDESCAN RECORDS

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SIDESCAN SYSTEM
020	2881350	2881900	119 - 134	SINGLE	LESSER AND GREATER ST. LAWRENCE HBRS.	KLEIN 401T	KLEIN (100 KHZ)

ATLANTIC GEOSCIENCE CENTRE
DATA SECTION
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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
001	CORE	2711310	47 18.20N	53 57.88W	36.0	ARGENTIA HARBOUR (NFLD)
002	CORE	2711330	47 18.32N	53 55.46W	82.0	PLACENTIA SOUND (NFLD)
003	CORE	2711350	47 18.04N	53 54.68W	40.0	PLACENTIA SOUND
004	GRAB	2711415	47 18.00N	53 54.57W	34.0	PLACENTIA SOUND
005	GRAB	2711422	47 17.94N	53 54.48W	26.0	PLACENTIA SOUND
006	GRAB	2711446	47 18.47N	53 55.68W	88.0	PLACENTIA SOUND
007	GRAB	2711456	47 18.92	53 56.00W	16.0	PLACENTIA SOUND
008	GRAB	2711502	47 19.02N	53 55.84W	16.0	PLACENTIA SOUND
009	GRAB	2711514	47 19.10N	53 56.12W	14.0	PLACENTIA SOUND
010	GRAB	2711523	47 18.73N	53 56.39W	10.0	PLACENTIA SOUND
011	GRAB	2711529	47 18.63N	53 56.90W	12.0	PLACENTIA SOUND
012	GRAB	2711536	47 18.61N	53 57.24W	52.0	PLACENTIA SOUND
013	GRAB	2711547	47 18.26N	53 57.85W	42.5	ARGENTIA HARBOUR.
014	GRAB	2711600	47 18.17N	53 58.42W	13.0	ARGENTIA HARBOUR.
015	GRAB	2711607	47 17.59N	53 59.07W	27.0	ARGENTIA HARBOUR.
016	GRAB	2721620	47 21.89N	53 53.37W	25.0	SHIP HARBOUR
017	GRAB	2721625	47 21.76N	53 53.41W	26.0	SHIP HARBOUR
018	GRAB	2721639	47 21.57N	53 53.79W	18.0	SHIP HARBOUR
019	GRAB	2721645	47 21.29N	53 53.67W	32.0	SHIP HARBOUR
020	GRAB	2721656	47 21.34N	53 54.03W	25.0	SHIP HARBOUR
021	GRAB	2721703	47 21.03N	53 54.38W	19.0	SHIP HARBOUR
022	GRAB	2721708	47 20.95N	53 54.33W	32.0	SHIP HARBOUR
023	GRAB	2741318	47 19.84N	53 56.17W	36.0	SHIP HARBOUR

ATLANTIC GEOSCIENCE CENTRE
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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
024	GRAB	2721718	47 20.60N	53 55.10W	13.0	SHIP HARBOUR
025	GRAB	2741340	47 20.61N	53 54.78W	30.0	ARGENTIA HBR. (ENTRANCE)
026	GRAB	2741406	47 19.19N	53 57.78W	16.0	ARGENTIA HBR. (ENTRANCE)
027	GRAB	2741413	47 19.04N	53 58.00W	13.0	ARGENTIA HBR. (ENTRANCE)
028	CORE	2741657	47 18.16N	53 57.96W	41.0	ARGENTIA HBR.
029	CORE	2741715	47 18.30N	53 55.40W	80.0	PLACENTIA SOUND
030	CORE	2741734	47 17.98N	53 54.56W	35.0	PLACENTIA SOUND
031	CORE	2741748	47 17.98N	53 54.52W	33.0	PLACENTIA SOUND
032	GRAB	2811302	47 40.42N	54 00.21W	125.0	EASTERN CHANNEL PLACENTIA BAY
033	GRAB	2811316	47 40.68N	54 01.11W	112.0	EASTERN CHANNEL PLACENTIA BAY
034	GRAB	2811330	47 40.97N	54 01.98W	205.0	EASTERN CHANNEL PLACENTIA BAY
035	GRAB	2811354	47 41.06N	54 00.26W	154.0	EASTERN CHANNEL PLACENTIA BAY
036	GRAB	2811408	47 41.83N	53 59.40W	66.0	EASTERN CHANNEL PLACENTIA BAY
037	GRAB	2811420	47 42.26N	54 00.68W	106.0	EASTERN CHANNEL PLACENTIA BAY
038	GRAB	2811433	47 42.90N	53 59.79W	62.0	EASTERN CHANNEL PLACENTIA BAY
039	GRAB	2811448	47 44.87N	53 59.24W	17.0	GREAT SOUTHERN HARBOUR. PLACENTIA BAY
040	GRAB	2811455	47 45.29N	53 58.71W	8.0	GREAT SOUTHERN HARBOUR. PLACENTIA BAY
041	GRAB	2811515	47 43.21N	54 01.30W	125.0	EASTERN CHANNEL PLACENTIA BAY

ATLANTIC GEOSCIENCE CENTRE
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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
042	GRAB	2811603	47 43.85N	54 02.56W	97.0	EASTERN CHANNEL PLACENTIA BAY
043	GRAB	2811612	47 43.72N	54 03.28W	235.0	EASTERN CHANNEL PLACENTIA BAY
044	GRAB	2811633	47 42.48N	54 03.70W	275.0	EASTERN CHANNEL PLACENTIA BAY
045	CORE	2811701	47 42.42N	54 00.97W	110.0	EASTERN CHANNEL PLACENTIA BAY
046	CORE	2811718	47 43.28N	54 00.64W	118.0	EASTERN CHANNEL PLACENTIA BAY
047	CORE	2811743	47 45.70N	54 04.00W	135.0	ENTRANCE TO COME BY CHANCE
048	CORE	2811824	47 49.88N	54 07.90W	54.0	OFF ENTRANCE TO PIPER'S HOLE.
049	CORE	2811840	47 50.88N	54 09.60W	27.0	OFF ENTRANCE TO PIPER'S HOLE
050	CORE	2811849	47 51.15N	54 09.94W	23.0	ENTRANCE TO PIPER'S HOLE.
051	GRAB	2811900	47 51.40N	54 10.30W	7.5	ENTRANCE TO PIPER'S HOLE
052	GRAB	2811907	47 51.06N	54 09.85W	27.0	ENTRANCE TO PIPER'S HOLE
053	GRAB	2811915	47 50.42N	54 08.48W	42.0	ENTRANCE TO PIPER'S HOLE
054	GRAB	2811928	47 49.08N	54 06.96W	53.0	OFF ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY
055	GRAB	2811937	47 48.87N	54 06.38W	43.0	ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY
056	GRAB	2811947	47 49.07N	54 05.72W	47.0	NORTH HARBOUR, PLACENTIA BAY
057	GRAB	2811957	47 50.08N	54 04.60W	18.0	NORTH HARBOUR, PLACENTIA BAY

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TABLE 3

TOTAL SAMPLE INVENTORY

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CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
058	GRAB	2812008	47 50.80N	54 05.58W	18.0	NORTH HARBOUR, PLACENTIA BAY
059	GRAB	2812029	47 48.15N	54 05.55W	115.0	OFF ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY
060	GRAB	2812050	47 46.58N	54 03.89W	116.0	ENTRANCE TO COME BY CHANCE
061	GRAB	2812108	47 48.33N	54 01.34W	28.0	COME BY CHANCE
062	GRAB	2812113	47 47.93N	54 01.58W	42.0	COME BY CHANCE
063	GRAB	2812120	47 47.63N	54 01.01W	12.5	COME BY CHANCE
064	GRAB	2812125	47 47.41N	54 00.94W	12.5	COME BY CHANCE
065	GRAB	2812138	47 46.45N	54 02.55W	72.0	COME BY CHANCE
066	GRAB	2812150	47 45.97N	54 01.80W	38.0	COME BY CHANCE
067	GRAB	2812156	47 45.52	54 02.52W	89.0	COME BY CHANCE
068	GRAB	2841329	47 26.25	53 52.24W	37.0	LONG HARBOUR (ST. CROIX BAY)
069	GRAB	2841337	47 26.06	53 52.52W	40.0	LONG HARBOUR (ST. CROIX BAY)
070	GRAB	2841344	47 25.90	53 52.82W	39.0	LONG HARBOUR (ST. CROIX BAY)
071	GRAB	2841349	47 25.70N	53 53.11W	44.0	LONG HARBOUR (ST. CROIX BAY)
072	GRAB	2841356	47 25.54N	53 53.39W	49.0	LONG HARBOUR (ST. CROIX BAY)
073	GRAB	2841404	47 25.30N	53 53.74W	46.0	LONG HARBOUR (ST. CROIX BAY)
074	GRAB	2841410	47 25.09N	53 54.11W	46.0	LONG HARBOUR
075	GRAB	2841419	47 24.80N	53 54.11W	63.0	LONG HARBOUR
076	GRAB	2841426	47 24.81N	53 53.65W	71.0	LONG HARBOUR
077	GRAB	2841433	47 24.85N	53 53.25W	60.0	LONG HARBOUR

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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
078	GRAB	2841441	47 24.94N	53 52.89W	57.0	LONG HARBOUR
079	GRAB	2841453	47 25.12N	53 53.39W	53.0	LONG HARBOUR
080	GRAB	2841503	47 24.89N	53 52.55W	55.0	LONG HARBOUR
081	GRAB	2841508	47 25.00N	53 52.17W	51.0	LONG HARBOUR
082	GRAB	2841514	47 24.94N	53 51.71W	45.0	LONG HARBOUR
083	GRAB	2841603	47 25.11N	53 51.39W	53.0	LONG HARBOUR
084	GRAB	2841615	47 25.15N	53 50.96W	22.0	LONG HARBOUR
085	GRAB	2841622	47 25.17N	53 50.60W	16.0	LONG HARBOUR
086	GRAB	2841630	47 25.19N	53 50.29W	28.0	LONG HARBOUR
087	GRAB	2841644	47 25.21N	53 50.09W	29.0	LONG HARBOUR
088	GRAB	2841649	47 25.20N	53 49.91W	17.0	LONG HARBOUR
089	GRAB	2841654	47 25.22N	53 49.85W	14.0	LONG HARBOUR
090	GRAB	2841703	47 25.32N	53 49.68W	11.0	LONG HARBOUR
091	GRAB	2841710	47 25.37N	53 49.56W	9.0	LONG HARBOUR
092	GRAB	2841718	47 25.39N	53 49.55W	8.0	LONG HARBOUR
093	GRAB	2841728	47 25.42N	53 49.78W	11.0	LONG HARBOUR
094	GRAB	2841740	47 25.40N	53 49.91W	12.0	LONG HARBOUR
095	GRAB	2841744	47 25.40N	53 50.04W	12.0	LONG HARBOUR
096	GRAB	2841753	47 25.42N	53 50.18W	13.0	LONG HARBOUR
097	GRAB	2841959	47 25.49N	53 50.68W	23.0	LONG HARBOUR
098	GRAB	2841805	47 25.57N	53 51.39W	19.0	LONG HARBOUR
099	GRAB	2841813	47 25.56N	53 51.36W	12.0	LONG HARBOUR
100	GRAB	2841819	47 25.30N	53 50.84W	26.0	LONG HARBOUR
101	GRAB	2841830	47 25.25N	53 49.69W	12.0	LONG HARBOUR
102	GRAB	2841839	47 25.31N	53 49.48W	12.0	LONG HARBOUR

ATLANTIC GEOSCIENCE CENTRE
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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
103	GRAB	2841844	47 25.37N	53 49.91W	13.0	LONG HARBOUR
104	GRAB	2841850	47 25.11N	53 50.13W	29.0	LONG HARBOUR
105	GRAB	2841854	47 25.06N	53 50.50W	33.0	LONG HARBOUR
106	GRAB	2841905	47 24.95N	53 50.94W	36.0	LONG HARBOUR
107	GRAB	2841913	47 24.88N	53 51.25W	31.0	LONG HARBOUR
108	GRAB	2841924	47 24.85N	53 51.55W	43.0	LONG HARBOUR
109	GRAB	2841935	47 24.77N	53 51.96W	48.0	LONG HARBOUR
110	GRAB	2841944	47 24.71N	53 52.33W	46.0	LONG HARBOUR
111	GRAB	2841951	47 24.63N	53 52.64W	47.0	LONG HARBOUR
112	GRAB	2842001	47 24.50N	53 53.11W	33.0	LONG HARBOUR
113	GRAB	2842009	47 24.44N	53 53.61W	19.0	LONG HARBOUR
114	GRAB	2842018	47 24.35N	53 53.99W	68.0	LONG HARBOUR
115	GRAB	2842031	47 24.28N	53 54.27W	68.0	LONG HARBOUR
116	CORE	2871152	47 10.50N	55 07.26W	46.0	MORTIER BAY (MARYSTOWN)
117	CORE	2871205	47 10.52N	55 07.39W	47.0	MORTIER BAY (MARYSTOWN)
118	GRAB	2871228	47 08.46N	55 05.02W	68.0	MORTIER BAY (MARYSTOWN)
119	GRAB	2871242	47 08.60N	55 05.11W	84.0	MORTIER BAY (MARYSTOWN)
120	GRAB	2871300	47 09.72N	55 05.12W	118.0	MORTIER BAY (MARYSTOWN)
121	GRAB	2871310	47 10.24N	55 05.26W	88.0	MORTIER BAY (MARYSTOWN)
122	GRAB	2871320	47 10.98N	55 06.29W	90.0	MORTIER BAY (MARYSTOWN)
123	GRAB	2871332	47 10.40N	55 07.21W	29.0	MORTIER BAY (MARYSTOWN)

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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
124	GRAB	2871337	47 10.55N	55 07.21W	43.0	MORTIER BAY (MARYSTOWN)
125	GRAB	2871343	47 10.39N	55 07.53W	17.5	MORTIER BAY (MARYSTOWN)
126	GRAB	2871351	47 10.09N	55 08.40W	11.0	MORTIER BAY (MARYSTOWN)
127	GRAB	2871733	47 11.22N	55 05.52W	+12.6	SPANISH ROOM POINT
128	GRAB	2871814	47 12.09N	55 05.85W	00.0	CASHEL COVE
129	GRAB	2871825	47 12.10N	55 05.84W	+ 1.7	CASHEL COVE
130	GRAB	2871840	47 12.03N	55 05.80W	00.0	CASHEL COVE
131	CORE	2881616	46 54.25N	55 20.58W	53.0	LITTLE ST. LAWRENCE HARBOUR
132	CORE	2881633	46 55.10N	55 21.25W	18.0	LITTLE ST. LAWRENCE HARBOUR
133	GRAB	2881641	46 55.07N	55 21.19W	18.0	LITTLE ST. LAWRENCE HARBOUR
134	GRAB	2881647	46 54.85N	55 21.00W	22.0	LITTLE ST. LAWRENCE HARBOUR
135	GRAB	2881653	46 54.58N	55 20.79W	28.0	LITTLE ST. LAWRENCE HARBOUR
136	GRAB	2881714	46 54.38N	55 20.52W	47.0	LITTLE ST. LAWRENCE HARBOUR
137	GRAB	2881722	46 54.25N	55 20.58W	105.0	LITTLE ST. LAWRENCE HARBOUR
138	GRAB	2881918	46 54.80N	55 23.15W	14.0	GREAT ST. LAWRENCE HARBOUR

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TABLE 3

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 89-026
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PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
139	GRAB	2881925	46 54.49N	55 22.89W	19.0	GREAT ST. LAWRENCE HARBOUR
140	GRAB	2881933	46 54.05N	55 22.69W	35.0	GREAT ST. LAWRENCE HARBOUR
141	GRAB	2881942	46 53.28N	55 21.46W	57.0	GREAT ST. LAWRENCE HARBOUR
142	GRAB	2881948	46 53.20N	55 21.21W	63.0	GREAT ST. LAWRENCE HARBOUR
143	GRAB	2881959	46 53.18N	55 21.40W	56.0	GREAT ST. LAWRENCE HARBOUR
144	CORE	2882011	46 54.10N	55 22.60W	37.0	GREAT ST. LAWRENCE HARBOUR

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TABLE 4

GRAB SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
004	VANVEEN	2711415	47 18.00N 53 54.57W	34.0	1	PLACENTIA SOUND	SOFT DARK GREY MUD WITH NUMEROUS WORM TUBES AND A FEW SHELL FRAGMENTS. LIGHT BROWN SURFACE LAYER. 2 BAGS IN BUCKET + 2 (40) DRAM VIALS.
005	VANVEEN	2711422	47 17.94N 53 54.48W	26.0	1	PLACENTIA SOUND	MUDDY GRAVEL. GRAVEL WITH DARK GREY MUD WITH SOME SAND GRANULES. ALSO CONTAINED A FEW WORM TUBES, SEA WEED FRAGMENTS, SCALLOP SHELL AND A SEA ANEMONE ATTACHED TO A PEBBLE. 2 BAGS IN A BUCKET.
006	VANVEEN	2711446	47 18.47N 53 55.68W	88.0	2	PLACENTIA SOUND	BLACK MUD. STRONG SMELL. INCLUDED A PLASTIC BAG FRAGMENT. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
007	VANVEEN	2711456	47 18.92 53 56.00W	16.0	1	PLACENTIA SOUND	MAINLY GRAVEL WITH MUD. GRAVEL IS MOSTLY SUB-ANGULAR. MOST COATED WITH PINK CORAL ON THE UPPER SIDE ONLY. SOME SPONGES ATTACHED. ALSO A FEW SHELL FRAGMENTS. 2 BAGS IN A BUCKET.
008	VANVEEN	2711502	47 19.02N 53 55.84W	16.0	1	PLACENTIA SOUND	OLIVE GREY MUD. SOME WORM TUBES. ONE ENCRUSTED BOLT (TIE ROD ASSEMBLY - HENRY). 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
009	VANVEEN	2711514	47 19.10N 53 56.12W	14.0	1	PLACENTIA SOUND	POORLY SORT OF MIXTURE OF OLIVE GREY MUD, SAND GRANULES AND GRAVEL. SOME OF THE GRAVEL IS COATED WITH CORAL. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
010	VANVEEN	2711523	47 18.73N 53 56.39W	10.0	1	PLACENTIA SOUND	POORLY SORTED FINE GRAVEL WITH SOME LARGER PEBBLES UP TO 10 CM. SOME OF WHICH HAVE A PINK CORAL COATING. SMALL AMOUNT OF DARK GREY SAND. 1 LIVE SEA URCHIN + FRAGMENTS OF SEA URCHINS. 2 BAGS IN A BUCKET.
011	VANVEEN	2711529	47 18.63N 53 56.90W	12.0	1	PLACENTIA SOUND	MUDDY GRAVEL. PREDOMINANTLY FINE GRAVEL (SUB-ANGULAR), SMALL AMOUNT OF GREY SAND. TWO LARGE (20 CM.) SCALLOP SHELLS, 1 ALIVE AND 1 DEAD. HENRY POUNCED ON THE LIVE ONE. 2 BAGS IN A BUCKET.
012	VANVEEN	2711536	47 18.61N 53 57.24W	52.0	1	PLACENTIA SOUND	BLACK SMELLY MUD. SCATTERED SINGLE VALVE SHELLS. 2 BAGS IN A BUCKET. 2 (40 DRAM) VIALS.

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GRAB SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
013	VANVEEN	2711547	47 18.26N 53 57.85W	42.5	3	ARGENTIA HARBOUR.	BLACK MUD WITH STRONG SMELL. LIGHT BROWN SURFACE LAYER. SOME WORM TUBES. BECAUSE OF THE 2 FAILED ATTEMPTS AND STRONG WINDS THIS SAMPLE WAS OFF THE ORIGINAL LOCATION. JAMMED LOCKING PIN CAUSED 2 FAILED ATTEMPTS. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
014	VANVEEN	2711600	47 18.17N 53 58.42W	13.0	1	ARGENTIA HARBOUR.	MUDDY GRAVEL. MAINLY GRAVEL WITH SEAWEED ATTACHED, GREY MUD WITH SOME FINE SAND. 2 BAGS IN ABUCKET + 2 (40) DRAM VIALS.
015	VANVEEN	2711607	47 17.59N 53 59.07W	27.0	1	ARGENTIA HARBOUR.	MUD. DARK OLIVE GREY WITH LIGHT BROWN SURFACE LAYER. SOME WORM TUBES. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
016	VANVEEN	2721620	47 21.89N 53 53.37W	25.0	1	SHIP HARBOUR	DARK OLIVE GREY MUD. VERY SMELLY. LIGHT BROWN SURFACE LAYER. SOME WORM TUBES. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
017	VANVEEN	2721625	47 21.76N 53 53.41W	26.0	4	SHIP HARBOUR	DARK OLIVE GREY MUD WITH A LIGHT BROWN SURFACE LAYER. WORM TUBES AND SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS).
018	VANVEEN	2721639	47 21.57N 53 53.79W	18.0	1	SHIP HARBOUR	DARK OLIVE GREY MUDDY SAND WITH A FEW PEBBLES. SOME WORM TUBES AND SHELL FRAGMENTS. ONE PIECE OF WOOD (30*2) CM.. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
019	VANVEEN	2721645	47 21.29N 53 53.67W	32.0	1	SHIP HARBOUR	DARK GREY MUD WITH A LIGHT BROWN SURFACE LAYER. VERY NUMEROUS WORM TUBES. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
020	VANVEEN	2721656	47 21.34N 53 54.03W	25.0	1	SHIP HARBOUR	DARK GREY MUD WITH A LIGHT BROWN SURFACE LAYER. SOME WORM TUBES. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
021	VANVEEN	2721703	47 21.03N 53 54.38W	19.0	1	SHIP HARBOUR	DARK GREY FINE SAND WITH SOME MUD. A FEW WORM TUBES AND SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
022	VANVEEN	2721708	47 20.95N 53 54.33W	32.0	1	SHIP HARBOUR	DARK GREY MUD WITH A LIGHT BROWN SURFACE LAYER. VERY NUMEROUS WORM TUBES. 2 BAGS IN A BUCKET + 2 (40) DRAM VIALS.
023	VANVEEN	2741318	47 19.84N 53 56.17W	36.0	2	SHIP HARBOUR	DARK GREY/BROWN MEDIUM/FINE SAND. A FEW WORM TUBES AND NUMEROUS PAIRS OF CLAM SHELLS (DEAD). 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.

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TABLE 4

GRAB SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
024	VANVEEN	2721718	47 20.60N 53 55.10W	13.0	3	SHIP HARBOUR	GRAVEL AND SAND. POORLY SORTED MIXTURE OF PEBBLES, SOME COBBLES AND COURSE SAND. 4 SAND DOLLARS. SLIGHT CORAL COATING ON ONE PEBBLE. 2 BAGS IN A BUCKET.
025	VANVEEN	2741340	47 20.61N 53 54.78W	30.0	3	ARGENTIA HBR. (ENTRANCE)	GRAVEL. PEBBLES AND COBBLES AND SOME FINE GROUND SAND. STONES HAVE CORAL ON ONE SIDE. ALSO A FEW SHELLS AND WORM TUBES. 1 BAG IN A BUCKET.
026	VANVEEN	2741406	47 19.19N 53 57.78W	16.0	1	ARGENTIA HBR. (ENTRANCE)	MEDIUM/FINE BROWN/GREY SAND. SAND DOLLAR AND SEAWEED FRAGMENTS. 1 BAG IN A BUCKET + 1 (40) DRAM VIAL.
027	VANVEEN	2741413	47 19.04N 53 58.00W	13.0	1	ARGENTIA HBR. (ENTRANCE)	BROWNISH GREY MEDIUM/FINE SAND. SOME SMALL SHELL FRAGMENTS + 1 SAND DOLLAR A LARGE FROM OF SEAWEED. 1 BAG IN A BUCKET + 1 (40) DRAM VIAL.
032	VANVEEN	2811302	47 40.42N 54 00.21W	125.0	1	EASTERN CHANNEL PLACENTIA BAY	MUDDY GRAVEL. MAINLY OLIVE BROWN MUD WITH A FEW WORM TUBES AND SHELL FRAGMENTS. MAINLY FINE GRAVEL BUT INCLUDES CLASTS OF 20 CM. 1 BAG IN A BUCKET + 1 (40) DRAM VIAL.
033	VANVEEN	2811316	47 40.68N 54 01.11W	112.0	1	EASTERN CHANNEL PLACENTIA BAY	MUDDY GRAVEL. POORLY SORTED GRAVEL, SUB-ROUNDED TO SUB-ANGULAR. SOME OLIVE/BROWN MUD WHICH APPEARED BLACK UNDER THE SURFACE. SOME WORM TUBES AND A FEW SHELL FRAGMENTS. GRAVEL UP TO 25 CM. 2 BUCKETS WITH 2 BAGS EACH + 1 (40) DRAM VIAL.
034	VANVEEN	2811330	47 40.97N 54 01.98W	205.0	1	EASTERN CHANNEL PLACENTIA BAY	MUD. SEMI STIFF MUD, MOTTLED BLACK/DARK OLIVE BROWN. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
035	VANVEEN	2811354	47 41.06N 54 00.26W	154.0	1	EASTERN CHANNEL PLACENTIA BAY	GRAVELLY MUD. DARK OLIVE/GREY/BROWN MUD WITH SUB-ROUNDED TO SUB-ANGULAR GRAVEL UP TO 10 CM. POORLY SORTED. NUMEROUS WORM TUBES (THIN AND THICK). 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
036	VANVEEN	2811408	47 41.83N 53 59.40W	66.0	1	EASTERN CHANNEL PLACENTIA BAY	MUDDY GRAVEL. POORLY SORTED GRAVEL. MOSTLY SUB-ANGULAR TO SUB-ROUNDED. MUD IS OLIVE BROWN. 1 BAG IN A BUCKET + 1 (40) DRAM VIAL.

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TABLE 1

GRAB SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
037	VANVEEN	2811420	47 42.26N 54 00.68W	106.0	1	EASTERN CHANNEL PLACENTIA BAY	GRAVELLY MUD. DARK OLIVE/BROWN MUD WITH GRAVEL. GRAVEL IS MOSTLY SUB-ANGULAR TO SUB-ROUNDED. NUMEROUS WORM TUBES AND A FEW SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
038	VANVEEN	2811433	47 42.90N 53 59.79W	62.0	1	EASTERN CHANNEL PLACENTIA BAY	MUDDY GRAVEL. MAINLY FINE GRAVEL TYPICALLY UP TO 4 CM. IN A OLIVE/BROWN MUD MATRIX. GRAVEL WAS MOSTLY SUB-ANGULAR TO SUB-ROUNDED. SOME SHELL FRAGMENTS AND SEAWEED. NUMEROUS SMALL STARFISH AND SEA URCHINS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
039	VANVEEN	2811448	47 44.87N 53 59.24W	17.0	1	GREAT SOUTHERN HARBOUR. PLACENTIA BAY	GRAVEL. SOME OF WHICH HAS A COATING OF PINK CORAL. A FEW STAR FISH AND SEA URCHINS AND A SMALL AMOUNT OF SILTY MUD. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
040	VANVEEN	2811455	47 45.29N 53 58.71W	8.0	1	GREAT SOUTHERN HARBOUR. PLACENTIA BAY	SAND. MID GREY MEDIUM TO COURSE SAND. A FEW GRANULES AND A SAND DOLLAR. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
041	VANVEEN	2811515	47 43.21N 54 01.30W	125.0	1	EASTERN CHANNEL PLACENTIA BAY	MUD. STIFF OLIVE/GREY MUD. VERY PUNGENT. SEVERAL WORM TUBES AND A FEW POCKETS OF MEDIUM SAND. LIGHT BROWN SURFACE LAYER. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
042	VANVEEN	2811603	47 43.85N 54 02.56W	97.0	1	EASTERN CHANNEL PLACENTIA BAY	MUDDY GRAVEL. POORLY SORTED MIXTURE OF MUD, SAND AND GRAVEL. MUD IS OLIVE BROWN WITH A FEW WORM TUBES AND SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
043	VANVEEN	2811612	47 43.72N 54 03.28W	235.0	1	EASTERN CHANNEL PLACENTIA BAY	MUD. DARK OLIVE BROWN MUD, SOMEWHAT STIFF. CONTAINS WORM TUBES AND A FEW PEBBLES(SUB-ANGULAR) 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
044	VANVEEN	2811633	47 42.48N 54 03.70W	275.0	1	EASTERN CHANNEL PLACENTIA BAY	MUD. VERY DARK GREY/BLACK MUD. LIGHT BROWN ON THE SURFACE. CONTAINS A FEW SMALL PEBBLES. PUNGENT ODOUR. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.

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TABLE 4

GRAB SAMPLES

CRUISE NUMBER = 89-026
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PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
051	VANVEEN	2811900	47 51.40N 54 10.30W	7.5	1	ENTRANCE TO PIPER'S HOLE	GRAVELY COURSE SAND. BROWN ON THE SURFACE BUT DARK GREY TO BLACK BELOW. ALSO CONTAINED WORMS AND NUMEROUS SCALLOP SHELLS AND TRACE AMOUNTS OF MUD. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
052	VANVEEN	2811907	47 51.06N 54 09.85W	27.0	1	ENTRANCE TO PIPER'S HOLE	DARK GREYISH BROWN SANDY MUD. A FEW ANGULAR PEBBLES. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
053	VANVEEN	2811915	47 50.42N 54 08.48W	42.0	1	ENTRANCE TO PIPER'S HOLE	DARK OLIVE GREY MUD. SOME WORM TUBES, A FEW SHELLS AND A FEW CLAMS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
054	VANVEEN	2811928	47 49.08N 54 06.96W	53.0	2	OFF ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY	MUDDY GRAVEL. MOSTLY ANGULAR AND SUB-ANGULAR CLASTS IN A MATRIX OF SANDY OLIVE BROWN MUD. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
055	VANVEEN	2811937	47 48.87N 54 06.38W	43.0	2	ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY	SANDY GRAVEL. ANGULAR COBBLES COATED WITH A PINK CORAL ON ONE SIDE ONLY. BROWN SAND. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
056	VANVEEN	2811947	47 49.07N 54 05.72W	47.0	2	NORTH HARBOUR, PLACENTIA BAY	SANDY GRAVEL. GREY/BROWN SAND. THE GRAVEL IS COATED ON ONE SIDE WITH PINK CORAL. 1 BAG IN ABUCKET + 1 (40) DRAM VIAL.
057	VANVEEN	2811957	47 50.08N 54 04.60W	18.0	1	NORTH HARBOUR, PLACENTIA BAY	SANDY GRAVEL. MOST OF THE GRAVEL IS SUB-ANGULAR TO SUB-ROUNDED IN A MATRIX OF DARK OLIVE BROWN SAND. THE GRAVEL ON THE SURFACE WAS COATED WITH PINK CORAL MOSTLY ON ONE SIDE. THERE WAS A LARGE FROME OF SEAWEED ATTACHED TO A COBBLE. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
058	VANVEEN	2812008	47 50.80N 54 05.58W	18.0	3	NORTH HARBOUR, PLACENTIA BAY	VERY SOFT DARK OLIVE BROWN/BLACK MUD. VERY PUNGENT. CONTAINS A FEW SHELL FRAGMENTS AND A FEW PEBBLES. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
059	VANVEEN	2812029	47 48.15N 54 05.55W	115.0	1	OFF ENTRANCE TO NORTH HARBOUR, PLACENTIA BAY	DARK OLIVE BROWN SOFT MUD. A FEW WORM TUBES AND CLAM SHELLS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
060	VANVEEN	2812050	47 46.58N 54 03.89W	116.0	1	ENTRANCE TO COME BY CHANCE	MUDDY GRAVEL. MOSTLY SUB-ANGULAR CLASTS. MUD IS OLIVE BROWN. WORM TUBES AND A FEW SHELL FREGMENTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.

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TABLE 4

GRAB SAMPLES

CRUISE NUMBER = 89-026
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PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
061	VANVEEN	2812108	47 48.33N 54 01.34W	28.0	1	COME BY CHANCE	SAND. DARK OLIVE GREY FINE/MEDIUM SAND WITH SOME MUD AND A FEW ANGULAR PEBBLES. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
062	VANVEEN	2812113	47 47.93N 54 01.58W	42.0	1	COME BY CHANCE	DARK OLIVE GREY FINE SAND. A FEW SHELLS AND SOME MUD. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
063	VANVEEN	2812120	47 47.63N 54 01.01W	12.5	1	COME BY CHANCE	SANDY GRAVEL CONSISTING OF DARK GREY/BROWN COURSE SAND AND PEA SIZED GRAVEL. MOSTLY SUB-ANGULAR TO SUB-ROUNDED. A FEW LARGER ANGULAR CLASTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
064	VANVEEN	2812125	47 47.41N 54 00.94W	12.5	2	COME BY CHANCE	COURSE GRAVEL. SUB-ROUNDED CLASTS COATED ALL OVER WITH PINK CORAL. 1 BAG IN A BUCKET.
065	VANVEEN	2812138	47 46.45N 54 02.55W	72.0	2	COME BY CHANCE	MUDDY GRAVEL. MAINLY LARGER THAN PEA SIZE GRAVEL. MOSTLY SUB-ANGULAR TO SUB-ROUNDED IN SIZE IN A MATRIX OF SANDY MUD. ONE STAR FISH AND 1 LARGE COBBLE WITH NO COATING. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
066	VANVEEN	2812150	47 45.97N 54 01.80W	38.0	1	COME BY CHANCE	GRAVELLY SAND. BROWN SAND WITH SOME PEA SIZED GRAVEL BUT ALSO SOME LARGER CLASTS COMPLETELY COATED WITH PINK CORAL. 1 BAG IN A BUCKET + 1 (40) DRAM VIAL.
067	VANVEEN	2812156	47 45.52 54 02.52W	89.0	1	COME BY CHANCE	MUDDY GRAVEL. SUB-ANGULAR TO SUB-ROUNDED GRAVEL IN A MATRIX OF DARK OLIVE BROWN MUD WITH A FEW SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
068	VANVEEN	2841329	47 26.25 53 52.24W	37.0	1	LONG HARBOUR (ST. CROIX BAY)	DARK OLIVE BROWN MUD WITH WORM TUBES AND A FEW PEBBLES AND SMALL SHELLS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
069	VANVEEN	2841337	47 26.06 53 52.52W	40.0	1	LONG HARBOUR (ST. CROIX BAY)	DARK OLIVE BROWN MUD. A FEW WORM TUBES AND SHELL FRAGMENTS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
070	VANVEEN	2841344	47 25.90 53 52.82W	39.0	1	LONG HARBOUR (ST. CROIX BAY)	DARK OLIVE BROWN MUD. NUMEROUS WORM TUBES AND SOME SHELL FRAGMENTS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.

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TABLE 4

GRAB SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
071	VANVEEN	2841349	47 25.70N 53 53.11W	44.0	1	LONG HARBOUR (ST. CROIX BAY)	SOFT DARK OLIVE BROWN MUD, WORM TUBES AND BI-VALVES. 1 FISH (8 IN. LONG). SOME LIGHT OLIVE MOTTLES IN THE SAMPLE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
072	VANVEEN	2841356	47 25.54N 53 53.39W	49.0	1	LONG HARBOUR (ST. CROIX BAY)	DARK OLIVE GREY MUD, 1 SEA CUCUMBER. SOME BROWN MOTTLES IN THE MUD. NUMEROUS FAT WORMS AND WIDE WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
073	VANVEEN	2841404	47 25.30N 53 53.74W	46.0	1	LONG HARBOUR (ST. CROIX BAY)	DARK OLIVE GREY MUD WITH SOME GRAVEL. MAINLY SMALL PEBBLES BUT INCLUDING 2 LARGE SUB-ANGULAR PEBBLES (7-8 CM.). NUMEROUS BROKEN SHELLS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
074	VANVEEN	2841410	47 25.09N 53 54.11W	46.0	1	LONG HARBOUR	OLIVE GREY SANDY MUD WITH SOME GRAVEL(SUB-ROUNDED) A FEW SHELLS, SOME WORMS AND WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
075	VANVEEN	2841419	47 24.80N 53 54.11W	63.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD. A FEW BI-VALVES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
076	VANVEEN	2841426	47 24.81N 53 53.65W	71.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD. SOME GRAVEL (SUB-ANGULAR AND SUB-ROUNDED). SHELL FRAGMENTS AND WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE.
077	VANVEEN	2841433	47 24.85N 53 53.25W	60.0	1	LONG HARBOUR	SOFT DARK OLIVE GREY MUD. 1 SEA CUCUMBER. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
078	VANVEEN	2841441	47 24.94N 53 52.89W	57.0	1	LONG HARBOUR	DARK OLIVE GREY MUD WITH LIGHT BROWN MOTTLES IN PLACES. 1 SHRIMP. 1 BAG IN A BUCKET FOR B.I.O. 2 BAGS FOR C-CORE. A SECOND SAMPLE WAS TAKEN FOR C-CORE WHICH ALSO CONTAINED A SEA CUCUMBER.
079	VANVEEN	2841453	47 25.12N 53 53.39W	53.0	1	LONG HARBOUR	SHELLY MUD. DARK OLIVE GREY MUD WITH WORM TUBES AND SHELLS INCLUDING 1 LARGE LIVE CLAM (8 CM.). 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE.

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GRAB SAMPLES

CRUISE NUMBER = 89-026
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PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
080	VANVEEN	2841503	47 24.89N 53 52.55W	55.0	1	LONG HARBOUR	DARK GREY MUD. MOTTLED A LIGHT BROWNISH GREY IN PLACES. ALSO SOME CLAMS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE.
081	VANVEEN	2841508	47 25.00N 53 52.17W	51.0	1	LONG HARBOUR	DARK GREY MUD. VERY SMELLY. A FEW WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C_CORE.
082	VANVEEN	2841514	47 24.94N 53 51.71W	45.0	1	LONG HARBOUR	DARK OLIVE GREY MUD. CONTAINED A PIECE OF WOOD (30*2 CM.). 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C_CORE.
083	VANVEEN	2841603	47 25.11N 53 51.39W	53.0	5	LONG HARBOUR	1ST ATTEMPT BROUGHT UP SEAWEED. 2ND ATTEMPT BROUGHT UP 2 LARGE MUSSLES (12 CM.). ONE WAS ENCRUSTED WITH PINK CORAL. 3RD WAS EMPTY. 4TH DIDN'T TRIP. 5TH WAS EMPTY.
084	VANVEEN	2841615	47 25.15N 53 50.96W	22.0	3	LONG HARBOUR	SAMPLE CONSISTED OF 1 LARGE COBBLE (20 CM.). SAMPLE STORED IN A BAG (TOO BIG FOR A BUCKET). THE LARGE COBBLE WAS COATED WITH PINK CORAL ON THE TOP. ALSO CONTAINED SMALLER PEBBLES.
085	VANVEEN	2841622	47 25.17N 53 50.60W	16.0	1	LONG HARBOUR	BROWN SILTY GRAVELY SAND. SOME SEAWEED AND SHELL FRAGMENTS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE.
086	VANVEEN	2841630	47 25.19N 53 50.29W	28.0	1	LONG HARBOUR	DARK OLIVE BROWN GRAVELY MUD. THE GRAVEL IS SUB-ROUNDED TO SUB-ANGULAR AND UP TO PEBBLE SIZE. 1 BAG IN A BUCKET FOR B.I.O.. 1 BAG FOR C-CORE. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE.
087	VANVEEN	2841644	47 25.21N 53 50.09W	29.0	2	LONG HARBOUR	1ST ATTEMPT DID NOT TRIP. DARK OLIVE BROWN SOFT MUD. ALSO CONTAINED A LARGE PIECE OF SEAWEED. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.

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GRAB SAMPLES

CRUISE NUMBER = 89-026
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088	VANVEEN	2841649	47 25.20N 53 49.91W	17.0	1	LONG HARBOUR	GREY BROWN MUDDY FINE GRAVEL INCLUDING 1 LARGE PIECE OF GRAVEL (10 CM.). 1 BAG IN A BUCKET FOR B.I..O. 1 BAG FOR C-CORE.
089	VANVEEN	2841654	47 25.22N 53 49.85W	14.0	2	LONG HARBOUR	1ST ATTEMPT WENT TO C-CORE. 1 BAG CONTAINING A LARGE PIECE OF SEAWEED ATTACHED TO A COBBLE + 1 SPIDER CRAB AND 1 STARFISH. MUDDY FINE GRAVEL. 2ND ATTEMPT CONTAINED SOME SEAWEED AND A MUDDY/ SANDY FINE GRAVEL (BROWNISH GREY). THE PEBBLES WERE SUB_ANGULAR TO SUB-ROUNDED. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C_CORE.
090	VANVEEN	2841703	47 25.32N 53 49.68W	11.0	1	LONG HARBOUR	DARK GREY GRAVELLY MUD. ANGULAR AND ROUNDED GRAVEL. 1 PIECE WITH PINK CORAL. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
091	VANVEEN	2841710	47 25.37N 53 49.56W	9.0	2	LONG HARBOUR	1ST ATTEMPT WENT TO C-CORE. MAINLY PEBBLES AND SOME MUD. ALSO PEBBLES COATED WITH PINK CORAL AND SOME DEAD MUSSLES. 2ND ATTEMPT CONTAINED BLACK SANDY GRAVELY MUD. 1 BAG IN A BUCKET TO B.I.O. 1 BAG TO C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL TO C-CORE.
092	VANVEEN	2841718	47 25.39N 53 49.55W	8.0	2	LONG HARBOUR	1ST ATTEMPT WAS GRAVEL. THIS SAMPLE WENT TO B.I.O. BAGGED IN A BUCKET. 2ND ATTEMPT WAS VERY DARK GRAVELLY MUD. C-CORE TOOK A (40) DRAM VIAL OF SURFACE MATERIAL. 1 BAG TO C-CORE. 1 BAG IN A BUCKET FOR B.I.O.. A BAG FROM THE FIRST ATTEMPT IS IN THE SAME BUCKET.
093	VANVEEN	2841728	47 25.42N 53 49.78W	11.0	3	LONG HARBOUR	1ST ATTEMPT WAS MUDDY GRAVEL AND WENT TO C-CORE. 2ND DIDN'T TRIP. 3RD CONTAINED MUDDY SANDY GRAVEL AND SOME SHELL FRAGMENTS. THERE WAS SOME PINK CORAL ON THE GRAVEL 1 BAG IN A BUCKET FOR B.I.O.. 1 BAG FOR C-CORE. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE.
094	VANVEEN	2841740	47 25.40N 53 49.91W	12.0	1	LONG HARBOUR	COURSE DARK GRAY SAND WITH SOME SAND DOLLARS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG TO C-CORE.

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PROJECT NUMBER = 870052

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095	VANVEEN	2841744	47 25.40N 53 50.04W	12.0	1	LONG HARBOUR	COURSE GREY SAND CONTAINING SOME SHELLS, SMALL AMOUNTS OF MUD AND A SAND DOLLAR. A CAMERA STATION WAS TAKEN BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
096	VANVEEN	2841753	47 25.42N 53 50.18W	13.0	1	LONG HARBOUR	DARK BROWNISH GREY GRAVELLY MUDDY COURSE SAND. 1 MUSSLE SHELL WITH PINK CORAL ON ONE SIDE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
097	VANVEEN	2841959	47 25.49N 53 50.68W	23.0	1	LONG HARBOUR	GREY BROWN MUD WITH GRAVEL, BROKEN SHELLS AND WORM TUBES. THE GRAVEL IS SUB-ANGULAR. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
098	VANVEEN	2841805	47 25.57N 53 51.39W	19.0	1	LONG HARBOUR	OLIVE BROWN GRAVELLY MUD INCLUDING 1 LARGE COBBLE. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
099	VANVEEN	2841813	47 25.56N 53 51.36W	12.0	1	LONG HARBOUR	GREY BROWN GRAVELLY SANDY MUD. CONTAINS WORM TUBES AND HAS A STRONG SMELL. 1 SPIDER CRAB AND A GASTRAPOD (LIVING). 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
100	VANVEEN	2841819	47 25.30N 53 50.84W	26.0	3	LONG HARBOUR	BROWN MUD WITH SOME SAND AND GRAVEL.SOME SHELL FRAGMENTS AND A FEW WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
101	VANVEEN	2841830	47 25.25N 53 49.69W	12.0	3	LONG HARBOUR	1ST ATTEMPT WAS SANDY GRAVEL AND WENT TO C-CORE IN A BAG. 2ND AND 3RD ATTEMPT IN SEPERATE BAGS IN THE SAME BUCKET FOR B.I.O.
102	VANVEEN	2841839	47 25.31N 53 49.48W	12.0	1	LONG HARBOUR	DARK GREY GRAVELLY SANDY MUD WITH A STRONG SMELL. THE GRAVEL IS ROUNDED TO SUB-ANGULAR. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG TO C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.

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PROJECT NUMBER = 870052

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103	VANVEEN	2841844	47 25.37N 53 49.91W	13.0	1	LONG HARBOUR	PEBBLEY MUDDY SAND. BROWN IN COLOR. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
104	VANVEEN	2841850	47 25.11N 53 50.13W	29.0	1	LONG HARBOUR	SOFT DARK OLIVE BROWN MUD WITH A FEW WORM TUBES. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
105	VANVEEN	2841854	47 25.06N 53 50.50W	33.0	1	LONG HARBOUR	DARK OLIVE GREY GRAVELLY MUD. THE GRAVEL IS MOSTLY FINE. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
106	VANVEEN	2841905	47 24.95N 53 50.94W	36.0	2	LONG HARBOUR	1ST ATTEMPT BROUGHT UP A LARGE COBBLE (DISCARDED). 2ND ATTEMPT BROUGHT UP A BROWN GRAVELLY SANDY MUD. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
107	VANVEEN	2841913	47 24.88N 53 51.25W	31.0	4	LONG HARBOUR	GREY BROWN GRAVELLY MUD IN THE 4TH ATTEMPT. THE SAMPLE ALSO CONTAINED SOME SAND. THE 1ST AND 3RD ATTEMPTS WERE EMPTY. THE 2ND ATTEMPT HAS A SMALL AMOUNT OF SAMPLE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
108	VANVEEN	2841924	47 24.85N 53 51.55W	43.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD WITH SOME WORM TUBES AND SHELL FRAGMENTS. A CAMERA STATION WAS DONE BY C-CORE ON THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
109	VANVEEN	2841935	47 24.77N 53 51.96W	48.0	2	LONG HARBOUR	DIDN'T TRIP ON THE FIRST ATTEMPT. DARK OLIVE GREY MUD WITH A FEW WORM TUBES AND SHELLS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
110	VANVEEN	2841944	47 24.71N 53 52.33W	46.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD. A FEW WORM TUBES AND SHELLS. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.

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PROJECT NUMBER = 870052

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
111	VANVEEN	2841951	47 24.63N 53 52.64W	47.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD. APPEARS TO GO LIGHT UPON EXPOSURE. NUMEROUS WORM TUBES AND SHELL FRAGMENTS. 1 LARGE SUB-ANGULAR PEBBLE. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
112	VANVEEN	2842001	47 24.50N 53 53.11W	33.0	1	LONG HARBOUR	BROWNISH GREY SHELLY MUDDY SAND. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
113	VANVEEN	2842009	47 24.44N 53 53.61W	19.0	4	LONG HARBOUR	MAINLY BROUGHT UP FRAGMENTS OF CORAL CRUSTS AS IF BROKEN OFF LARGE BOULDERS. NO SAMPLE.
114	VANVEEN	2842018	47 24.35N 53 53.99W	68.0	1	LONG HARBOUR	DARK OLIVE BROWN MUD. A CAMERA STATION WAS DONE BY C-CORE AT THIS SITE. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE. 1 (40) DRAM VIAL OF SURFACE MATERIAL FOR C-CORE.
115	VANVEEN	2842031	47 24.28N 53 54.27W	68.0	5	LONG HARBOUR	GREYISH BROWN SHELLY MUD ON THE 5TH ATTEMPT. THE 2ND ATTEMPT BROUGHT UP 1 COBBLE, A SCALLOP SHELL, SOME MUD AND 1 CLAM SHELL. 1 BAG IN A BUCKET FOR B.I.O. 1 BAG FOR C-CORE.
118	VANVEEN	2871228	47 08.46N 55 05.02W	68.0	2	MORTIER BAY (MARYSTOWN)	THE 1ST ATTEMPT WAS A BRITTLE STAR AND 2 PEBBLES. 2ND ATTEMPT WAS A COURSE SHELLY SAND INCLUDING A WORM TUBE. BOTH ATTEMPTS BAGGED SEPERATELY IN THE SAME BUCKET.
119	VANVEEN	2871242	47 08.60N 55 05.11W	84.0	1	MORTIER BAY (MARYSTOWN)	MUDDY SANDY GRAVEL, BROWNISH IN COLOR. INCLUDES SOME VERY ANGULAR PEBBLES, WORM TUBES, SHELL FRAGMENTS, BRITTLE STARS AND SOME LIVING CLAMS.
120	VANVEEN	2871300	47 09.72N 55 05.12W	118.0	1	MORTIER BAY (MARYSTOWN)	DARK GREY MUDDY FINE SAND. SOME WORM TUBES AND SHELL FRAGMENTS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
121	VANVEEN	2871310	47 10.24N 55 05.26W	88.0	1	MORTIER BAY (MARYSTOWN)	DARK BROWN SMELLY MUD WITH SOME SAND. CONTAINED FAT WORM TUBES, SUB-ANGULAR PEBBLES WITH NUMEROUS FINE WORM TUBES, SOME FATTER. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.

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122	VANVEEN	2871320	47 10.98N 55 06.29W	90.0	1	MORTIER BAY (MARYSTOWN)	BLACK MUD WITH SOME SHELL FRAGMENTS. STRONG SMELL. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
123	VANVEEN	2871332	47 10.40N 55 07.21W	29.0	1	MORTIER BAY (MARYSTOWN)	THIS SAMPLE WAS TAKEN IN THE WRONG LOCATION. MUDDY GRAVEL. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
124	VANVEEN	2871337	47 10.55N 55 07.21W	43.0	1	MORTIER BAY (MARYSTOWN)	PEBBLY OLIVE BROWN MUD WITH PATCHES OF PINK CLAY BELOW THE SURFACE. 1 RUBBER BOOT. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
125	VANVEEN	2871343	47 10.39N 55 07.53W	17.5	1	MORTIER BAY (MARYSTOWN)	VERY DARK GREY/BLACK MUDDY GRAVEL. A PINK LITHOTHAMNION ON THE TOP OF A COBBLE. LARGE PIECES OF KELP ATTACHED TO STONES. SOME LIVING MOLLUSKS. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
126	VANVEEN	2871351	47 10.09N 55 08.40W	11.0	1	MORTIER BAY (MARYSTOWN)	BLACK MUD WITH SOME WORM TUBES. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
133	VANVEEN	2881641	46 55.07N 55 21.19W	18.0	2	LITTLE ST. LAWRENCE HARBOUR	1ST ATTEMPT- A FINE GREY SAND, SOME GRAVEL. 2ND ATTEMPT- FINE GREY SAND, 1 SAND DOLLAR. EACH ATTEMPT IN A SEPERATE BAG IN THE SAME BUCKET. 1 (40) DRAM VIAL.
134	VANVEEN	2881647	46 54.85N 55 21.00W	22.0	1	LITTLE ST. LAWRENCE HARBOUR	GREY FINE SAND. SOME SHELLS AND GRAVEL WITH SEAWEED ATTACHED. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
135	VANVEEN	2881653	46 54.58N 55 20.79W	28.0	7	LITTLE ST. LAWRENCE HARBOUR	MOSTLY COURSE GRAVEL GENERALLY COATED WITH PINK LITHOTHAMNION, OFTEN ON 1 SIDE ONLY BUT SOMETIMES ALL OVER. ALSO CONTAINED A SMALL AMOUNT OF MEDIUM SHELLY SAND (BAGGED SEPERATELY). A LOT OF RED SEAWEED ATTACHED TO THE GRAVEL. 3 BAGS IN 2 BUCKETS.
136	VANVEEN	2881714	46 54.38N 55 20.52W	47.0	2	LITTLE ST. LAWRENCE HARBOUR	GREY FINE MEDIUM SAND CONTAINING SOME FINE SHELLY MATERIAL. 2 BAGS IN A BUCKET + 1 (40) DRAM VIAL.
137	VANVEEN	2881722	46 54.25N 55 20.58W	105.0	1	LITTLE ST. LAWRENCE HARBOUR	GREY MEDIUM/FINE SAND WITH A FEW SHELLS. 2 BAGS IN A BUCKET.
138	VANVEEN	2881918	46 54.80N 55 23.15W	14.0	1	GREAT ST. LAWRENCE HARBOUR	FINE SILTY SAND, BLACK IN COLOR. 2 BAGS IN A BUCKET.

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139	VANVEEN	2881925	46 54.49N 55 22.89W	19.0	1	GREAT ST. LAWRENCE HARBOUR	BROWN MEDIUM SAND WITH SOME PEBBLES AND SHELL FRAGMENTS AND SEA URCHINS. 2 BAGS IN A BUCKET.
140	VANVEEN	2881933	46 54.05N 55 22.69W	35.0	1	GREAT ST. LAWRENCE HARBOUR	DARK OLIVE GREY MUDDY FINE SAND. A THIN SURFACE LAYER OF MUDDIER MATERIAL. 1 SHRIMP AND A FEW SMALL SHELL FRAGMENTS. SOME SMALL BI-VALVES AND A WHITE WORM. 2 BAGS IN A BUCKET.
141	VANVEEN	2881942	46 53.28N 55 21.46W	57.0	1	GREAT ST. LAWRENCE HARBOUR	BROWN MEDIUM SAND WITH SOME SHELL HASH. 2 BAGS IN A BUCKET.
142	VANVEEN	2881948	46 53.20N 55 21.21W	63.0	2	GREAT ST. LAWRENCE HARBOUR	MEDIUM SAND WITH SOME SHELLS AND 1 SAND DOLLAR. A FEW SUB-ANGULAR PEBBLES. 2 BAGS IN A BUCKET.
143	VANVEEN	2881959	46 53.18N 55 21.40W	56.0	1	GREAT ST. LAWRENCE HARBOUR	BROWN MEDIUM SAND. SHELL HASH AND A SEA URCHIN. 2 BAGS IN A BUCKET.
127		2871733	47 11.22N 55 05.52W	+12.6	1	SPANISH ROOM POINT	THIS IS A SHORE SAMPLE. SITE (061A) COASTAL CLIFF. STONY RED CLAY TILL. 1 BAG.
128		2871814	47 12.09N 55 05.85W	00.0	1	CASHEL COVE	THIS IS A SHORE SAMPLE. SITE (061) BEACH FORESHORE. SAND-PEBBLE GRAVEL. 1 BAG.
129		2871825	47 12.10N 55 05.84W	+ 1.7	1	CASHEL COVE	THIS IS A SHORE SAMPLE. SITE (061) BEACH CREST. SAND-PEBBLE GRAVEL. 1 BAG.
130		2871840	47 12.03N 55 05.80W	00.0	1	CASHEL COVE	THIS IS A SHORE SAMPLE. SITE (061) EBB-DELTA SWASH BAR. SAND-PEBBLE GRAVEL. 1 BAG.

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TABLE 5

CORE SAMPLES

CRUISE NUMBER = 89-026
CHIEF SCIENTIST = DR. JOHN SHAW
PROJECT NUMBER = 870052

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
001	GRAVITY	2711310	47 18.20N 53 57.88W	36.0	252	190	113	1	ARGENTIA HARBOUR (NFLD)	DARK GREY MUD IN CORE AND CATCHER. WORM TUBES.
002	GRAVITY	2711330	47 18.32N 53 55.46W	82.0	252	190	87	1	PLACENTIA SOUND (NFLD)	CATCHER WAS BLACKISH GREY MUD. CORE WAS BLACKISH GREY MUD, CREAMY AND SOFT. CORE WAS DISTURBED ON RECOVERY.
003	GRAVITY	2711350	47 18.04N 53 54.68W	40.0	252	212	44	1	PLACENTIA SOUND	OLIVE GREY MUD IN CATCHER WITH SOME WORM TUBES. BLACK PEBBLEY MUD ON THE OUTSIDE OF THE WEIGHTS. CORE WAS DARK OLIVE GREY GRAVELEY MUD. SOME SHELL FRAGMENTS. CORE WAS DISTURBED DURING RECOVERY.
028	GRAVITY	2741657	47 18.16N 53 57.96W	41.0	252	250	103	1	ARGENTIA HBR.	CORE WAS MOSTLY OLIVE/GREY MUD. WORM TUBES ON THE OUTSIDE AROUND THE WEIGHTS. THE CORE WAS DISTURBED ON RECOVERY. CATCHER WAS EMPTY.
029	GRAVITY	2741715	47 18.30N 53 55.40W	80.0	252	250	122	1	PLACENTIA SOUND	NOTE- THE CORE QUITE POSSIBLY HIT TWICE. BLACKISH MUD, VERY SOUPY AND QUITE DISTURBED. NOTHING IN THE CATCHER.
030	GRAVITY	2741734	47 17.98N 53 54.56W	35.0	252	252	85.5	1	PLACENTIA SOUND	CATCHER SAMPLE BAGGED IN A BUCKET. SMELLY OLIVE GREY MUD. CORE WAS DISTURBED ON RECOVERY.
031	GRAVITY	2741748	47 17.98N 53 54.52W	33.0	252	252	82	1	PLACENTIA SOUND	VALVE WAS REMOVED FOR THIS ATTEMPT AND A DOUBLE CATCHER WAS INSERTED. CORE WAS OLIVE GREY MUD. STIFF MUD IN THE CATCHER. CATCHER SAMPLE BAGGED IN A BUCKET.
045	GRAVITY	2811701	47 42.42N 54 00.97W	110.0	252	213	144	1	EASTERN CHANNEL PLACENTIA BAY	GREY PEBBLY MUD AROUND THE WEIGHTS. CATCHER WAS EMPTY. CORE WAS DISTURBED DURING RECOVERY. CUTTER WAS BENT. SURFACE AT THE TOP OF THE CORE WAS PEBBLY MUD WITH A FEW WORM TUBES.
046	GRAVITY	2811718	47 43.28N 54 00.64W	118.0	252	196	43	1	EASTERN CHANNEL PLACENTIA BAY	OLIVE GREY MUD AROUND THE WEIGHTS. CATCHER WAS EMPTY. CORE WAS OLIVE GREY MUD.

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047	GRAVITY	2811743	47 45.70N 54 04.00W	135.0	252	69	45	1	ENTRANCE TO COME BY CHANCE	THE CATCHER CONTAINED A LIGHT GREY STIFF CLAY. OLIVE GREY MUD WAS AROUND THE BARREL. THE CUTTER WAS BADLY BENT.
048	GRAVITY	2811824	47 49.88N 54 07.90W	54.0	252	172	69	1	OFF ENTRANCE TO PIPER'S HOLE.	CATCHER WAS EMPTY. DARK OLIVE GREY SANDY MUD ON THE WEIGHTS. THE SAME MATERIAL WAS AT THE TOP OF THE CORE BUT AT THE BOTTOM IT WAS A LIGHT GREY PEBBLY MUD.
049	GRAVITY	2811840	47 50.88N 54 09.60W	27.0	252		27	1	OFF ENTRANCE TO PIPER'S HOLE	GREY GRAVELY SAND AT THE BASE OF THE CORE AND DARK OLIVE GREY SAND A T THE TOP. THE CATCHER WAS EMPTY.
050	GRAVITY	2811849	47 51.15N 54 09.94W	23.0	252	175	79	1	ENTRANCE TO PIPER'S HOLE.	THE CATCHER HAD A VERY STIFF OLIVE GREY SILT. THE CORE AT THE TOP WAS A SOFT OLIVE BROWN SILT CONTAINING SMALL PEBBLES AND SMALL GASTRAPODS. THE TOP WAS SOMEWHAT DISTURBED. THE WEIGHTS AND THE BARREL WERE SMEARED WITH DARK OLIVE GREY SILT WITH NUMEROUS SMALL SHELL FRAGMENTS.
116	GRAVITY	2871152	47 10.50N 55 07.26W	46.0	252	112	53	1	MORTIER BAY (MARYSTOWN)	THE CATCHER HAD A STIFF GREY CLAYEY SILT WITH BROKEN SHELLS. THE CORE WAS A GRAVELLY MUD AT THE TOP AND A SHELLY MUD AT THE BASE. THE VALVE WAS REMOVED FOR THIS CORE.
117	GRAVITY	2871205	47 10.52N 55 07.39W	47.0	252	217	80	1	MORTIER BAY (MARYSTOWN)	GREY GRAVELLY MUD AROUND THE WEIGHTS. THE CATCHER HAD A STIFF GREY MUD. THE CORE IS MOSTLY GREY MUD, STIFF AT THE BOTTOM.
131	GRAVITY	2881616	46 54.25N 55 20.58W	53.0	252		0	0	LITTLE ST. LAWRENCE	2 ATTEMPTS. NO SAMPLE. THE CUTTER WAS HIGHLY POLISHED SUGGESTING SAND OR FINE GRAVEL. THIS WAS LATER PROVED CORRECT BY A GRAB SAMPLE.

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SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
132	GRAVITY	2881633	46 55.10N 55 21.25W	18.0	252		0	0	LITTLE ST. LAWRENCE	NO SAMPLE. SUSPECT SAND.
144	GRAVITY	2882011	46 54.10N 55 22.60W	37.0	252		17	0	GREAT ST. LAWRENCE	SITE OF GRAB SAMPLE 140. 1ST ATTEMPT- EMPTY (NO VALVE ON 2ND ATTEMPT- 17 CM. OF SAND (BAGGED

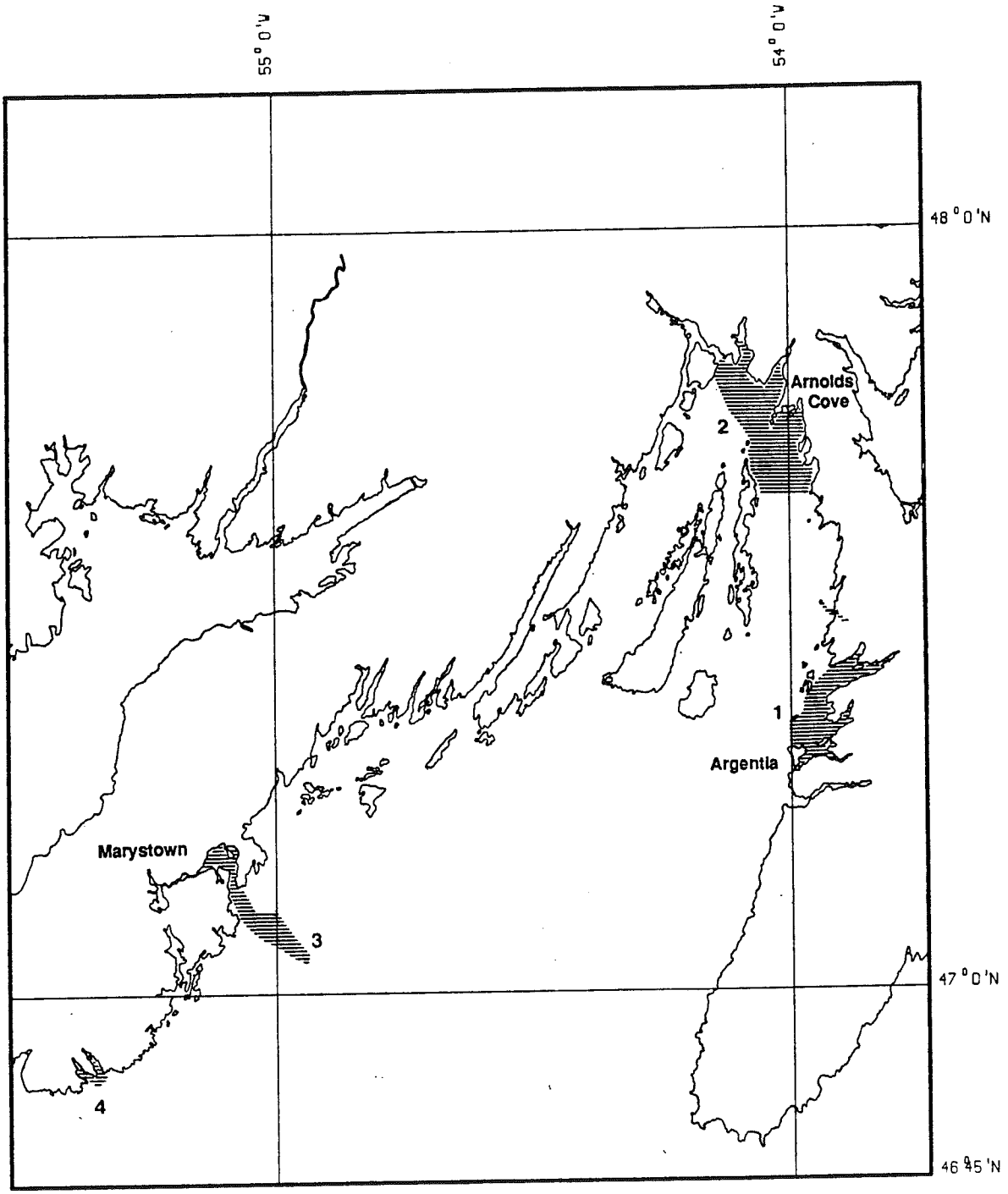

Figure 1: Regional setting. Survey areas are shaded.

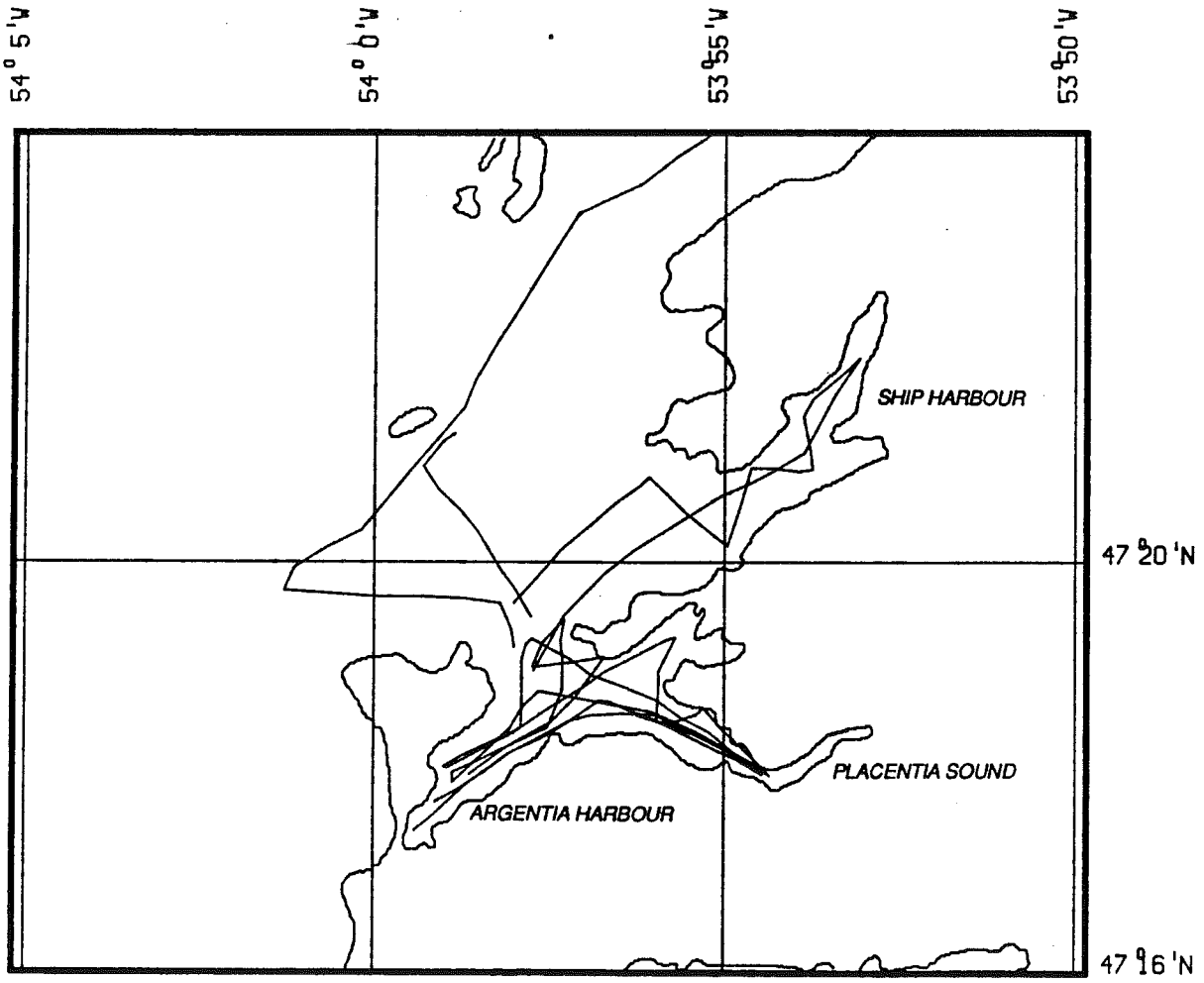

Figure 2: Track Plot Argentia Harbour, Placentia Sound and Ship Harbour.

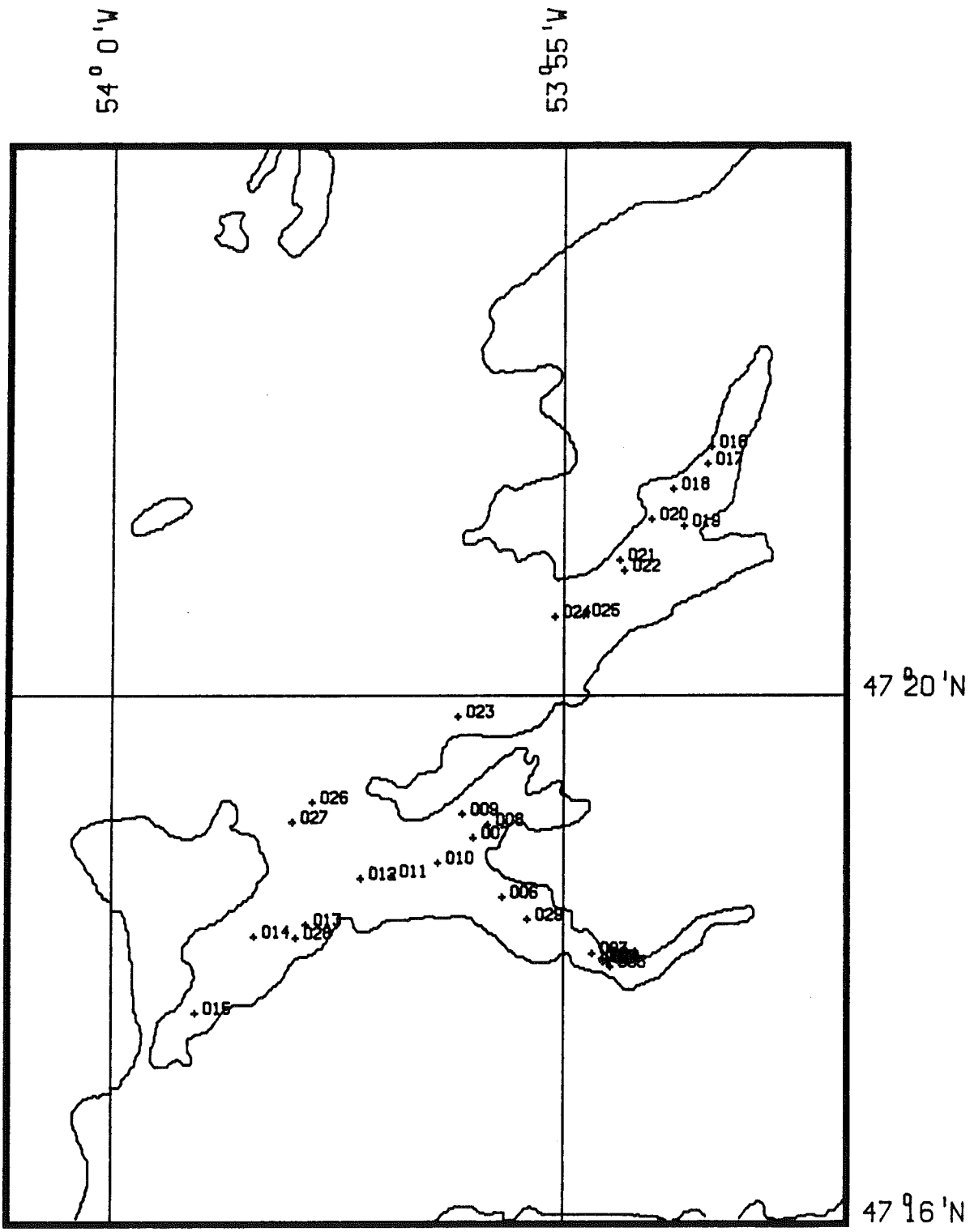

Figure 3: Sample locations, Argentia Harbour, Placentia Sound and Ship Harbour.

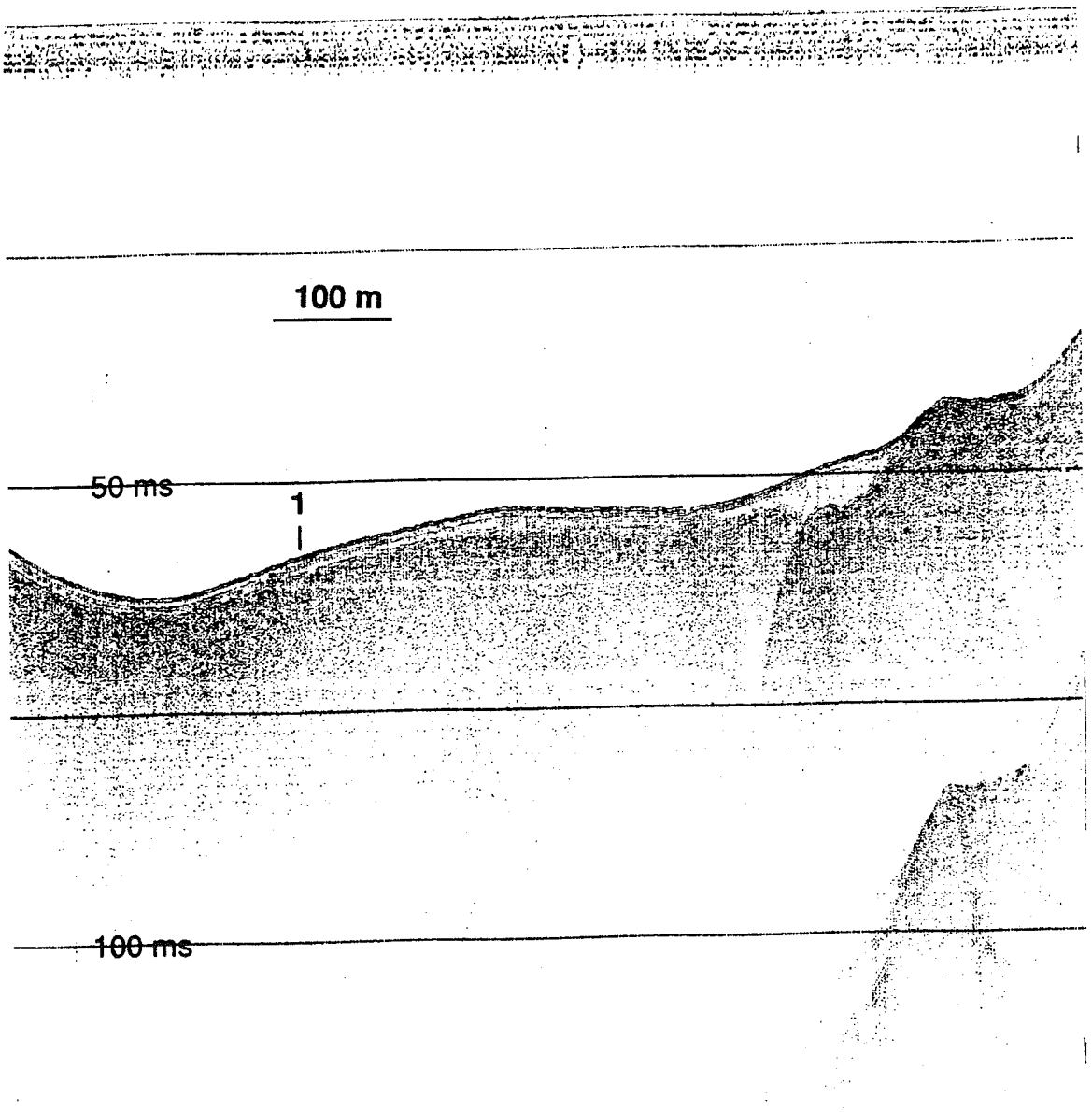

Figure 4: Seistec profile showing approximate location of core 1 in Argentia Harbour. The profile shows an acoustic unit which is charged with shallow gas, and which is interpreted as postglacial mud.

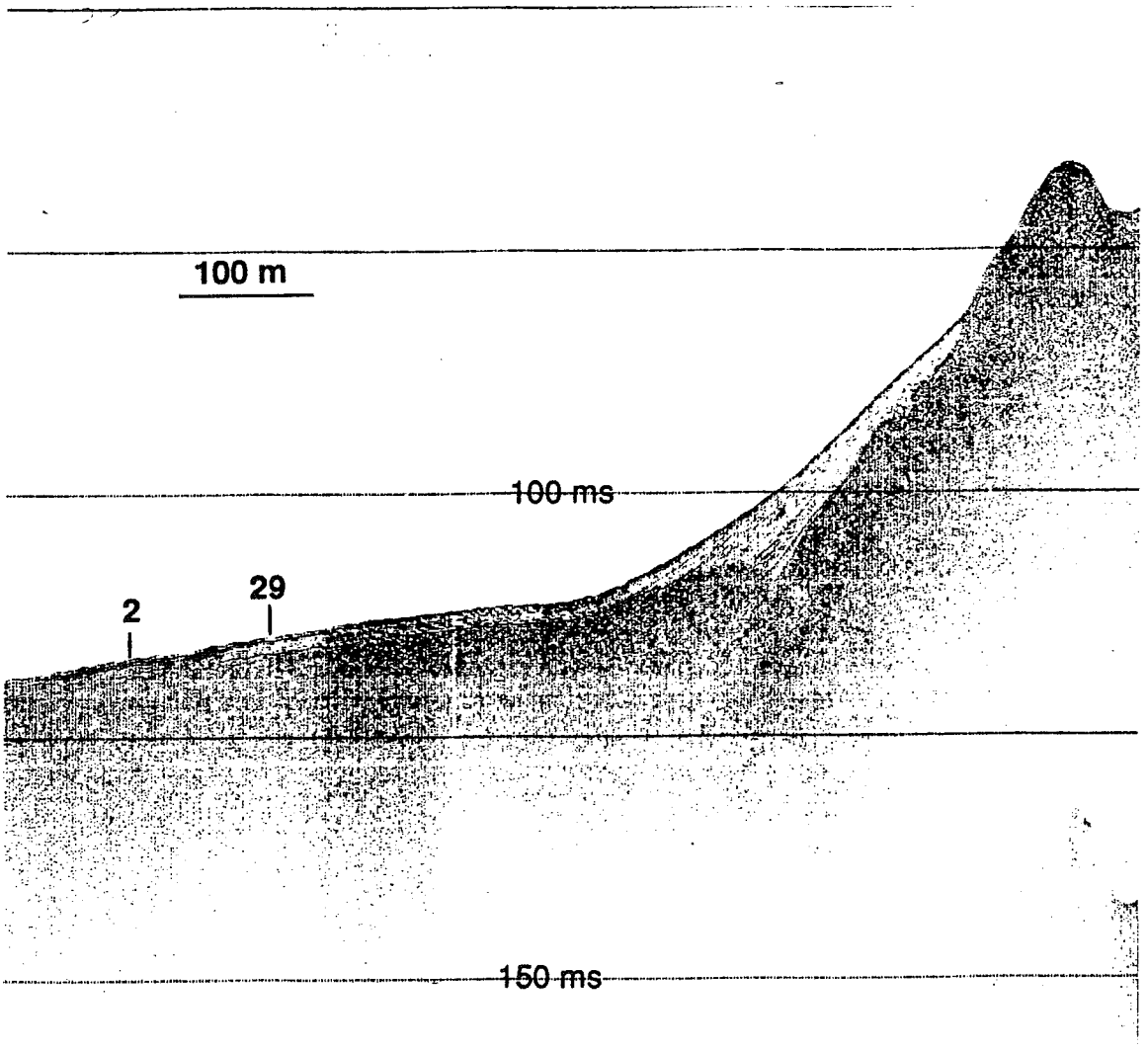

Figure 5: Seistec profile showing approximate sampling locations of cores 2 and 29 in Placentia Sound. Shallow gas is present in the postglacial mud at the coring sites, but is absent where the mud is thinner, towards the right of the illustration

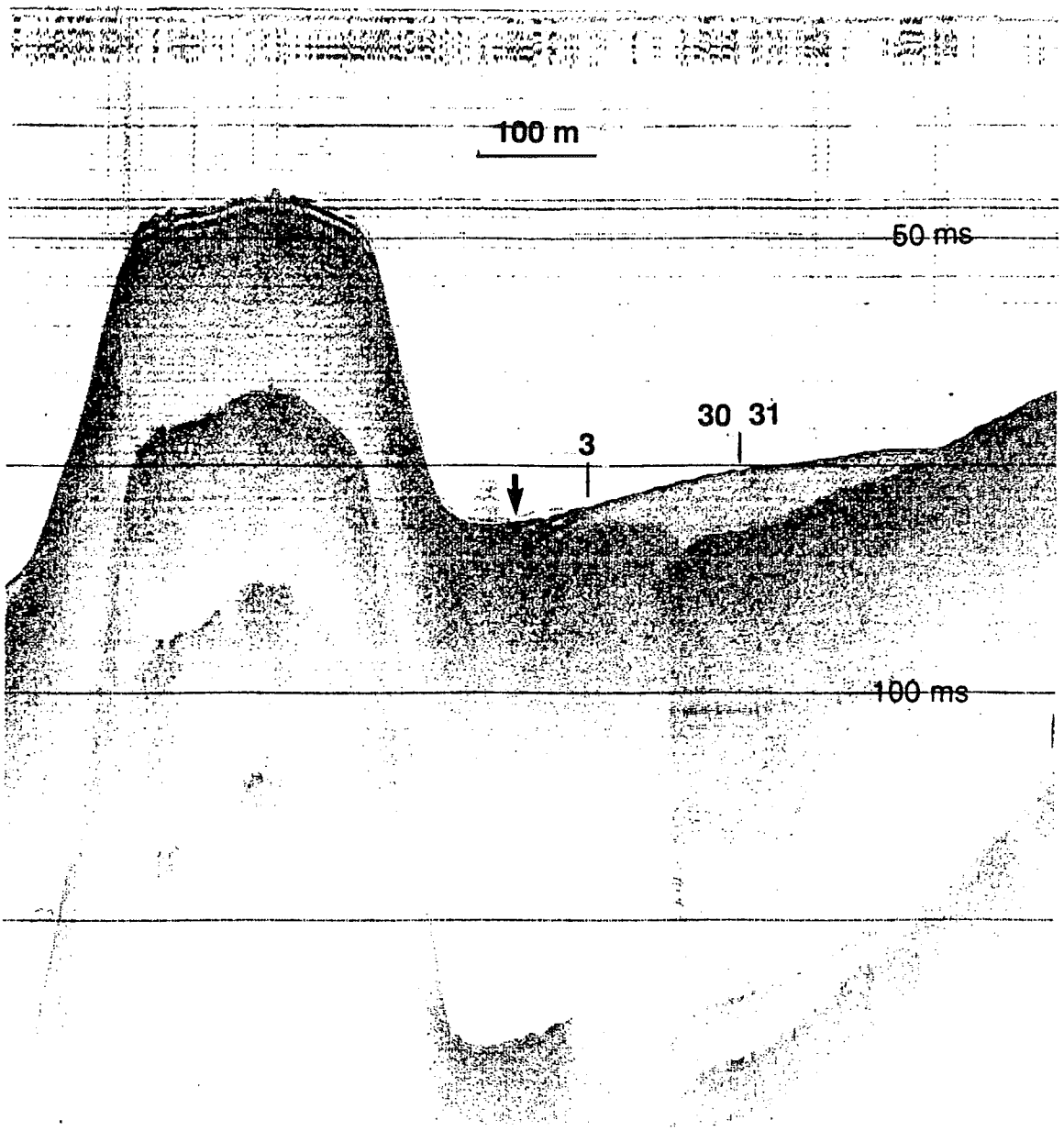

Figure 6: Seistec profile showing approximate sampling locations of cores 3, 30 and 31 in Placentia Sound. The arrow indicates the location of pock marks seen on the sidescan record.

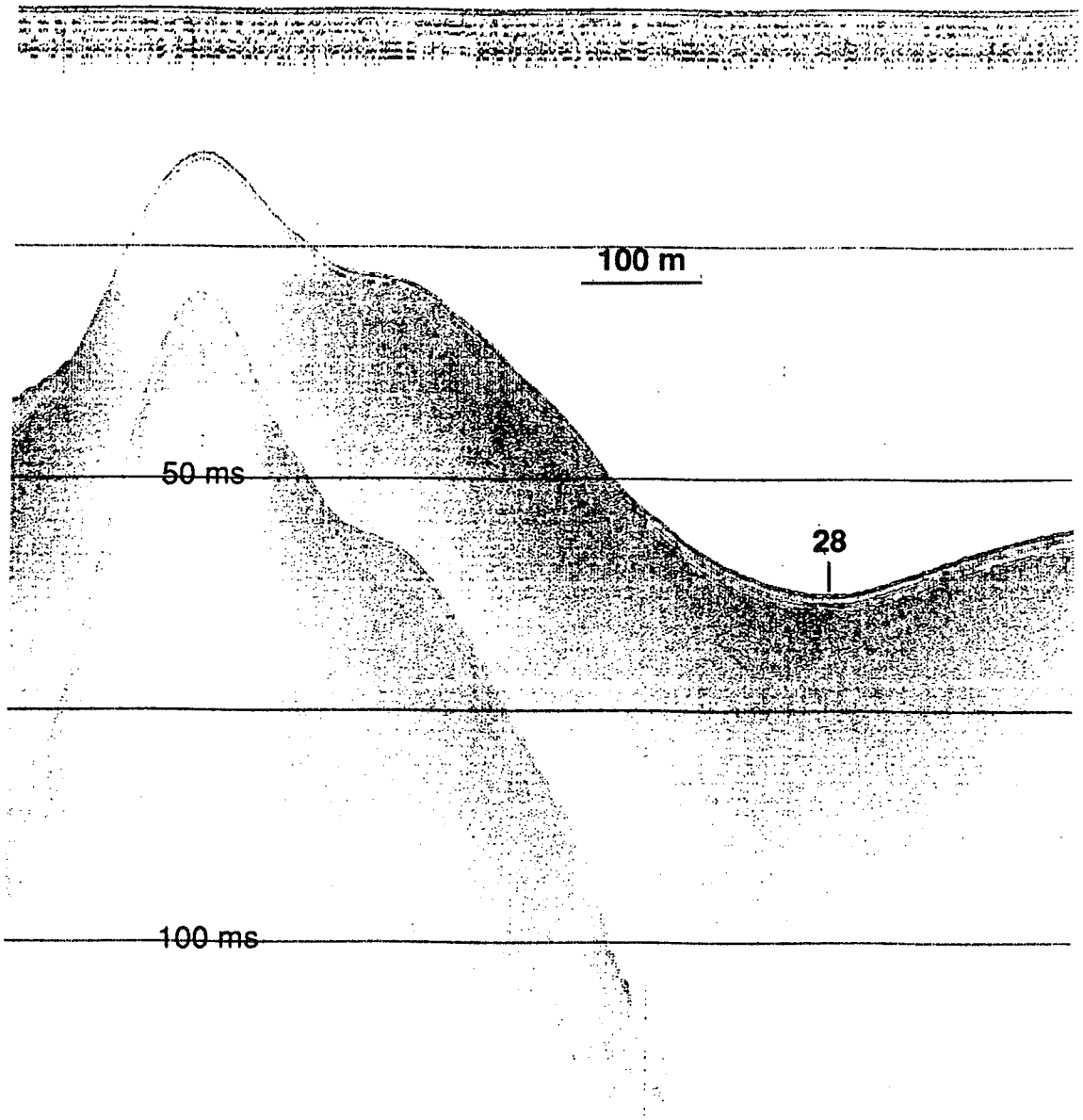

Figure 7: Seistec profile showing approximate sampling location of core 28, Argentia Harbour. The core penetrated postglacial mud containing shallow gas.

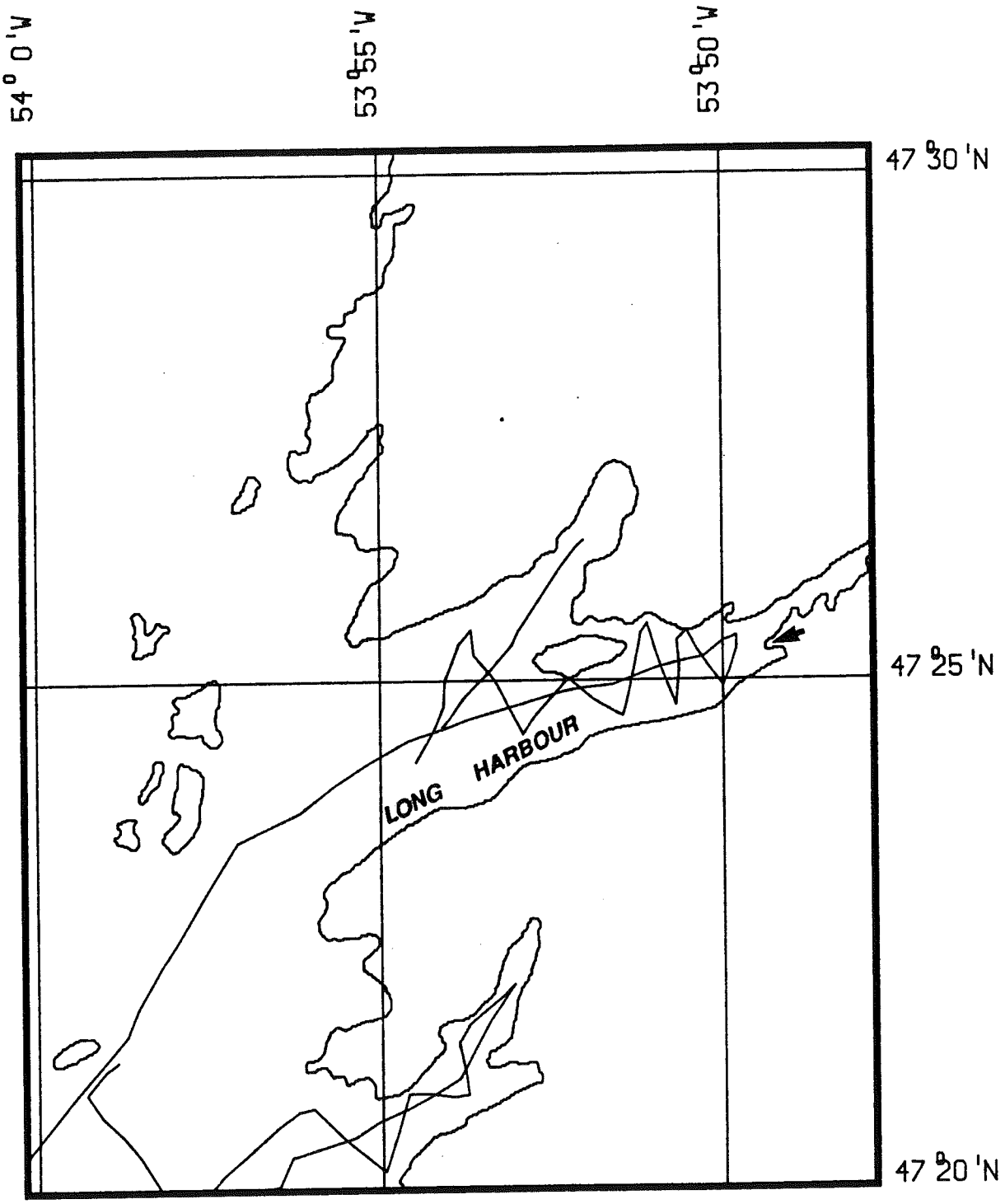

Figure 8: Track plot, Long Harbour. The arrow indicates the location of the defunct ERCO phosphorus plant.

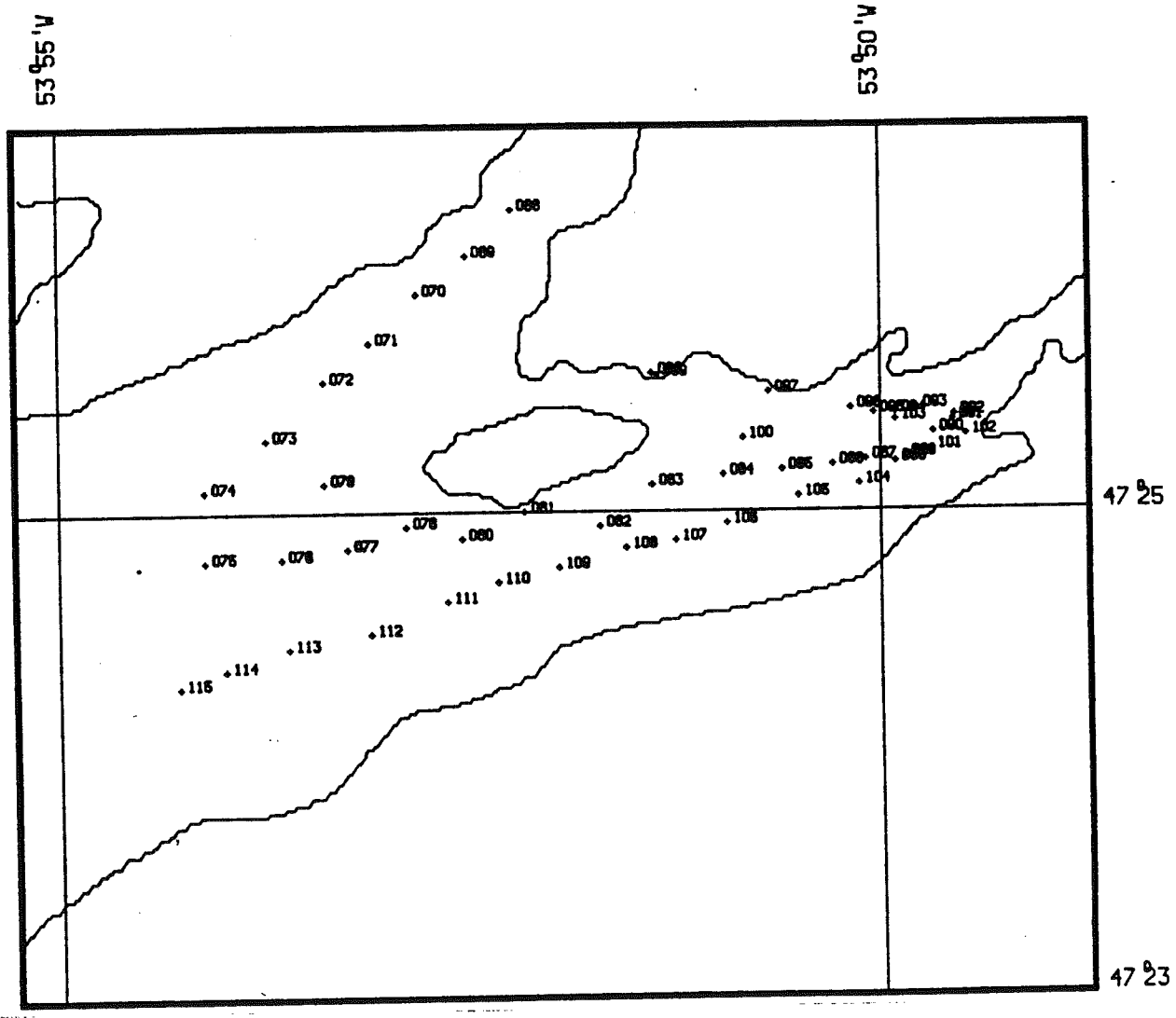

Figure 9: Sample locations, Long Harbour.

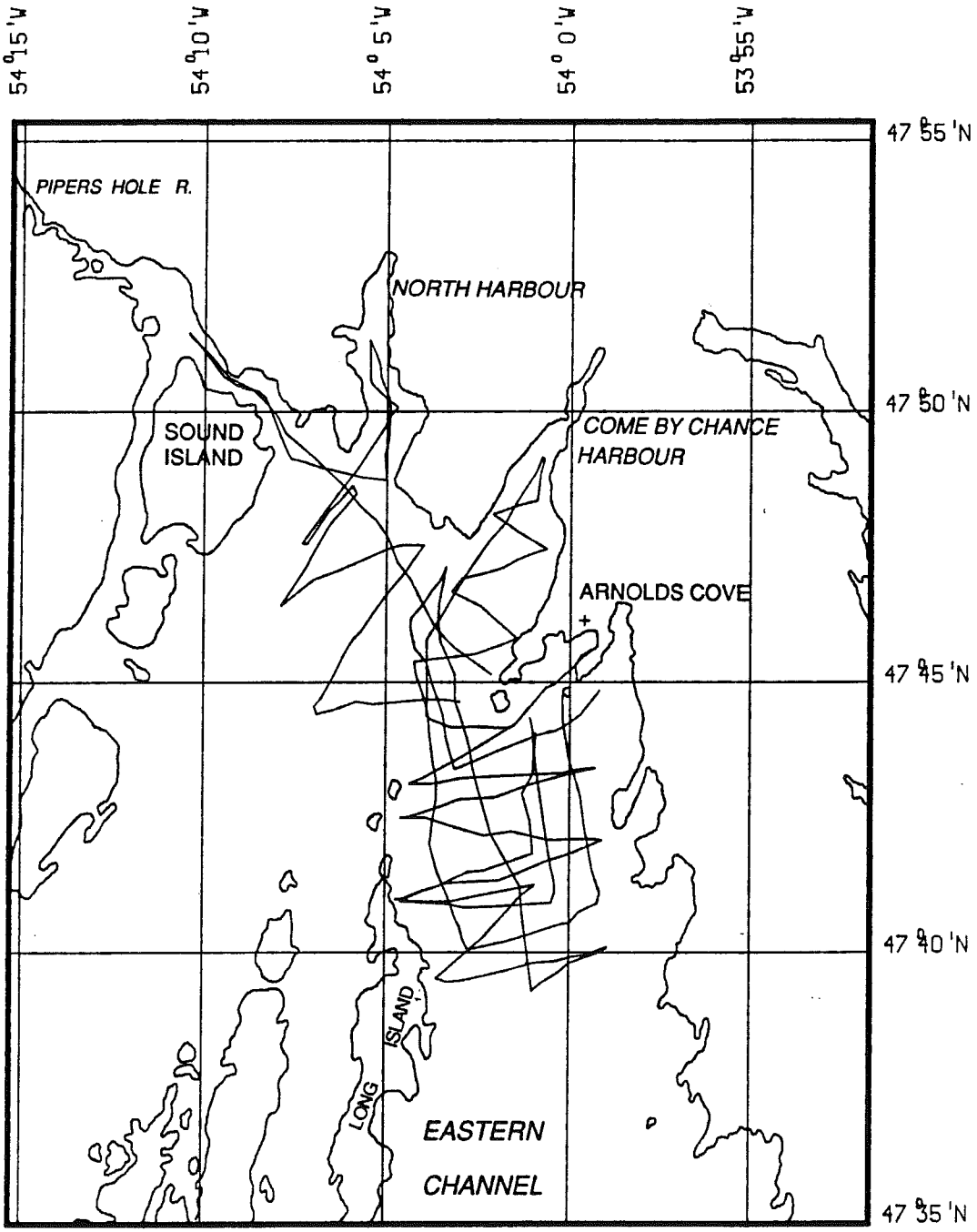

Figure 10: Track plot, northern Placentia Bay.

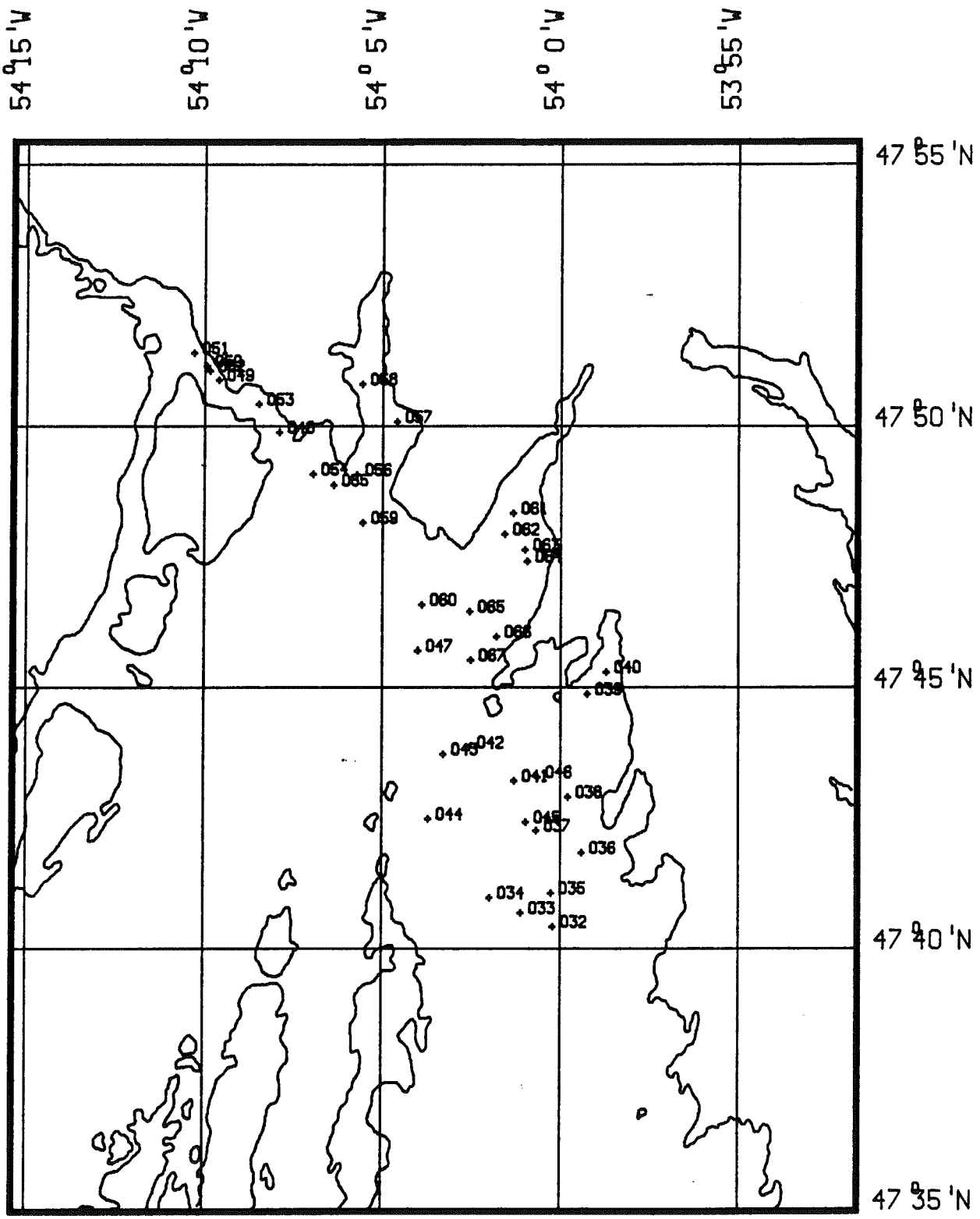

Figure 11: Sample locations, northern Placentia Bay.

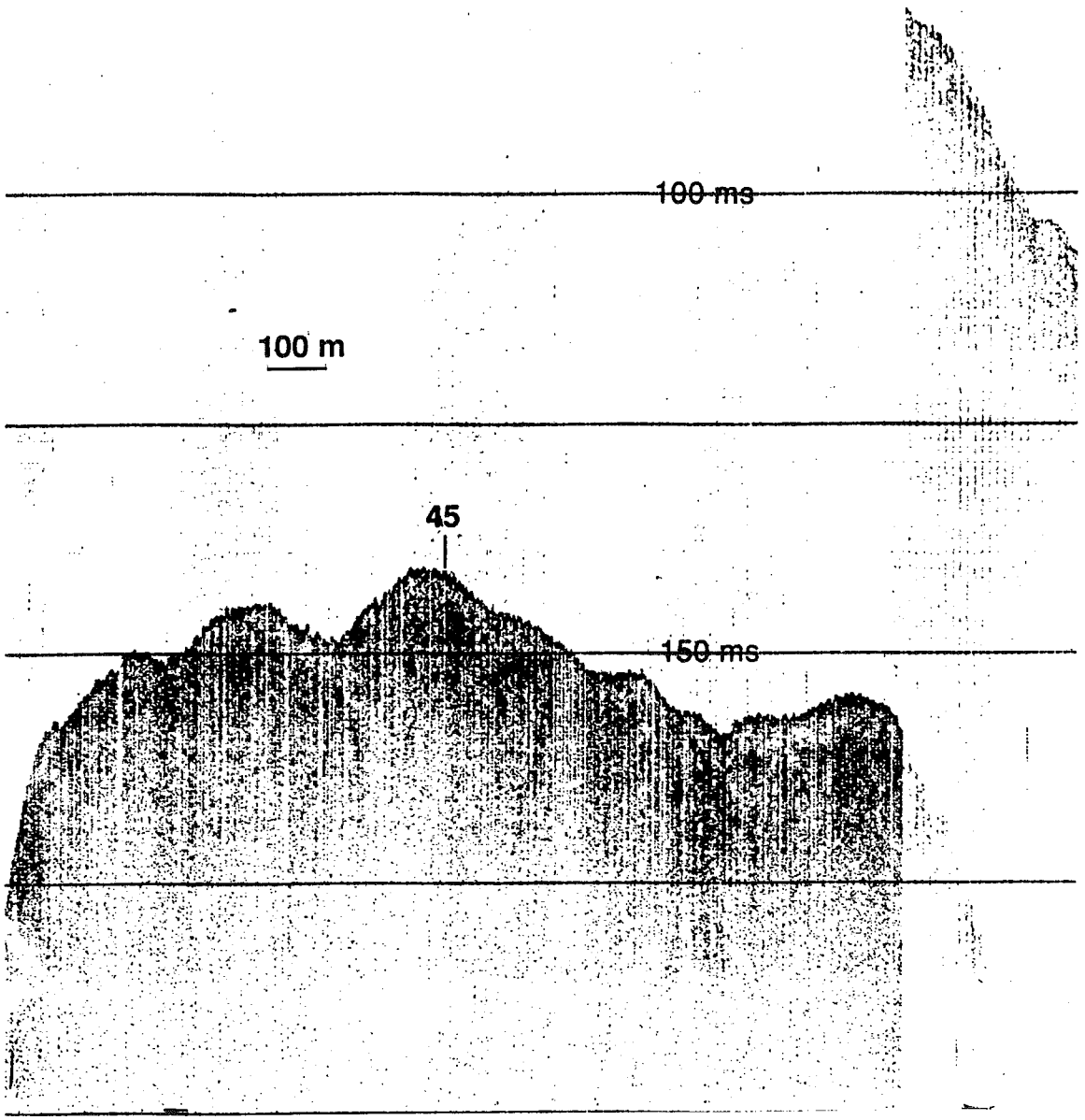

Figure 12: Seistec profile showing approximate location of core 45 in Eastern Channel, northern Placentia Bay.

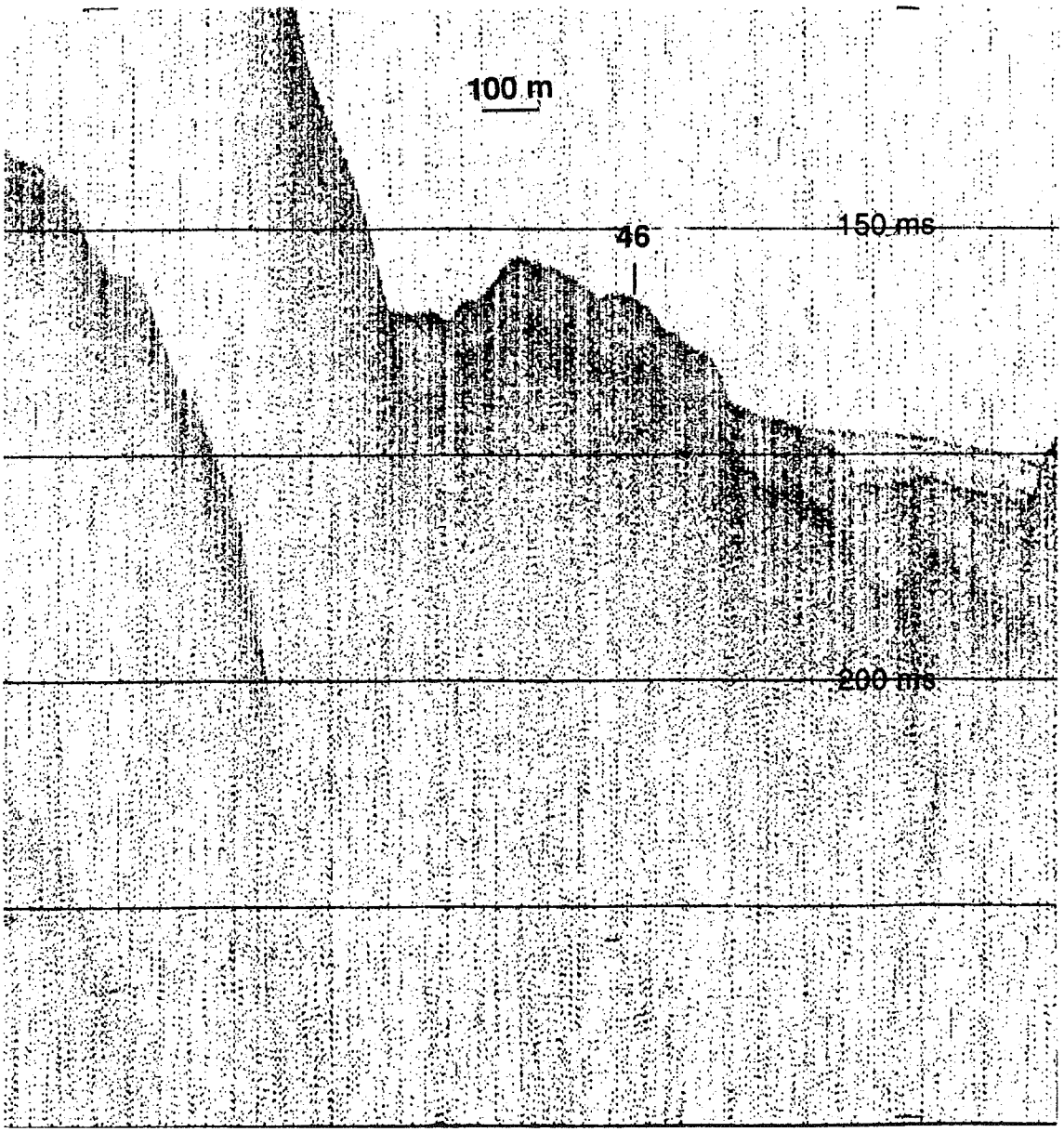

Figure 13: Seistec profile showing approximate location of core 46 in Eastern Channel, northern Placentia Bay.

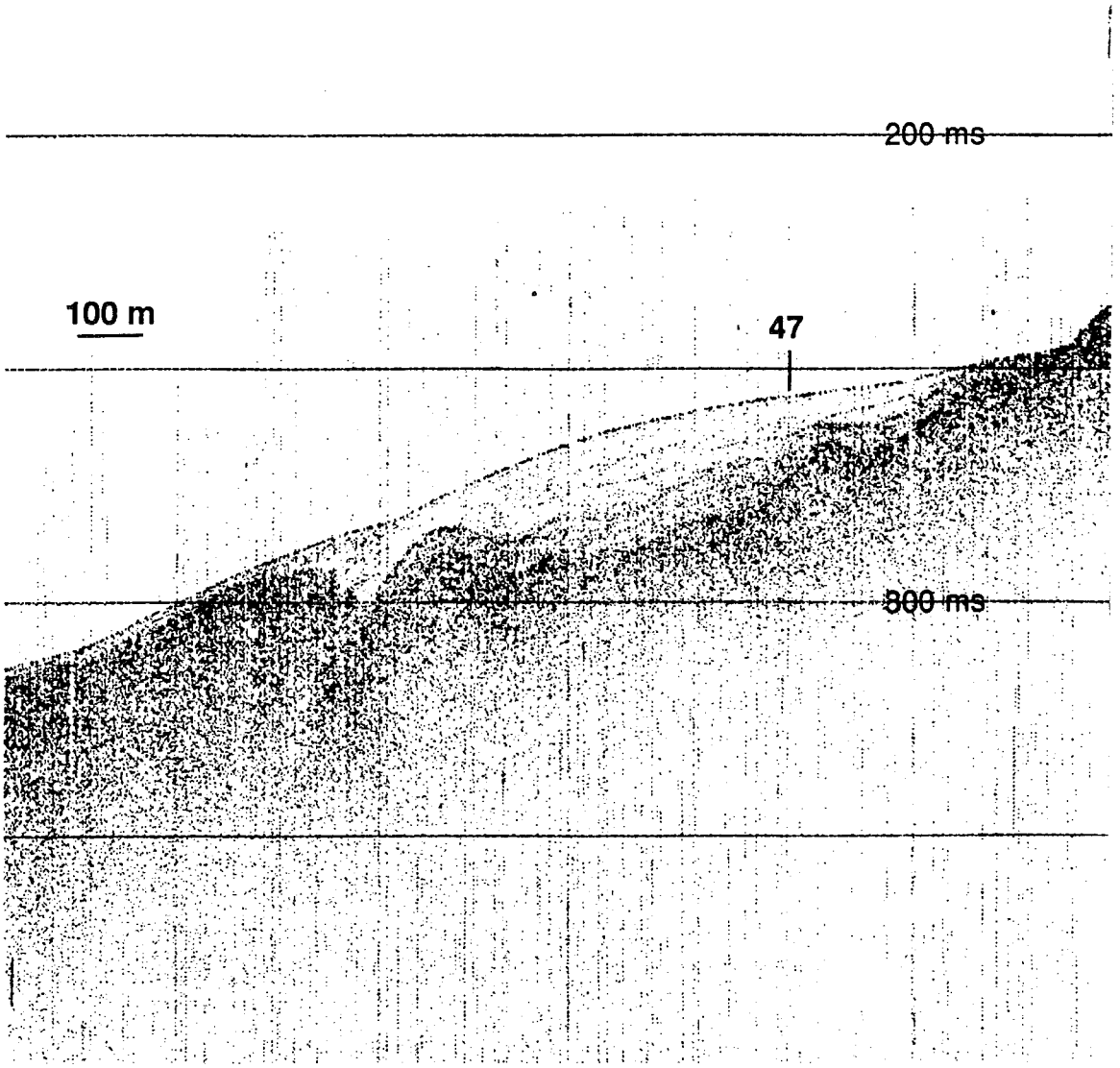

Figure 14: Seistec profile showing approximate location of core 47, entrance to Come by Chance Harbour, northern Placentia Bay. The core penetrated a unit which is provisionally interpreted as postglacial mud. This unit thickens towards the left of this illustration, where it contains shallow gas.

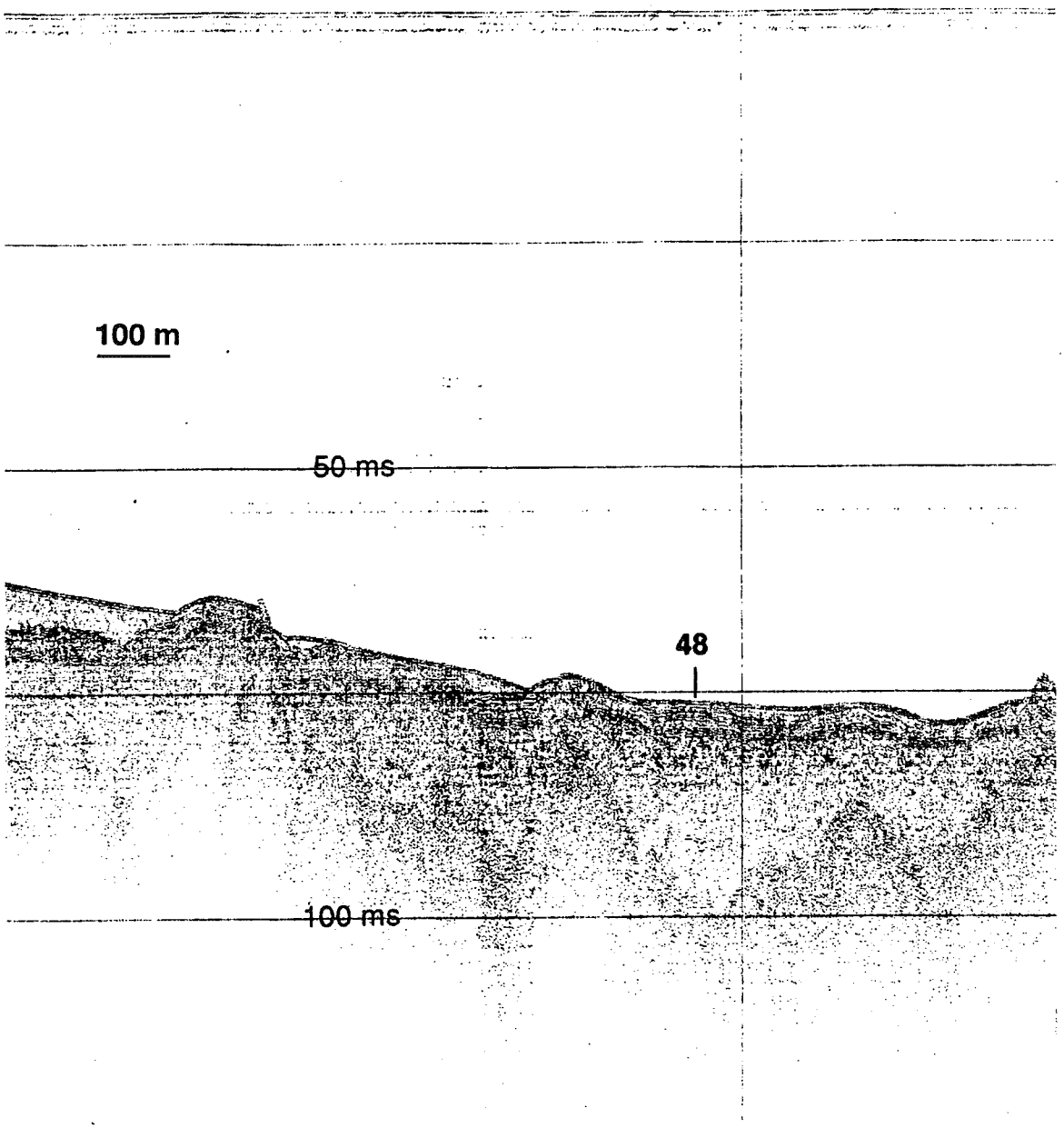

Figure 15: Seistec profile showing location of core 48, near Pipers Hole, northern Placentia Bay. At the core site, a thin, acoustically transparent unit overlies a thin, well stratified, draped unit

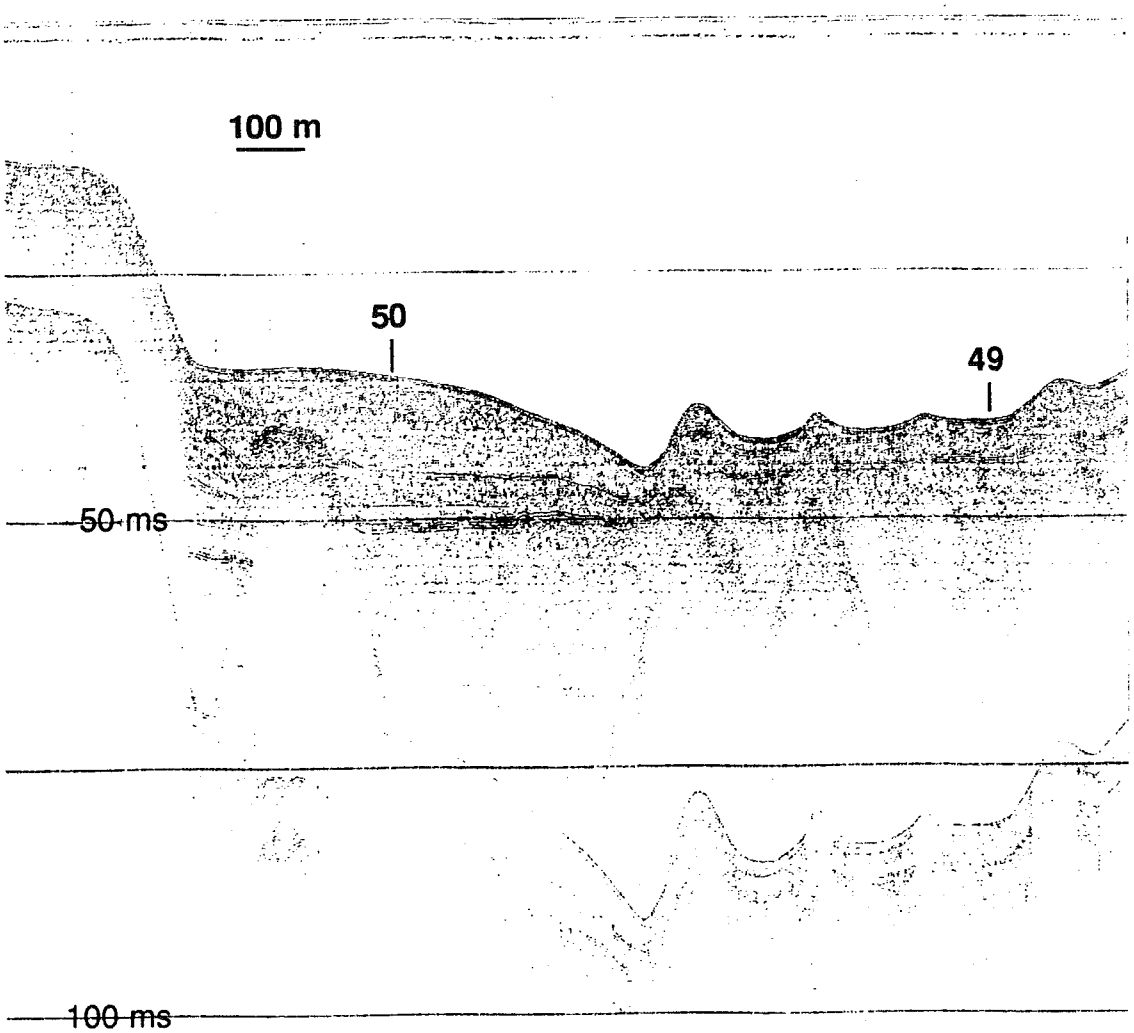

Figure 16: Seistec profile showing locations of cores 49 and 50, near Pipers Hole, northern Placentia Bay. Core 50 is located on a lens of acoustically transparent, weakly stratified sediment which overlies a partly draped unit containing stronger reflectors. This unit is penetrated by core 49. The terrace at the left may be a delta, formed during a lowstand of relative sea level.

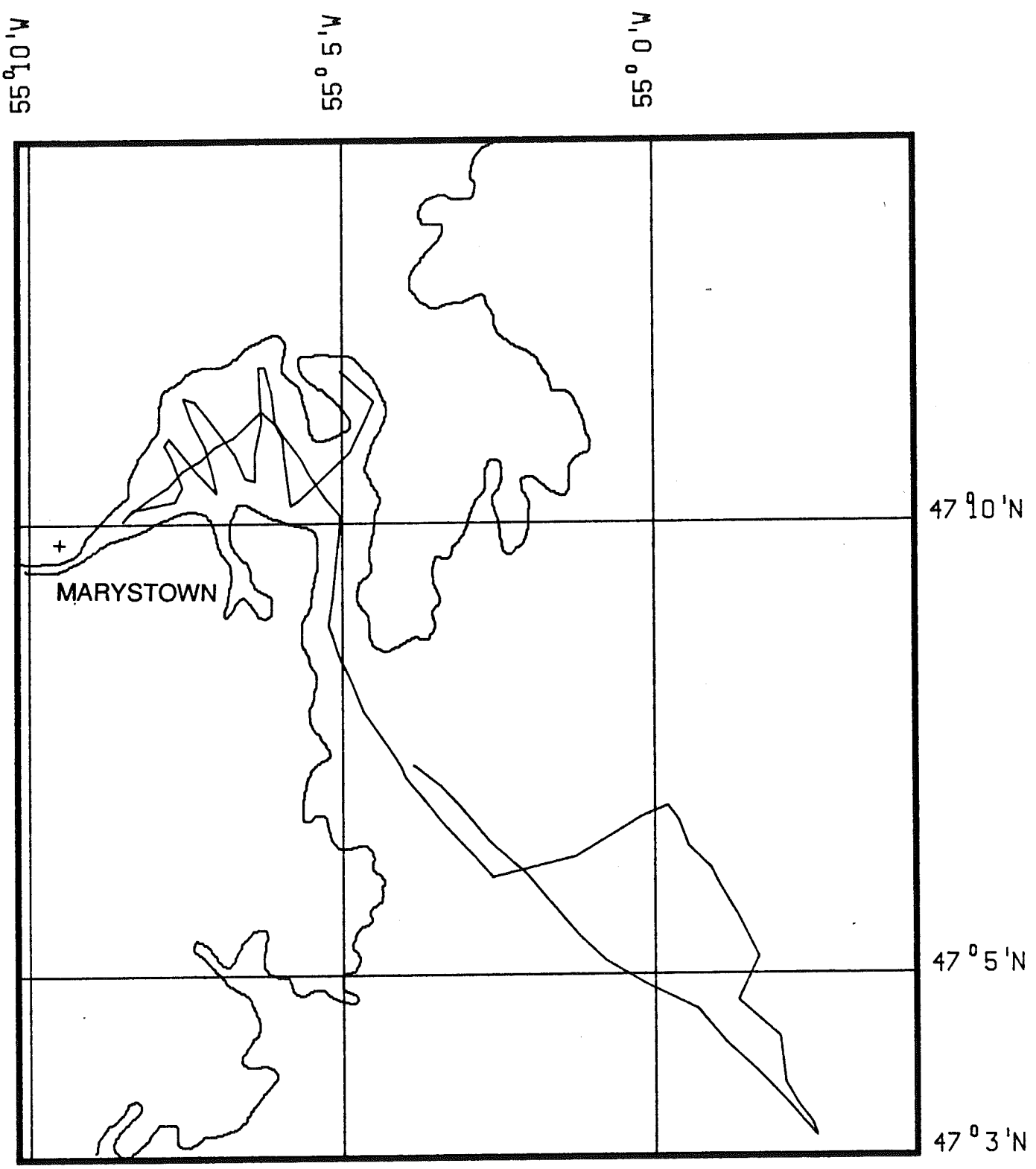

Figure 17: Track plot, Mortier Bay area.

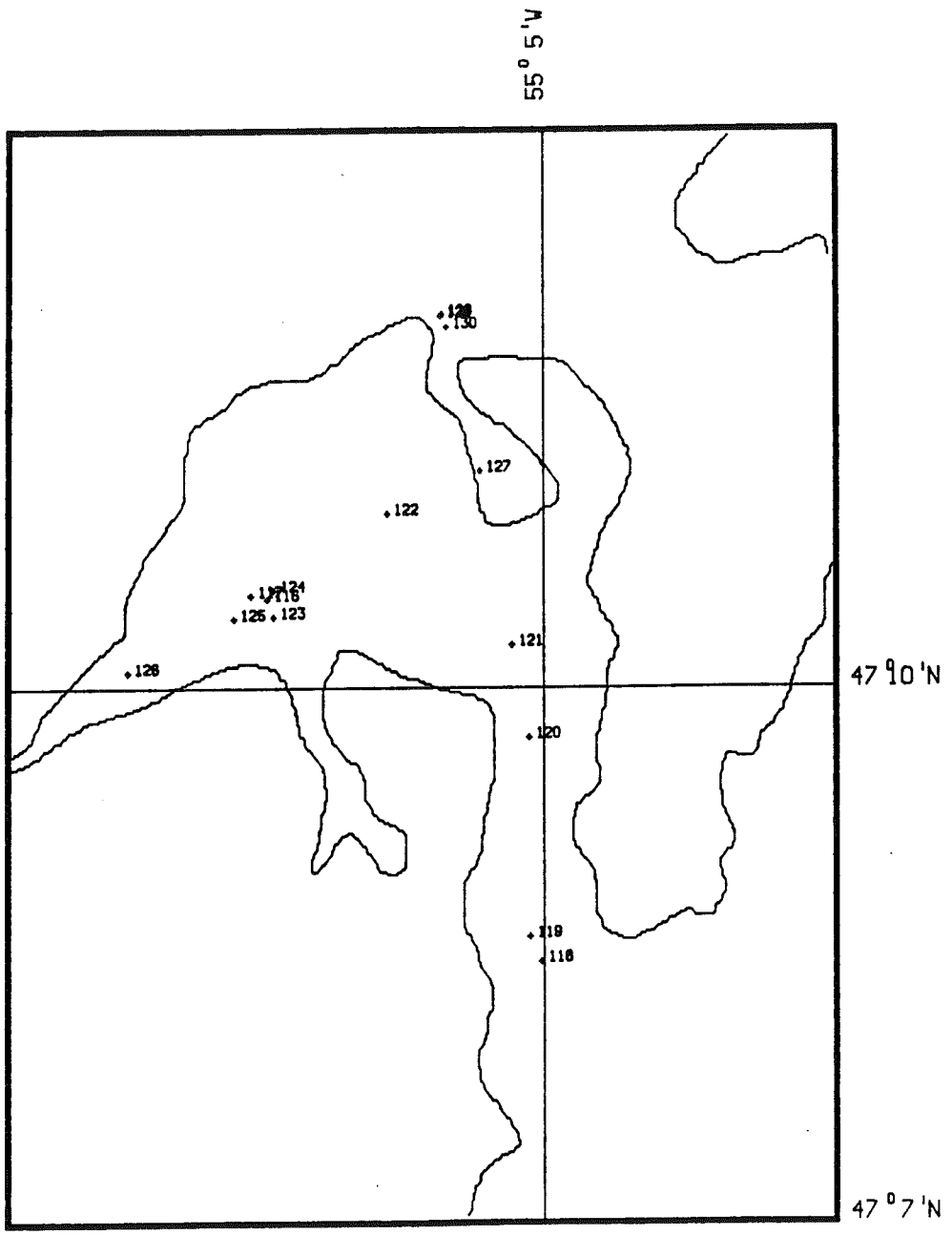

Figure 18: Sample locations, Mortier Bay area. Note the obvious displacement of the shoreline on this and all other maps. This is caused by the use of a large-scale computer shoreline file.

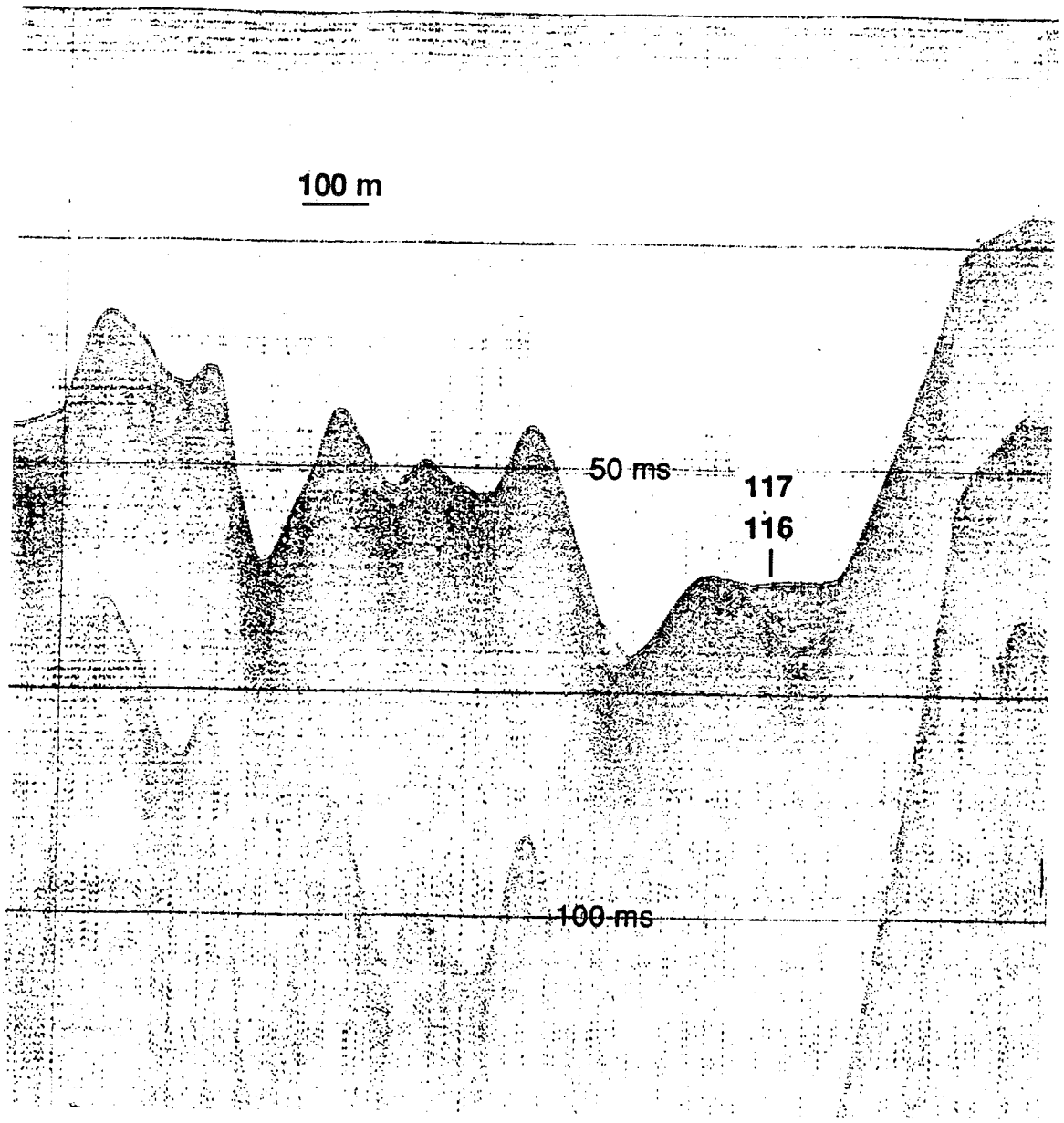

Figure 19: Seistec profile showing locations of cores 116 and 117 in Mortier Bay.

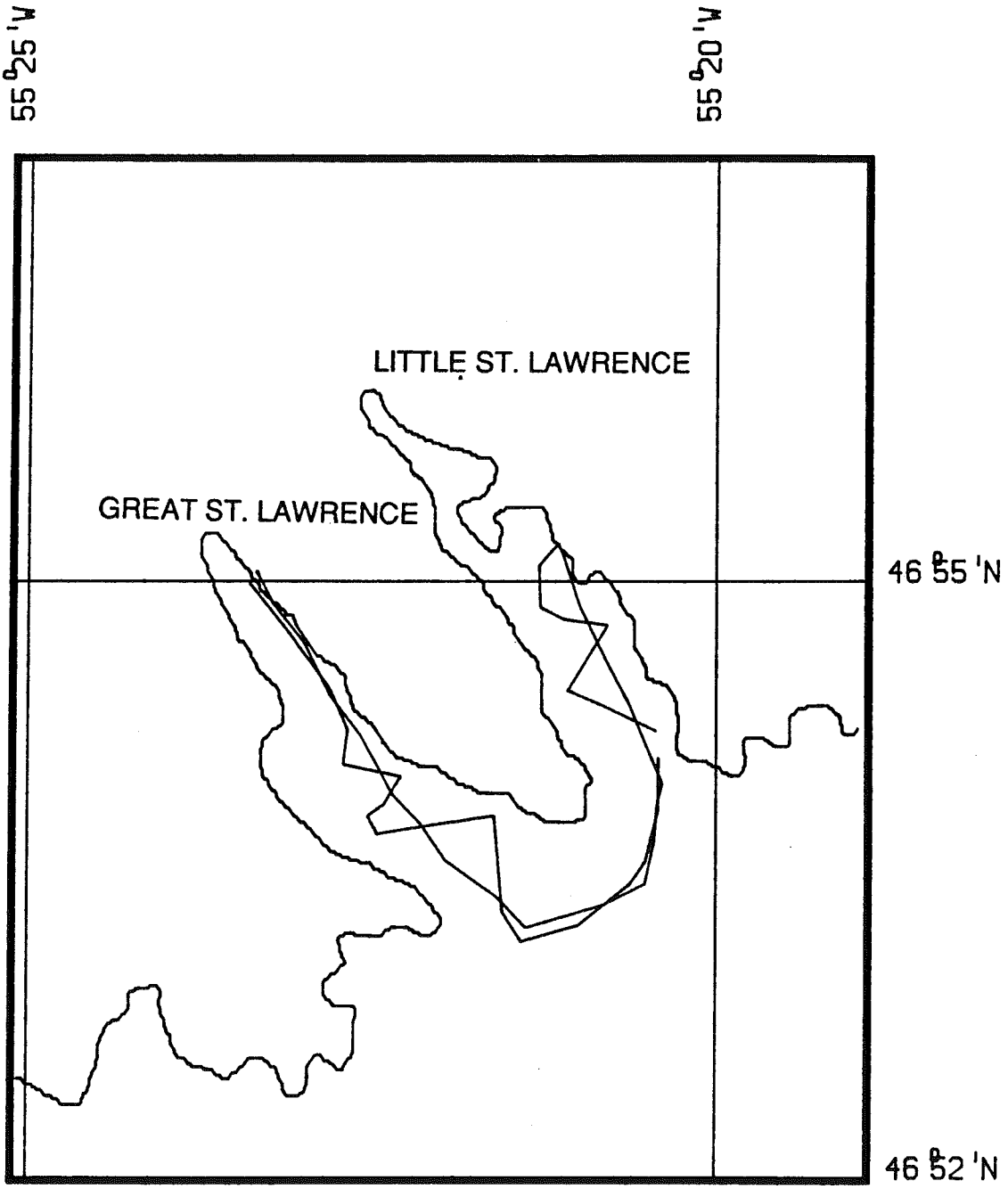

Figure 20: Track plot, Great St. Lawrence Harbour and Little St. Lawrence Harbour.

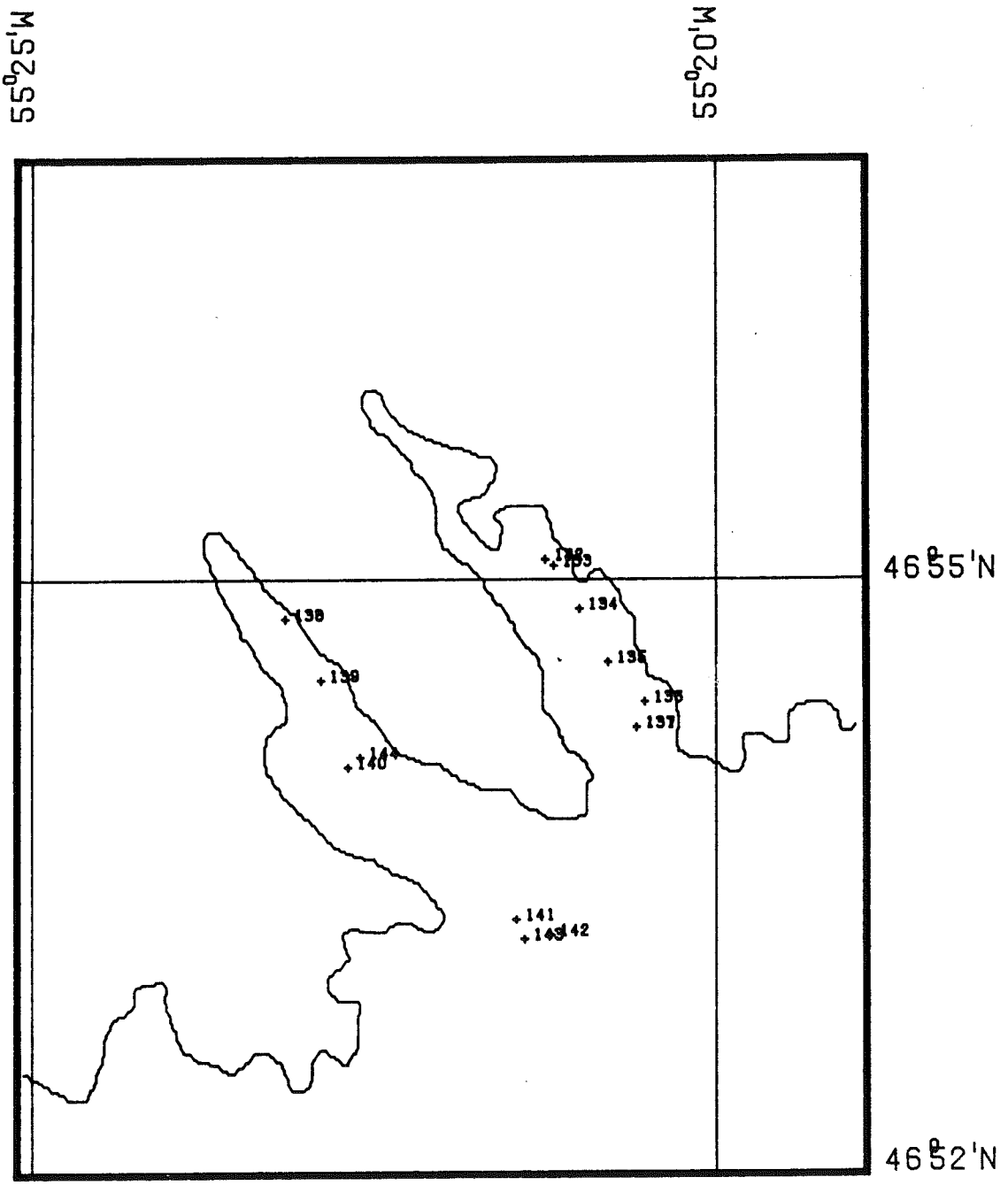

Figure 21: Sample locations, Great St. Lawrence Harbour and Little St. Lawrence Harbour.

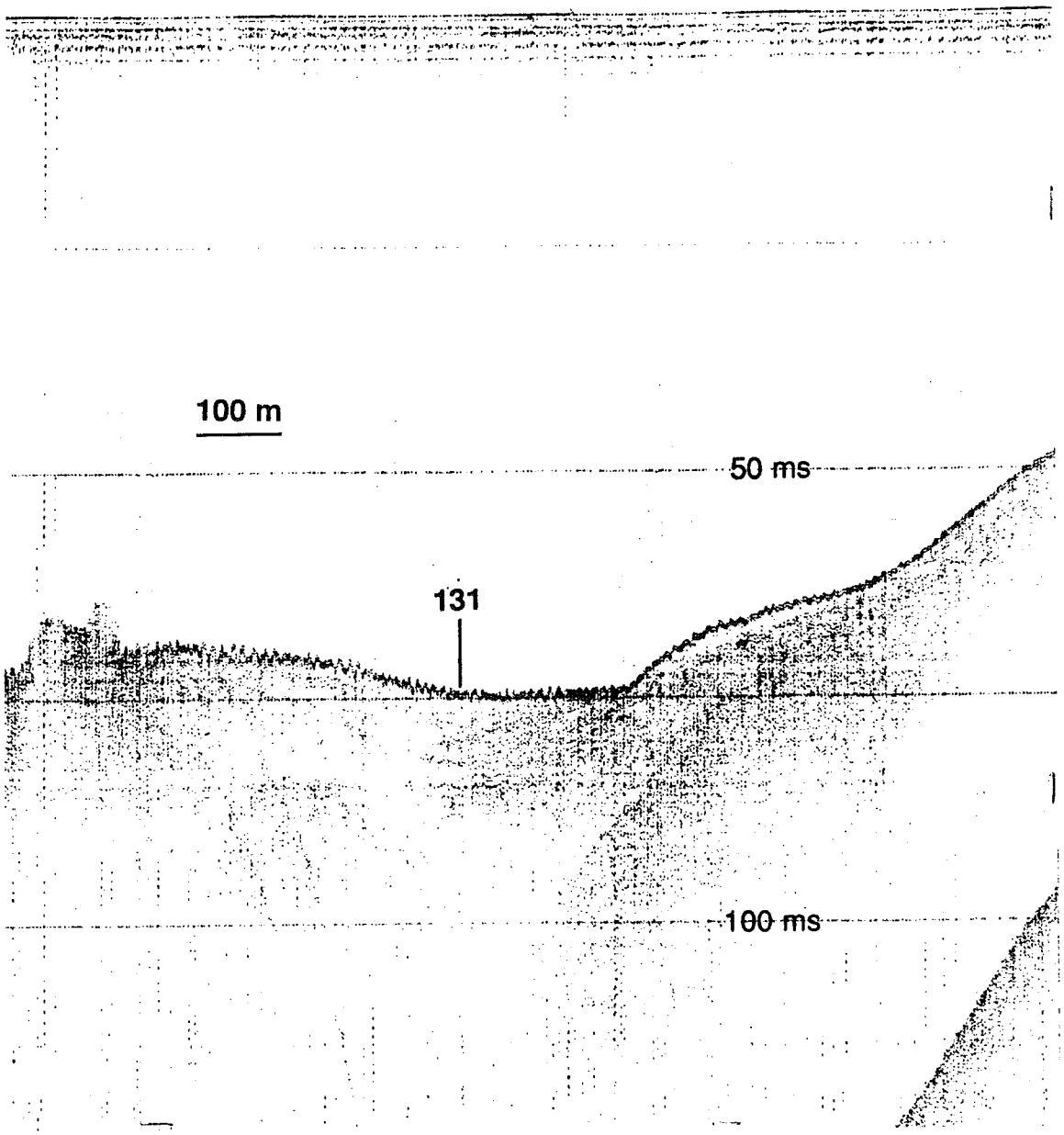

Figure 22: Seistec profile showing approximate location of core 131, Little St. Lawrence Harbour.

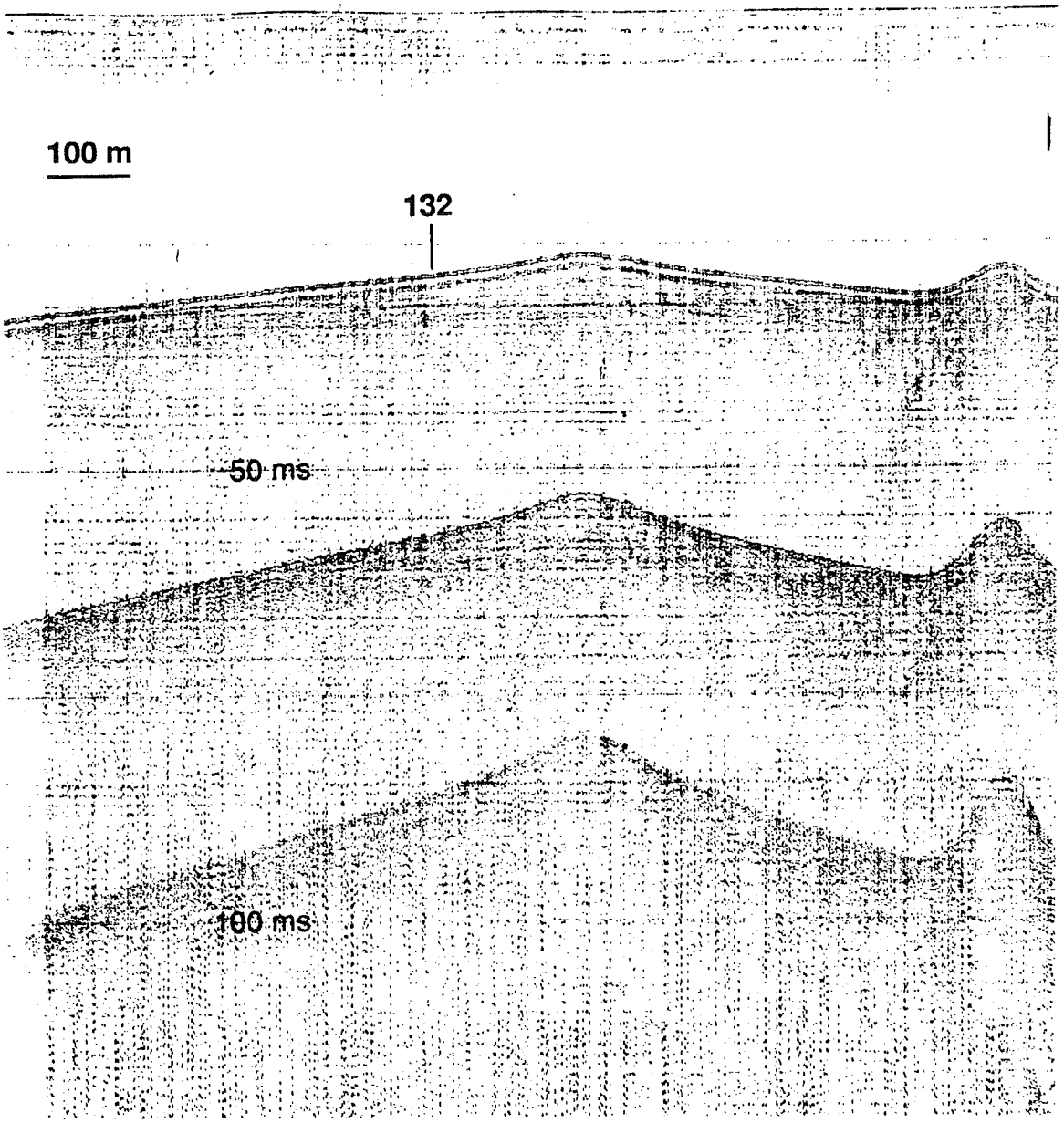

Figure 23: Seistec profile showing approximate location of core 132 in Little St. Lawrence Harbour.

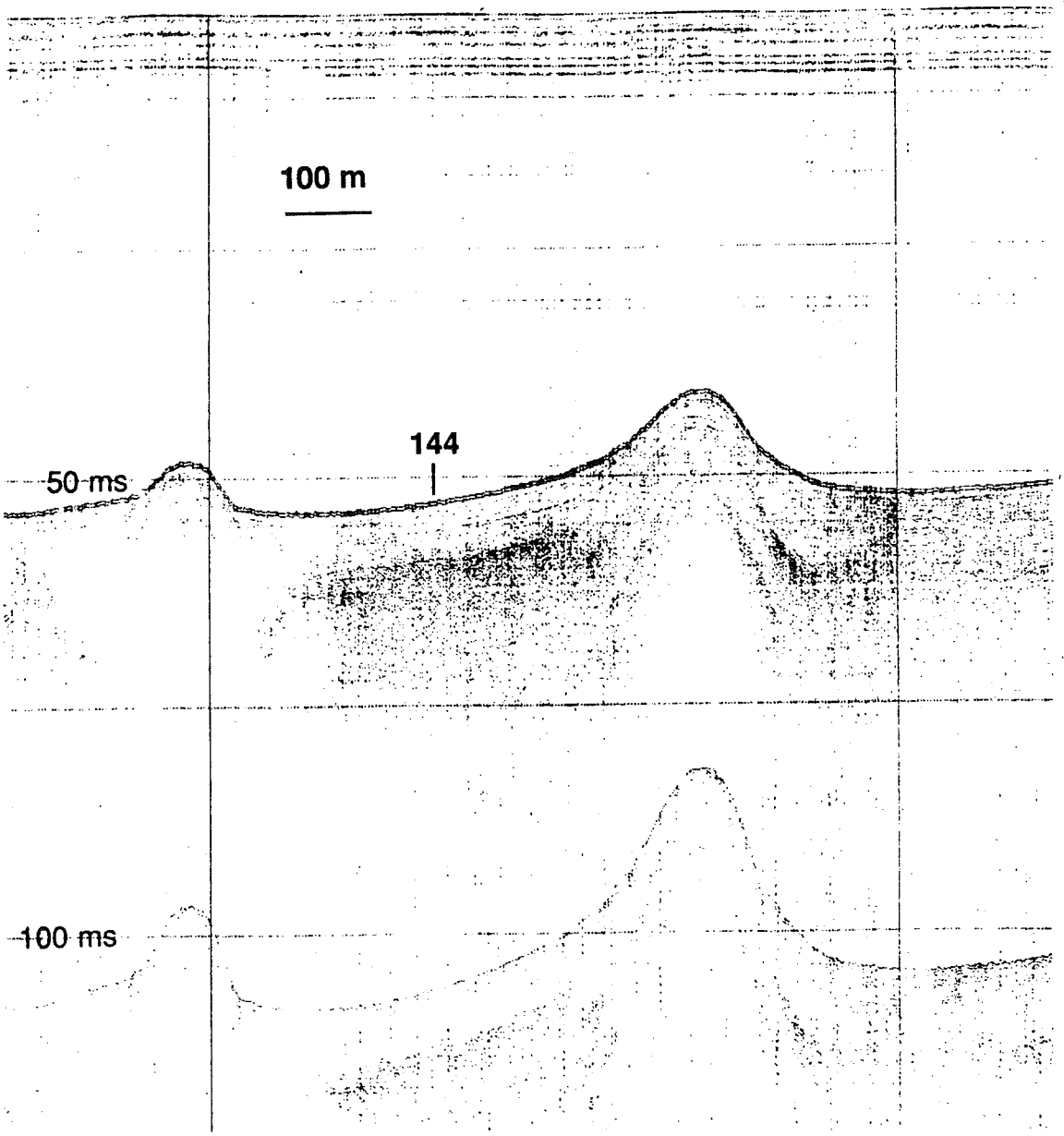

Figure 24: Seistec profile showing location of core 144 in Great St. Lawrence Harbour.