MARINE GEOLOGICAL SURVEYS IN THE NEARSHORE OF NORTHEAST NEWFOUNDLAND: WHITE BAY, BAIE VERTE, GREEN BAY AND HALLS BAY.

Report on Final Phase of Hudson Cruise 90-013.

J. Shaw and B. Wile

Geological Survey of Canada
Commission géologique du Canada

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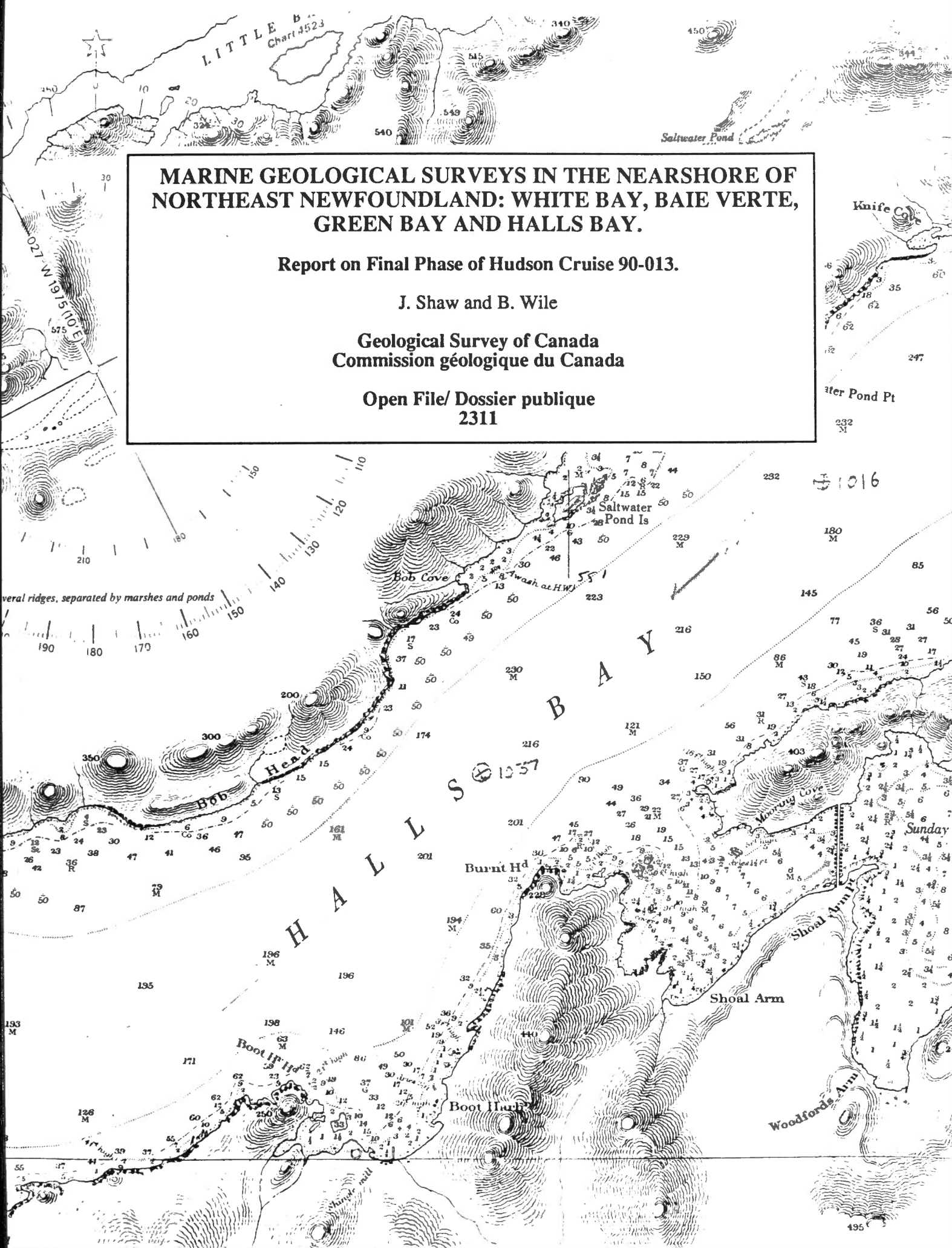

Bedford Institute of Oceanography
Institut océanographique de Bedford

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B2Y 4A2, Canada

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GENERAL INFORMATION

Cruise:	Hudson 90-013 (final phase)
Dates:	14-22 June 1990
Area of operations:	White Bay, Baie Verte, Green Bay, Halls Bay and adjacent parts of the northeast Newfoundland inner shelf.
Agency:	Geological Survey of Canada Atlantic Geoscience Centre Bedford Institute of Oceanography Dartmouth, Nova Scotia
Master:	L. Strum
Senior Scientist:	C. Hillaire-Marcel
Asst. Sr. Scientist:	J. Shaw
Staff:	R. Murphy (AGC) technician M. Gorveatt (AGC) technician F. Jodrey (AGC) technician P. Girouard (AGC) technician C. Brown (AGC) technician D. Frobel (AGC) technician G. Standen (Seastar Ltd.) Huntec operator P. Giles (McMaster University) student B. Jensen (The National Forest and Nature Agency, Denmark) scientist S. Solomon (C-CORE) scientist P. Simpkin (IKB Technologies Ltd.) D. Howse (Marine Institute, St. John's)

INTRODUCTION

This is a report on the objectives and accomplishments of the final phase of Hudson cruise 90-013. A previous report prepared by Senior Scientist C. Hillaire-Marcel (1990) includes a summary of AGC activities. J. Shaw supervised the AGC program during the final phase of the cruise. S. Solomon participated as an AGC contractor representing C-CORE (Centre for Cold Ocean Resources Engineering, Memorial University of Newfoundland). P. Simpkin and D. Howse tested software as part of a contract with AGC to develop a replacement for the Acoustic Reflectivity Unit, part of the Huntec Deep-Tow seismic reflection system.

OBJECTIVES

The main objective of the last phase of cruise 90-013 was to collect cores, seabed samples and geophysical data, including high- resolution seismic reflection data, from the inner shelf off northeast Newfoundland, in an area extending from White Bay to Hamilton Sound (Fig. 1). These data are essential for assessment of the marine placer potential of the region. Under the terms of a contract with AGC, C-CORE provided advice on the selection of target areas.

It was intended that the survey would extend offshore to link with areas of previous high-resolution coverage (Haworth, 1975, 1978; Dale and Haworth, 1979), thus providing a regional understanding of the Quaternary geology. It was expected that the results obtained from the Hudson cruise would provide a basis for a follow-up cruise by C.S.S. Navicula in July/August 1990.

SUMMARY OF ACCOMPLISHMENTS

Seven days were allotted for the final phase of the cruise, including two days transit from Newfoundland to Nova Scotia. This total was reduced to six when the vessel was assigned to search and rescue duties. Consequently, the Hudson did not go to the Hamilton Sound region, so investigations were concentrated in the western part of the study area. Enclosure 1 shows the survey tracks along which acoustic data were collected. Enclosure 2 shows tracks within Baie Verte only.

Data were collected using a 12 kHz ship's echo sounder, a Huntec Deep-Tow high-resolution seismic reflection system (internal and external hydrophones), and a sleeve-gun seismic reflection system (NSRF 25 ft and SE 100 ft eels). When Huntec became inoperative due to technical problems, 3.5 kHz profiles were obtained. Both systems were not operated simultaneously because of mutual interference. Experiments with collection of 3.5 kHz data while the vessel was in transit and at high speed (13.5 kts) were undertaken. A record was collected along the ship's track from the Strait of Belle Isle to the vicinity of Port au Port Peninsula (Figure 2). This record, obtained under calm sea conditions, is of high quality. Because of equipment difficulties, sidescan sonograms were only collected on the first traverse into Baie Verte.

A total of 36 samples was collected, comprising 5 gravity cores, 3 IKU grab samples, and 28 van Veen grab samples (Tables 1 to 4). Enclosure 3 gives sample locations. Locations of samples within Baie Verte only are shown on Enclosure 2.

A number of samples were washed and concentrated on board the vessel. Samples of heavy-mineral concentrate and splits of whole

samples were analyzed by fire assay. Splits of whole samples were analyzed for major and trace-element geochemistry using lithium borohydrate fusion followed by ICP-MS. The results of geochemical analyses and gold assays are contained in a report by Shaw et al. (1990).

PRELIMINARY SCIENTIFIC RESULTS

The data collected during cruise 90-013 is limited in its coverage, although of good quality. This interpretation is, therefore, of a preliminary nature. A more comprehensive understanding of the Quaternary sediments and seabed characteristics of the region is likely to result from the interpretation of this data together with that subsequently collected during cruise Navicula 90-035 (Shaw, Beaver and Wile, in prep.). This additional data includes shallow seismic reflection profiles, sidescan sonograms, grab samples, bottom photographs, and gravity cores.

Acoustic stratigraphy

On the basis of acoustic attributes, such as presence or absence of coherent reflections, reflection intensities, spacing and structural relationships, four principal acoustic units are initially identified within the Quaternary sequence in the region. These are:

Unit 1 This unit is stratigraphically lowest, and is characterized by a high-intensity surface reflection. It appears acoustically opaque on Huntec DTS profiles, with occasional weak internal reflections close to the upper surface. On sleeve-gun profiles it has a structural style of high intensity, dipping, anticlinal and synclinal reflections. Unit 1 is interpreted as bedrock.

Unit 2 Incoherent reflections, moderately dense, with an opaque tone, are typical of this unit. Occasionally, two or more layers of this acoustic character are present, separated by moderate intensity reflections. The upper bounding surface is hummocky and irregular. The unit invariably overlies unit 1. Off the east coast of Baie Verte Peninsula it occurs in a bank bodies many kilometres long and several kilometres wide. It is usually overlain by unit 3. Unit 2 is interpreted as glacial diamict or till.

Unit 3 This unit contains moderate- to high-intensity continuous coherent reflections, highly conformable to the underlying terrain of units 1 and 2. Most sections of unit 3 are 10-20 m in thickness. It has a strong upper bounding reflection. Unit 3 is interpreted as glaciomarine sediment, mainly mud or silty mud with

sandy layers.

In fiords such as Green Bay and Halls Bay, unit 3 is of greater thickness, and exhibits greater variability in acoustic character with depth. In addition to intervals of continuous coherent reflections of variable intensity, acoustically transparent intervals up to 20 m in thickness occur.

Unit 4 This unit is highest in the stratigraphic succession. Typically it overlies unit 3 (glaciomarine). It is well stratified but differs from unit 3 in that the reflections are of low intensity, giving the unit an acoustically transparent character. It occurs mainly in seabed depressions in a ponded style. Cores and grab samples from this unit indicate that it is mud. Occasional point source reflections are interpreted as ice-rafted boulders. Unit 4 is interpreted as postglacial mud.

Distribution and lithology of acoustic units

Baie Verte The inner part of Baie Verte contains only a thin (several metres) veneer of Quaternary sediment overlying bedrock. The outer bay contains an elongated, narrow body of stratified sediment (units 3 and 4), confined between steep bedrock walls. Close to the south coast of the outer bay, sediment is either thin or absent, and much of the seabed is bedrock with a rough surface. This zone was previously thought to possess the highest potential for placer gold, since it lies immediately offshore from an area with the greatest concentration of showings.

The material in grab samples from within Baie Verte (Enclosure 2) is highly variable. Samples from the inner bay typically comprise mixtures of gravel and mud, except samples from relatively deep locations, for example, numbers 39 and 45, where ponded muddy sediments occur.

In the outer bay, grab samples from the deep basins (numbers 44, 45, 46 and 48) are mainly mud, with little or no coarse clastic material. However, at locations close to shore, these sediments are much coarser. The IKU sampler would not collect samples on the hard bottom in the vicinity of samples 47 and 49. IKU sample 48 was predominantly coarse gravel encrusted with the coraline algae *Lithothamnion*.

Inner shelf north of Baie Verte Peninsula Much of the area offshore from the north coast of the Baie Verte Peninsula, between the mainland and the Horse Islands, is devoid of Quaternary sediment cover, or has several metres cover at most. In places up to 5 m of unit 3 (glaciomarine) is overlain by a maximum of 5 m of unit 4 (postglacial mud). However, in water depth shallower than about 180 m, the sediment cover is discontinuous, with no internal

reflections on seismic reflection profiles. This is interpreted as a zone of modern iceberg scour. Large grounded icebergs were observed in the area during the cruise. Sidescan sonar data obtained subsequently (Shaw et al., in prep.) show iceberg furrows on the seabed in this area, and extensive areas of sand and gravel close to the coast.

Grab samples from this area (68, 69 and 70), in water depths of 193 - 211 m, comprise mixtures of mud and coarse gravel.

White Bay Preliminary interpretation of the data from White Bay confirms the results of the 1975 survey (Haworth, 1975). The bay contains a relatively thick Quaternary sequence. A typical stratigraphy is: 0-10 m unit 2 (till); 10-15 m unit 3 (glaciomarine); 15-35 m unit 4 (postglacial mud). A core which penetrated unit 4 sediments (90-013-035) contained gas, although no gas reflections were observed on the seismic reflection profiles (Fig. 3).

On the east side of White Bay the sediments are much thinner, and there is evidence of seabed truncation of both glaciomarine and postglacial units.

Inner shelf east of Baie verte Peninsula Offshore from the east side of the Baie Verte Peninsula the seabed consists of an irregular rocky plateau, with isolated pockets of stratified sediments. The plateau drops steeply into deeper water. At the foot of the steep slope is a long, narrow bank. It is composed of unit 2 sediments, and contains a prominent internal reflection. This bank is interpreted as a moraine which extends from beyond Gull Island to the Sutherland Bank. It is draped by glaciomarine sediments approximately 10 m thick, with a cover of postglacial mud. Two cores penetrated the till / glaciomarine / postglacial sequence in this area (cores 90-013-051 and 90-013-054) (Figs. 4 and 5).

Grab samples from this region fall into two groups. Samples from the plateau are typically sand or gravel (numbers 53, 57, 58 and 59). The remainder are muddy, with minor amounts of sand.

Green Bay and Halls Bay Considerable thicknesses (over 150 m) of stratified sediment are present in Green Bay and Halls Bay. The acoustically transparent postglacial mud is a few tens of metres thick. The upper part of the glaciomarine sequence is about 20 m thick, and overlies sediments which are also probably glaciomarine, but which display considerable variation in acoustic styles. Acoustically-transparent intervals up to 20 m thick alternate with intervals containing the highly conformable, moderate to high intensity coherent reflections which are definitive of unit 2.

The ship's track extended close to the head of Halls Bay, adjacent

to raised marine deltas believed to date to ca. 12 ka BP (Tucker, 1974). The postglacial sediment is only a few metres and the underlying glaciomarine sediments are highly contorted, probably as a result of slumping. Core 90-103-063 (Fig. 6) penetrated these sediments.

CRUISE ITINERARY

Thursday 14 June, day 165

AGC personnel departed Dartmouth on 17:55 flight to Gander, Nfld.

Friday 15 June, day 166

C.S.S. Hudson on search and rescue standby in Goose Bay. AGC personnel wait in Gander. Shaw and Solomon revise cruise plan.

Saturday 16 June, day 167

Personnel depart Gander 05:00 local time, arrive at Lewisporte 06:00. Launch from Hudson arrives at wharf at about 07.30 with participants from previous parts of the cruise. Personnel board Hudson by about 08.00 and vessel departs Lewisporte shortly after. The crew are informed of cruise plan. Staff participate in lifeboat drill and safety meeting, followed by a short briefing on cruise objectives by Shaw.

Begin streaming geophysical survey equipmentg northeast of Baie Verte in the afternoon, running a line into the bay. Huntec data starts at about 17:00 (all times from here are UT). Sidescan winch fails shortly after the beginning of data collection. Sidescan is taken aboard. Retrieve gear at 18:35 and sail to head of bay to pick up a crew member who missed the vessel in Lewisporte. Begin streaming gear about 20:00 (Line 20). Head out of the bay and turn west towards White Bay. Chief engineer and AGC staff working on winch problems.

Sunday 17 June, day 168

Pull gear just after 10:38. Take long core (sample 035) which contains gas. Vessel returns to Baie Verte. Commence sampling program with van Veen grab sampler and IKU grab. IKU fails to operate several times, for unknown reasons. Eventually, after oiling, it functions, although samples are poor because of a hard bedrock bottom. The Baie Verte samples are numbered 36 to 49.

Depart Baie Verte in evening and move to a waypoint southwest of Horse Islands. Begin streaming gear on line 33. Sidescan not deployed because the water is too deep and there is uncertainty concerning the erratic functioning of the winch.

Monday 18 June, day 169

During the night continue streaming gear in a pattern around the Baie Verte Peninsula, ending about 13:15, at the end of line 42. Retrieve gear and commence van Veen sampling and coring off east side of the peninsula. Collect 11 van Veen samples, beginning with sample 50. Collect two long cores (samples 51 and 54). Number 62 is the final grab sample for the day. Towards nightfall the vessel moves to a position at the mouth of the Southwest Arm of Green Bay. Gear is streamed and a long line to the northeast is commenced (line 42).

Tuesday 19 June, day 170

Continue on survey lines, turning at a waypoint off Cape St. John and heading to the southwest. Turn south into Halls Bay where the lines end at the head of the bay at about 14:40. Commence coring operation (sample 64) at approximately 15:40. Vessel heads north to collect a grab sample (64), a core (65), and two grab samples in Green Bay (66 and 67). Steam to a position south of Horse Island and begin collection of the last three grab samples of the cruise (68, 69 and 70), finishing at 02:15 on day 171. Hudson begins homeward voyage via the Strait of Belle Isle.

Wednesday 20 June, day 171

En route to BIO. The 3.5 kHz system is switched on at 10:59 UT in the strait while the vessel is doing 13.5 kts in fine weather.

Thursday 21 June, day 172

3.5 kHz is switched off at 04:40 UT. Hudson en route to BIO, passing through Cabot Strait to reach vicinity of Canso by evening.

Friday 22 June, day 173

Hudson arrives BIO wharf at about 08:00 local time.

TECHNICAL SUMMARY

Data Acquisition

Data were collected with the following systems:

Huntec high-resolution Deep Tow Seismic System (DTS). This utilized a 540 joule power source. The EPC 4100 recorded the internal hydrophone, and EPC 4603 the external hydrophone. Data display was at 250 ms sweep and the firing rate was 750 ms. The data were recorded on a Teac VHS tape recorder. Channel 4 recorded the internal hydrophone (LC 10), channel 5 the trigger/synchronization, and channel 6 the external hydrophone (10/15 streamer).

40 in^3 sleeve-gun with NSRF 25 ft and SE 100 ft eels.

3.5 kHz hull-mounted sounder, used when Huntec was inoperative.

12 kHz hull-mounted sounder

Klein sidescan sonar

van Veen grab sampler

IKU grab sampler, deployed from a hydraulic crane

The AGC Long Corer, a gravity coring system comprising up to 10 barrels, each 10 ft in length.

Loran-C derived co-ordinates of the vessel's tracks were logged at one minute intervals. The co-ordinates of sample locations are derived from Loran-C.

Equipment problems

There were several problems with the Huntec DTS during the cruise. On 19 June at 0203 UT the fish was taken apart after the leak alarm sounded. There was no sign of water in the pressure housings. At 0955 UT the fish was raised due to the possibility of contact with fishing gear. The system was brought on board after sounding of the leak alarm and an accumulation of moisture in the deck connector box was removed. Examination of the winch showed that the deck cable had been caught in the winch slip ring pin. The outer insulation was damaged and shorting had occurred. Temporary repairs were effected by splicing in a length of cable and the system was redeployed. When Huntec was inoperative the 3.5 kHz ship's sounder was used, and provided good quality profiles.

Problems were encountered when the Markay winch was used to deploy

the sidescan fish. After deploying the sidescan fish to approximately 100 m depth on day 167, the winch would not respond to the in/out control. The swivel base still worked, indicating that hydraulic pressure was available to the winch. There was a shorting hose from Xa to Xb of the control lever where it fed the control valve for forward and reverse. When the shorting hose was removed and the two fittings on the control valve were capped, the winch seemed to work.

After about 15 minutes of data collection the port side of the sidescan did not appear to be working. The fish was recovered and the port channel checked for operation. It appeared to be functional so the fish was deployed again.

During payout the fish was caught by a loop on the sidescan cable. The winch was reversed but did not work. On the third attempt to pull in cable the winch begun pulling in cable at full speed and brought the fish right into the block. It continued to pull until the pumping unit was turned off. It was decided that the winch would not be used until all the control valves were checked. The Chief Engineer on board agreed to check the valves on the winch for proper operation. The winch was not used for the remainder of the cruise.

Navigation

The ship's location, based on Loran-C, was logged at one minute intervals. It is believed that these are true positions, relative to latitude and longitude. However, difficulty may be experienced in reconciling these positions with the coastline as it appears on some of hydrographic charts. Most of the hydrographic charts currently available for northeast Newfoundland are old, in some casesdating back to the 1870's. When a comparison is made between these charts and NTS sheets, it is evident that latitudes and longitudes on the hydrographic charts are incorrectly positioned relative to coastal outlines. Co-ordinates plotted on one of these charts will be incorrectly positioned relative to the coastline.

For example, a comparison between chart 4592 (Little Bay Island to League Rock) and NTS sheet 2E/12 shows major discrepancies. In the vicinity of Oil Island, 55° 45' W on the hydrographic chart is ~0.5 km farther west than on the NTS sheet. Latitude shows a lesser error. For example, on the west coast of Pilley's Island, 49° 32' N is ~150 m farther south than on the NTS map.

Chart 4585 (Green Head to Little Bay Island) shows similar discrepancies. At Jackson's Cove, in Green Bay, 56° 00' W is located 0.5 km west of its position on NTS 12H/9. Just across the bay, at Young Head, near Smith's Harbour, latitude 49° 44' N on the chart is ~0.15 km south of its position on NTS 2E/12.

On chart 4591 (Pilley's Island Harbour/Halls Bay and Sunday Cove), longitude 56° 04' W is ~0.15 km west of that longitude on NTS 12/8. Latitude 49° 29' N is ~0.1 km north of its NTS position.

Chart 4520 is the only chart available for much of the coast of the Baie Verte Peninsula. In the Baie Verte region, longitude 56° 00' W on the NTS sheet runs down the middle of the Ming's Bight, but on the hydrographic chart it is located 2.1 km westward, running through the peninsula between Ming's Bight and Baie Verte. The displacement of latitude appears to be negligible.

More modern charts are accurate and reconcile well with the NTS sheets. This applies to charts 4521 (Baie Verte), and 4522 (Tilt Cove and La Scie Harbour).

LIST OF CHARTS

4520 Orange Bay to Cape Bonavista, Scale 1:286,000 at Lat.49° 40'. Edition 4, 24th January 1986. Note that longitudes are incorrect on this chart, particularly in the Baie Verte area.

4521 Baie Verte. Scale 1:25,000. Edition 20, 15th May 1987. Longitudes on this chart differ from those on chart 4520.

4522 Approaches to Tilt Cove and La Scie Harbour (various scales). Edition 37, 11th September 1987.

4591 Halls Bay and Sunday Cove. Scale 1:37,400. Edition 35, 28th August 1987.

4592 Little Bay Island to League Rock. Scale 1:24,400. Edition 25, 24th June 1983.

ACKNOWLEDGEMENTS

The positive attitude and excellent cooperation of the Master, officers, and crew of C.S S. Hudson were much appreciated. M. Gorveatt and F. Jodrey gave vital technical support, and exceptionally valuable assistance was rendered by R. Murphy. The smooth running of the cruise was also assisted by the contributions of P. Girouard, G. Standen, B. Jensen, D. Frobel, C. Brown, S. Solomon, and P. Giles. The descriptions of problems with technical systems are based on reports by G. Standen (Huntec) and B. Wile (AGC).

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Shaw, J., Beaver, D. and Wile, B. in prep. Navicula operations in northeast Newfoundland coastal waters: Hamilton Sound, Baie Verte, La Scie, Halls Bay, Little Bay, Sunday Cove Island. Geological Survey of Canada Open File Report.

Shaw, J., Solomon, S.M., Emory-Moore, M., Forbes, D. L. and Proudfoot, D.N. 1990 Geochemical data and gold assays for seabed samples from inner-shelf sites off northeast Newfoundland. Geological Survey of Canada, Open File Report 2294.

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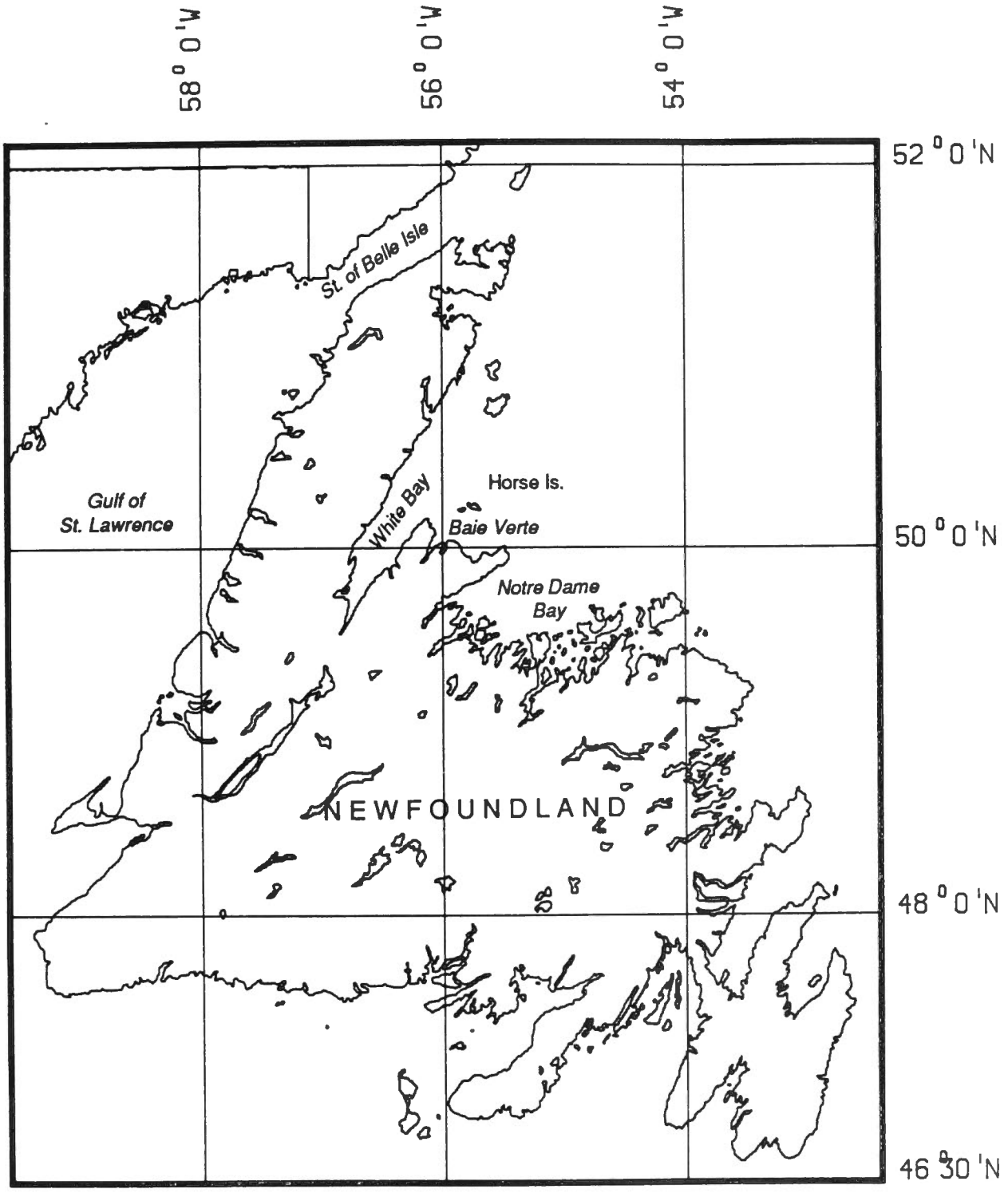

FIGURE 1. Location map.

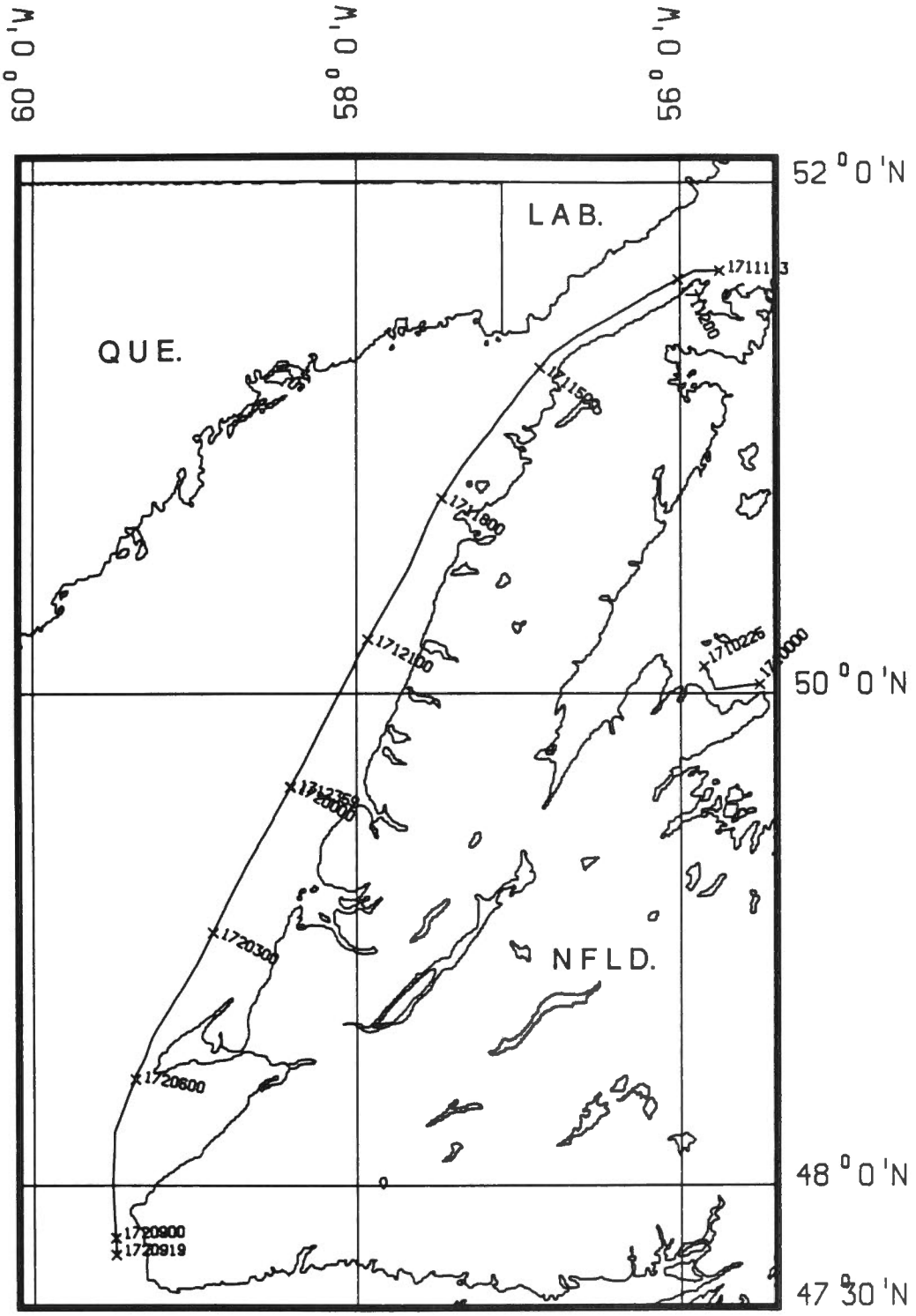

FIGURE 2. Ship's tracks during collection of 3.5 kHz data on the homeward voyage.

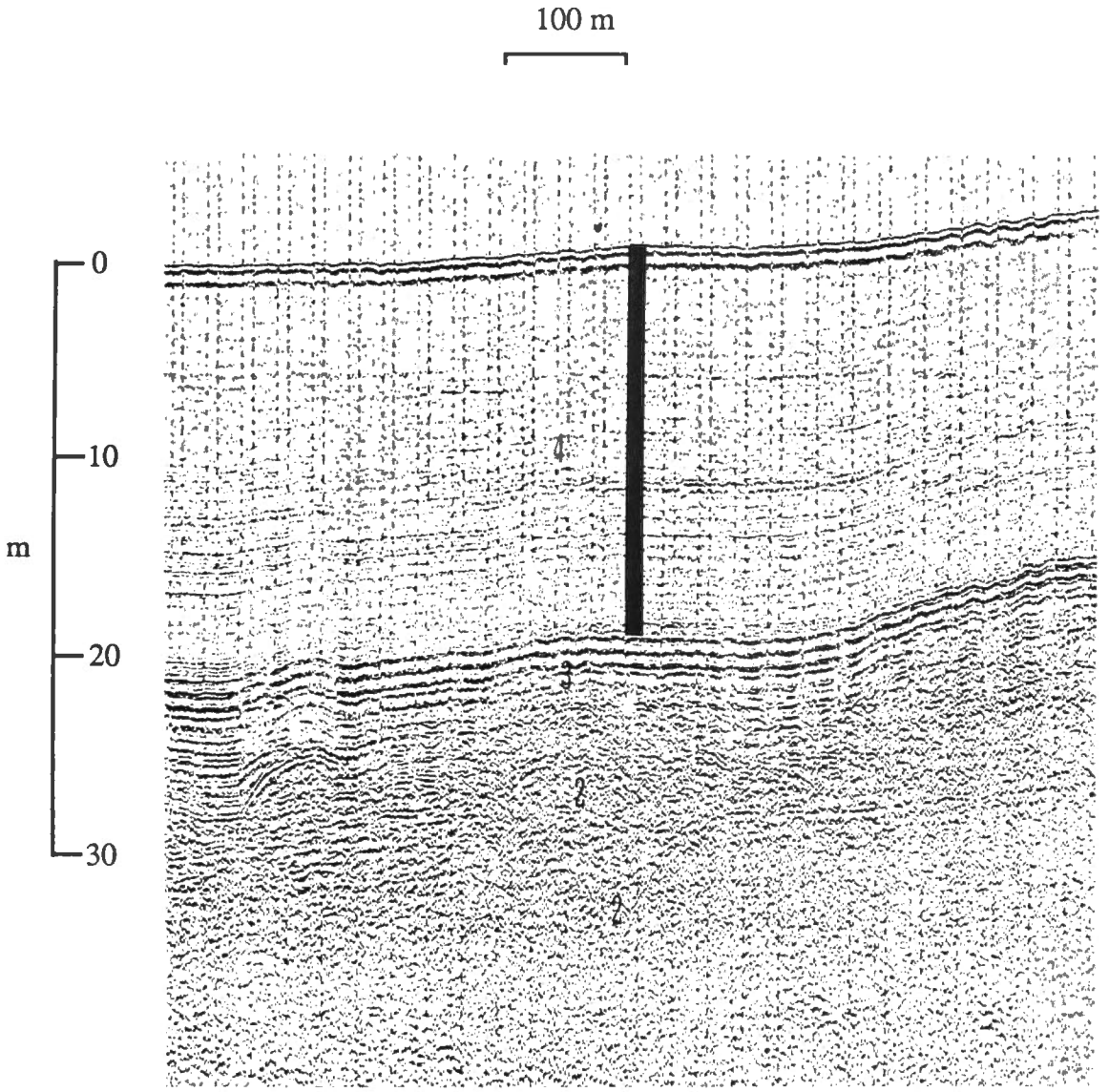

FIGURE 3. Huntec DTS profile at the site of core 90-013-035 in White Bay, seismic day /time 168 0930. Seismostratigraphic units are numbered. The corer penetrated postglacial mud (unit 4), and appears to have terminated at the upper surface of unit 3 (glaciomarine). Unit 3 at his location overlies a relatively thick (approx. 25 m) deposit of unit 2 (till).

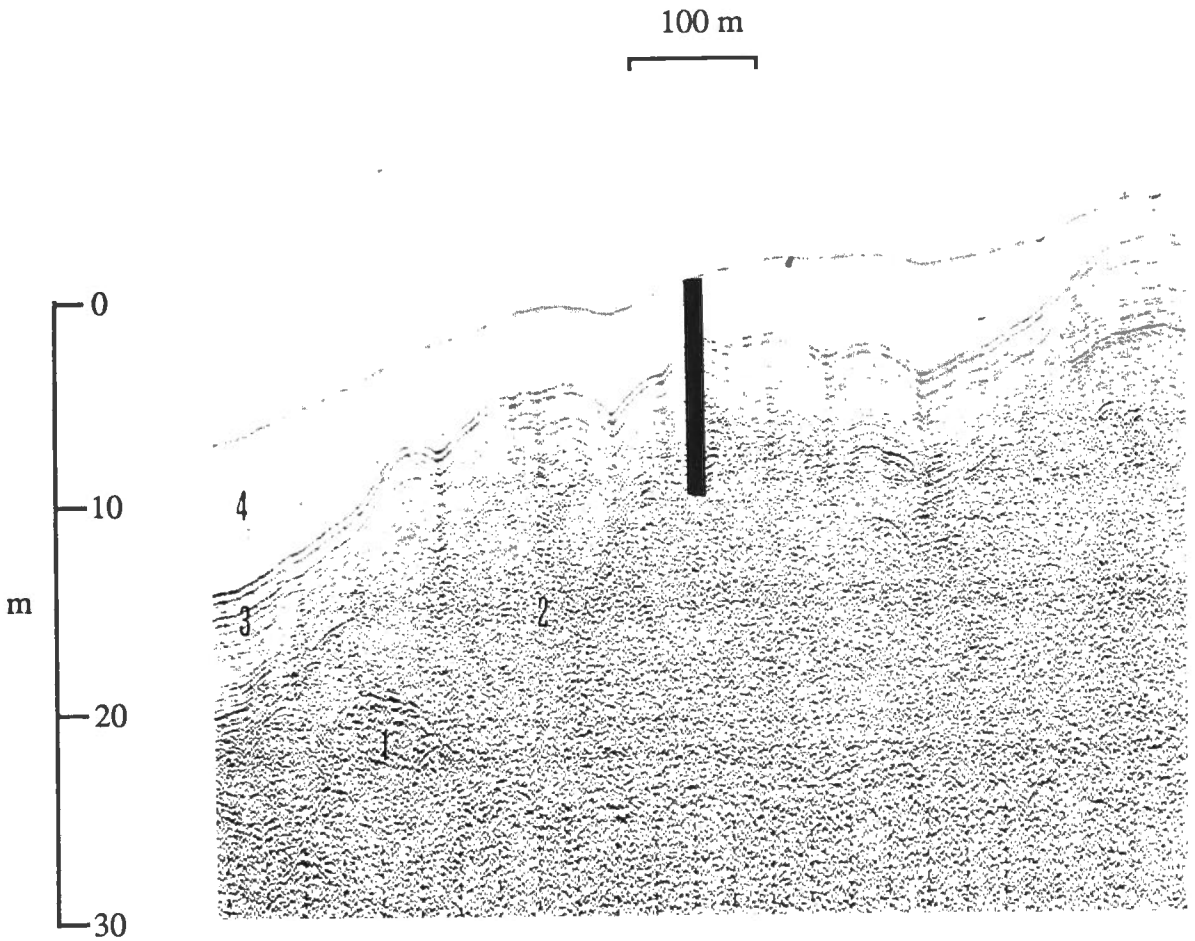

FIGURE 4. Huntec DTS profile at the site of core 90-013-051 in Notre Dame Bay, seismic day /time 169 1030. The corer penetrated units 4 and 3, and terminated close to the top of unit 2. The unit 2 sediments here are part of a bank located offshore from the east coast of the Baie Verte Peninsula.

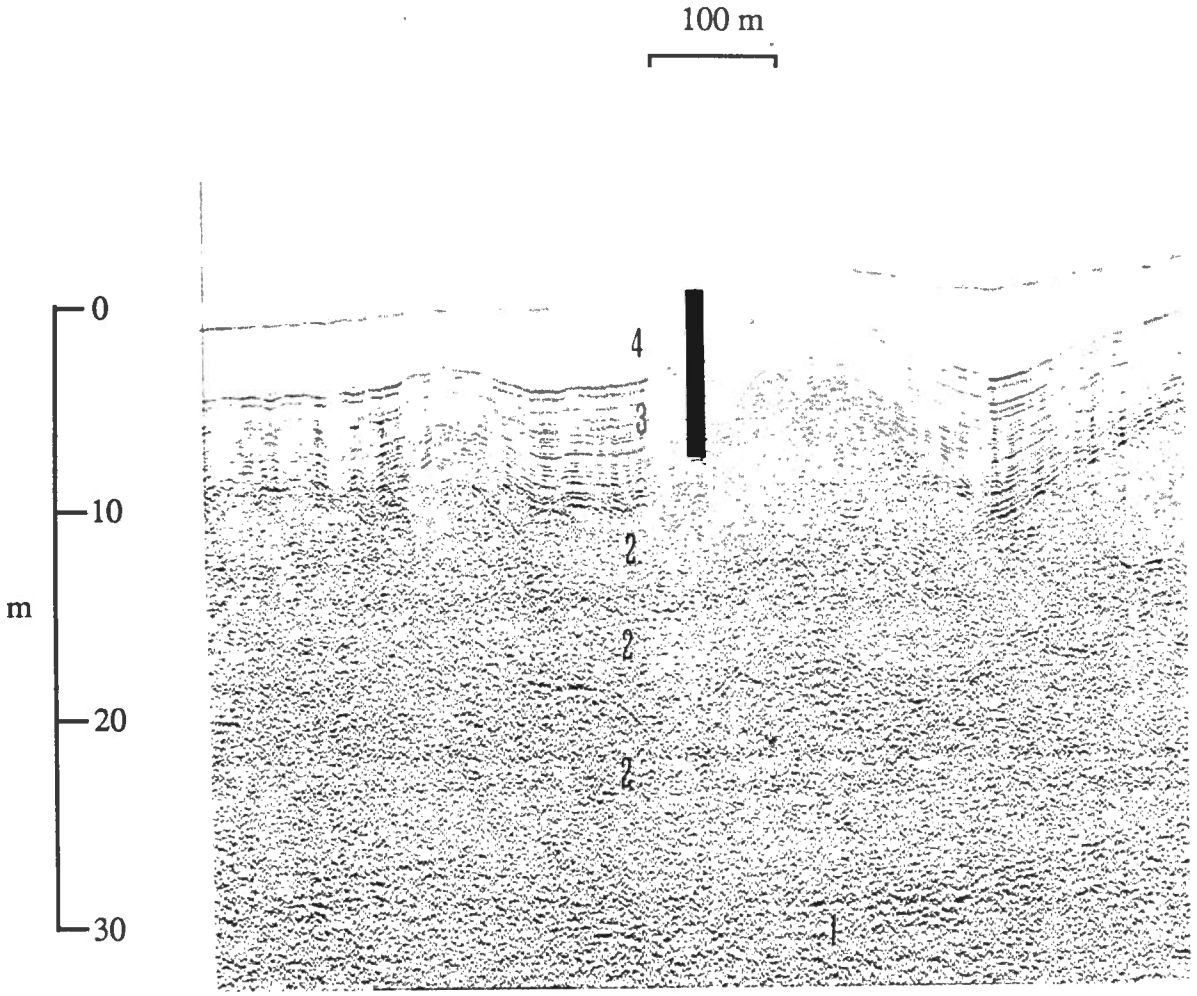

FIGURE 5. Huntec DTS profile at the site of core 90-013-054 in Notre Dame Bay, seismic day /time 169 0842. This corer penetrated units 4 and 3, and terminated at the top of unit 2. This site is on top of the bank of unit 2 sediments east of the Baie Verte Peninsula.

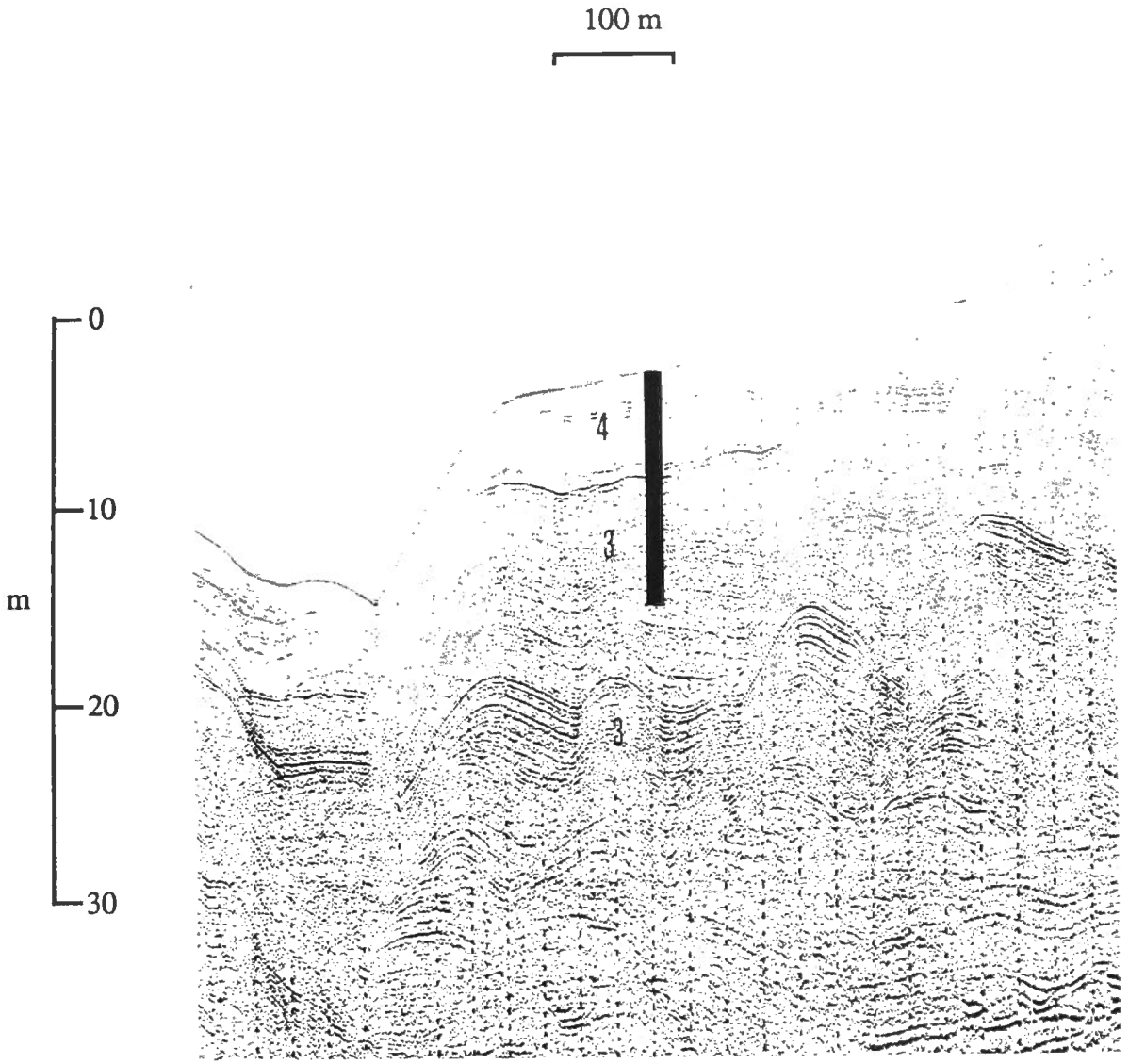

FIGURE 6. Huntec DTS profile at the site of core 90-013-063 in Halls Bay, seismic day /time 170 1422. The corer penetrated a thin interval of unit 4 sediments and terminated in a facies of unit 3. The site is close to one of the raised marine deltas in Halls Bay (Tucker, 1974).

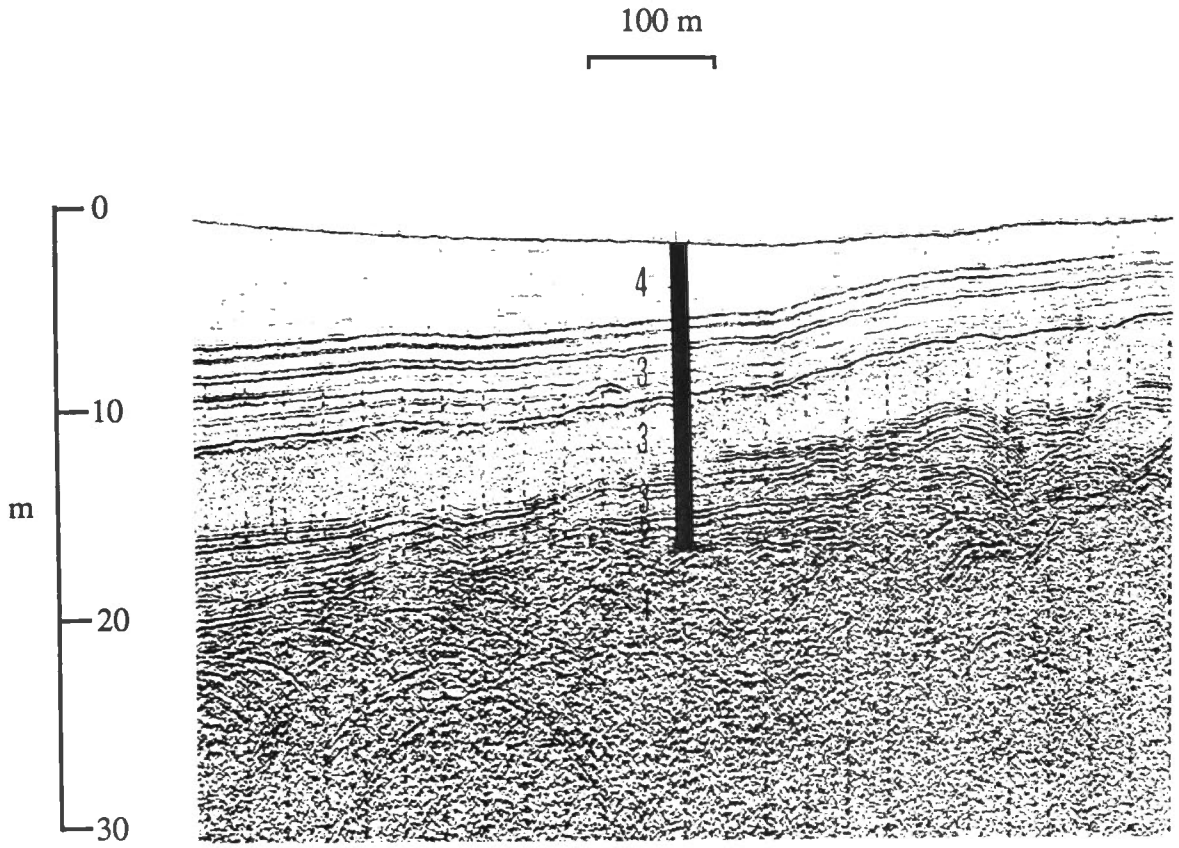

FIGURE 7. Huntec DTS profile at the site of core 90-013-064 in Notre Dame Bay, seismic day /time 170 0907. The core intersects unit 4, then an interval of unit 3 which contains a strong point reflection. It then intersects an acoustically transparent interval within unit 3. This interval pinches out to the left in this figure. The core then penetrates sediments with acoustic characteristics more typical of unit 3 and terminates in a thin layer of unit 2 overlying bedrock (unit 1).

ATLANTIC GEOSCIENCE CENTRE
OATH SECTION
WINS- REPORTING PACKAGE

TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
035	CORE	1681200	50 07.90N	56 24.21W	362	WHITE BAY
035TWC	CORE	1681200	50 07.90N	56 24.21W	362	WHITE BAY
036	GRAB	1681513	49 56.31N	56 10.96W	25	BAIE VERTE
037	GRAB	1681549	49 56.63N	56 09.95W	32	BAIE VERTE
038	GRAB	1681604	49 57.16N	56 09.17W	44	BAIE VERTE
039	GRAB	1681654	49 57.48N	56 09.20W	54	BAIE VERTE
040	GRAB	1681706	49 57.90N	56 09.28W	42	BAIE VERTE
041	GRAB	1681718	49 58.13N	56 08.97W	72	BAIE VERTE
042	IKU	1681744	49 59.61N	56 03.07W	43	BAIE VERTE
043	GRAB	1681806	50 00.48N	56 06.52W	157	BAIE VERTE
044	GRAB	1681840	50 01.00N	56 06.60W	186	BAIE VERTE
045	GRAB	1681900	50 01.55N	56 05.19W	242	BAIE VERTE
046	GRAB	1681932	50 01.42N	56 04.91W	311	BAIE VERTE
047	IKU	1681958	50 01.72N	56 03.52W	51	BAIE VERTE
048	GRAB	1682017	50 02.26N	56 03.31W	228	BAIE VERTE
049	IKU	1682044	50 02.52N	56 01.68W	55	BAIE VERTE
050	GRAB	1691425	49 45.93N	55 38.34W	288	NOTRE DAME BAY
051	CORE	1691507	49 47.96N	55 36.42W	263	NOTRE DAME BAY
051TWC	CORE	1691507	49 47.96N	55 36.42W	263	NOTRE DAME BAY
052	GRAB	1691602	49 49.42N	55 36.05W	228	NOTRE DAME BAY
053	GRAB	1691647	49 51.87N	55 35.25W	98	NOTRE DAME BAY
054	CORE	1691746	49 50.42N	55 28.03W	252	NOTRE DAME BAY
054TWC	CORE	1691746	49 50.42N	55 28.03W	252	NOTRE DAME BAY
055	GRAB	1691835	49 50.48N	55 27.08W	253	NOTRE DAME BAY
056	GRAB	1691905	49 51.25N	55 26.87W	257	NOTRE DAME BAY

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
057	GRAB	1691933	49 53.15N	55 27.59W	147	NOTRE DAME BAY
058	GRAB	1692018	49 54.13N	55 27.12W	97	NOTRE DAME BAY
059	GRAB	1692100	49 51.77N	55 33.71W	150	NOTRE DAME BAY
060	GRAB	1692125	49 51.02N	55 30.45W	227	NOTRE DAME BAY
061	GRAB	1692231	49 47.32N	55 42.76W	275	NOTRE DAME BAY
062	GRAB	1692300	49 48.05N	55 44.77W	229	NOTRE DAME BAY
063	CORE	1701532	49 27.89N	56 04.70W	241	HALLS BAY
063TWC	CORE	1701532	49 27.89N	56 04.70W	241	HALLS BAY
064	CORE	1701947	49 45.84N	55 38.61W	311	MOUTH HALLS BAY
064TWC	CORE	1701947	49 45.84N	55 38.61W	311	MOUTH HALLS BAY
065	GRAB	1701830	49 45.38N	55 39.63W	273	MOUTH HALLS BAY
066	GRAB	1702003	49 45.37N	55 39.76W	277	MOUTH HALLS BAY
067	GRAB	1702025	49 45.88N	55 49.98W	292	GREEN BAY
068	GRAB	1710100	50 01.09N	55 46.02W	193	LA SCIE AREA
069	GRAB	1710132	50 03.39N	55 48.72W	205	LA SCIE AREA
070	GRAB	1710252	50 05.79N	55 50.60W	211	LA SCIE AREA

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TABLE 2

GRAB SAMPLES

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
036	VAN VEEN	1681513	49 56.31N 56 10.96W	25	2	BAIE VERTE	DARK GREY-GREEN SANDY MUD WITH ABUNDANT PEBBLES AND COBBLES.
037	VAN VEEN	1681549	49 56.63N 56 09.95W	32	1	BAIE VERTE	DARK OLIVE GREY VERY GRAVELLY, SANDY MUD.
038	VAN VEEN	1681604	49 57.16N 56 09.17W	44	1	BAIE VERTE	IKU ATTEMPTED 4 TIMES BUT WOULD NOT CLOSE. ONE 2.5 GAL. BUCKET FULL. DARK GREY-GREEN, MUDDY, SANDY GRAVELLY, VERY SOFT.
039	VAN VEEN	1681654	49 57.48N 56 09.20W	54	1	BAIE VERTE	DARK OLIVE GREY MUD WITH ABUNDANT FINE SAND AND A FEW PEBBLES.
040	VAN VEEN	1681706	49 57.90N 56 09.28W	42	1	BAIE VERTE	DARK OLIVE-GREY SANDY MUD WITH COBBLES AND GRANULES.
041	VAN VEEN	1681718	49 58.13N 56 08.97W	72	1	BAIE VERTE	DARK OLIVE GREY, STIFF/PLASTIC MUD WITH TRACES OF SAND, NO COBBLES.
043	VAN VEEN	1681806	50 00.48N 56 06.52W	157	3	BAIE VERTE	ATTEMPT NO. 2 DID NOT TRIP. OLIVE SOFT VERY GRAVELLY MUD/MUDDY GRAVEL WITH SOME SAND.
044	VAN VEEN	1681840	50 01.00N 56 06.60W	186	1	BAIE VERTE	OLIVE GREY STIFF SILTY CLAY.
045	VAN VEEN	1681900	50 01.55N 56 05.19W	242	1	BAIE VERTE	MUD. DARK OLIVE GREY SILTY MUD WITH A FEW PEBBLES.
046	VAN VEEN	1681932	50 01.42N 56 04.91W	311	1	BAIE VERTE	DARK GREY SILTY CLAY, VERY SOFT AND ORGANIC-RICH.
048	VAN VEEN	1682017	50 02.26N 56 03.31W	228	1	BAIE VERTE	OLIVE GREY SANDY MUD, VERY SILTY, STIFF, WITH FEW COBBLES AND GRAVEL.
050	VAN VEEN	1691425	49 45.93N 55 38.34W	288	3	NOTRE DAME BAY	OLIVE GREY SILTY, SANDY CLAY WITH A FEW PEBBLES.
052	VAN VEEN	1691602	49 49.42N 55 36.05W	228	2	NOTRE DAME BAY	OLIVE GREY SANDY MUD WITH COBBLES.
053	VAN VEEN	1691647	49 51.87N 55 35.25W	98	2	NOTRE DAME BAY	OLIVE GREY FINE TO MEDIUM WELL SORTED SAND.
055	VAN VEEN	1691835	49 50.48N 55 27.08W	253	1	NOTRE DAME BAY	GREY-GREEN, STIFF MUD WITH SAND AND GRANULES.
056	VAN VEEN	1691905	49 51.25N 55 26.87W	257	1	NOTRE DAME BAY	OLIVE GREY, STIFF, STICKY SILTY MUD WITH A TRACE OF SAND AND NO GRAVEL.

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TABLE 2

GRAB SAMPLES

CRUISE NUMBER = 30013
CHIEF SCIENTIST = MILLAIRE-MARCEL
PROJECT NUMBER =

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF ATTEMPTS	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
[illegible]	VAN VEEN	1691933	49 53.15N 55 27.59W	147	3	NOTRE DAME BAY	OLIVE GREY SAND GRAVEL WITH COBBLES TO 10CM.
[illegible]	VAN VEEN	1692018	49 54.13N 55 27.12W	97	3	NOTRE DAME BAY	GREY GREEN, SLIGHTLY MUDDY COARSE SAND WITH NO GRAVEL.
059	VAN VEEN	1692100	49 51.77N 55 33.71W	150	1	NOTRE DAME BAY	OLIVE GREY WELL SORTED FINE SAND WITH A LITTLE MUD.
060	VAN VEEN	1692125	49 51.02N 55 30.45W	227	1	NOTRE DAME BAY	DARK GREY, SLIGHTLY MUDDY SILTY FINE SAND (SAND IS QUITE WELL SORTED), NO COBBLES.
061	VAN VEEN	1692231	49 47.32N 55 42.76W	275	1	NOTRE DAME BAY	OLIVE GREY MUD, SOFT, WITH A TRACE OF SAND AND SILT, NO COBBLES.
062	VAN VEEN	1692300	49 48.05N 55 44.77W	229	1	NOTRE DAME BAY	GRITTY MUD WITH A STARFISH.
[illegible]	VAN VEEN	1701830	49 45.38N 55 39.63W	273	2	MOUTH HALLS BAY	OLIVE GREY MUDDY, SANDY SILT WITH ABUNDANT GRAVELS AND COBBLES.
064	VAN VEEN	1702003	49 45.37N 55 39.78W	277	1	MOUTH HALLS BAY	OLIVE GREY SANDY MUD WITH ABUNDANT GRAVEL AND COBBLES.
065	VAN VEEN	1702025	49 45.08N 55 49.98W	292	1	GREEN BAY	OLIVE GREY, PLASTIC, SILTY MUD WITH SOME SAND.
[illegible]	VAN VEEN	1710100	50 01.09N 55 46.02W	193	1	LA SCIE AREA	OLIVE GREY, GRITTY MUD WITH COBBLES TO SEVERAL CM. AND ABUNDANT FINE SAND.
[illegible]	VAN VEEN	1710132	50 03.39N 55 48.72W	205	1	LA SCIE AREA	OLIVE GREY VERY SANDY MUD WITH GRAVEL AND COBBLES TO 15CM.
070	VAN VEEN	1710252	50 05.79N 55 50.60W	211	1	LA SCIE AREA	OLIVE GREY VERY SANDY MUD WITH GRAVEL AND A FEW COBBLES (AND A LARGE PIECE OF BLACK SHALE .

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TABLE 3

IKU GRAB SAMPLES

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

SAMPLE NUMBER	TYPE OF SAMPLER	JULIAN DAY/TIME	LATITUDE LONGITUDE	DEPTH (MTRS)	NO OF ATTEMPTS	NO OF SUBSAMPLES	NO OF CORES	PHOTOS TAKEN	GEOGRAPHIC LOCATION	NOTES
042	IKU	1681744	49 59.61N 56 07.06W	43	1				BAIE VERTE	WORKED WELL. MUDDY SANDY GRAVEL HEAVILY ENCRUSTED WITH CORALLINE ALGAE.
047	IKU	1681958	50 01.72N 56 03.52W	51	2				BAIE VERTE	ATTEMPT NO. 1 AND 2 NO SAMPLE.
049	IKU	1682044	50 02.52N 56 01.68W	55	2				BAIE VERTE	ATTEMPT NO. 1 AND 2 NO SAMPLE.

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TABLE 4

CORE SAMPLES

CRUISE NUMBER = 90013
CHIEF SCIENTIST = [illegible]RE-MARCEL
PROJECT NUMBER =

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
035	AGC LONG CORE	1681200	50 07.90N 56 24.21W	362	2735	1874			WHITE BAY	LONG CORE SITE. 6SFT. APPARENT PENETRATION, 4SFT. OF CORE [illegible], CONTAINED GAS.
035TWC	TRIGGER WEIGHT	1681200	50 07.90N 56 24.21W	362		61	35	1	WHITE BAY	CUTTER PUSHED OUT AND PUT IN 1/2 ROUND.
051	AGC LONG CORE	1691507	49 47.96N 55 36.42W	263		912	1060		NOTRE DAME BAY	15M APPARENT PENETRATION, OLIVE MUD IN TRIGGER WEIGHT, STIFF, REDDISH GRITTY CLAY AT BASE OF CORE.
051TWC	TRIGGER WEIGHT	1691507	49 47.96N 55 36.42W	263		100	0	0	NOTRE DAME BAY	SAMPLE PUT IN BAG.
054	AGC LONG CORE	1691746	49 50.42N 55 28.03W	252	912	912	0	3	NOTRE DAME BAY	FULL PENETRATION. BOTTOM OF CORE HAS STIFF RED/BROWN CLAY WITH GRANULES.
054TWC	TRIGGER WEIGHT	1691746	49 50.42N 55 28.03W	252		0	0	0	NOTRE DAME BAY	EMPTY.
063	AGC LONG CORE	1701532	49 27.89N 56 04.70W	241	1824	1216	0	0	HALLS BAY	C-C 5CM.
063TWC	TRIGGER WEIGHT	1701532	49 27.89N 56 04.70W	241		0	0	0	HALLS BAY	NO SAMPLE.
064	AGC LONG CORE	1701947	49 45.94N 55 38.61W	311		1812	1520	0	MOUTH HALLS BAY	CUTTER SAMPLE BAGGED.
064TWC	TRIGGER WEIGHT	1701947	49 45.94N 55 38.61W	311		100	30	1	MOUTH HALLS BAY	NO CUTTER OR CATCHER SAMPLE.

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TABLE 5

SEISMIC RECORDS

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
27	1671659	1681040	SE 100'	16 TO 32	SINGLE	BAIE VERTE	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
28	1671700	1681040	NSRF 25	16 TO 32	SINGLE	BAIE VERTE	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
28	1682127	1691316	NSRF 25'	33 TO 42	SINGLE	NOTRE DAME BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
29	1682127	1691316	DE 100'	33 TO 42	SINGLE	NOTRE DAME BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
30	1700035	1701437	NSRF 25'	43, 44, 45	SINGLE	NOTRE DAME BAY AND HALL BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
31	1700035	1701437	SE 100'	43, 44, 45	SINGLE	NOTRE DAME BAY AND HALL BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN

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TABLE 6

HUNTEC RECORDS

CRUISE NUMBER = 90013
CHIEF SCIENTIST = [illegible]-MARCEL
PROJECT NUMBER =

POLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	HUNTEC SYSTEM
1	1671650	1681038	INTERNAL	16 TO 32	SINGLE	BAIE VERTE	EPC 4100	AGC
2	1671720	1681038	EXTERNAL	16 TO 32	SINGLE	BAIE VERTE	EPC 4100	AGC
3	1682140	1691316	EXTERNAL	33 TO 42	SINGLE	NOTRE DAME BAY	EPC 4100	AGC
4	1682140	1691316	INTERNAL	33 TO 42	SINGLE	NOTRE DAME BAY	EPC 4100	AGC
5	1700034	1701437	EXTERNAL	43, 44, 45	SINGLE	NOTRE DAME BAY AND HALL BAY	EPC 4100	AGC
6	1700034	1701437	INTERNAL	43, 44, 45	SINGLE	NOTRE DAME BAY AND HALL BAY	EPC 4100	AGC
7	1700034	1701437	INTERNAL	43, 44, 45	SINGLE	NOTRE DAME BAY AND HALL BAY	EPC 4100	AGC

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TABLE 7

SEISMICS/SIDESCAN COMBINED ON-LINE DATA TAPES

CRUISE NUMBER = 78015
CHIEF SCIENTIST = WILLIAMS-MARCEL
PROJECT NUMBER =

TAPE NUMBERS	START DAY/TIME	STOP DAY/TIME	GEOGRAPHIC LOCATION	CHANNEL INFO	NOTES
	167----	1672120	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 16 TO 23
2	1672120	1680010	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 23 TO 28
3	1680010	1680305	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 28 & 29
4	1680305	1680600	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 29 & 30
5	1680600	1680853	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 30 & 31
6	1680853	1681039	BAIE VERTE	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINE 32
7	1682126	1690015	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINE 34
8	1690016	1690310	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 34 & 35
9	1690310	1690600	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 35 & 36
10	1690600	1690857	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 36 & 37

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TABLE 2

SEISMICS/SIDESCAN COMBINED ON-LINE DATA TAPES

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

TAPE NUMBERS	START DAY/TIME	STOP DAY/TIME	GEOGRAPHIC LOCATION	CHANNEL INFO	NOTES
11	1690858	1691226	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 37 TO 42
12	1691226	1700151	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 42 & 43
13	1700151	1700455	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINE 43
14	1700455	1700745	NOTRE DAME BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 43 & 44
15	1700745	1701048	NOTRE DAME BAY AND HALLS BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINES 44 & 45
16	1701048	1701340	HALLS BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINE 45
17	1701340	1701437	HALLS BAY	CH.1-3 = AGC SEISMICS CH 4 = HUNTEC INTERNAL CH 5 = HUNTEC TRIGGER SYNC CH 6 = HUNTEC EXTERNAL	LINE 45

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TABLE 9

3.5 KHZ RECORDS

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
13	1671400	1671630		NOTRE DAME BAY	EPC 4100	ORE HULL MOUNTED
14	1700210	1701249	45	HALLS BAY	EPC 4100	ORE HULL MOUNTED
15	1711059	1712254		STRAIT BELLE ISLE	EPC 4100	ORE HULL MOUNTED
16	1712259	1720440		STRAIT BELLE ISLE	EPC 4100	ORE HULL MOUNTED

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TABLE 9

BATHYMETRY RECORDS

CRUISE NUMBER = 90013
CHIEF SCIENTIST = HILLAIRE-MARCEL
PROJECT NUMBER =

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	FREQUENCY	LINE NUMBERS	PARAMETER	GEOGRAPHIC LOCATION	RECORDER	NOTES
10	1671520	1681207	12 KHZ.	16 TO 32	HULL MOUNTED	BAIE VERTE	UGR	
11	1682120	1692028	12 KHZ.	33 TO 42	HULL MOUNTED	BAIE VERTE TO WHITE BAY	UGR	
12	1692023	1700715	12 KHZ.	43, 44	HULL MOUNTED	NOTRE DAME BAY	UGR	
13	1700735	1702135	12 KHZ.	44, 45	HULL MOUNTED	HALLS BAY	UGR	
14	1711232	1720440	12 KHZ.		HULL MOUNTED	STRAIT BELLE ISLE	UGR	