Cruise Report

CSS HUDSON Cruise 86-027

Brian MacLean

Atlantic Geoscience Centre

Geological Survey of Canada

Bedford Institute of Oceanography

Dartmouth, N.S.

CRUISE DESIGNATION: 86-027

VESSEL: CSS Hudson

DATES: August 26 - September 26, 1986

AREA: Lancaster Sound, Barrow St., Viscount Melville Channel, Wellington and Queens Ch., Austin and Byam Martin Ch., Hudson Strait.

RESPONSIBLE AGENCY: Atlantic Geoscience Centre

SHIP'S MASTER: Captains: F.W. Mauger and J. Lewis

SENIOR SCIENTIST: Brian MacLean

PERSONNEL:

*D. Beaver, AGC

A. Bedo, MEL

*H. Boudreau, Hydrography

*B. Chapman, AGC

L. Harris, MEL

E. Head, MEL

D. Hodgson, Terrain Sci.

*A. Hunt, Univ. of Vermont

*A. Jennings, INSTAAR

P. Joannou, Polar Shelf

*W. LeBlanc, AGC

B. Loncarevic, AGC

*S. Merchant, AGC

*J. Neilson, AGC

*C. Powell, AGC

*R. Murphy, AGC

T. Siferd, MEL

G. Sonnichsen, AGC

*G. Standen, Huntec

*A. Taylor, Terrain Sci.

R. Taylor, AGC (2nd Senior)

*H. Weile, AOL

*Resolute to Deception Bay, August 26 - September 26

Cruise 86-027 was carried out from CSS Hudson and commenced at Resolute Bay on August 25 and ended at Deception Bay, Quebec, on September 26, 1986.

Proposed Program Area

The proposed primary area embraced the Wellington Channel - Crozier Strait - Norwegian Bay - Belcher Channel - east Lougheed Island areas, and the Byam Martin Channel region (Figure 1).

A secondary area comprised parts of Lancaster Sound, Barrow Strait, and tributary channels to the south: Prince Regent and Peel Sounds and Admiralty Inlet, as well possibly as some follow-up studies in Jones Sound and its approaches. The secondary area was mainly an alternate if ice conditions were unfavourable in the primary program area.

Objectives

The cruise objectives were the collection of geological, geophysical, geotechnical, biological, physical, physical oceanographic, and hydrographic data as outlined below.

(1) Geology - surficial sediments: areal distribution of units, thickness, composition, geotechnical properties, post-depositional modification, geochronology, glacial and post glacial history;

- bedrock: areal distribution of units and structure; and
- coastal and onshore geological investigations.

(2) Biology - investigation of relationships between metabolic and feeding rates and ambient phytoplankton concentrations;

- flowmeter and CTD measurements to locate and to define physical oceanographic parameters; and
- investigate enhancement of levels of benthic biomass in regions of polynyas.

(3) Hydrography - collection of bathymetric data along all tracks.

(4) Seabed thermal data - insitu heat probe measurements and laboratory thermal conductivity measurements on sediment cores.

Methods

Geophysical data were acquired with a single channel seismic reflection system (655cm^3 compressed air source and Nova Scotia Research Foundation hydrophone), Huntec high resolution deep tow seismic system, Bedford Institute of Oceanography sidescan, hull mounted 14.25 kHz echosounder (Kelvin Hughes 26B). Sediment samples were obtained with a Benthos piston corer, VanVeen grab, box and gravity corer. Biological studies included CTD measurements, water bottle casts, vertical plankton tows, and collection of seabed biota. Geothermal studies included insitu seabed measurements with a Bullard-type temperature gradiometer probe. Bottom photographs were obtained with UMEL cameras. Piston cores were split, logged, x-rayed and photographed; shearvane, thermal conductivity, and magnetic susceptibility measurements were made; and subsampling was done for texture, geotechnical properties, microfossils (and paleomagnetics on 2 cores).

Oceanographic and biological studies measured conductivity, temperature and depth with a guideline model 8770 portable CTD system. Zooplankton quantitative determinations were obtained by means of a 100 micron ring net with a 0.5 m diameter. Zooplankton for physiological experiments were collected using a 780 micron mesh and a 0.75 m opening sampling only the top 50 m of the water column phytoplankton concentrations were sampled for the top 30 m using 5 L Niskin bottles mounted on a CTD rosette.

The primary navigational positioning system was the BIONAV integrated system interfaced to GPS Navstar (Magnavox T-Set), Transit satellite system, ship's log and gyro, and in eastern Hudson Strait, Loran C (see appendix item 3), supplemented by radar range and bearing. GPS positioning was available for two periods totalling 12 hours per day. A backup, GNS aircraft-type navigation system proved unsuitable, possibly due to antenna problems.

Ice information was obtained by means of a weather satellite imagery receiver on loan from Polar Continental Shelf Project, visual inspection and reconnaissance by a Jet Ranger 206-B helicopter and Ice Central broadcast ice charts and reports. The satellite imagery data proved to be an invaluable source of up to date regional information whereas helicopter observations provided more detailed information on a more local scale and beneath extensive cloud cover. A reconnaissance of ice conditions in the Prince Regent Inlet/Fury-Hecla Strait/northern Foxe Basin region, the proposed route to Hudson Strait and Deception Bay, was carried out by a chartered Twin Otter aircraft from Resolute.

The helicopter was also used to transfer personnel ashore for coastal and Quaternary geological investigations.

Ice Conditions

Wellington-Queens Channel region: close pack ice limited the survey in a few areas of Wellington Channel, but conditions generally ranged from open water to open pack ice. Similar conditions prevailed in Sophia Channel.

Byam Martin Channel region: Austin and Byam Martin Channels north to the ice jam between Domett Point and Ile Vanier, and northwestern Parry Channel were covered by new ice, but which had little effect on the surveys. Large multi-year ice floes concentrated around northern and western Byam Martin Island prevented surveys in Byam Channel.

Parry, Barrow, Prince Regent, Fury-Hecla regions: concentrations of pack ice varied daily with heaviest pack being along the south sides of Viscount Melville, Barrow Strait, and western Lancaster Sound and in Prince Regent Inlet.

Unfavourable ice conditions in Prince Regent and at the western end of Fury and Hecla Strait ruled out passage to Hudson Strait via that route.

Results

Although ice conditions in the Arctic Islands in 1986 were generally worse than normal, the cruise was successful in obtaining extensive information in Wellington Channel, Byam Martin and Austin Channels and in eastern Barrow Strait as well as reconnaissance data in Sophia and northern Queens Channels, and at various localities along the north side of Parry Channel south of Melville and Bathurst Islands (Figure 2 and Table I). These areas represent active and potential oil transportation routes and thus constitute important parts of the NOGAP study area. Ice conditions rendered the Norwegian Bay - Belcher Channel - east Lougheed region inaccessible.

With the exception of parts of eastern Barrow Strait, little or no regional marine geological data of the type acquired in 1986 previously existed for the regions surveyed during cruise 86-027. There was no information for Wellington Channel and the areas of northern Parry Channel and the data previously collected from Byam Martin - Austin Channel consisted mainly of scattered sediment samples and localized surveys along proposed pipe line routes. Parts of western Barrow Strait previously had been extensively sampled but little continuous acoustic profile data existed. In eastern Barrow Strait profiles obtained in 1986 extended and tied together previous acoustic and sample data, defined sediment boundaries and relationships, and obtained samples for determining geotechnical properties of the seabed sediments.

The following is a preliminary outline of the geological data obtained.

1. Wellington Channel: surficial sediments in general are thickest in the northern part of the channel where clayey and silty sediments (some sand and gravel sized particles are also present), 2-3 m thick, overlying 5-10 m of till-like sediments occur extensively. In the southern part of the channel surficial sediments commonly total 10 m or less in thickness, but locally are up to 20 m where apparent glacial deposits locally thicken. Locally these sediments are thinly mantled by mainly silty sediments.
2. Byam Martin and Austin Channels: surficial sediments in this region in general are thicker than in Wellington Channel. The Quaternary section in places includes clayey and silty sediments, with sandy and gravelly components, but unstratified sediments, which appear to represent glacial deposits, are the most areally extensive, and also the thickest, up to 30 m or more (50 m observed in one locality). Moraine-like accumulations occur locally, with some possible multiple till deposits represented.

One of the acoustic profile tracks across Byam Martin Channel was along a proposed pipe line route between Melville Island and Ile Vanier.

3. Northern Parry Channel: surficial sediments range up to approximately 10 m in thickness along the north side of Viscount Melville Sound southeast of Melville Island and south of Byam Channel. As found elsewhere, deposits interpreted to be glacial material are the most widespread of the surficial sediment units. Multiple sequences of these sediments, some 20 m or more in total thickness, occur adjacent to Keen Bank near the entrance to Austin Channel. These are discontinuously mantled by thin (±1 m) clayey or silty sediment.

   Clayey and silty sediments up to 5 m in thickness overlie apparent glacial till in a small basin east of Lowther island.

4. Eastern Barrow Strait: sediments in this region include thick deposits interpreted to be glacial sediments that locally appear to contain multiple till sequences and to form moraines in which thicknesses may reach 70 m. These sediments are variably overlain by up to 3 m of stratified (acoustically) sediments and up to 7 m of unstratified (acoustically), mainly clayey and silty sediments.

   Surveys in northern Prince Regent Inlet were severely restricted by ice conditions but the limited data indicate 5 to 6 m of unstratified (acoustically) sediments overlying bedrock in the area surveyed. Fine textured sediments are thin and confined to areas greater than 400 m water depth.

5. En route to Deception Bay, acoustic and other geophysical data were obtained along tie lines in eastern Hudson Strait, in another area 93 km

west of Cape Hopes Advance and in the western part of the Strait where the 1985 survey tracks were extended south of Nottingham Island as far west as 77°00'W.

6. Coastal and on shore geology: (R. Taylor) Reconnaissance of the shores of northern Wellington Channel was carried out on Dundas Island and near Cape Majendie, Devon Island. Beach profiles were resurveyed in the Radstock Bay and Cape Ricketts areas of Devon Island, on the north coast of Somerset Island and on Cameron and Lowther Islands. Aerial oblique video coverage of the coastline was obtained for part of the western coast of Byam Martin Island and southeastern Melville Island from near Ross Point eastward to tie, 5 km north of Robertson Point, with video data obtained in 1985 (see appendix item 1).

   On shore geological investigations (D. Hodgson) of Quaternary sediments were attempted on Devon, Cameron, Byam Martin, Lowther and Dundas Islands, but for the most part these were severely hampered by the snow cover.

7. Biological studies: (E. Head) CTD profiles and water and plankton net samples were collected at stations throughout the Arctic Islands survey area. One of the striking features of the data was the contrast in results from stations of similar latitudes in Wellington and Byam Martin Channels. In the latter area, concentrations of algae were low ($<1 \mu g$ chlorophyll per litre) and the top 50 m was characterized by a layer of cold water of low salinity, originating from the Arctic Ocean. In Wellington Channel, although the source water is the same, CTD profiles showed a well mixed water column with high concentrations of algae ($>15 \mu g$

chlorophyll per litre). The difference between the two regions is attributed to water entering Wellington Channel having to pass through Penny Strait, a shallow and turbulent area, whereas water entering Byam Martin Channel encounters no such restricted passage. This mixing is thought to cause nutrient enrichment of the surface water, which in turn accounts for the high algal concentration of Wellington Channel. Wave conditions in part were more energetic in Wellington Channel during the survey than in Byam Martin Channel where new ice had formed and sea conditions were quiescent.

8. Geothermal program: (A. Taylor) Insitu measurements were made at 8 stations with a Bullard-type temperature gradiometer probe and thermal conductivity measurements were made on 33 core sections.

   The distribution of thermal conductivity values show some distinct differences among the main geographic areas examined, which appear to relate to variations in textural and geotechnical properties of the sediments.

General Comments

1. Sincere thanks are extended to Captain F.W. Mauger, and latterly to Captain J. Lewis, officers and crew of CSS Hudson and the cruise scientific staff for their cooperation, interest and support of the program throughout the cruise.

2. The Wellington Channel, Austin and Byam Martin Channel regions where extensive surveys were carried out, represent important parts of the NOGAP program area, and we were fortunate that ice conditions permitted

this work to be achieved, considering the generally unfavourable ice conditions in the Arctic Islands region in 1986.

3. The lack of the IKU clam shell sampler through its loss earlier this year was a distinct handicap to sediment sampling.

4. Offloading of unused helicopter fuel at Resolute was not possible due to failure of the slinging hook on the helicopter.

5. Significant discrepancies were encountered between apparent piston core penetration and length of cores recovered, which persisted despite various adjustments and equipment changes tried. This may be a function of the sediment characteristics, but the reasons are puzzling and AGC needs to check further into this problem.

6. The extent of Loran-C coverage available in Hudson Strait appeared substantially more limited than during cruise 85-027.

7. Fuel limitations were of concern, particularly at the beginning, but favourable ice conditions and slow survey speeds in Wellington, Austin and Byam Martin Channels together with conservative usage elsewhere eased this problem.

8. Problems were encountered with ice in the air gun air lines; the sidescan cable was damaged near the fish and had to be cut after becoming entangled with the Huntec cable; 1 NSRF eel deteriorated in output quality after extensive use and a second, previously unused one, appeared to have substantially less sensitivity; one 100 ft SE eel section was damaged apparently through contact with the Huntec cable off Deception Bay.

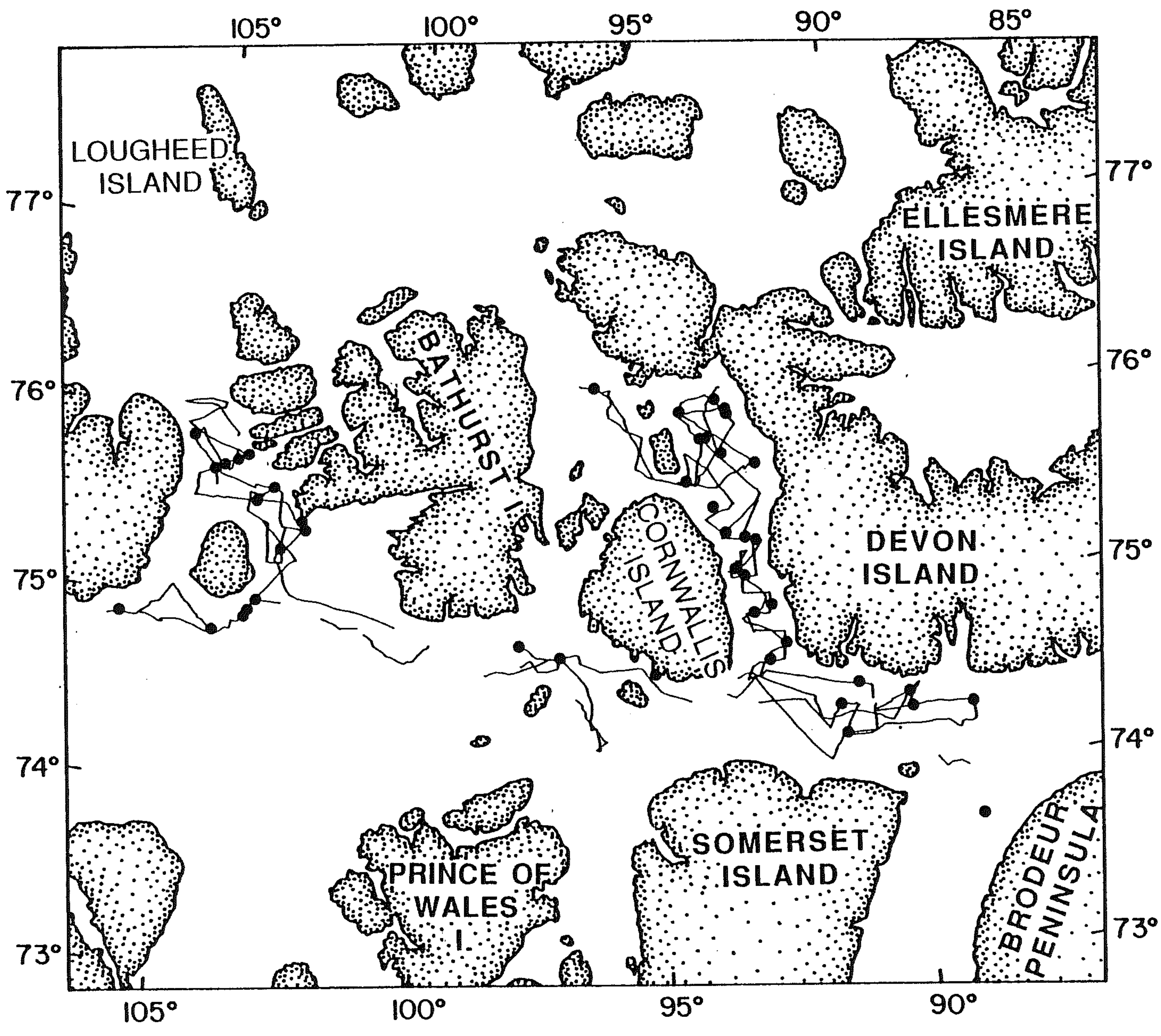


Fig. 1 CRUISE 86-027 TRACKS AND STATIONS

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
1	2400324	75 12.20N	93 14.60W	192.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
2	2400454	75 12.12N	93 14.00W	193.8	CTD	WELLINGTON CHANNEL	CTD (MEL)
3	2400523	75 12.20N	93 14.50W	193.8	WATER	WELLINGTON CHANNEL	WATER (MEL)
4	2400537	75 12.20N	93 14.50W	193.8	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
5	2410405	76 02.80N	93 10.00W	137.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
6	2410427	76 02.70N	93 10.00W	143.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
7	2410455	76 02.60N	93 10.00W	143.0	WATER	WELLINGTON CHANNEL	WATER (MEL)
8	2410508	76 02.60N	93 10.00W	143.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
9	2411753	75 54.50N	93 43.00W	350.0	CORE	WELLINGTON CHANNEL	PISTON CORE. LENGTH: 13 CM.
9TWC	2411753	75 54.50N	93 43.00W	350.0	CORE	WELLINGTON CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 190 CM.
10	2411815	75 54.88N	93 49.00W	320.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
11	2411929	75 55.48N	93 41.77W	311.0	CORE	WELLINGTON CHANNEL	PISTON CORE. LENGTH: 28 CM.
11TWC	2411929	75 55.48N	93 41.77W	311.0	CORE	WELLINGTON CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 176 CM.
12	2412106	75 49.26N	93 22.93W	265.0	CORE	WELLINGTON CHANNEL	PISTON CORE. LENGTH: 200CM.
12TWC	2412106	75 49.26N	93 22.93W	265.0	CORE	WELLINGTON CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 131 CM.
13	2412154	75 49.56N	93 21.26W	265.0	CORE	WELLINGTON CHANNEL	BOX CORE

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
14	2412222	75 49.44N	93 20.19W	265.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
15	2420451	76 07.30N	93 27.00W	165.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
16	2420451	76 07.30N	93 27.00W	165.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
17	2420530	76 07.17N	93 26.71W	165.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
18	2420556	76 07.19N	93 26.04W	165.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
19	2420607_	76 07.17N	93 25.83W	165.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
20	2420720	76 04.45N	93 12.41W	183.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
21	2420734	76 04.38N	93 11.65W	143.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
22	2420753	76 04.34N	93 10.78W	143.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
23	2421203	76 03.75N	94 15.50W	93.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
24	2421220	76 03.60N	94 15.00W	105.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
25	2422109	75 45.70N	92 37.59W	74.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
26	2422122	75 45.59N	92 37.77W	74.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
27	2430315	75 41.60N	94 08.50W	95.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
28	2430334	75 41.00N	94 08.50W	95.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
29	2430343	75 41.00N	94 08.50W	100.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB (MEL)

TABLE 1

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
30	2430402	75 40.80N	94 08.30W	100.0	WATER	WELLINGTON CHANNEL	WATER (MEL)
31	2430412	75 40.90N	94 10.00W	100.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
32	2431552	76 13.00N	96 10.00W	247.0	GRAB	QUEENS CHANNEL	VAN VEEN GRAB
33	2431620	76 13.00N	96 10.00W	247.0	PLANKTON	QUEENS CHANNEL	PLANKTON TOW (MEL)
34	2431642	76 12.25N	96 10.26W	240.0	CAMERA	QUEENS CHANNEL	UMEL CAMERA
35	2441355	75 24.70N	93 26.50W	271.0	CORE	WELLINGTON CHANNEL	PISTON CORE. LENGTH: 81 CM.
35TWC	2441355	75 24.70N	93 26.50W	271.0	CORE	WELLINGTON CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 150 CM.
36	2441434	75 24.30N	93 25.30W	271.0	CORE	WELLINGTON CHANNEL	BOX CORE
37	2441507	75 24.10N	93 24.10W	271.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
38	2441530	75 23.70N	93 24.45W	256.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
39	2441644	75 23.63N	93 21.57W	252.0	PROBE	WELLINGTON CHANNEL	HEAT PROBE (A. TAYLOR)
40	2441904	75 32.79N	93 37.51W	137.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
41	2441926	75 32.66N	93 37.16W	137.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
42	2442308	75 21.80N	93 02.00W	156.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
43	2442330	75 21.60N	93 01.15W	165.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
44	2450024	75 21.30N	92 45.00W	185.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB

TABLE 1

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
45	2450045	75 21.00N	92 45.30W	207.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
46	2450535	75 09.37N	93 04.05W	146.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
47	2450547	75 09.34N	93 03.98W	146.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
48	2450613	75 09.41N	93 03.95W	147.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
49	2450639	75 09.21N	93 02.45W	147.0	CTD	WELLINGTON CHANNEL	CTD (MEL)
50	2450655	75 09.26N	93 02.69W	147.0	BOTTLE	WELLINGTON CHANNEL	WATER (MEL)
51	2450706	75 09.31N	93 02.68W	147.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
52	2450744	75 09.40N	93 02.01W	143.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
53	2450813	75 09.46N	93 01.67W	143.0	CORE	WELLINGTON CHANNEL	GRAVITY CORE
54	2450834	75 09.61N	93 01.15W	143.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
55	2450856	75 09.61N	93 01.15W	143.0	CTD	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
56	2451936	74 59.54N	92 32.30W	174.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
57	2452000	74 59.47N	92 32.30W	174.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
58	2452330	74 57.50N	92 54.80W	201.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
59	2452354	74 57.40N	92 54.00W	201.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
60	2460551	74 46.98N	92 17.84W	73.0	CTD	WELLINGTON CHANNEL	CTD (MEL)

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
61	2460608	74 46.86N	92 17.87W	72.0	PLANKTON	WELLINGTON CHANNEL	PLANKTON TOW (MEL)
62	2460628	74 46.86N	92 17.99W	73.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
63	2460652	74 46.86N	92 17.99W	73.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
64	2461008	74 41.80N	92 40.50W	137.0	GRAB	WELLINGTON CHANNEL	VAN VEEN GRAB
65	2461029	74 41.80N	92 40.50W	137.0	CAMERA	WELLINGTON CHANNEL	UMEL CAMERA
66	2470413	74 25.10N	91 18.00W	165.0	CTD	BARROW STRAIT	CTD (MEL)
67	2470427	74 25.00N	91 15.80W	165.0	GRAB	BARROW STRAIT	VAN VEEN GRAB
68	2470438	74 25.10N	91 18.00W	165.0	CTD	BARROW STRAIT	CTD (MEL)
69	2470449	74 25.10N	91 18.00W	165.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
70	2470510	74 25.00N	91 19.00W	165.0	BOTTLE	BARROW STRAIT	WATER (MEL)
71	2470516	74 25.00N	91 19.00W	165.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
72	2481624	74 45.55N	97 04.00W	287.0	CORE	W. BARROW STRAIT	PISTON CORE. LENGTH: 262 CM.
72TWC	2481624	74 45.55N	97 04.00W	287.0	CORE	W. BARROW STRAIT	TRIGGER WEIGHT CORE. LENGTH: 161 CM.
73	2481645	74 45.74N	97 03.62W	276.0	PLANKTON	W. BARROW STRAIT	PLANKTON TOW (MEL)
74	2481658	74 45.78N	97 03.26W	275.0	CTD	W. BARROW STRAIT	CTD (MEL)
75	2481731	74 45.69N	97 03.49W	279.0	CORE	W. BARROW STRAIT	BOX CORE

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
76	2481833	74 45.74N	97 03.21W	278.0	PROBE	W. BARROW STRAIT	HEAT PROBE (A.TAYLOR)
77	2481917	74 45.72N	97 03.74W	278.0	CORE	W. BARROW - STRAIT	PISTON CORE. LENGTH: 305 CM.
78	2500213	75 47.90N	103 57.0W	166.4	GRAB	BYAM MARTIN CHANNEL	VAN VEEN GRAB
79	2500236	75 47.40N	103 57.4W	166.4	CAMERA	BYAM MARTIN CHANNEL	UMEL CAMERA
80	2500257	75 47.40N	103 58.2W	166.4	CTD	BYAM MARTIN CHANNEL	CTD (MEL)
81	2500308	75 47.80N	103 57.5W	173.0	PLANKTON	BYAM MARTIN CHANNEL	PLANKTON TOW (MEL)
82	2500323	75 47.80N	103 57.5W	173.0	CTD	BYAM MARTIN CHANNEL	CTD (MEL)
83	2500331	75 47.80N	103 57.5W	173.0	PLANKTON	BYAM MARTIN CHANNEL	PLANKTON TOW (MEL)
84	2500351	75 47.80N	103 58.5W	183.0	CTD	BYAM MARTIN CHANNEL	CTD (MEL)
85	2500402	75 47.80N	103 58.5W	184.0	PLANKTON	BYAM MARTIN CHANNEL	PLANKTON TOW (MEL)
86	2502029	75 49.16N	103 59.9W	182.9	CORE	BYAM MARTIN CHANNEL	PISTON CORE. LENGTH: 253 CM.
86TWC	2502029	75 49.16N	103 59.9W	182.9	TRIGGER	BYAM MARTIN CHANNEL	TRIGGER WEIGHT CORE: LENGTH 103 CM.
87	2502048	75 48.88N	103 59.1W	182.9	PROBE	BYAM MARTIN CHANNEL	HEAT PROBE (A. TAYLOR)
88	2502134	75 48.60N	103 58.5W	183.0	CORE	BYAM MARTIN CHANNEL	BOX CORE
89	2502229	75 46.18N	104 11.2W	170.0	CORE	BYAM MARTIN CHANNEL	PISTON CORE. LENGTH: 201 CM.
89TWC	2502229	75 46.18N	104 11.2W	170.0	TRIGGER	BYAM MARTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 140 CM.

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
90	2510128	75 43.60N	104 28.5W	150.0	GRAB	BYAM MARTIN CHANNEL	VAN VEEN GRAB
91	2510201	75 44.50N	104 31.5W	150.0	CAMERA	BYAM MARTIN CHANNEL	UMEL CAMERA
92	2510219	75 44.36N	104 29.5W	150.0	PLANKTON	BYAM MARTIN CHANNEL	PLANKTON TOW (MEL)
93	2510241	75 44.32N	104 29.5W	150.0	CTD	BYAM MARTIN CHANNEL	CTD (MEL)
94	2510708	75 52.82N	105 14.5W	214.0	PLANKTON	BYAM MARTIN CHANNEL	PLANKTON TOW (MEL)
95	2510728	75 52.81N	105 14.5W	214.0	GRAB	BYAM MARTIN CHANNEL	VAN VEEN GRAB
96	2510750	75 52.30N	105 13.6W	220.0	CAMERA	BYAM MARTIN CHANNEL	UMEL CAMERA
97	2511752	75 25.07N	102 37.6W	165.0	GRAB	BYAM MARTIN CHANNEL	VAN VEEN GRAB
98	2511813	75 25.05N	102 36.9W	166.0	CORE	BYAM MARTIN CHANNEL	PISTON CORE. LENGTH: 182 CM.
98TWC	2511813	75 25.05N	102 36.9W	166.0	CORE	BYAM MARTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 117 CM.
99	2511931	75 25.07N	102 34.7W	166.0	GRAB	AUSTIN CHANNEL	VAN VEEN GRAB
100	2512111	75 27.75N	102 40.9W	210.0	CORE	AUSTIN CHANNEL	PISTON CORE. LENGTH: 244 CM.
100TWC	2512111	75 27.75N	102 40.9W	210.0	CORE	AUSTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 78 CM.
101	2512134	75 27.60N	102 41.0W	210.0	CTD	AUSTIN CHANNEL	CTD (MEL)
102	2512154	75 27.53N	102 40.7W	210.0	CORE	AUSTIN CHANNEL	BOX CORE
103	2512229	75 27.75N	102 41.2W	201.0	CORE	AUSTIN CHANNEL	PISTON CORE. LENGTH: 341 CM.

TABLE 1

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
103TWC	2512229	75 27.75N	102 41.2W	201.0	CORE	AUSTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 35 CM.
104	2520103	75 18.50N	103 06.5W	152.0	GRAB	AUSTIN CHANNEL	VAN VEEN GRAB
105	2520130	75 18.10N	103 04.5W	152.0	CAMERA	AUSTIN CHANNEL	UMEL CAMERA
106	2520149	75 18.10N	103 04.5W	152.0	CTD	AUSTIN CHANNEL	CTD (MEL)
107	2520204	75 18.10N	103 04.5W	152.0	PLANKTON	AUSTIN CHANNEL	PLANKTON TOW (MEL)
108	2520226	75 18.80N	103 04.0W	152.0	CTD	AUSTIN CHANNEL	CTD (MEL)
109	2520235	75 18.80N	103 04.0W	152.0	PLANKTON	AUSTIN CHANNEL	PLANKTON TOW (MEL)
110	2520247	75 18.80N	103 04.0W	152.0	PLANKTON	AUSTIN CHANNEL	PLANKTON TOW (MEL)
111	2521204	75 33.00N	103 41.5W	97.0	GRAB	AUSTIN CHANNEL	VAN VEEN GRAB
112	2521227	75 33.80N	103 42.2W	110.0	CAMERA	AUSTIN CHANNEL	UMEL CAMERA
113	2521438	75 37.80N	103 21.8W	271.0	CORE	AUSTIN CHANNEL	PISTON CORE. LENGTH: 356 CM.
113TWC	2521438	75 37.80N	103 21.8W	271.0	CORE	AUSTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 161 CM.
114	2521535	75 37.70N	103 21.9W	267.0	CTD	AUSTIN CHANNEL	CTD (MEL)
115	2521625	75 37.80N	103 21.0W	267.0	CORE	AUSTIN CHANNEL	PISTON CORE. LENGTH: 65 CM.
115TWC	2521625	75 37.80N	103 21.0W	267.0	CORE	AUSTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 145 CM.
116	2521712	75 38.15N	103 21.2W	267.0	PROBE	AUSTIN CHANNEL	HEAT PROBE (A. TAYLOR)

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
117	2521747	75 37.97N	103 20.9W		CORE	AUSTIN CHANNEL	BOX CORE
118	2522239	75 42.60N	104 42.7W	260.0	CORE	AUSTIN CHANNEL	PISTON CORE. LENGTH: 70 CM.
119TWC	2522239	75 42.60N	104 42.7W	260.0	CORE	AUSTIN CHANNEL	TRIGGER WEIGHT CORE. LENGTH: 165 CM.
119	2522314	75 42.00N	104 43.5W	260.0	PROBE	BYAM MARTIN CHANNEL	HEAT PROBE (A. TAYLOR)
120	2532121	74 52.50N	106 24.8W	70.0	GRAB	VISCOUNT MELVILLE	VAN VEEN GRAB
121	2532150	74 53.13N	106 23.7W	70.0	CAMERA	VISCOUNT MELVILLE	UMEL CAMERA
122	2540548	74 50.25N	104 25.4W	179.0	CTD	VISCOUNT MELVILLE	CTD (MEL)
123	2540605	74 50.22N	104 25.1W	179.0	PLANKTON	VISCOUNT MELVILLE	PLANKTON TOW (MEL)
124	2540628	74 50.31N	104 25.0W	179.0	CTD	VISCOUNT MELVILLE	CTD (MEL)
125	2540636	74 50.41N	104 24.9W	179.0	PLANKTON	VISCOUNT MELVILLE	PLANKTON TOW (MEL)
126	2540855	74 55.84N	103 47.3W	82.0	GRAB	VISCOUNT MELVILLE	VAN VEEN GRAB
127	2540929	74 55.92N	103 47.0W	82.0	CAMERA	VISCOUNT MELVILLE	UMEL CAMERA
128	2541012	74 57.80N	103 43.0W	88.0	GRAB	VISCOUNT MELVILLE	VAN VEEN GRAB
129	2541038	74 57.60N	103 43.0W	88.0	CAMERA	VISCOUNT MELVILLE	UMEL CAMERA
130	2541126	75 00.95N	103 34.2W	150.0	CORE	VISCOUNT MELVILLE	GRAVITY CORE. LENGTH: 110 CM.
131	2550254	74 49.80N	97 55.00W	135.0	GRAB	BARROW STRAIT	VAN VEEN GRAB

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
132	2550306	74 49.80N	97 56.00W	135.0	CTD	BARROW STRAIT	CTD (MEL)
133	2550313	74 49.80N	97 55.50W	135.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
134	2550330	74 49.50N	97 56.00W	135.0	CTD	BARROW STRAIT	CTD (MEL)
135	2550343	74 49.50N	97 56.00W	135.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
136	2552335	74 39.40N	95 03.90W	110.0	CTD	BARROW STRAIT	CTD (MEL)
137	2552351	74 39.20N	95 03.05W	112.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
138	2560015	74 39.20N	95 02.60W	112.0	CTD	BARROW STRAIT	CTD (MEL)
139	2570531	74 31.50N	90 53.30W	216.0	CTD	BARROW STRAIT	CTD (MEL)
140	2570540	74 31.60N	90 53.70W	216.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
141	2570604	74 31.60N	90 53.70W	216.0	CTD	BARROW STRAIT	CTD (MEL)
142	2570614	74 31.70N	90 54.50W	216.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
143	2570703	74 32.10N	90 55.80W	216.0	GRAB	BARROW STRAIT	VAN VEEN GRAB
144	2571632	74 15.56N	91 14.21W	330.0	CORE	LANCASTER SOUND	PISTON CORE. LENGTH: 438 CM.
144TWC	2571632	74 15.56N	91 14.21W	330.0	CORE	LANCASTER SOUND	TRIGGER WEIGHT CORE. LENGTH: 166 CM.
145	2571653	74 15.53N	91 13.44W	330.0	CTD	LANCASTER SOUND	CTD (MEL)
146	2571728	74 15.58N	91 12.89W	330.0	CORE	EAST BARROW STRAIT	BOX CORE

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES
147	2571803	74 15.67N	91 11.34W	330.0	PROBE	EAST BARROW STRAIT	HEAT PROBE (A.TAYLOR)
148	2580424	74 20.27N	88 34.53W	332.0	GRAB	BARROW STRAIT	VAN VEEN GRAB
149	2580456	74 20.33N	88 36.04W	332.0	CAMERA	BARROW STRAIT	UMEL CAMERA
150	2580519	74 20.34N	-8837.16W	325.0	CTD	BARROW STRAIT	CTD (MEL)
151	2580530	74 20.35N	88 37.60W	325.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
152	2580545	74 20.35N	88 38.13W	325.0	CTD	BARROW STRAIT	CTD (MEL)
153	2580555	74 20.39N	88 38.57W	325.0	PLANKTON	BARROW STRAIT	PLANKTON TOW (MEL)
154	2581808	74 22.01N	89 51.26W	329.0	CORE	LANCASTER SOUND	PISTON CORE. LENGTH: 621 CM.
154TWC	2581808	74 22.01N	89 51.26W	329.0	CORE	LANCASTER SOUND	TRIGGER WEIGHT CORE. LENGTH: 156 CM.
155	2581829	74 22.09N	89 51.21W	329.0	CTD	LANCASTER SOUND	CTD (MEL)
156	2581848	74 22.11N	89 51.15W	329.0	PLANKTON	LANCASTER SOUND	PLANKTON TOW (MEL)
157	2581908	74 22.11N	89 51.36W	329.0	CORE	LANCASTER SOUND	BOX CORE
158	2581937	74 22.09N	89 50.78W	329.0	PROBE	LANCASTER SOUND	HEAT PROBE (A. TAYLOR)
159	2582106	74 26.55N	89 52.50W	287.0	CORE	LANCASTER SOUND	PISTON CORE. LENGTH: 375 CM.
159TWC	2582106	74 26.55N	89 52.50W	287.0	CORE	LANCASTER SOUND	TRIGGER WEIGHT CORE. LENGTH: 115 CM.
160	2582145	74 26.53N	89 51.51W	287.0	PROBE	LANCASTER SOUND	HEAT PROBE (A. TAYLOR)

TABLE 1

86-027 STATIONS

STATION NUMBER	JULIAN DAY / TIME	LATITUDE	LONGITUDE	DEPTH (METRES)	SAMPLE TYPE	GEOGRAPHIC LOCATION	NOTES	
161	2582228	74 26.40N	89 51.40W	289.0	CAMERA	LANCASTER SOUND	UMEL CAMERA	
162	2611254	73 44.00N	88 44.20W	404.0	PISTON	PRINCE	PISTON CORE	LENGTH:137 CM

APPENDIX

1. Coastal Studies in the central Queen Elizabeth Islands (R.B. Taylor)

AREA OF OPERATIONS

Coastal zone sites along western Devon, Dundas, Somerset, Cameron and Lowther Islands (Fig. 1) within the central Queen Elizabeth Islands, District of Franklin, N.W.T.

DATES OF OPERATION

August 25 - September 18, 1986.

OBJECTIVES

1. To revisit and resurvey beach profile stations which were established in the early 1970's to determine net morphological changes over an 8 to 16 year period.
2. To determine the presence of new storm ridges along the modern beach and relate them to the size, spacing and age of similar beach deposits across the raised sequence.
3. To determine the distribution of ice push deposits across the modern and raised beach sequences; and correlate the severity and character of the ice push deposits to specific time periods and the magnitude of processes forming them.
4. To examine and map the distribution and thickness of nearshore sediments at selected beach profile sites where the geology and ice conditions are appropriate.
5. To extend the aerial video coverage of the coastlines in the Arctic

Islands, for environmental and management planning and for scientific research.

BASE OF OPERATIONS

Ground and aerial surveys were completed from the research vessel CSS Hudson using a Bell 206B helicopter CG-XMH on floats. The research was conducted in conjunction with GSC Project 820050 - Geology of Arctic Island Channels - B. MacLean, Chief Scientist and other staff from the Atlantic Geoscience Centre and Doug Hodgson, Geological Survey of Canada.

SUMMARY OF OPERATIONS

Following our arrival at Resolute Bay on August 26, 1986, we boarded CSS Hudson which was anchored in Resolute Harbour. The transfer of most of our gear was completed by personnel from Polar Continental Shelf earlier in the day but the rest was transferred with personnel, by barge, by roughly 1900 hours ADT. The remainder of the day was spent getting equipment set up and personnel settled in their new quarters. The ship sailed out of Resolute Bay that evening but did not begin survey lines until the next day; coastal surveys did not commence until August 29.

August 29, 1986. Departed the ship at 0915 ADT by helicopter to conduct a reconnaissance of the shores of northern Wellington Channel. Brief stops were made at the south coast to examine the beach morphology and at the top of the plateau on the northeastern peninsula of Dundas Island to search for glacial striae. Snow cover prevented an extensive examination of the rock surfaces which were severely weathered by solutional and gyrogenic processes. No striae were observed. A beach profile station and survey of the raised beach sequence to 25 m asl was completed at the gravel beach just east of Cape Majendie, Devon Island. Returned to the ship by 1430 ADT.

September 2, 1986. Depart the ship at 1300 ADT on route to Radstock Bay and Cape Ricketts, Devon Island where numerous beach profile stations existed. Established in 1969 and 1970, these profiles had been last surveyed in 1981. Five profiles were surveyed along the western shore of Radstock Bay between Caswall Tower and Cape Liddon and one was at Cape Ricketts. Helicopter returned to the ship at 1910 ADT.

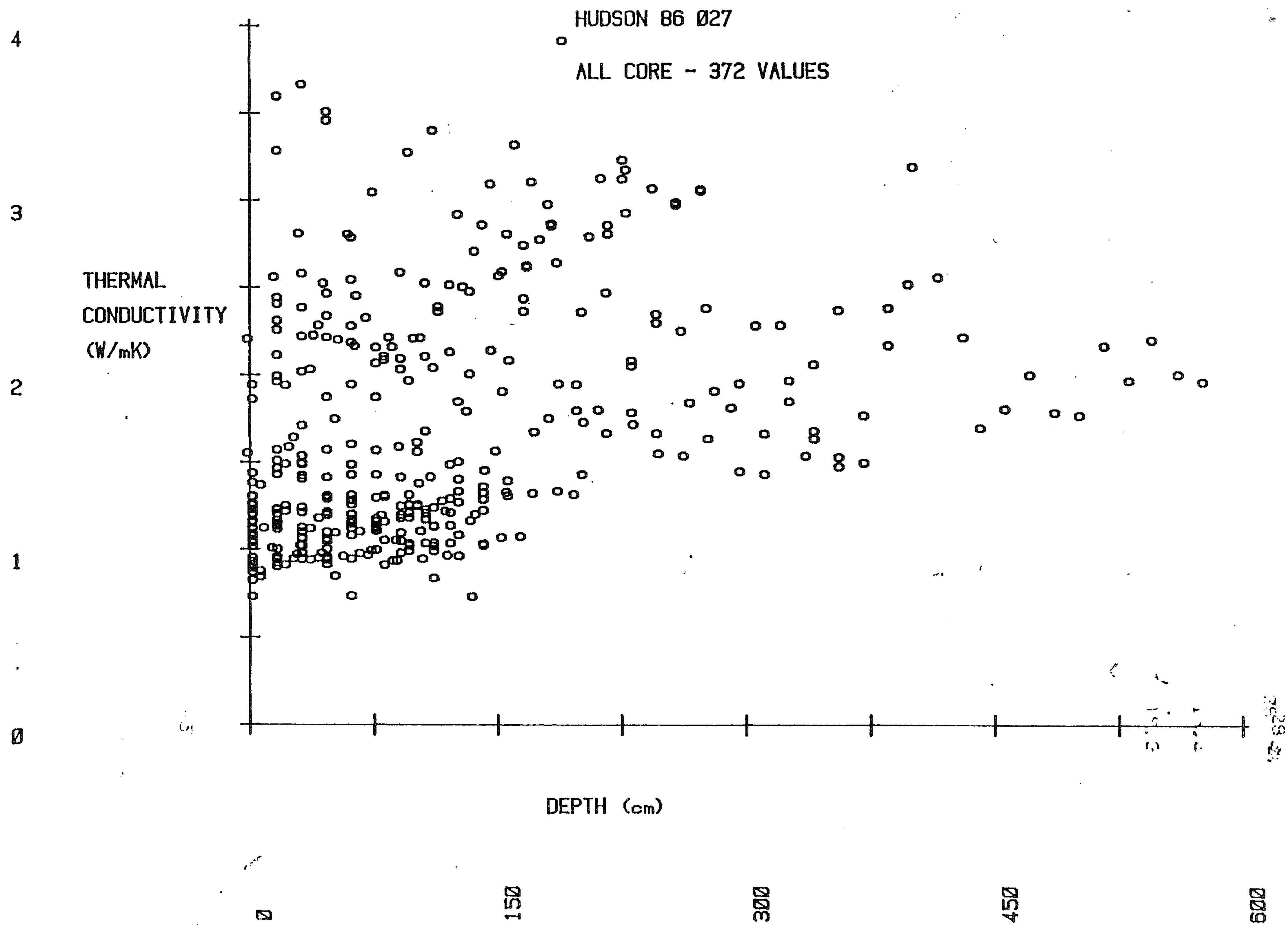
September 3, 1986. Departed for Somerset Island at 1310 ADT. Following a brief scan of the sea ice conditions toward Prince Leopold Island, the helicopter flew west to beach profile stations located just to the west and 5 km east of Cape Rennell as well as stations between Irvine and Garnier Bays. A total of five profiles were resurveyed before returning to the ship at 1915 ADT.

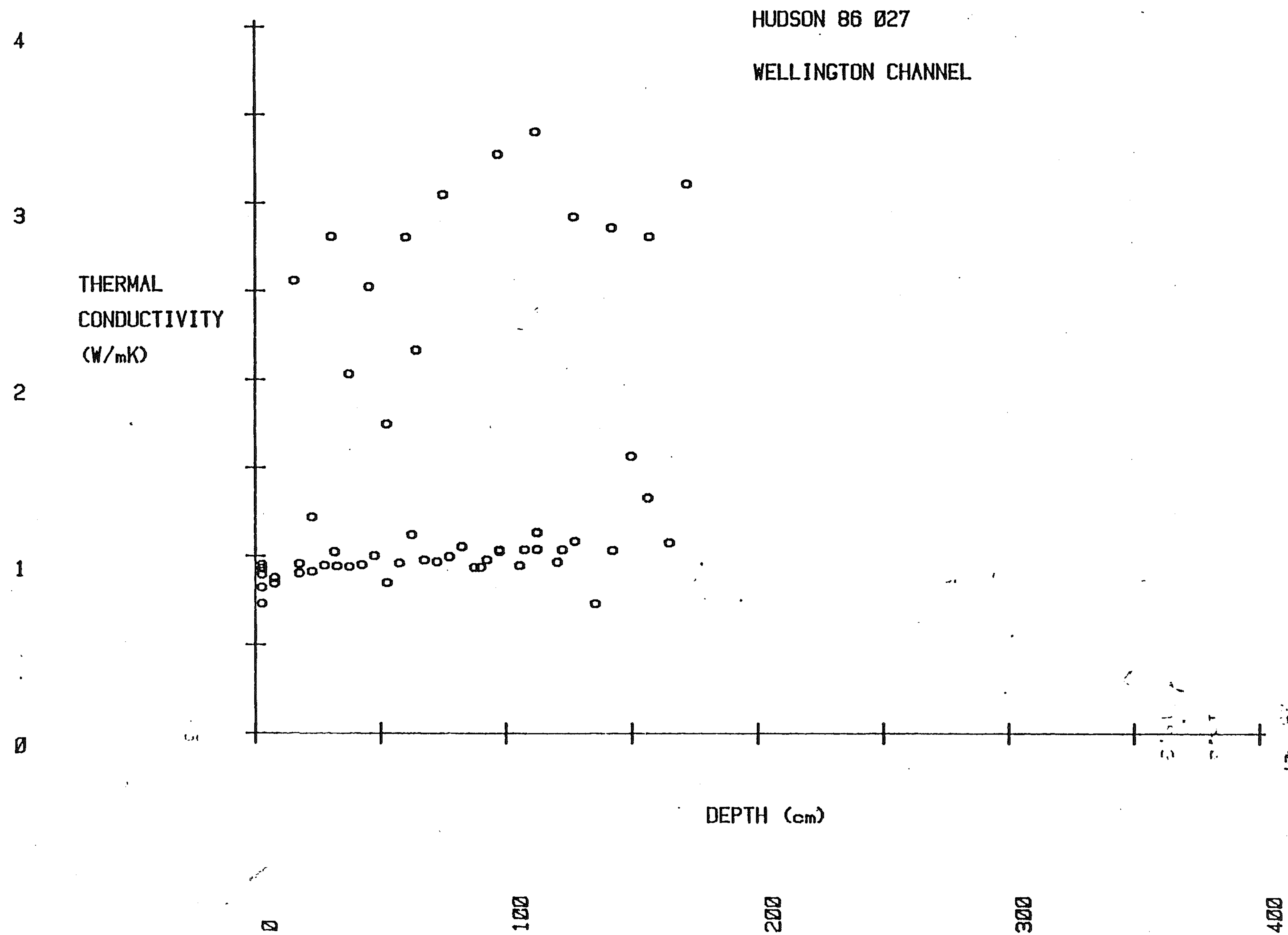
September 9, 1986. Departed the ship at 1245 ADT on route toward Cameron Island to examine ice conditions along the northern channels and complete beach surveys. Two beach profiles were surveyed, one near Cape Clerk at the SE corner of Cameron Island and the other was at Cape Kennedy at the SW corner of the island. Other profiles located along southern Cameron Island could not be found because of snow and ice cover. New sea ice covered most of the inter island channels and near shore it was thick enough to support a person, i.e. 3-4 cm. The only large open water area was along the centre of Arnott Strait. Even the passage cut through the Strait a few days earlier by the oil tanker ARCTIC had closed and refrozen. Land was too snow covered to conduct Quaternary geological surveys. Returned to the ship at 1600 ADT. An ice reconnaissance flight was run down Byam Channel and a couple of field stops were completed on northern Byam Martin Island to examine the surficial sediments. Helicopter returned to CSS Hudson at roughly 2100 ADT.

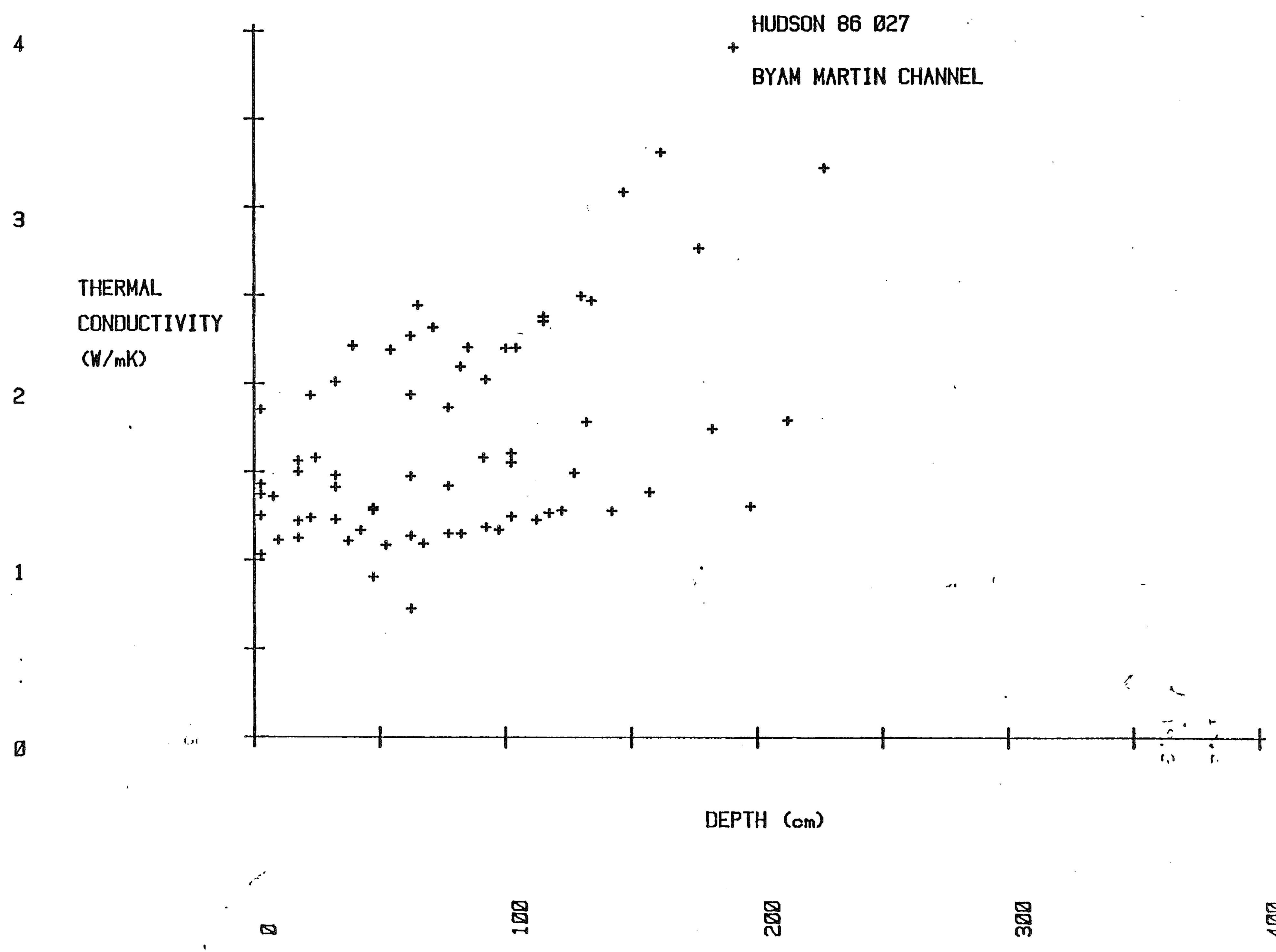
September 10, 1986. A bright sunny day and minimum snow cover on southern Melville Island presented an opportunity to finally complete some aerial oblique video coverage of the coastline. Departed ship at 1530 ADT and began video photography at 1600 just to the west of Ross Point, southern Melville Island. Video coverage was continuous alongshore to a position 5 km north of Robertson Point, eastern Melville Island (1650 ADT) which was the southern limit of the coastal video coverage completed along Melville Island during 1985 (Project 820050, GSC Open File 1298). An attempt was made to obtain video imagery along the shoreline of western Byam Martin Island however due to excessive snow cover only the section between May Cove and Kay Point was completed.

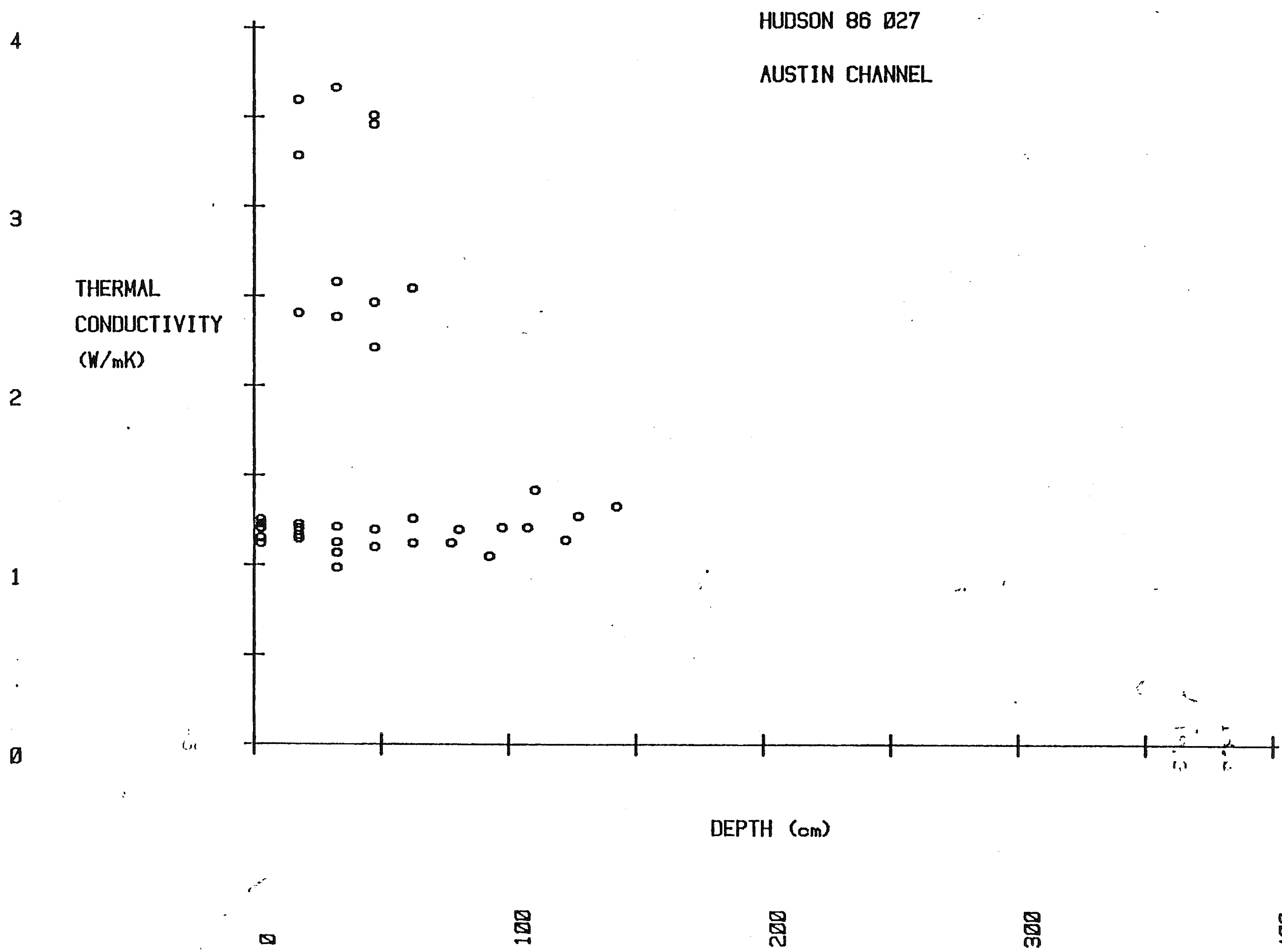
September 12, 1986. Flew from CSS Hudson at 0945 ADT to Lowther Island in overcast snowy conditions, air temperature -4°C. Completed surveys of two beach profiles and extended them upslope to 20 m asl. Snow cover particularly in the swales hampered surveys and the search for dateable material.

Brief searches were made for striae on the upper bedrock slopes of the Island but with no success. Returned to the ship at 1430 ADT.

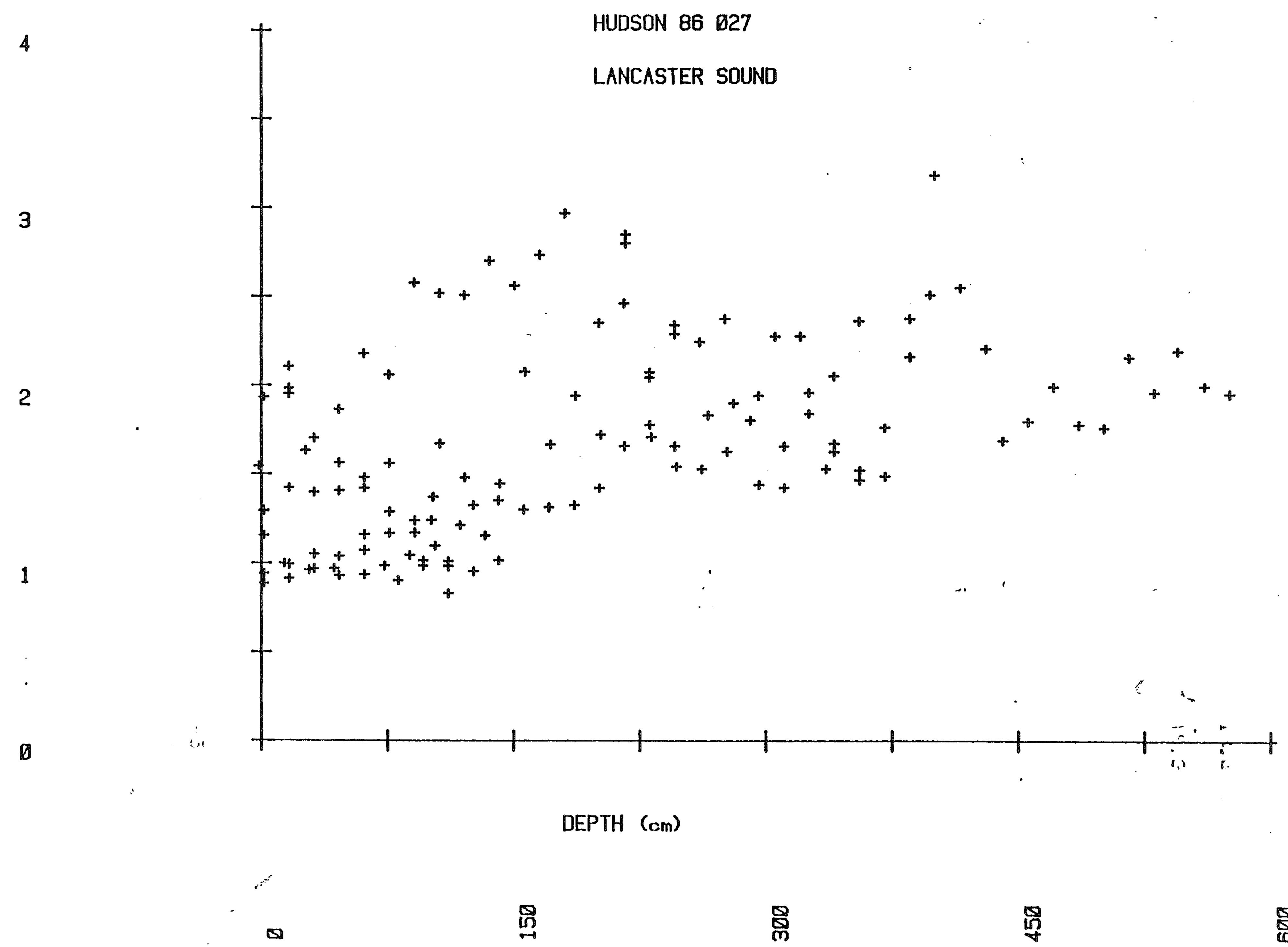

HUDSON 86 Ø27
ALL CORE - 372 VALUES
THERMAL
CONDUCTIVITY
(W/mK)
DEPTH (cm)
4
3
2
1
Ø
Ø
15Ø
3ØØ
45Ø
6ØØ

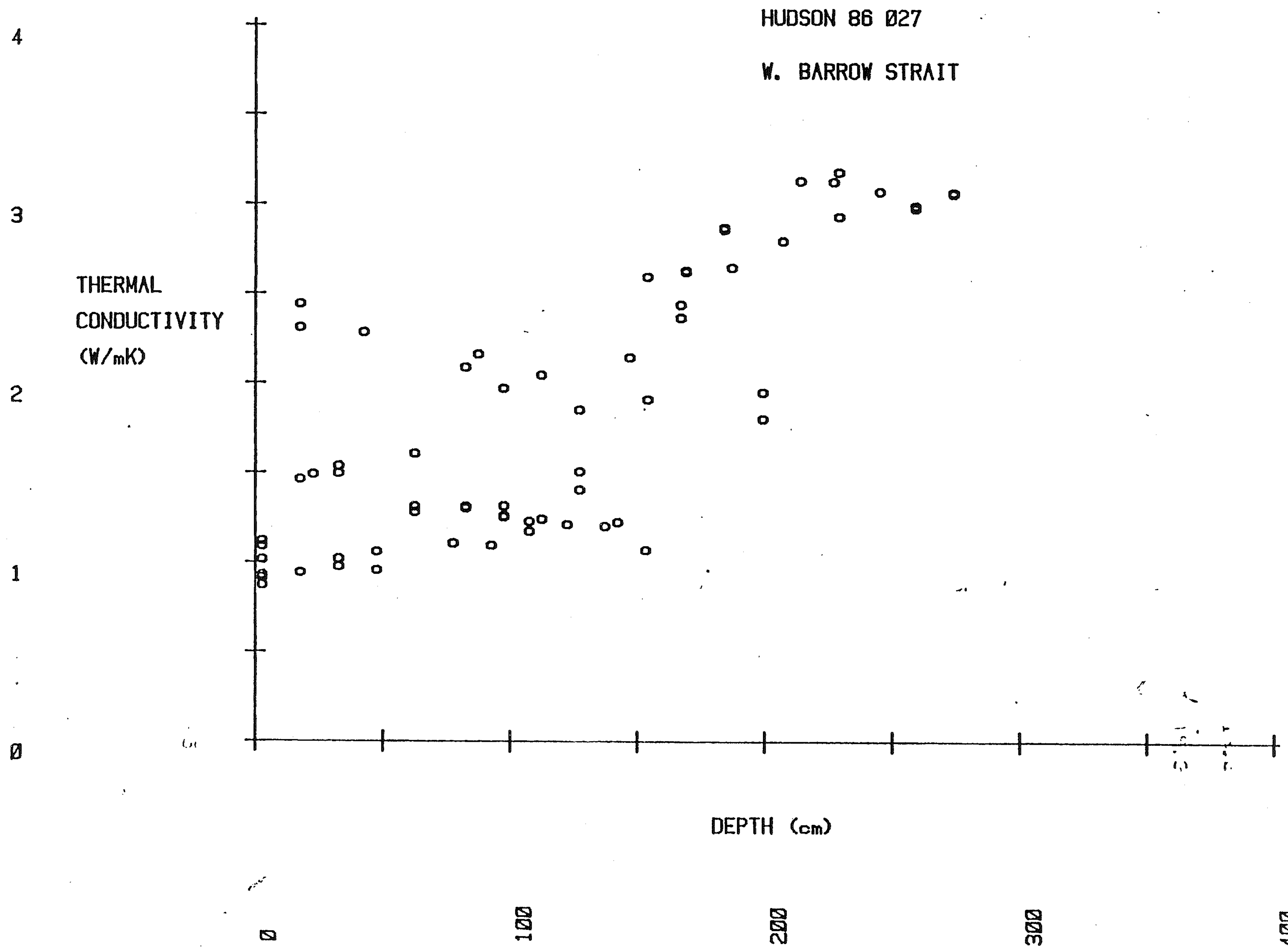

HUDSON 86 Ø27
WELLINGTON CHANNEL
THERMAL
CONDUCTIVITY
(W/mK)
4
3
2
1
Ø
DEPTH (cm)
Ø
100
200
300
400

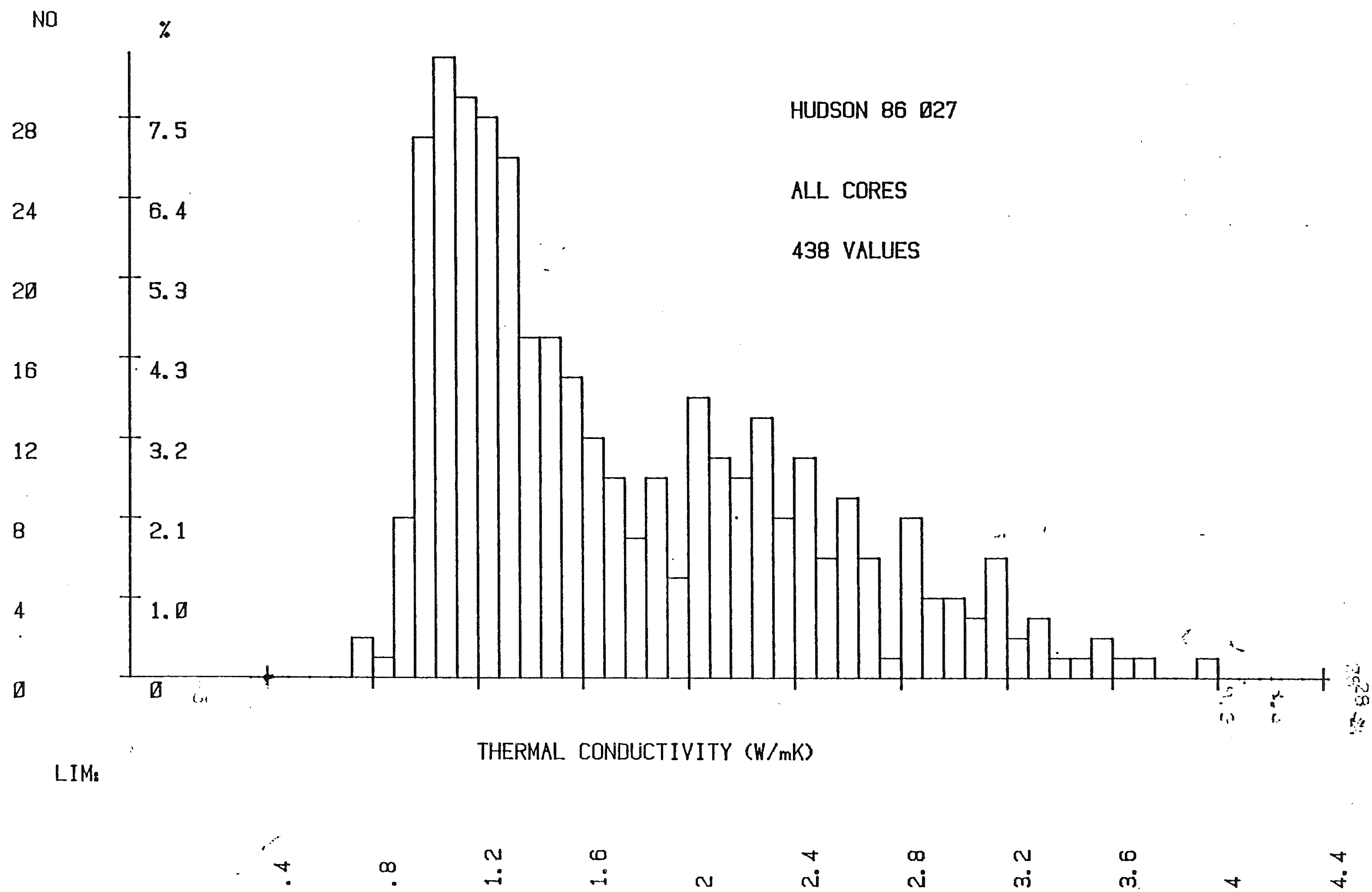

HUDSON 86 027
BYAM MARTIN CHANNEL
THERMAL
CONDUCTIVITY
(W/mK)
0
1
2
3
4
DEPTH (cm)
0
100
200
300
400



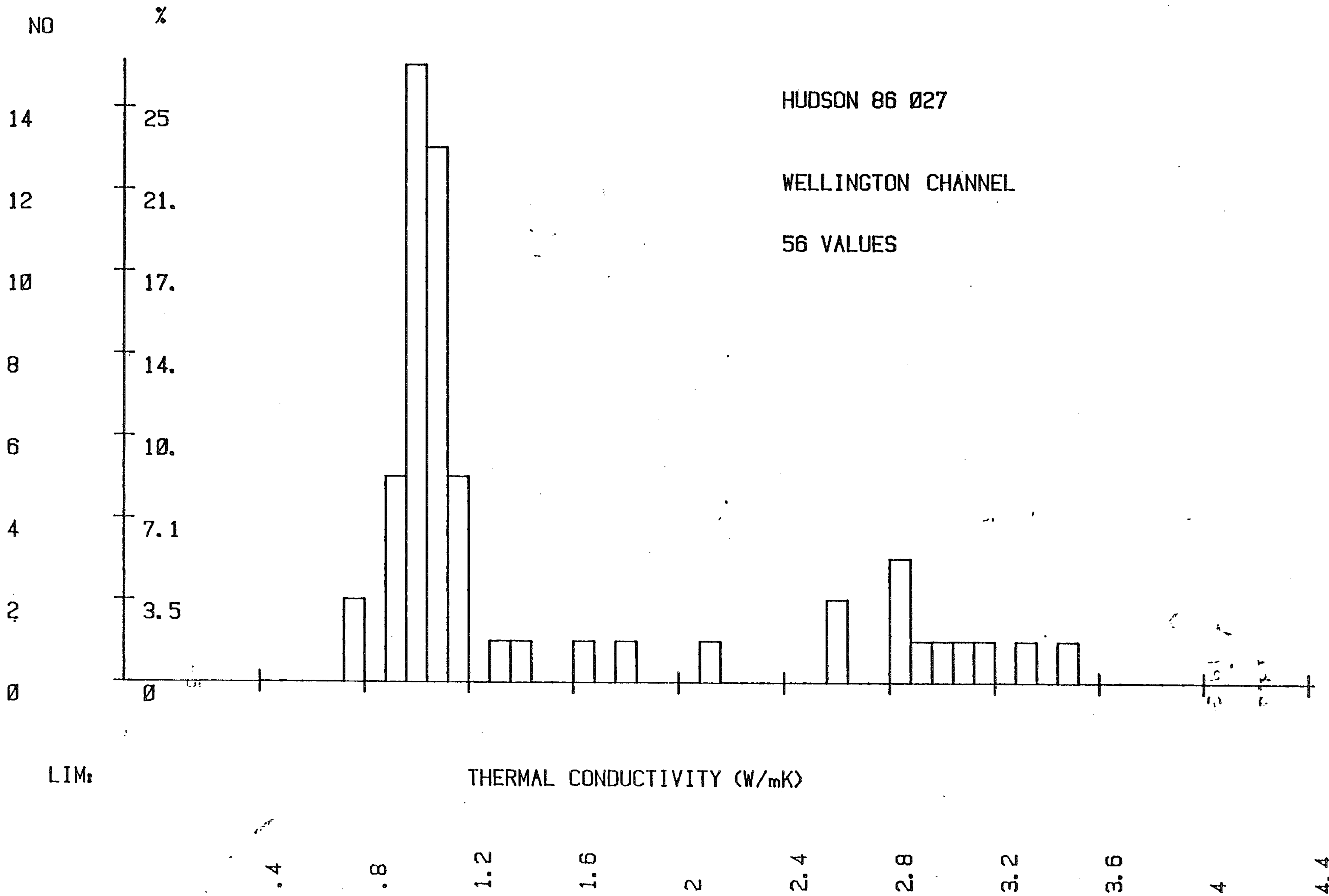
HUDSON 86 027
AUSTIN CHANNEL
THERMAL
CONDUCTIVITY
(W/mK)
0
1
2
3
4
DEPTH (cm)
0
100
200
300
400

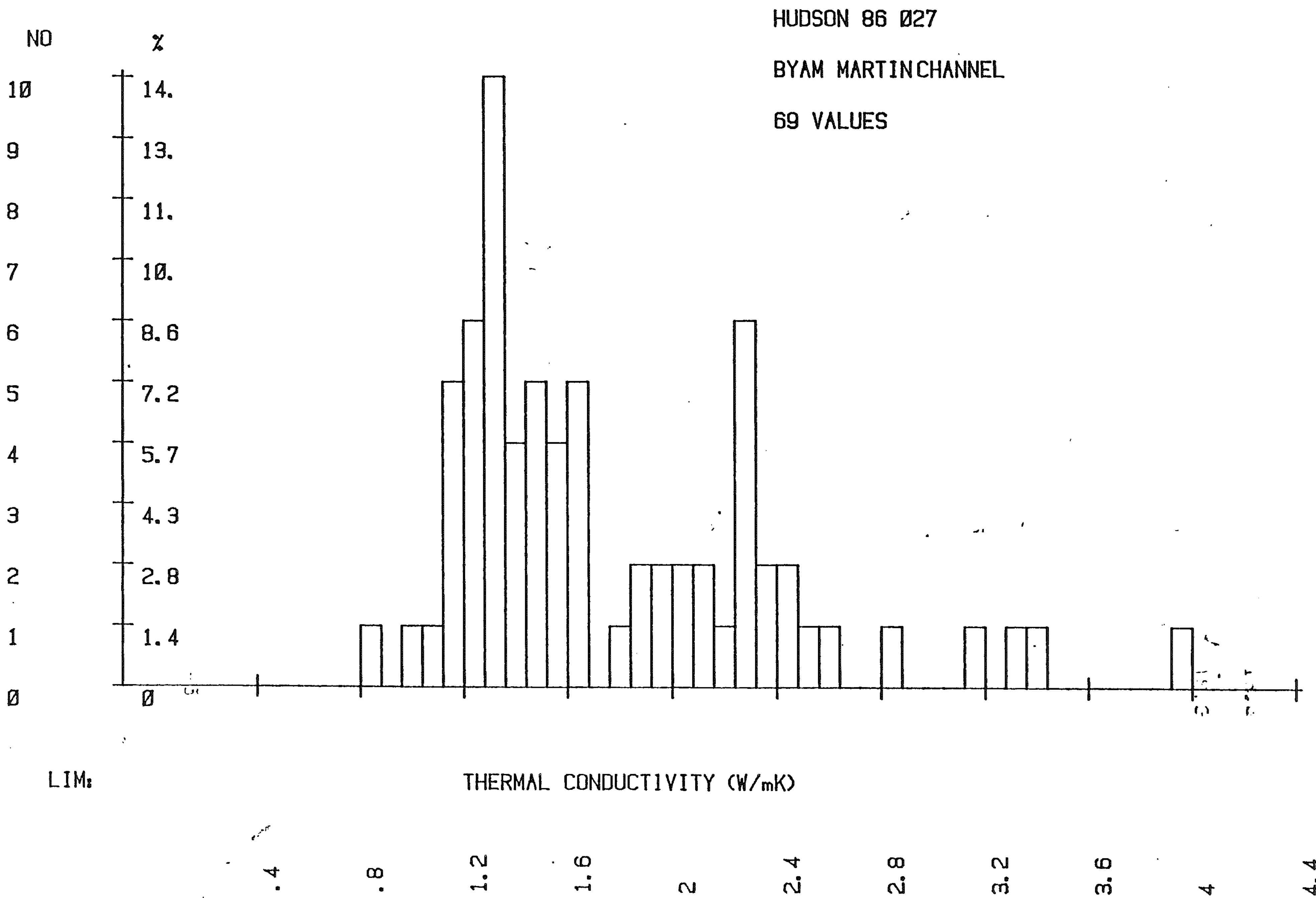

HUDSON 86 027
LANCASTER SOUND
4
3
2
1
0
DEPTH (cm)
0
150
300
450
600

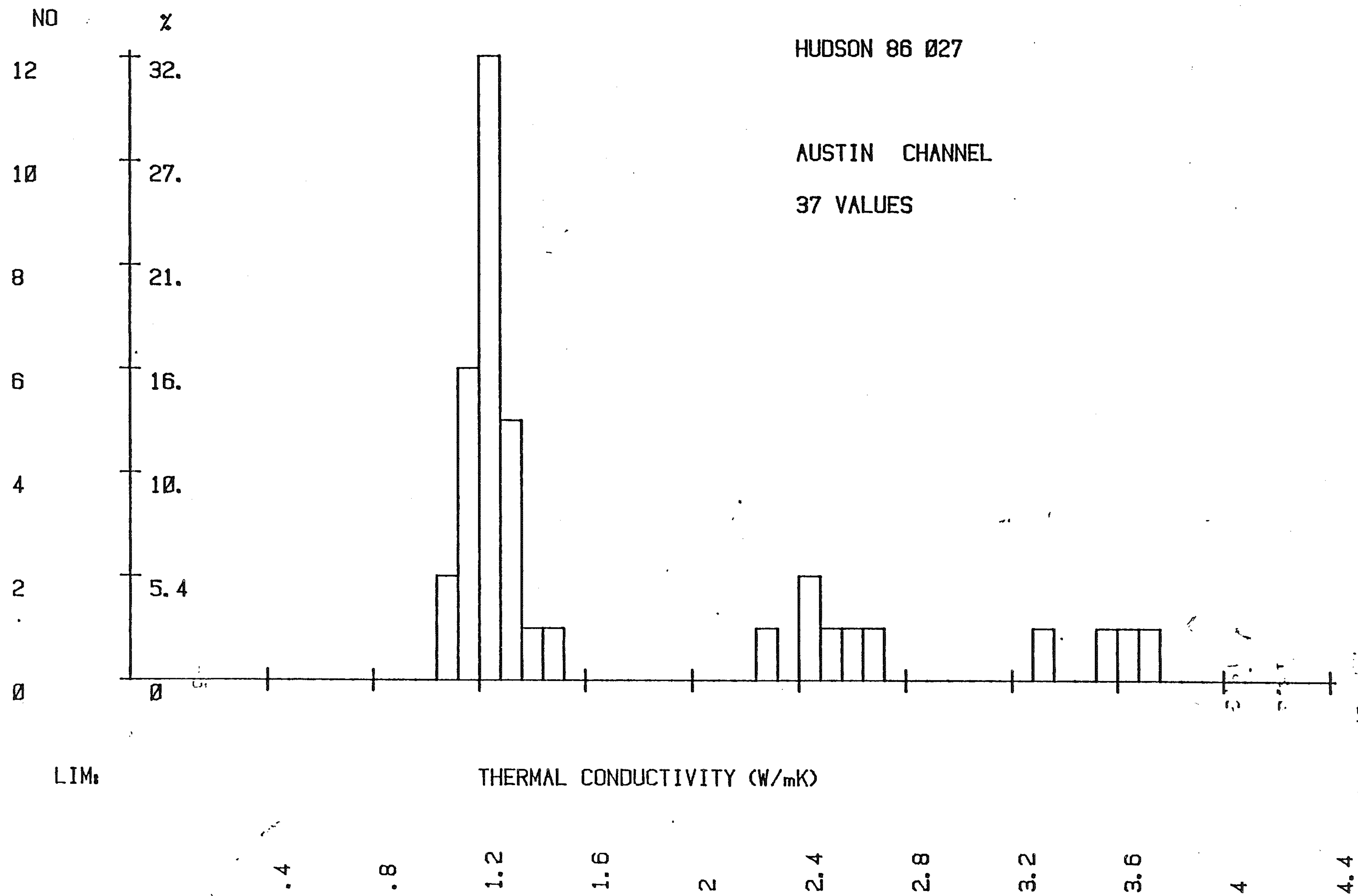

HUDSON 86 027
W. BARROW STRAIT
THERMAL
CONDUCTIVITY
(W/mK)
DEPTH (cm)
4
3
2
1
0
0
100
200
300
400

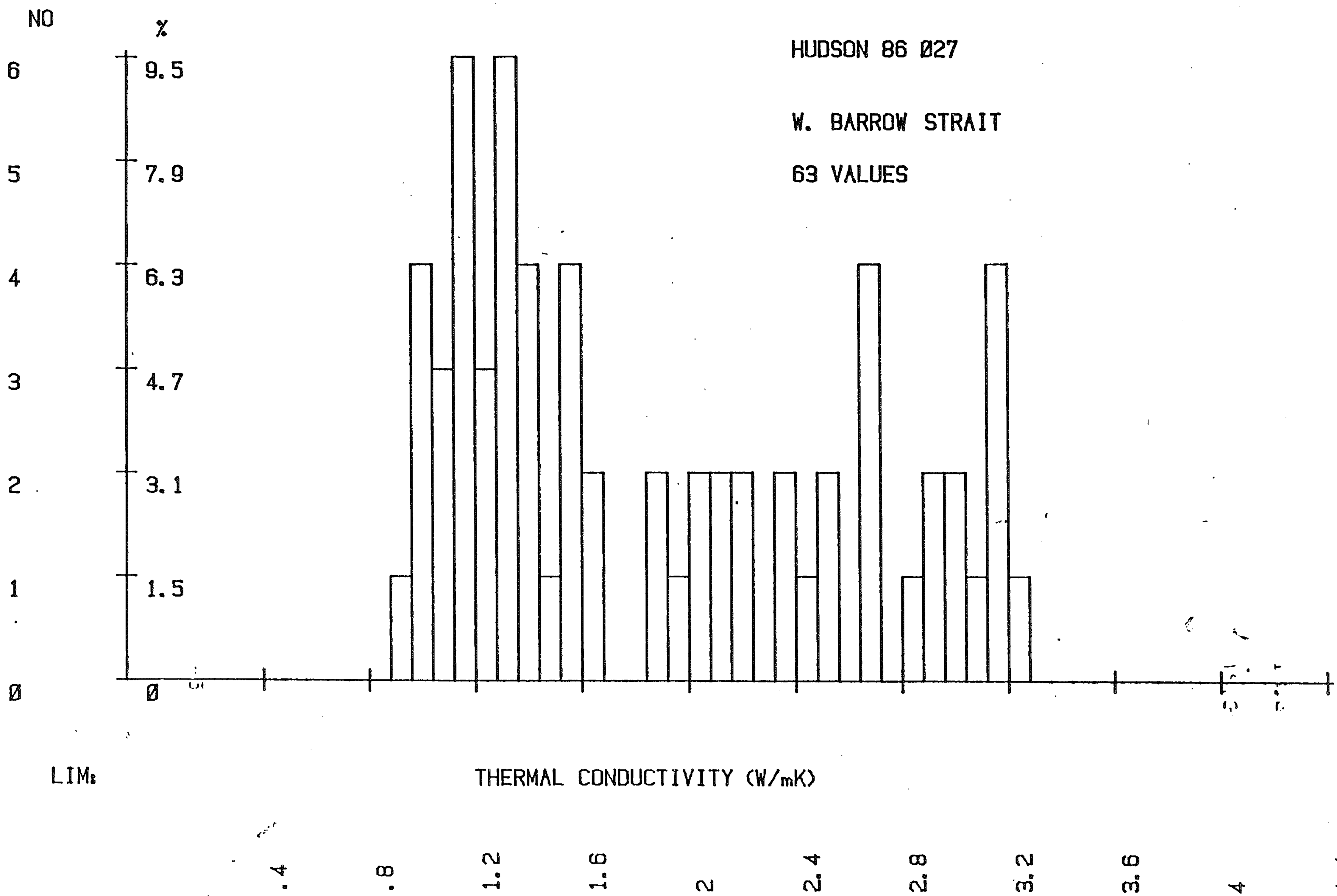


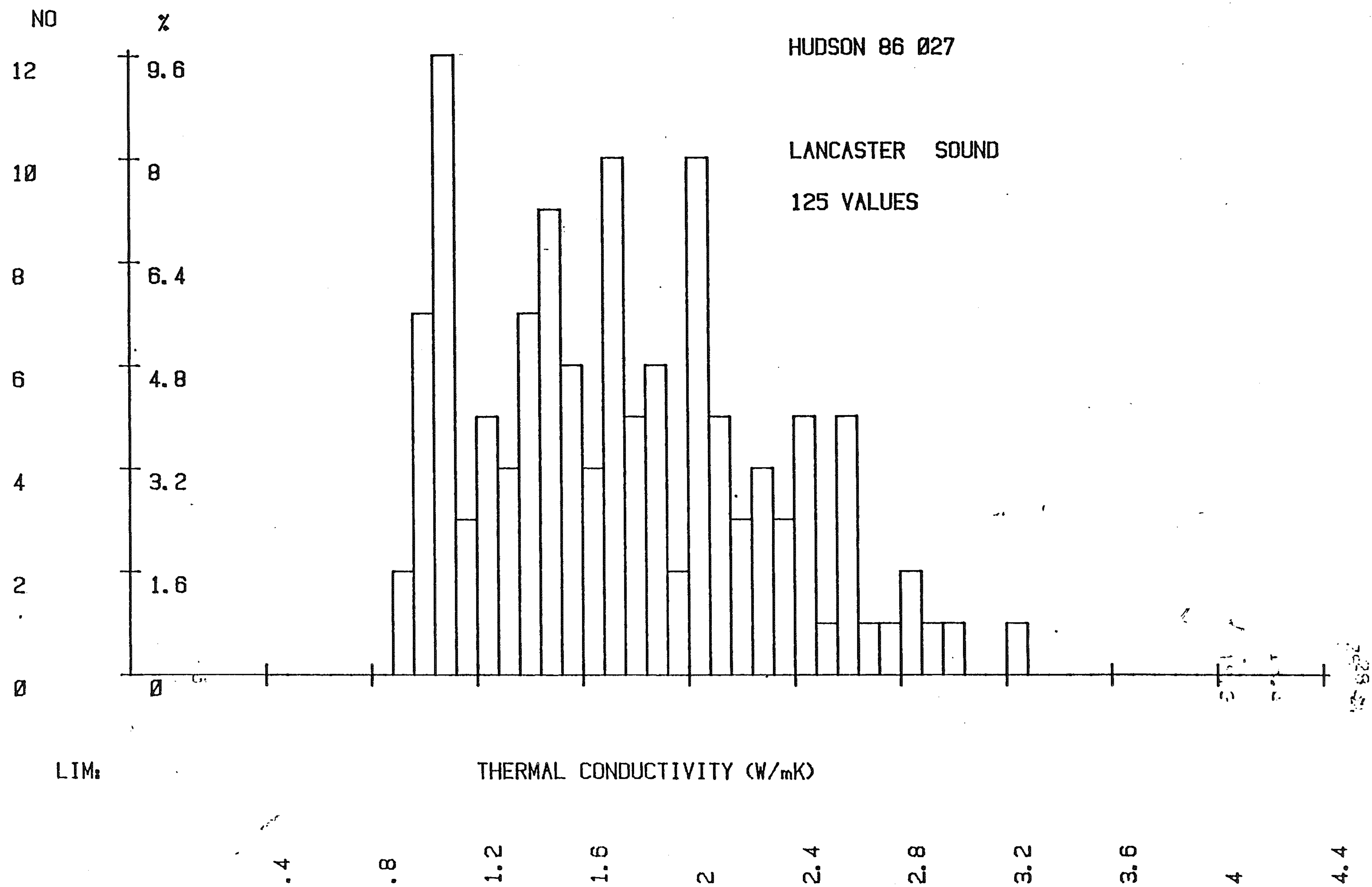
NO
%
28
24
20
16
12
8
4
0
7.5
6.4
5.3
4.3
3.2
2.1
1.0
0
HUDSON 86 027
ALL CORES
438 VALUES
THERMAL CONDUCTIVITY (W/mK)
LIM:
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4


NO
%
HUDSON 86 027
WELLINGTON CHANNEL
56 VALUES
14
12
10
8
6
4
2
0
25
21.
17.
14.
10.
7.1
3.5
0
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4

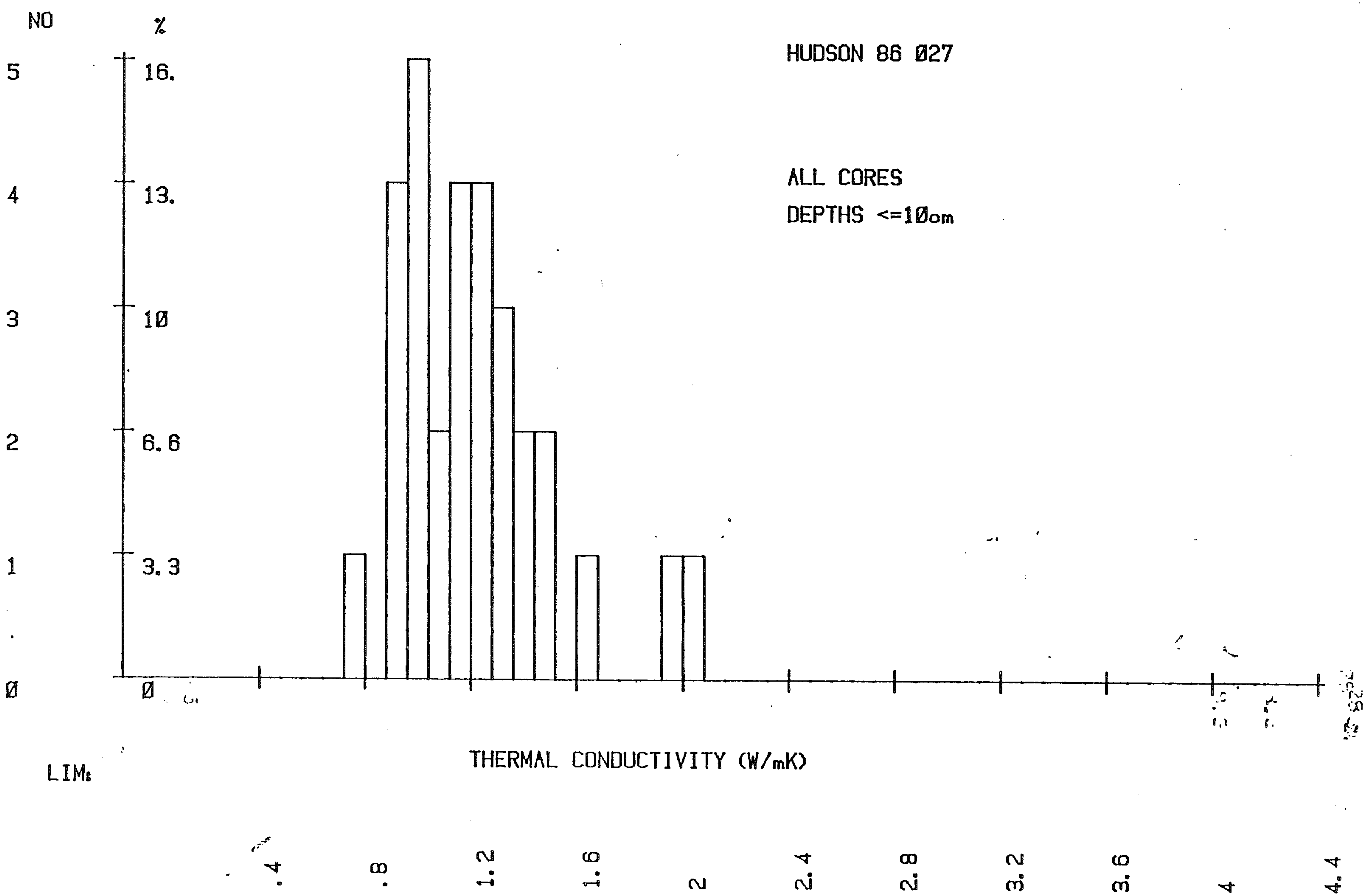

HUDSON 86 Ø27
BYAM MARTINCHANNEL
69 VALUES
NO
%
1Ø
9
8
7
6
5
4
3
2
1
Ø
14.
13.
11.
1Ø.
8.6
7.2
5.7
4.3
2.8
1.4
Ø
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4


NO
%
12
10
8
6
4
2
0
32.
27.
21.
16.
10.
5.4
0
HUDSON 86 027
AUSTIN CHANNEL
37 VALUES
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4


HUDSON 86 Ø27
W. BARROW STRAIT
63 VALUES
NO
6
5
4
3
2
1
Ø
%
9.5
7.9
6.3
4.7
3.1
1.5
Ø
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4



HUDSON 86 Ø27
LANCASTER SOUND
125 VALUES
NO
%
12
10
8
6
4
2
0
9.6
8
6.4
4.8
3.2
1.6
Ø
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4



NO
%
5
4
3
2
1
Ø
16.
13.
1Ø
6.6
3.3
Ø
HUDSON 86 Ø27
ALL CORES
DEPTHS <=1Øom
THERMAL CONDUCTIVITY (W/mK)
LIM:
.4
.8
1.2
1.6
2
2.4
2.8
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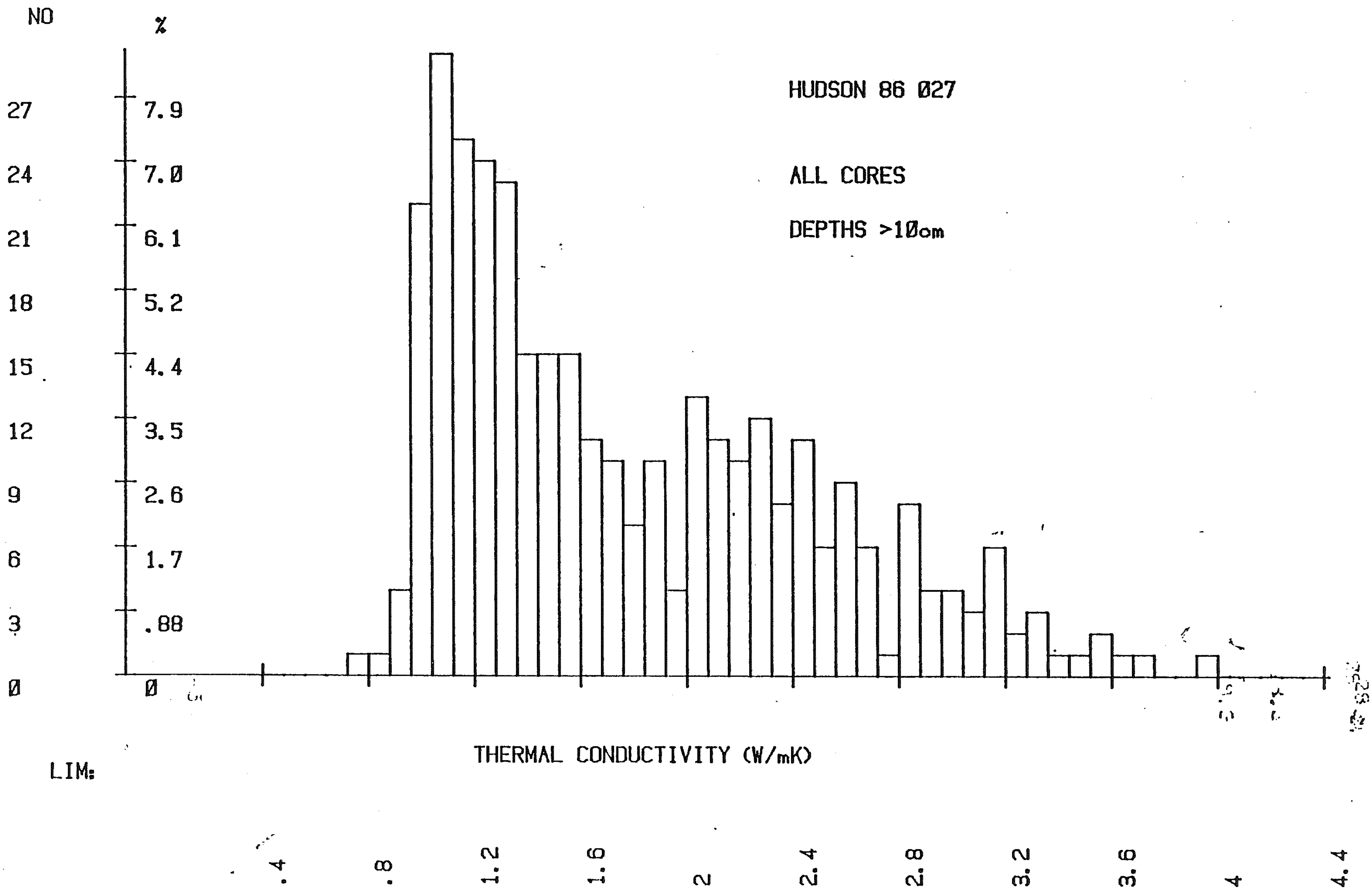
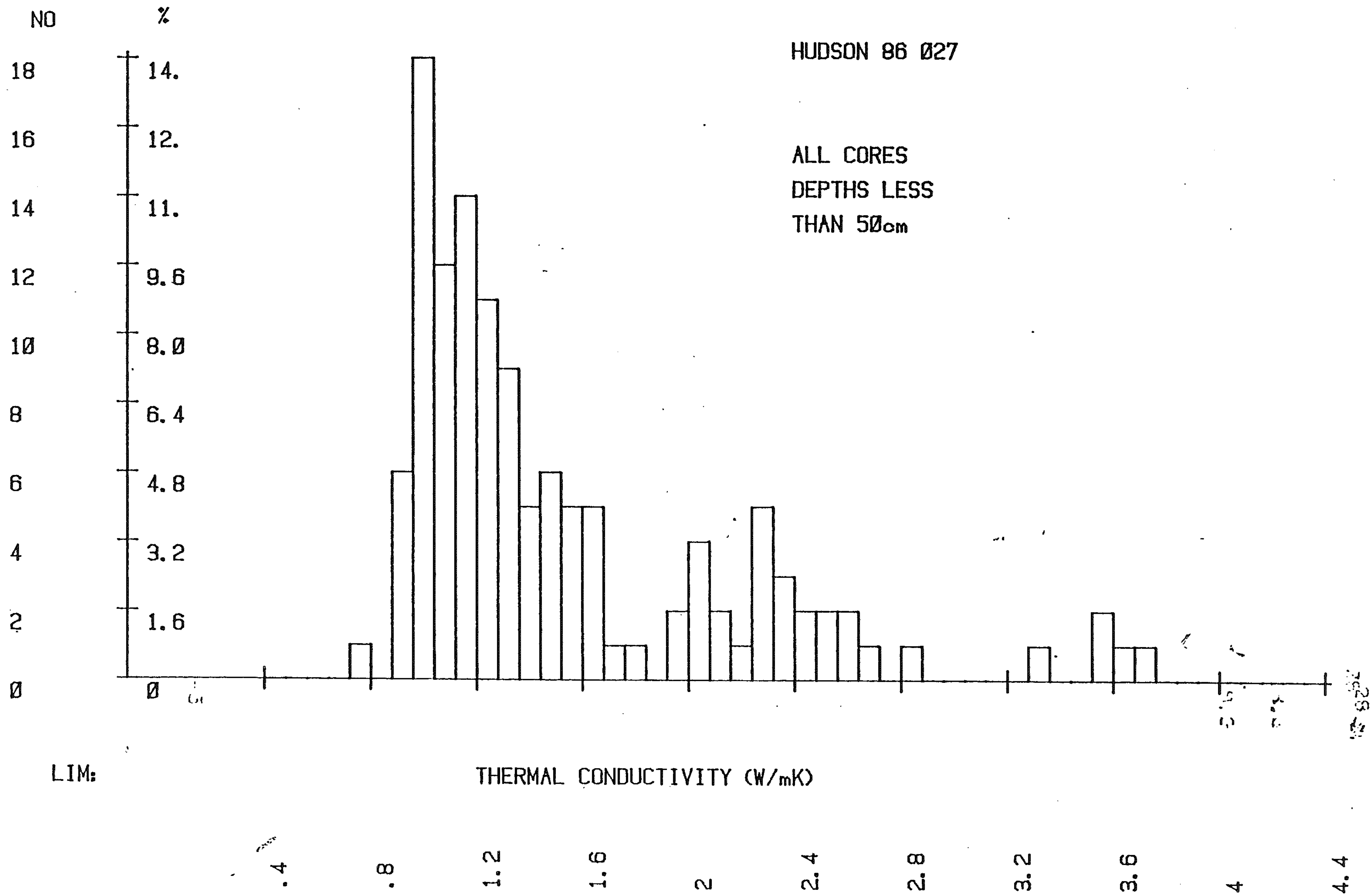
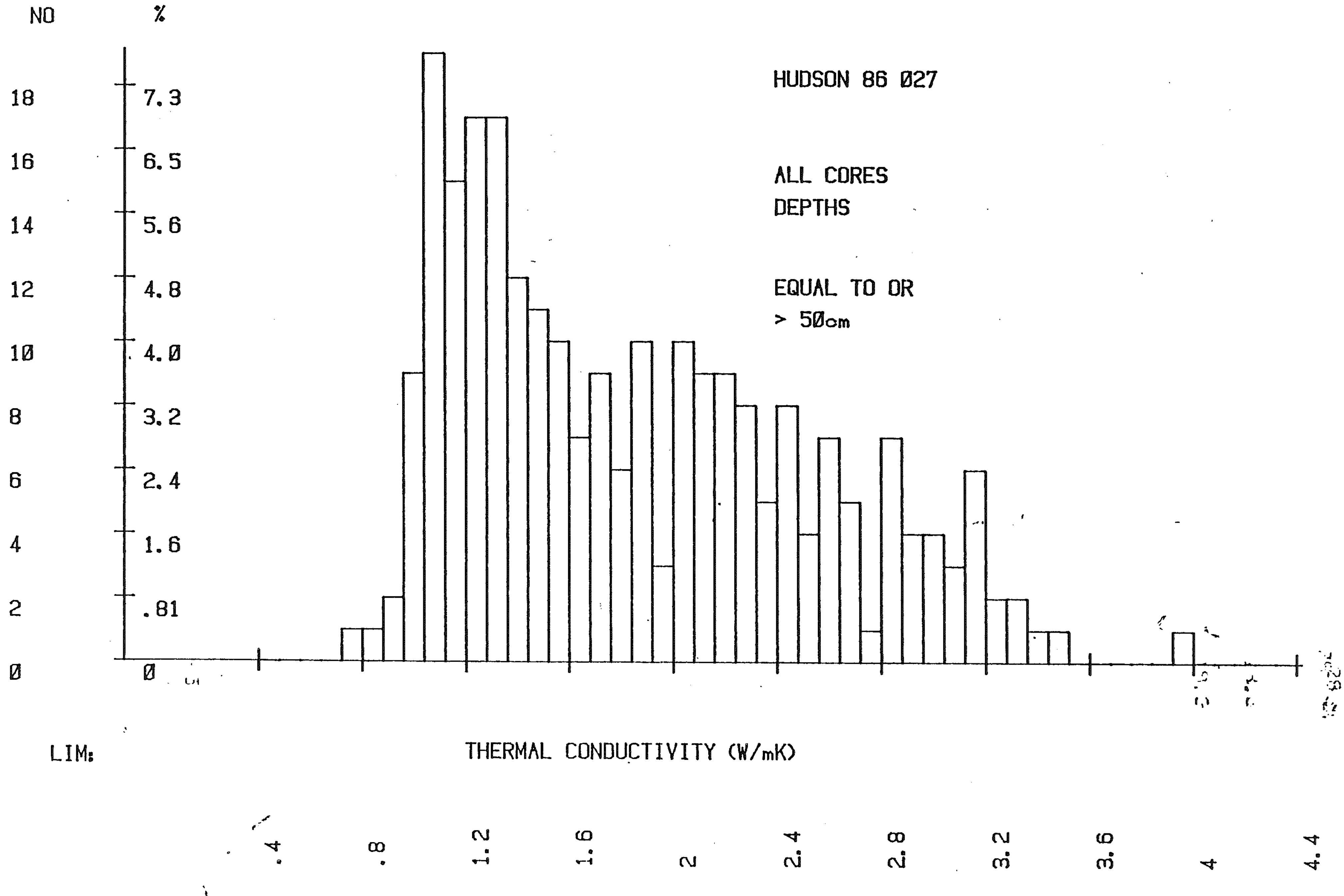
3.6
4
4.4

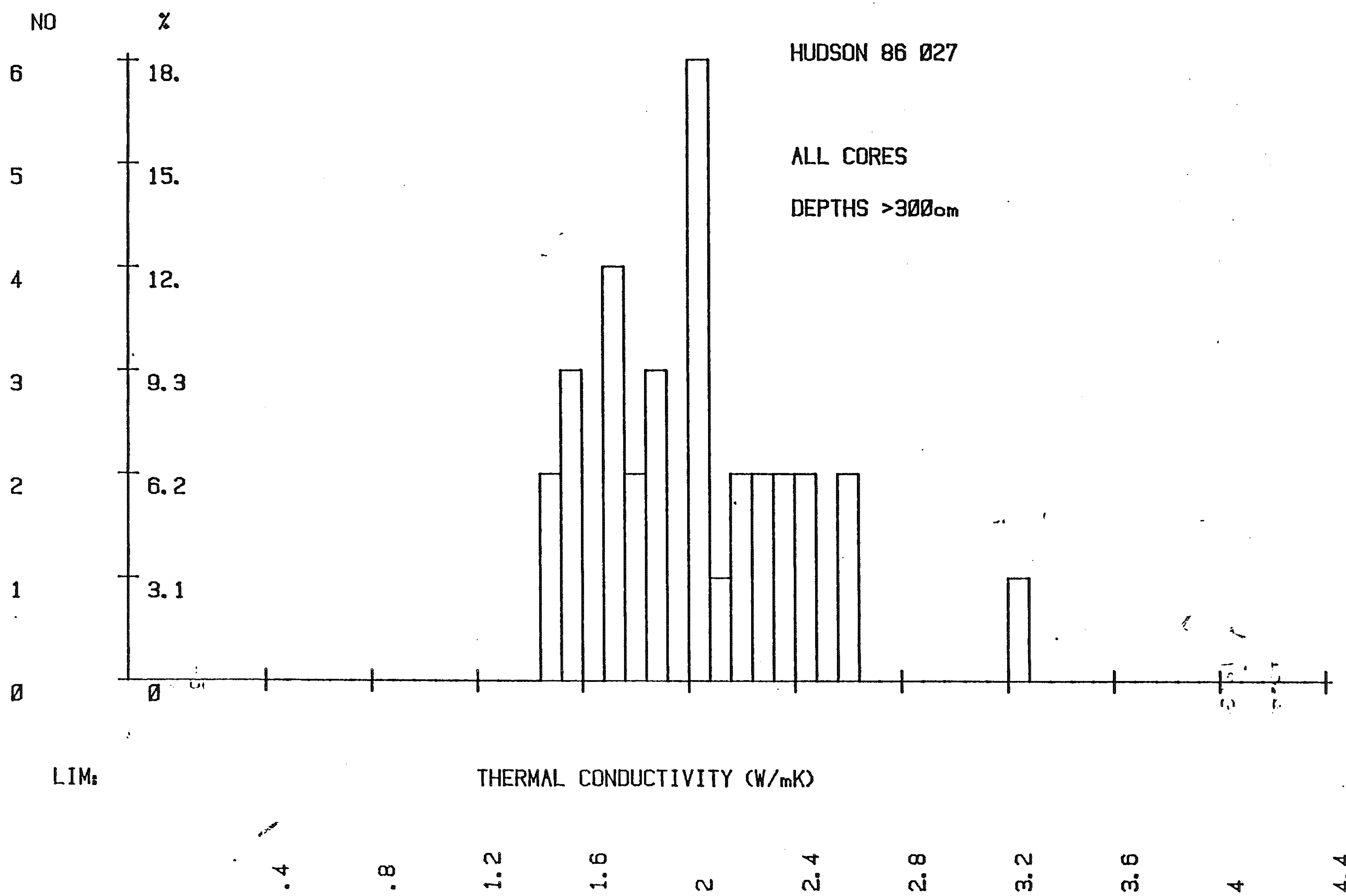


HUDSON 86 Ø27
ALL CORES
DEPTHS >1Øcm
NO
%
27
24
21
18
15
12
9
6
3
Ø
7.9
7.Ø
6.1
5.2
4.4
3.5
2.6
1.7
.88
Ø
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4
THERMAL CONDUCTIVITY (W/mK)
LIM:



HUDSON 86 Ø27
ALL CORES
DEPTHS LESS
THAN 5Øcm
NO
18
16
14
12
1Ø
8
6
4
2
Ø
%
14.
12.
11.
9.6
8.Ø
6.4
4.8
3.2
1.6
Ø
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4


NO
%
18
16
14
12
10
8
6
4
2
0
7.3
6.5
5.6
4.8
4.0
3.2
2.4
1.6
.81
0
HUDSON 86 027
ALL CORES
DEPTHS
EQUAL TO OR
> 50cm
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4



HUDSON 86 027
ALL CORES
DEPTHS >300om
NO
%
6
5
4
3
2
1
0
18.
15.
12.
9.3
6.2
3.1
0
LIM:
THERMAL CONDUCTIVITY (W/mK)
.4
.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4

2. Geothermal Program (A. Taylor)

In the Geothermal program, 8 stations were occupied with a Bullard-type temperature gradiometer probe and thermal conductivity measurements were made on 33 core sections.

The Bullard heat flow probe is capable of measuring precise sediment temperatures at 8 thermistor positions along a 1.6cm diameter, 3m long probe in the sediments. The temperature gradient so obtained is combined with thermal conductivities measured on a nearby core to yield an estimate of terrestrial heat flow. This parameter is related to the crustal geology although transient effects such as seasonal changes in bottom water temperature or migration of pore water in the sediments may be detected due to their thermal effect on the deeper sediments.

At four of the eight stations occupied with the Bullard probe, recording level on the reel-to-reel tape was too low for further processing on the ship. At the remaining stations, record quality was satisfactory. At two of these latter stations, it appears that the probe had not penetrated the bottom or had fallen over after partial penetration. This may arise from difficulty in penetrating the generally coarse-grained, clast-filled sediments. Such a situation is suspected upon retrieval if there is only a partial mud smear along the length of the probe; and upon data analysis if a near isothermal gradient is measured.

A good gradient determination was made at station 147 in East Barrow Strait. Further analysis is required to correct for possible transient influences, but the measured gradient is rather high, about 80mK/m. The average thermal conductivity at nearby core station 144 is 1.03W/mK (watts per metre Kelvin) to 1.5m (trigger core); conductivities appear to increase with depth in the piston core and are somewhat higher (near 2W/mK at 3m measured depth). Considering the possible uncertainty in depth actually sampled by the piston corer, this data suggests a provisional terrestrial heat flow for the station of at least $80mW/m^2$ (i.e. 80 x 1.03). This is consistent with generally high heat flows measured at onshore wells throughout the Arctic Archipelago.

Thermal conductivity measurements were made generally at 15cm intervals on all but a couple of cores. In all, 438 individual readings were made (see tables), although 10% of these were repeats. Measurements were made by a computer-controlled data acquisition system using the needle probe method. These probes are less than a millimetre in diameter, about 6cm long and contain a heating element over the full length. A thermistor inside the same probe measures the rise in temperature due to the heater. When inserted into sediment, the rate of temperature rise is related to the thermal conductivity of the sediment.

Thermal conductivity of sediments is controlled largely by the conductivity of the matrix material and of water; the value for water is 0.6W/mK. Values for the solid components may be much higher. Hence, thermal conductivity is an additional geotechnical parameter that is sensitive to water content and matrix properties.

On Hudson 86-027, thermal conductivities ranged from about 0.8 to 4W/mK, contrasting to values 0.7 to 1.3 in deep sea sediments and 1.3 (average) in upper sediments from the outer Beaufort Shelf. The high values are undoubtedly related to the granularity and incidence of clasts. Further correlation with detailed core descriptions and other geotechnical measurements will be most interesting.

In reference to the attached graphs, a number of points stand out:

1. Of the 438 determinations, 27% are greater than 2W/mK. The distribution diagram has a principal peak around 1W/mK, with a prominent tail to higher values and a secondary peak at 2W/mK. When all values are plotted against depth, a tendency for conductivity to increase with depth is noted. This would suggest a decreasing water content and compaction, perhaps also a lithology variation. The effect is less pronounced if the nominal depths assigned to the piston cores are low.
2. The distribution of thermal conductivity values show some distinct differences in the major geographic areas sampled. Values in Wellington Channel peak around 1.0W/mK, while in Byam Martin Channel, there is a broader peak around 1.3W/mK with a substantial tail to higher conductivity. This suggests a finer textured sediment in the former area. Values in Barrow Strait and Lancaster Sound fall on a broad distribution between 1.0 and more than 2.5.
3. Similar comparisons were made with various depth intervals. Thermal conductivities at assigned depths less than 10cm peaked between 1.0 - 1.3W/mK, with no tail beyond 2.0; while for depths greater than 10cm, a long tail appeared in the distribution diagram to over 3W/mK. This reflects the generally soft, uniform sediments noted in the upper few centimetres of each core.
4. Observations during the core retrieval operations suggest that the piston core has been not sampling the upper sediment section. Further evidence

of this may be seen in the thermal conductivity values; at several stations (e.g. station 86) the conductivity-depth profile for the piston core mirrors that of the trigger weight core but appears more shallow than the trigger weight profile. At other stations (e.g. stations 12, 77, 99 and 154) there is no particular correlation between piston core and trigger weight core conductivities, but the former are distinctly higher in value than the latter. Both observations suggest the piston cores may have been assigned depths 30 - 50cm too shallow (station 86); or a metre or more (stations 12, 77, 99 and 154) because the higher conductivities are more appropriate for deeper horizons.

3. NAVIGATION (H. Boudreau)

A. General

The primary survey positioning system was Bedford Institute's BIONAV integrated navigation system. The secondary system was ship's radar, augmented with a rented GNS (Omega) receiver in "stand-alone" mode.

Positions were obtained from BIONAV approximately 60% of the time with an accuracy of ±35 metres with GPS. The remainder of the time, except for two days when Loran was available, positions were obtained using ship's radar. The GNS was unable to properly track stations and was not used.

Navigation data was logged on BIONAV disc files at 1 min. intervals and on CIGAL (Dr. Loncarevic's development system) at 10 sec. intervals.

B. BIONAV

BIONAV was interfaced to the following inputs:

1. Magnavox T-set (GPS Navstar).
2. TRANSIT satellite receiver.
3. Ship's log/gyro.
4. Loran LC408 receiver (2).

The navigation programs were set up to accept GPS Navstar whenever four satellites were available and positional errors computed to be less than 20 metres in both latitude and longitude. This provided positions for slightly less than eight hours each day. During the first week, programs were modified to accept three satellites, making GPS available twelve hours per day with the accuracy only slightly reduced (25 metres) for the remainder of the cruise.

Between times of GPS coverage, BIONAV positions were obtained by dead-reckoning (using ship's log/gyro) updated by Transit satellite. This was unsatisfactory when in even very light ice because of large unpredictable errors in log reading. Later in the cruise (third week), when in ice-free waters, this normally provided positioning to an accuracy of ± 350 metres. The accuracy of dead reckoning deteriorated to as much as ± 2 naut. mi. in currents approaching 2 knots.

Loran signals from Fox Harbour, Labrador, and Angissoq, Greenland, were acquired just south of Cape Dyer, at ranges of slightly over 600 miles. Loran was then used to position the ship between times of GPS coverage. Estimated accuracy was ± 200 metres.

As range from Fox Harbour increased to over 700 naut. mi., with a combination of very low signal strength and rapidly changing land path, Loran positions became extremely unstable with shifts of ± 0.3 naut. mi. being observed. At this point it was decided to discontinue Loran for BIONAV positioning.

C. GNS (Omega)

A GNS receiver was leased from Polar Shelf, the intention being to supplement observations during periods when GPS Navstar was not available. This receiver did not function as expected and its use was discontinued.

The cause was not determined; however, it was suspected that the antennae was at fault, e.g. when elecrically grounded as recommended, an unacceptable interference was seen on ship's radiotelephone equipment.

D. Radar

Radar positioning was available 95% of the time, and was used when neither GPS nor Loran was available. Quality of positions varied with availability of good targets at short range (less than 6 miles) to poor targets at long range.

Estimated positional accuracy of radar while on survey was ± 0.1 naut. mi. to ± 0.4 naut. mil.

Radar positions were monitored and superceded by Transit satellite positions when available.