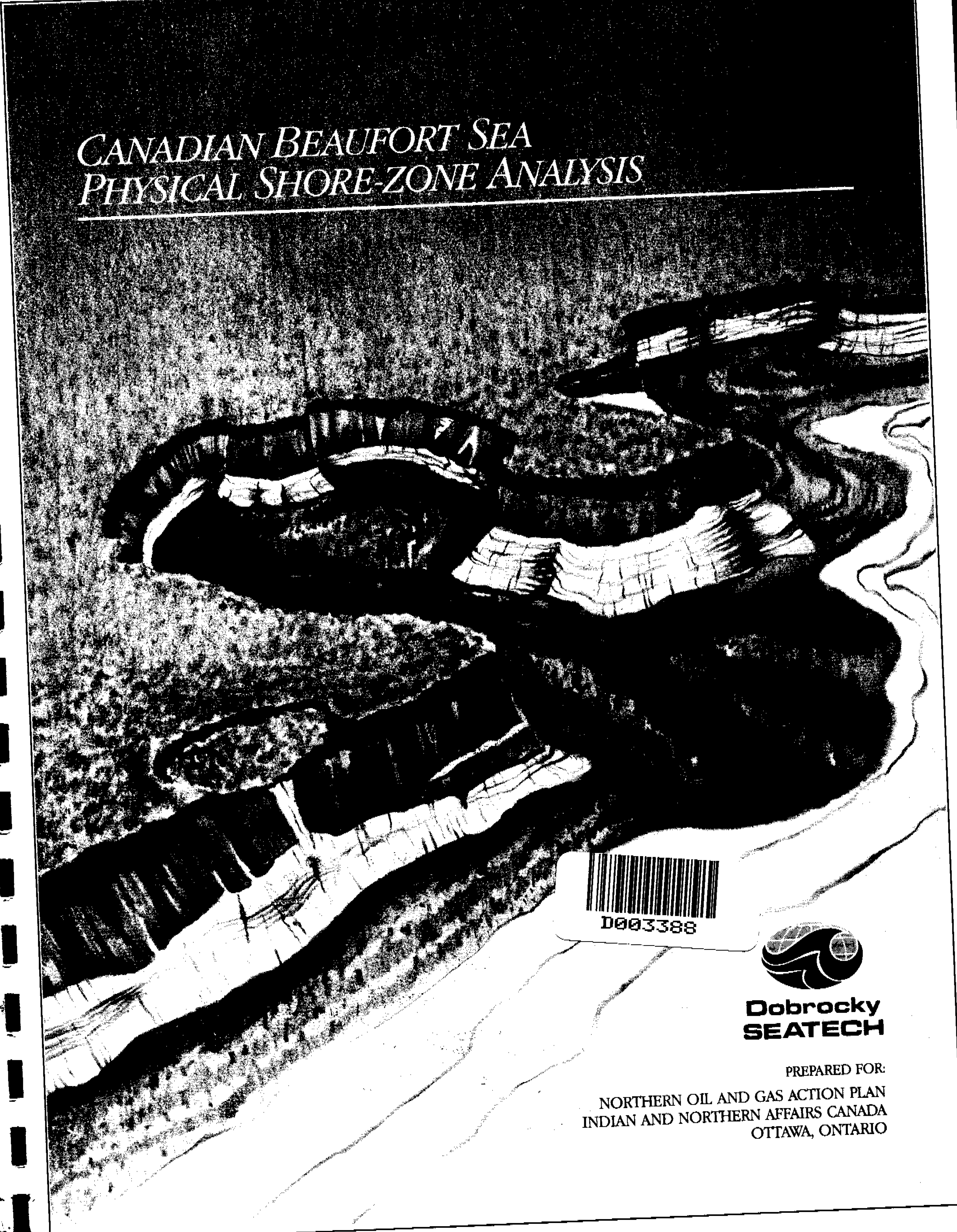

CANADIAN BEAUFORT SEA
PHYSICAL SHORE-ZONE ANALYSIS

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PREPARED FOR:

NORTHERN OIL AND GAS ACTION PLAN
INDIAN AND NORTHERN AFFAIRS CANADA
OTTAWA, ONTARIO

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Final Report

CANADIAN BEAUFORT SEA
PHYSICAL SHORE-ZONE ANALYSIS

by

John R. Harper
P. Douglas Reimer
and
Arlene D. Collins

Dobrocky Seatech Ltd.
9865 West Saanich Road
P.O. Box 6500
Sidney, B.C.   V8L 4M7

for

Northern Oil and Gas Action Plan
Indian and Northern Affairs Canada
Ottawa, Ontario
K1A 0C9

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SUMMARY

An analysis of the Canadian Beaufort Sea coastal zone (Alaskan/Yukon border to Baillie Islands) was conducted to provide regional summaries of (a) coastal morphology, (b) coastal stability and (c) coastal processes. It is anticipated that the analysis will be used in the development of resource management strategies and in the evaluation of proposed developments (impact and design assessment). A total of 2,077 km of coastline were examined using aerial photographs, low altitude oblique video imagery and previously existing field studies.

The Coastal Information System, developed by the Geological Survey of Canada, was used to systematically characterize coastal morphology and record data in a digital data base. Six coastal types were defined from the data base and were used to characterize the coastal zone. The results indicate a predominance of erosional landform types (60 to 80% of the coastline mapped) with relatively few (<20%) widely dispersed accretional landforms.

Over 1,000 comparisons of coastal stability were made using 1950's and 1970's air photos. The results indicate that the Beaufort Sea coast is undergoing wide scale regional retreat. Most sections of the coast exhibit mean coastal retreat rates greater than 1 m/yr; however, areas near the active channels of the Mackenzie River delta, are retreating almost everywhere at rates greater than 2 m/yr. A maximum retreat rate of 18 m/yr was measured in the Shallow Bay portion of the delta.

The presence of significant quantities of terrestrial ice in the coastal sediments is one of the primary causes of the wide scale retreat. It is also hypothesized, however, that the Canadian Beaufort Sea is undergoing a relative sea level rise, which is contributing to the rapid retreat. There is indirect circumstantial evidence that supports this contention. The presence of terrestrial ice and a possible relative sea level rise are causing rapid retreat of most segments of the Beaufort Sea coastline. This is manifest in the dominance of erosional landforms. An important exception occurs on the western Yukon coast where long linear barrier islands appear stable. It is speculated that onshore movement of material due to ice push is the primary process responsible for supplying material to these barriers.

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ACKNOWLEDGEMENTS

This study was contracted as part of the Northern Oil and Gas Action Plan (NOGAP) by Indian and Northern Affairs Canada, Ottawa to Dobrocky Seatech Ltd., Sidney, B.C. (Contract No. 25ST.NOGAPA 5/2). Numerous individuals provided assistance including: Dr. Martin Barnett, Co-Scientific Authority, of Indian and Northern Affairs Canada: Dr. Donald Forbes, Co-Scientific Authority, of the Geological Survey of Canada; Dr. Peter Lewis, (British Columbia) Ministry of Environment; Mr. Yos Lussenburg, Gulf Canada Resources Inc. Their assistance is gratefully acknowledged.

1.0 INTRODUCTION

1.1 STATEMENT OF THE PROBLEM

There are approximately 2,000 km of coastline in the southern Beaufort between the Alaskan border and Cape Bathurst on the Parry Peninsula and including 900 kilometres of the Mackenzie River Delta (Figure 1.1). The coastline is almost completely comprised of unconsolidated sediments and, as such, is an extremely dynamic environment susceptible to reworking by both arctic marine processes as well as periglacial processes.

Present offshore oil and gas exploration activities have had a minimal effect on these resources to date and have been primarily concentrated at McKinley Bay and Tuktoyaktuk Harbour areas. However, other shore facilities have been proposed (Dome, n.d.; Gulf 1982) and a nearshore production field near the Mackenzie River Delta remains a very real possibility for the near future (Mr. Evan Birchard, Esso Resources Canada Ltd., pers. comm. 1983). In addition to anticipated development associated with offshore (or onshore) hydrocarbon development, there are other competing uses for coastal resources in the Beaufort Sea such as Parks Canada's proposed terrestial and marine parks, proposed wildlife refuges and existing subsistence use areas. The potential impacts associated with offshore oil and gas development and the potential for conflicting use requirements of these resources will require that Indian and Northern Affairs Canada (INAC) develop effective plans for managing the coastal resources of the Beaufort Sea.

Prior to this project, there has been no systematic detailed inventory of physical shore zone characteristics in the southern Beaufort Sea nor has there been any comprehensive synthesis of the coastal processes affecting these resources. Development of a systematic data base is essential to the implementation of effective resource management strategies. This study

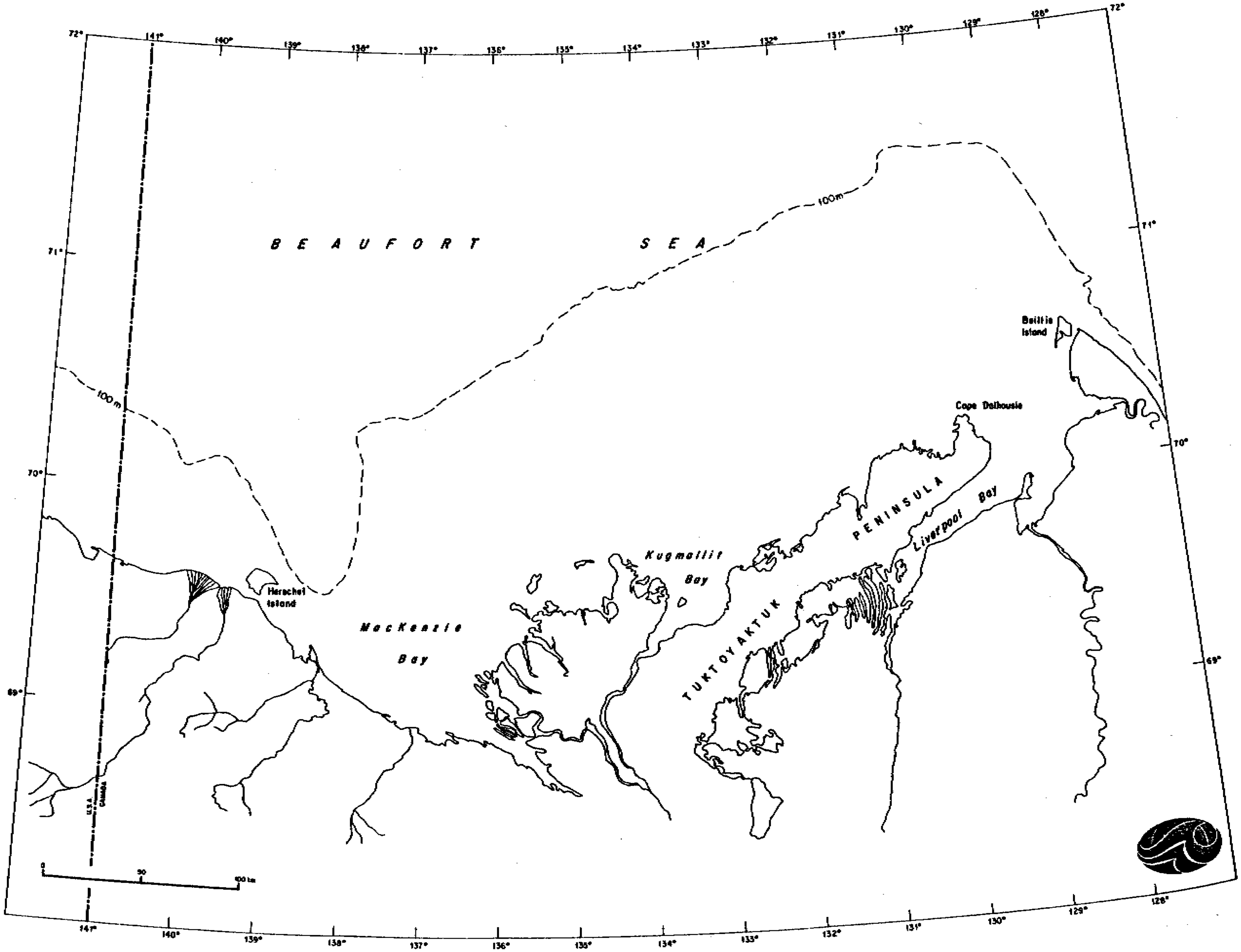

Figure 1.1 Study area.

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represents the first step in the development of appropriate management strategies and provides not only a detailed inventory of coastal resources but also identifies deficiencies in our understanding of resource sensitivity to proposed developments.

1.2 OBJECTIVES

The overall goal of this study was to provide a systematic inventory of physical coastal resources and processes and to provide a synthesis as to how these resources could be affected by development. Specifically, objectives were to provide:

(1) an inventory of physical shore-zone character;

(2) a documented assessment of coastal stability (erosional and accretional) in the study area;

(3) an assessment and review of oceanographic, terrestrial and other environmental factors that affect the character of the coastal zone;

(4) a coastal information data base of the above results that will allow the manipulation of data sets in computer files;

(5) the graphic presentation of selected resource information on 1:50,000 scale maps and smaller scale summary maps;

(6) a synthesis of the coastal information data that will provide resource managers with insight into the distribution, origin, stability and sensitivity of coastal resources in the Beaufort Sea;

(7) a presentation of results to resource managers in Whitehorse, Yellowknife and Ottawa.

1.3 ORGANIZATION OF REPORT

This report is organized into four principal components:

- Technical Report
- Coastal Erosion Rate Measurements (Appendix 1)
- Maps (Appendix 2)
- Data Sheets (Appendix 3, seperate appendix)

The technical report contains background on the region, methods, results and discussion of results with respect to proposed development. Appendix 2 contains 151 maps at 1:50,000 scale; the maps are produced in black and white and in an 8-1/2 x 11 inch format to facilitate reproduction. The data sheets (Appendix 3) provide additional detail on shore-zone character (substrate type, dimensions of units, etc.) and are keyed to the maps with a unit identification number; the data sheets permit a high level of detail to be recorded but allow a simple map format to be retained.

2.0 STUDY RATIONALE

In order to meet the objectives of the study (Section 1.2) a series of tasks were undertaken to develop new information on the Beaufort Sea coastal zone and to synthesize existing information. From these sources, it is possible to develop conceptual models of dominant coastal processes in the Beaufort Sea. Although these models remain largely unverified in terms of field data from the Canadian Beaufort Sea, they are in part empirically derived from Alaskan Beaufort Sea field studies and, as such are thought to be reasonable representations of present processes in the Canadian Beaufort Sea. The models provide a means of assessing impact that might result from development proposals (Figure 2.1).

There are three principal components of the study:

(1) a coastal mapping program (Section 2.1) for systematically categorizing coastal morphology and coastal substrate types,

(2) coastal stability measurements (Section 2.2) to accurately estimate rates of coastal accretion and erosion, and

(3) a coastal processes synthesis (Section 2.3), which is developed from the review of the few studies from the Canadian Beaufort Sea coast and from the numerous studies of the Alaskan Beaufort Sea coast.

The synthesis of these components outlines the rationale for the development of coastal processes models (Section 2.4) that provide some qualitative prediction capabilities. The approach for each of these components is briefly outlined in the following sections.

2.1 COASTAL MAPPING

Documentation of existing coastal geomorphology provides considerable insight into present-day coastal processes in terms of sediment supply, sediment transport paths and coastal stability. For example, the predominance of coastal cliffs indicates a net coastal sediment deficit and suggests that the coast is in dynamic disequilibrium as a result of

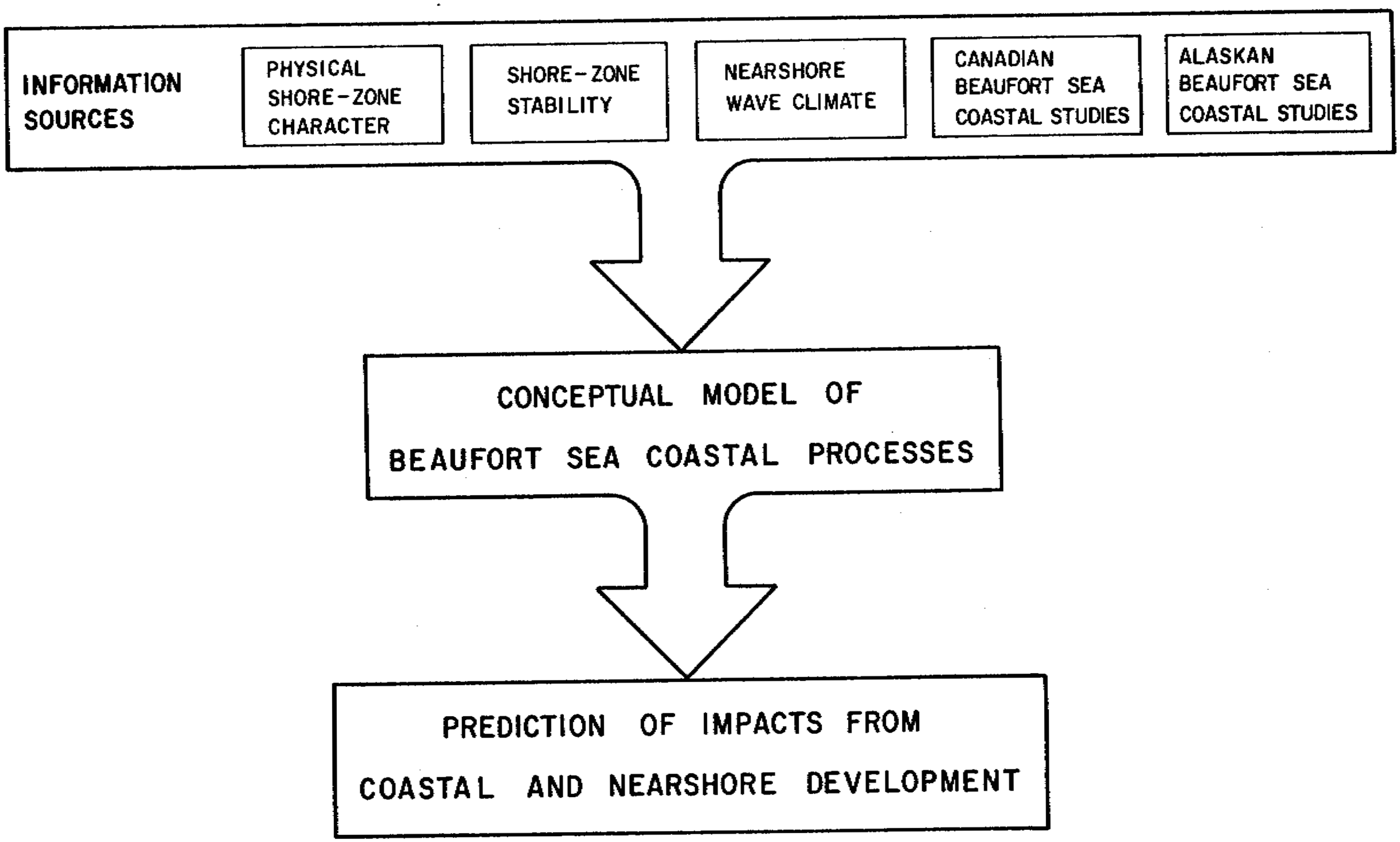

Figure 2.1 Schematic diagram of project rationale.

changing environmental processes. The presence of retrogressive thaw failures on the coastal cliffs further indicates that the eroded material is fine grained and ice-rich, and therefore is probably transported offshore rather than deposited in the nearshore. Additionally, barrier islands and spits provide an index of net transport directions and, as such, indicate where potential sediment sources and sinks exist. These few examples illustrate the utility of inferring coastal process elements from coastal geomorphology.

A shore-zone classification system is required to systematically categorize coastal morphology and coastal substrate types. These coastal types are then mapped to illustrate regional patterns. In conventional mapping programs, considerable detail is lost during the mapping process because maps must be made comparatively simple to be clear. In this study a data base system was used (a) to systematically record coastal character in detail and (b) to allow summaries to be easily derived from the detailed data base. The coastline is mapped in segments of homogeneous morphology (in the longshore direction) and a data base entry established for each coastal segment.

Upon completion of the mapping program, the data base was integrated to provide summary statistics and to assist in mapping the regional distribution of resources. A nine-track computer tape of data complements the coastal morphology maps that were developed as part of this study; the tape will allow the data base to be easily updated and/or expanded as more detailed information becomes available.

2.2 COASTAL STABILITY

Coastal morphology provides an excellent indication of coastal stability; however, it is qualitative in nature and cannot be used to estimate coastal sediment budgets or establish risks associated with engineering proposals. Coastal stability was estimated along the entire Beaufort Sea coast, from the Alaskan border to Cape Bathurst to quantitatively estimate rates of change. A comparative air photo analysis utilizing 1950's and 1970's air photos was used to evaluate erosion and accretion rates. The approach is comparatively inexpensive because no field work is involved and it provides both site specific and regional data on rates of change. As such, the coastal stability analysis permits quantitative measurements to be linked to the coastal mapping program.

2.3 COASTAL PROCESSES

No field work was conducted as part of this study and inferences from previous field programs in both the Canadian and Alaskan Beaufort Sea areas are used to infer coastal processes throughout the study area. Theoretical model studies conducted previously (e.g. Baird and Hall, 1980) and in association with this study (Philpott Consultants, 1985) provided additional input to the conceptual coastal process models (Figure 2.1). In particular, these studies allow estimates of year to year and seasonal variability to be included in the models, and provide insight into the temporal variations of coastal processes that is not available from either the coastal mapping or stability components of the study.

2.4 CONCEPTUAL COASTAL MODELS

The ultimate goal of the study is to develop a sufficient understanding to define a conceptual model(s) of the coastal processes that are important in different regions of the Canadian Beaufort Sea or important on different coastal types of the Beaufort Sea. The models serve as the basis for assessing coastal impacts (Figure 2.1) and may also serve as the experimental design for detailed field studies.

3.0 PREVIOUS STUDIES

3.1 DESCRIPTION OF THE REGION

A brief description of the region is provided and for descriptive purposes is subdivided into (a) the physical environment, which includes the static geological and physiographic components of the coastal system and (b) the physical processes or driving forces of the transport system (climate, hydrology, oceanography).

3.1.1 Geology and Physiography

Physiography and Relief

The major portion of the study area is located within the Arctic Coastal Plain, which is subdivided into the Yukon Coastal Plain and Mackenzie Delta (Bostock, 1967). A portion of the Interior Plains (Anderson Plain) occurs along the eastern shore of Liverpool Bay (Figure 3.1). The offshore shelf, which extends approximately to the 80 m isobath (Figure 3.2) is comprised of a series of cross-shelf ridges and plateaus (Figure 3.3).

Regional Geology

The regional geology follows similiar trends to the major physiographic subdivisions (Figure 3.1). The Yukon Coastal Plain area consists mainly of glacial and glacial marine deposits; the Mackenzie Delta consists of deltaic sediments, glacial outwash materials and possibly some glacial marine sediments in the Richards Island area; and the Anderson Plain includes late Paleozoic to Tertiary sedimentary rocks, although along the short section of the Liverpool Bay area, sediments are unconsolidated outwash materials.

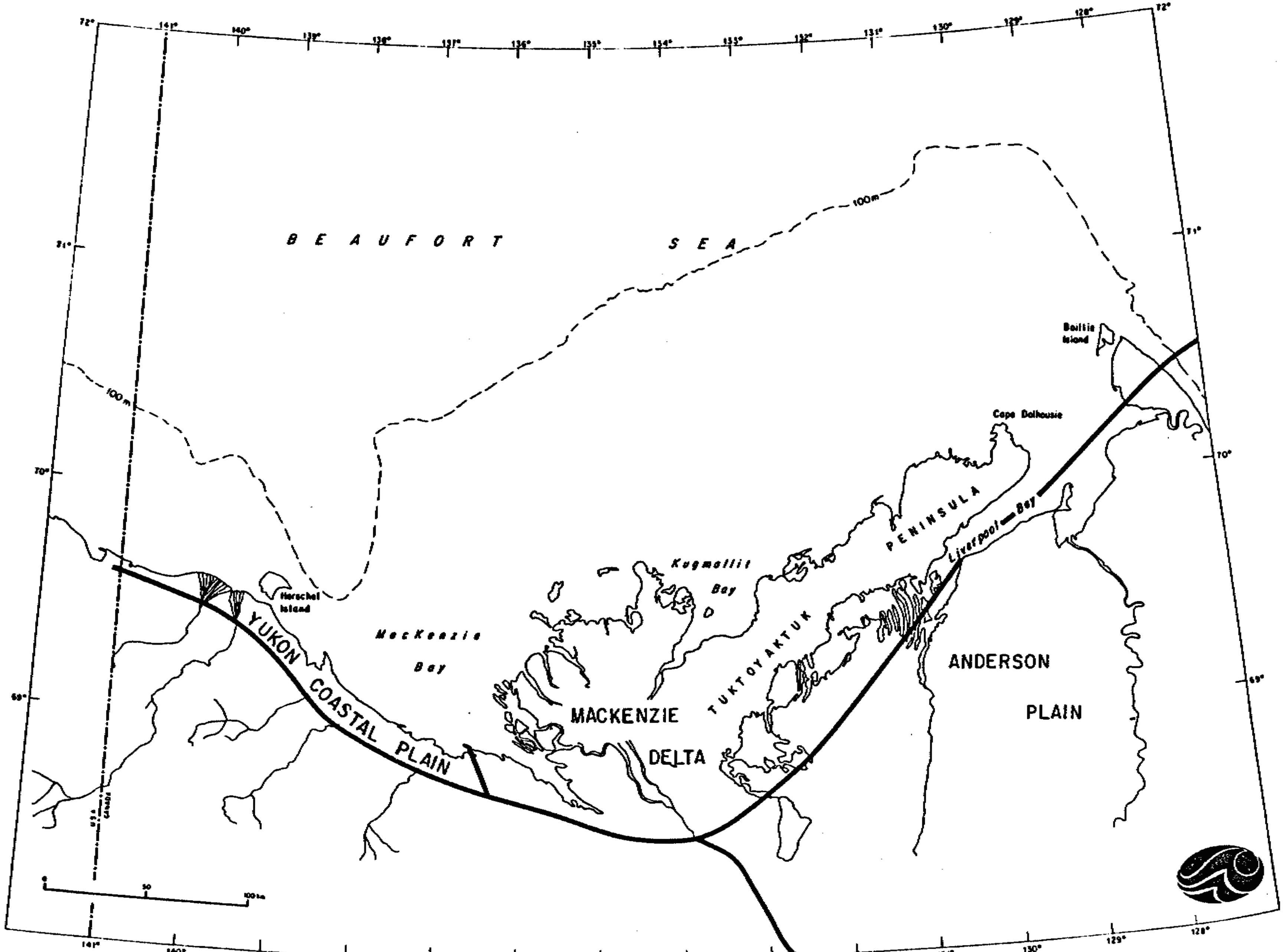

Figure 3.1 Terrestrial physiographic regions (after Bostock, 1970).

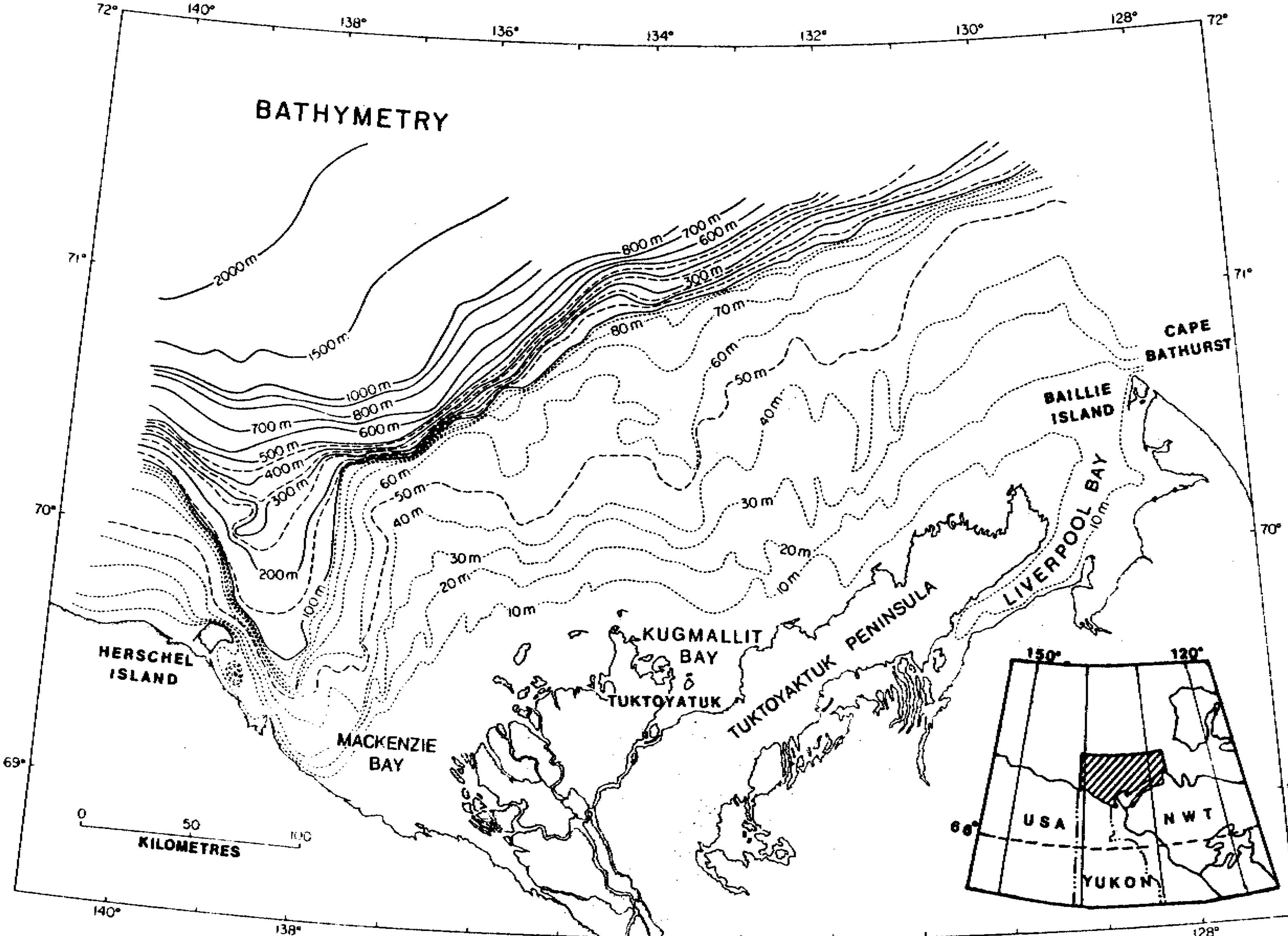

Figure 3.2 Bathymetric map of the Beaufort Sea shelf (from Pelletier, 1974).

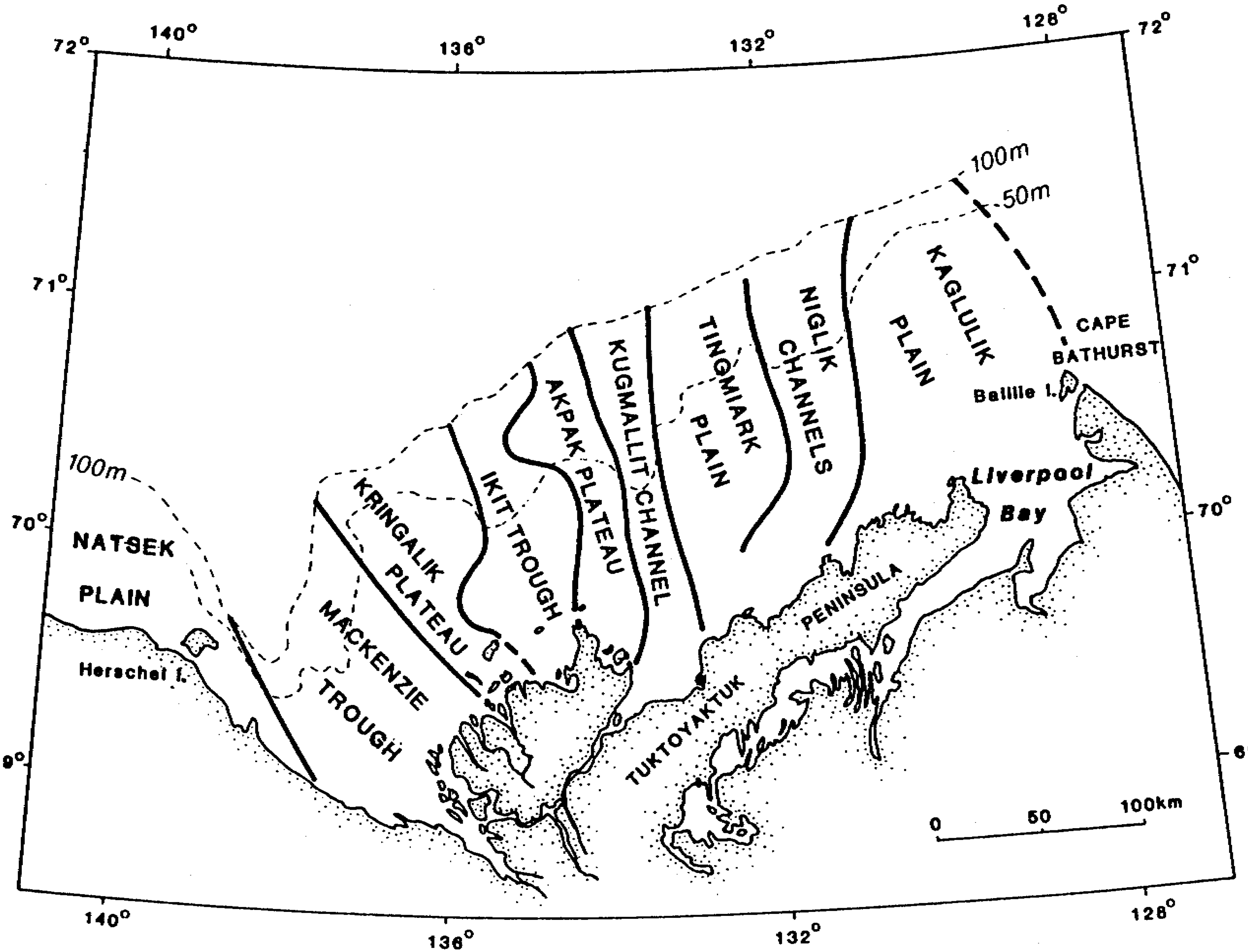

Figure 3.3 Offshore physiographic regions of the Beaufort Sea shelf (after O'Connor, 1982a).

The distribution of sediments offshore is illustrated in Figure 3.4 and indicates that much of the shelf is dominated by muds which thin to the east and are absent on the western shelf. The muds are thought to be contributed principally by the Mackenzie River during the past 15,000 years.

The glaciations of the coast have clearly been important; however to date both the sequence of glacial events and the extent of the most recent glaciation are not certain. A narrow tongue of ice probably extended into the Mackenzie Canyon dividing the shelf into eastern and western segments. (Rampton, 1982). The important features are that most of the shelf or coastal areas are believed not to have been glaciated during the Wisconsin advance (i.e. the most recent advance) but that outwash during glacial retreat probably contributed significantly to the initial development of the Mackenzie Delta and also to deposits along the Tuktoyaktuk Peninsula. Mackay (1963a) has identified a major outwash channel that discharged through McKinley Bay.

An additional aspect of the glaciations is the effect that they have had on sea level change, which is discussed in the next section.

Onshore, the entire area is underlain by continuous permafrost with the exception of major lakes and river channels. As a result, ice, in the form of both pore ice and massive ice, is present in the surficial sediments. Where coastal erosion is rapid, offshore permafrost may occur. In the vicinity of the Mackenzie Delta (Shallow Bay), the permafrost table is within 2 m of the seabed at distances of 500 m offshore (Hollingshead et al, 1978).

Sea Levels

Sea level has risen approximately 55 m over the last 15,000 years (Figure 3.5) and may be rising at as much as 10 mm/year (Figure 3.6; Canadian Hydrographic Service Tidal Data presented in Baird and Associates 1983; see also Hill et al. 1985). As a result of the increase in sea level, much of the coast is undergoing rapid erosion and many lower reaches of the stream valleys are submerged.

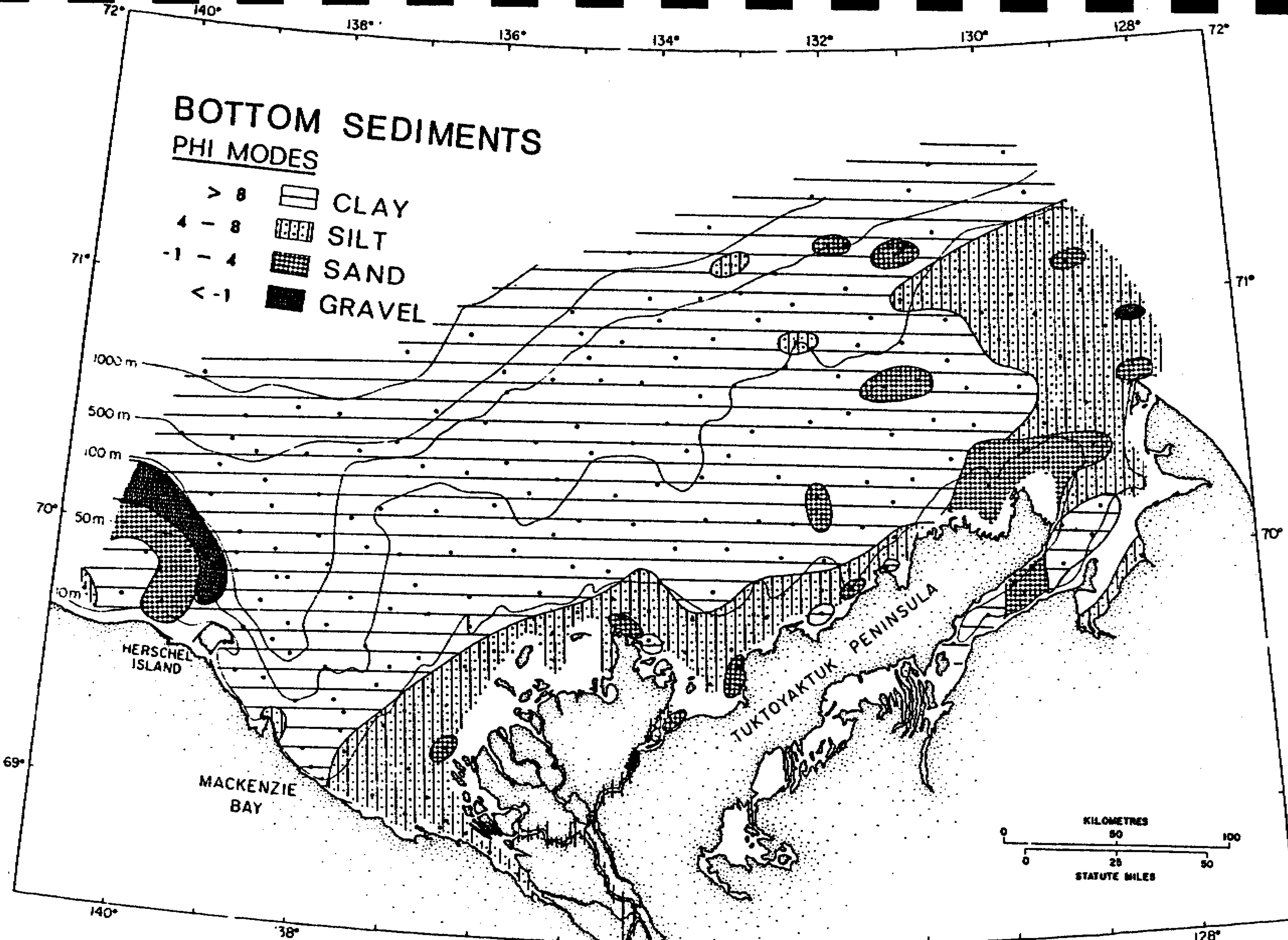

Figure 3.4 Bottom sediment distribution of the Beaufort Sea shelf (from Pelletier, 1974).

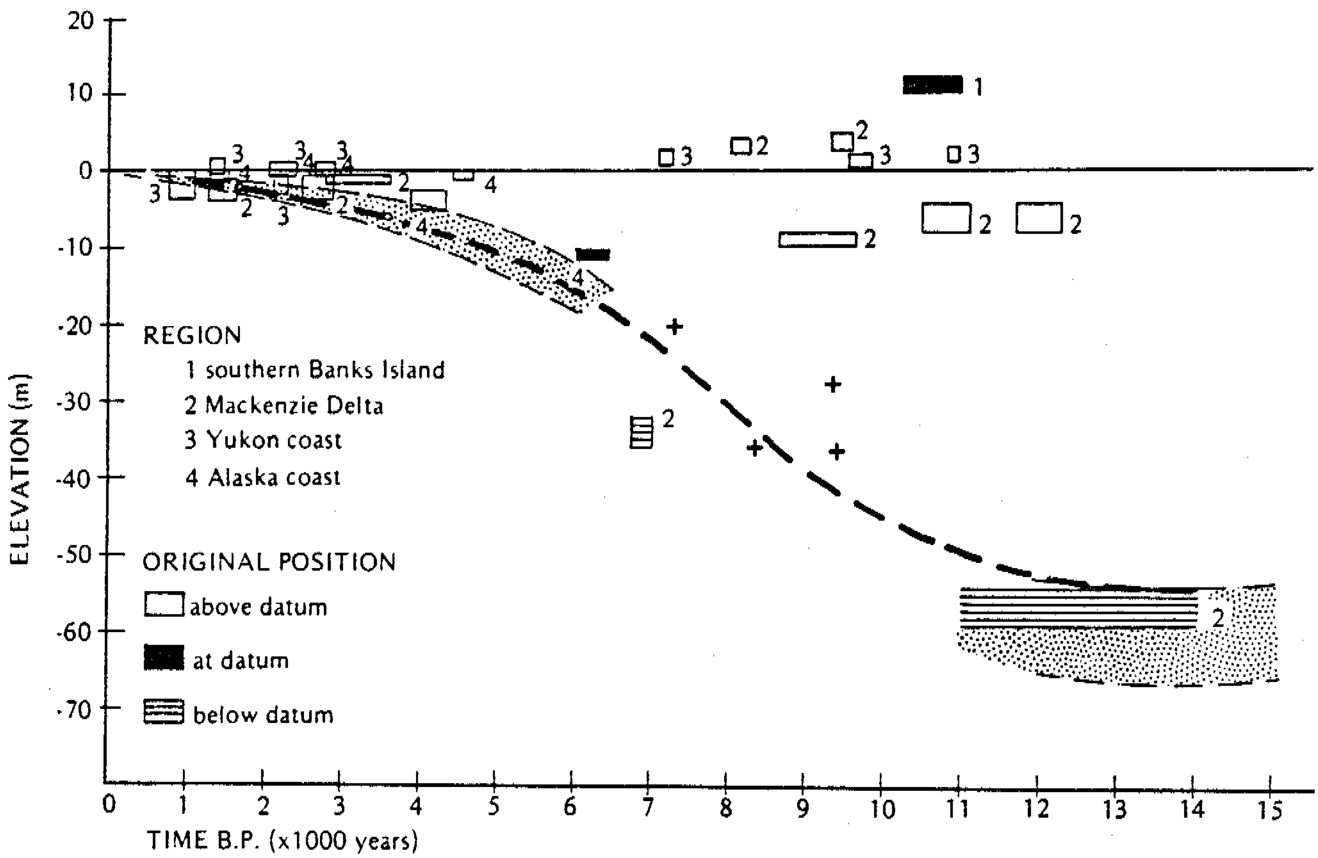

Figure 3.5 Proposed Holocene sea level curve for the Beaufort Sea coast (from Forbes, 1981). Recent unpublished radiocarbon dates are indicated (+) and suggest that the sea level rose steadily from 11,000 B.P. to 6,000 B.P. (Blasco, 1981, pers. comm). The various boxes indicate (a) the sample position relative to present sea level and (b) the interpretation of environment of deposition at the time when material was deposited (i.e. below sea level, at sea level or above sea level).

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3.1.2 Climate

Temperature

Temperature is of indirect effect to Beaufort Sea coastal processes in that (a) low mean annual temperatures (-10°C at Tuktoyaktuk) have resulted in the formation of continuous permafrost throughout the region and (b) low winter temperatures (-27°C for January at Tuktoyaktuk) result in the formation of sea ice for approximately nine months of the year, effectively preventing wave activity and coastal processes.

Wind

The distribution of coastal winds along the Canadian Beaufort Sea coast is illustrated in Figure 3.7. In some locations, the direct effect of winds is evident in the form of coastal dune deposits; however, these features are rare in the study area. A more important effect may result from the deflation of fine-grained sediments from barrier islands and spits leaving coarse lag deposits of gravel material over predominantly sandy gravel sediments (Figure 3.8). This process has been described for other arctic shorelines (Reimnitz and Maurer, 1979; Woodward-Clyde Consultants, 1985), although its significance on the Canadian Beaufort Sea coast is probably minimal except at very localized areas.

Wind stress over water generates waves, currents and surges (see Section 3.1.4) and as such has important indirect effects on oceanographic processes; wind stress over ice is important in causing ice motion, which can have a direct impact on the shoreline.

3.1.3 Hydrology

Mackenzie River

The Mackenzie River is the second largest river in North America and the drainage basin is in excess of 1,800,000 km^2. Mean annual flow rates are in the order of 11,500 m^3/s (Table 3.1), although year-to-year order of magnitude variations occur. Peak flow is typically in late June. Annual sediment input is estimated at 1.5 x 10^7 metric tonnes (Table 3.1), of which most is silt and clay. The pro-delta (area landward of

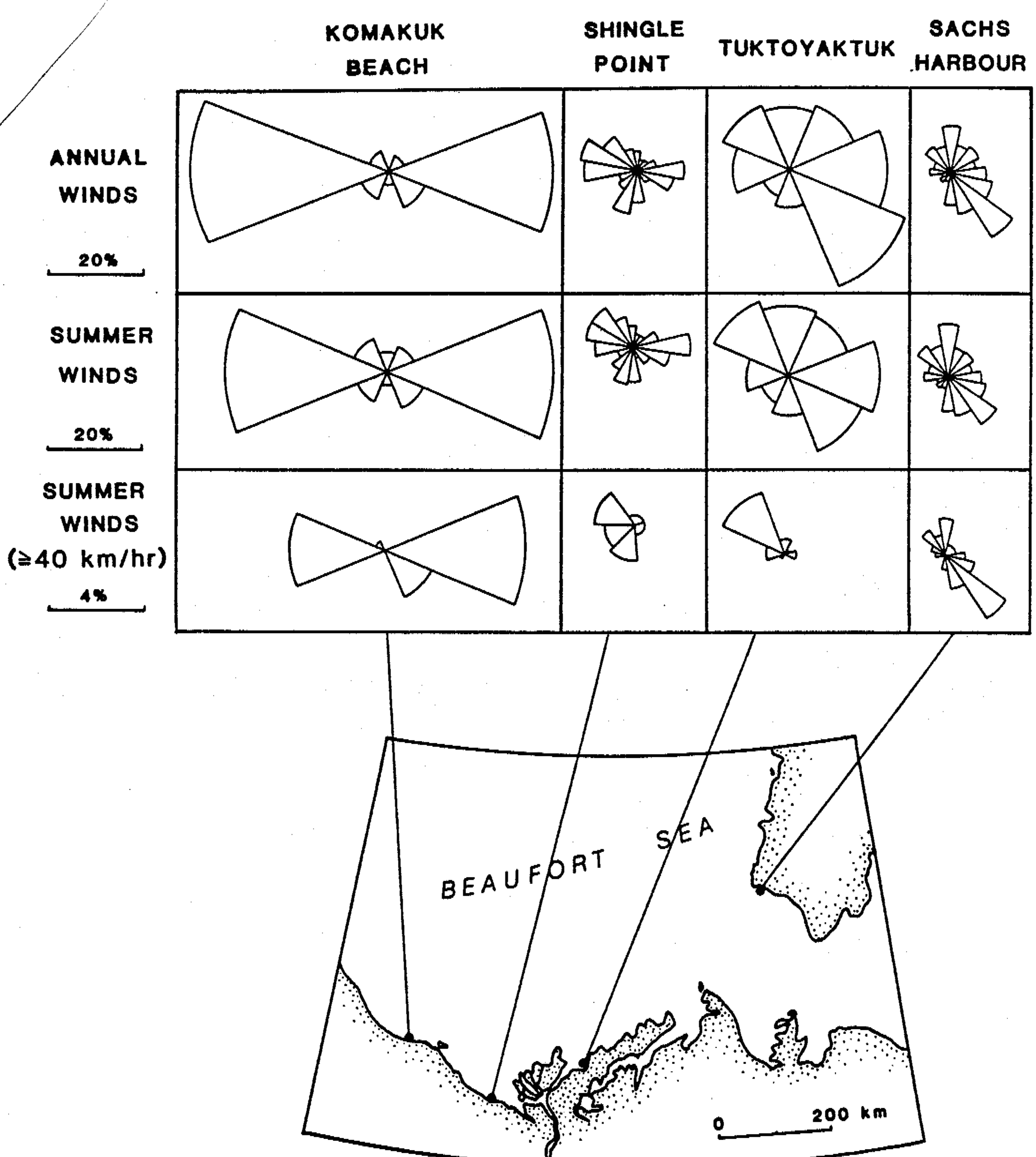

Figure 3.7 Beaufort Sea wind distribution (from Harper and Penland, 1982).

Figure 3.8 Photograph of gravel lag layer on barrier island surface formed by wind deflation of surface sediments (Chukchi Sea Coast, 1983).

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Table 3.1 Discharge Characteristics of Beaufort Sea Rivers

River	Drainage Basin area(km^2)	Mean Annual Flow Rate (m^3/s)	Peak Flow Rate (m^3/s)[1]	Estimated Annual Sediment Discharge (metric tonnes)[2]
Mackenzie	1,800,000	11,500	34,000	1.5×10^7
Big Fish	2,300		520	160,000
Eagle Creek	240		110	17,000
Blow	3,700		710	260,000
Running	420		160	29,000
Babbage	5,000		910	350,000
Unnamed (Phillips Bay)	230		110	16,000
Spring	560		190	40,000
Unnamed (Roland Bay)	270		110	19,000
Firth	6,200		1,000	440,000
Malcolm	1,100		310	78,000
Fish Creek	240		110	17,000
Backhouse	86		52	6,100
Clarence Lagoon	170		84	12,000
Craig	120		65	8,500

[1] Peak flow data are estimated values (from McDonald and Lewis, 1973)

[2] from Harper and Penland (1982)

the 5 m isobath) is thought to be the principal sediment sink of the Mackenzie River with lesser amounts distributed across the shelf (Harper and Penland, 1982).

Yukon Coast Rivers

The hydrology of the Yukon coast rivers is not well documented, however, a few gauging studies have been used to rate discharge as a function of drainage basin size (Table 3.1). This figure compares favourably with calibrated measurements from the Alaskan Arctic Coastal Plain (Reimnitz, 1985, pers. comm.). Flow occurs only during the summer on these rivers and peaks in early June. Estimates of sediment input are in the range of 6,000 to 440,000 metric tonnes per year. Interestingly, most of the Yukon rivers discharge into lagoons and estuaries and show little evidence of progradation; as such, it is doubtful if much of their sediment load is actually reaching the coastal zone or is contributing significantly to the coastal sediment budget. Forbes (1981) noted that approximately half the sediment production from the Babbage River basin may be transported from the estuary, although little gravel moves beyond the Upper Delta.

3.1.4 Oceanography

Sea Ice

Sea ice reforms annually in the Beaufort Sea and limits the open-water season to approximately three months (mid-July to mid-October). The presence of sea ice effectively limits wave activity to these three open-water months, and, as a result, the coastal processs are essentially dormant during the remaining nine months. The presence of pack-ice offshore (Figure 3.9) limits wave action even during the open-water months so that the Beaufort Sea is a comparatively low wave-energy environment.

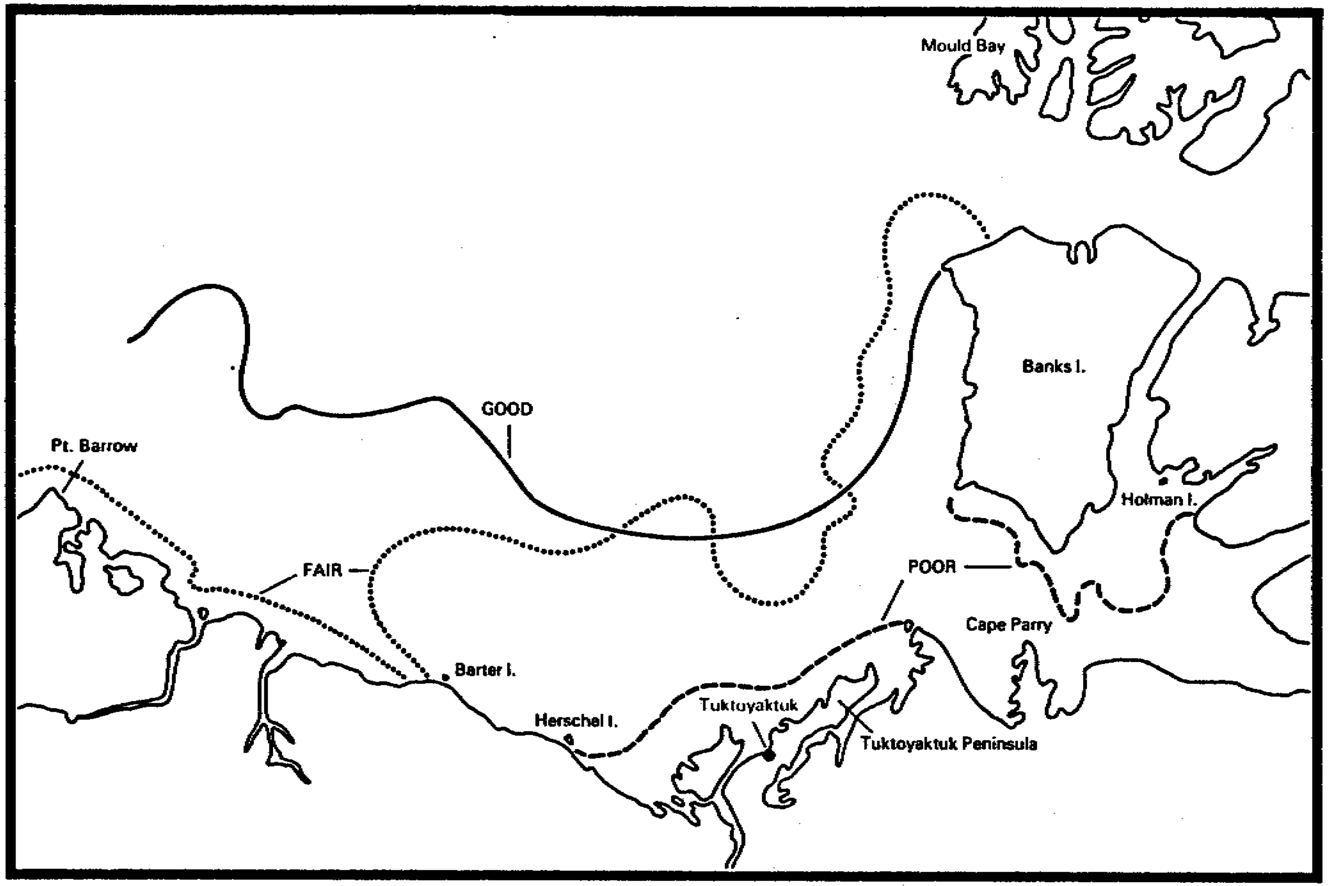

Figure 3.9 Median position of ice edges in good to poor years (from Milne and Herlinveaux, 1976).

Waves

Waves are generated only during the open-water season, which occurs from approximately mid-July to mid-October, and despite this short open-water season, waves are the most significant modifying process of the Beaufort coastal zone. Open-water wave characteristics are as follows:

- **background waves** that are less than 1 m in height, account for less than 30% of the annual wave energy and occur 78% of the time,
- **intermediate storm waves** that are 1 to 2 m in height, account for nearly 50% of the wave energy and occur 20% of the time,
- **severe storm waves** that are greater than 2 m in height, account for 20% of the annual wave energy and occur less than 2% of the time.

The relative proportion of wave power and frequency of occurrence of each wave class is schematically illustrated in Figure 3.10.

The dominant wave approach directions for six locations in the Beaufort Sea are illustrated in Figure 3.11 and indicate that most of the storm-wave energy orginates from the northwest.

The waves generate longshore transport along the coast due to breaking waves and may be important in transporting sediments to offshore areas as well (Harper and Penland 1982; Fissel and Birch 1984).

Currents

Tidal currents are small in the Canadian Beaufort Sea (Fissel and Birch, 1984) and currents in the shallow coastal areas of the Beaufort Sea are assumed to be principally wind-driven, although no measurements have been made in water depths of less than 7 m. The general circulation patterns that occur under the two dominant wind directions are illustrated in Figure 3.12. Local current patterns will vary depending on coastal orientation and configuration.

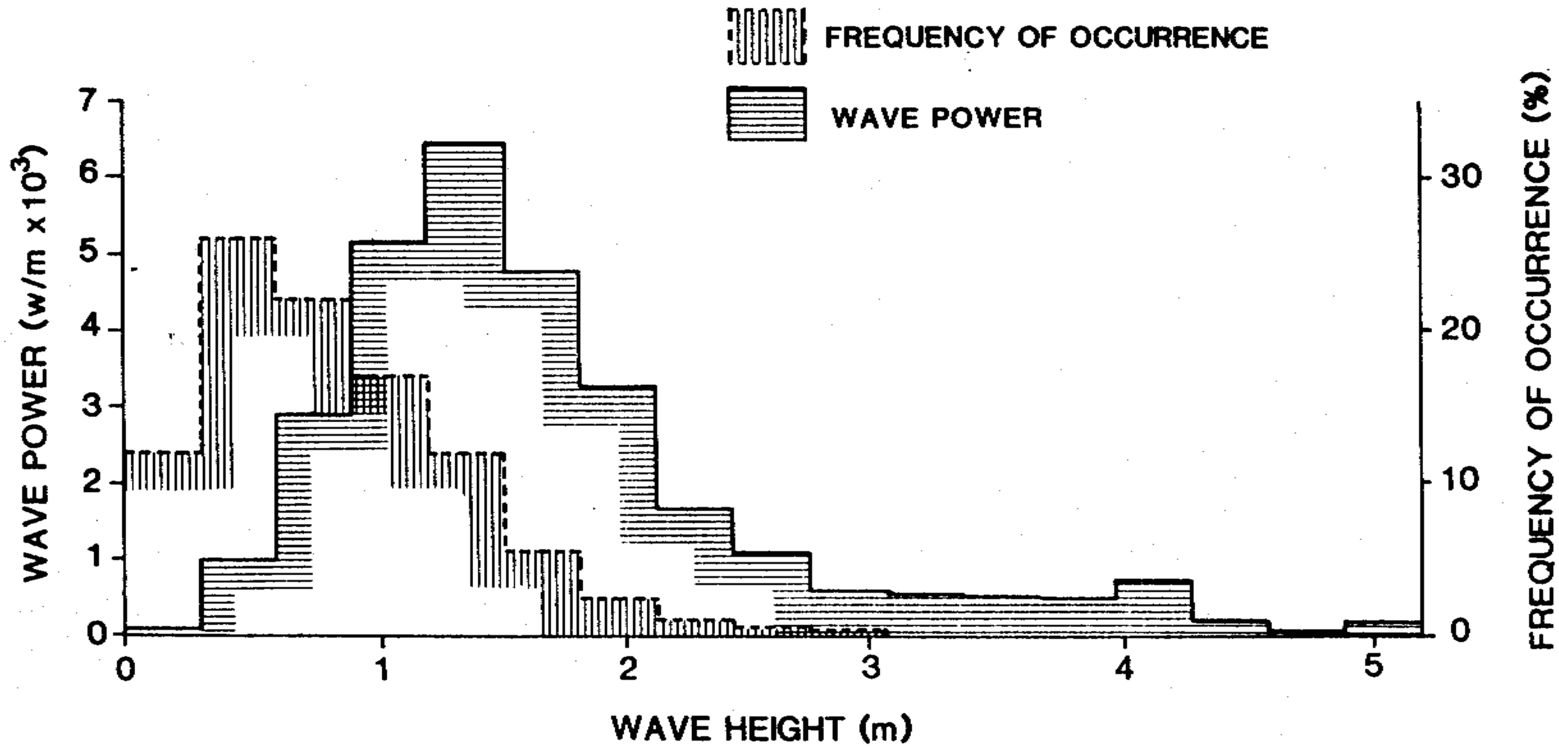

Figure 3.10 Wave power and wave frequency of occurrence classified by height class. Note that a large portion of the total power is concentrated in infrequently occurring wave height classes (from Harper and Penland, 1982).

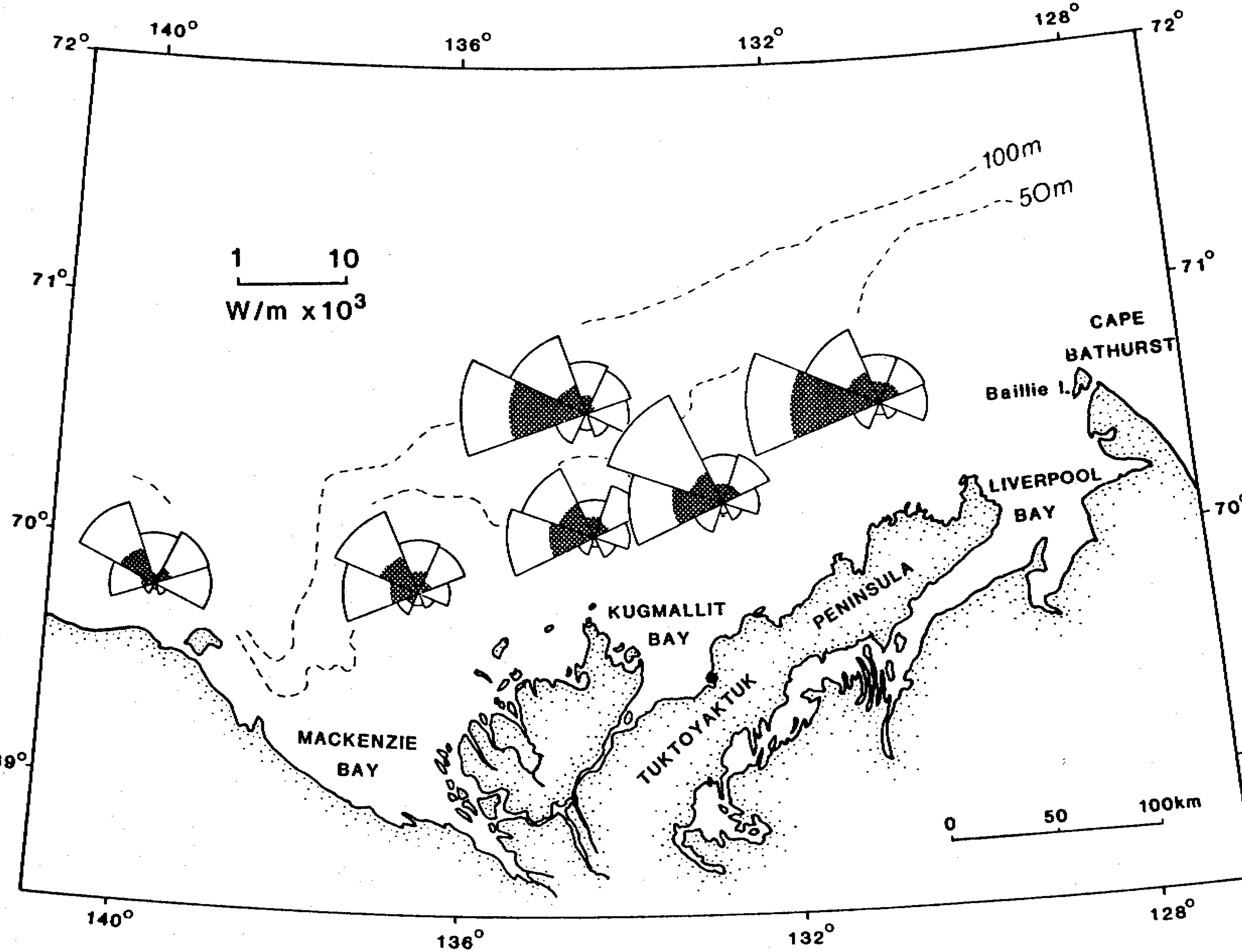

Figure 3.11 Wave power roses computed from wave climate summaries (Baird and Hall, 1980). The wave power components due to waves greater than 2 m in height are shown as the shaded portion of the wave rose (from Harper and Penland, 1982).

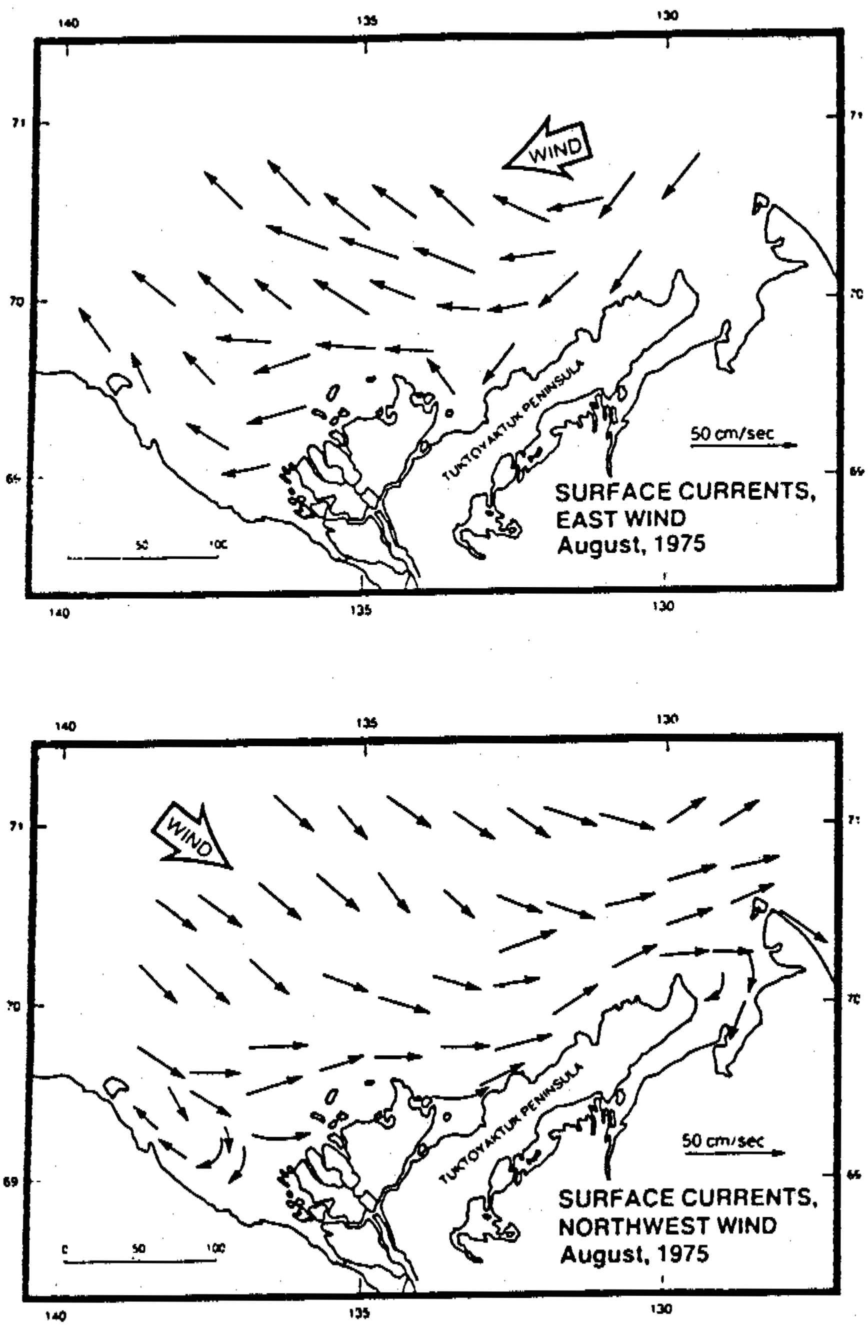

Figure 3.12 Wind driven circulation patterns in the southern Beaufort Sea (from Milne and Herlinveaux, 1976).

Tides and Storm Surges

The astronomical tide is very small in the Canadian Beaufort Sea. Tidal ranges for selected areas are listed in Table 3.2 and indicate typical ranges of 0.2 m to 0.7 m.

Table 3.2 Canadian Beaufort Sea Tidal Ranges

	Small Tide	Large Tide
C. Dalhousie	0.5 m	0.7 m
Tuktoyaktuk	0.3 m	0.5 m
Herschel Island	0.2 m	0.4 m

Storm surges are known to be significant and are of concern to engineering design analysis. Large surges occurred in 1944 and 1970 and are thought to have exceeded 2.5 m in height along most coastal areas (Anon., 1971). Indeed, driftwood lines are frequently found at elevations greater than 2 metres above mean sea level (McDonald and Lewis, 1973; Forbes, 1981).

Henry (1975; 1984) has conducted storm surge analyses for Tuktoyaktuk that predict 100 year surge levels in the range of 3.7 m above chart datum (lowest normal limit of low tides) or 2.5 m above topographic chart datum (mean high water level). An addition to the swash limit will result from the wave height contribution; this contribution will vary significantly depending on the degree of exposure to waves. Harper (1985) provides a very precise documentation of storm log lines in the Tuktoyaktuk vicinity and indicates that maximum surge levels are in the 2.3 to 2.4 m range above mean sea level; log lines in exposed locations, subject to surge and swash processes, may be in excess of 3.4 m above mean sea level.

3.2 COASTAL STUDIES

Existing information from previous studies was reviewed for potential use in developing conceptual models of the Beaufort Sea coastal processes (e.g. Figure 2.1). This involved the review of previous coastal process studies in both the Canadian Arctic and the Alaskan Arctic as well as other related topics such as surficial geology, oceanography and marine geology. Research programs in the Alaskan Beaufort Sea and Canadian Beaufort Sea provide an interesting contrast in that the Alaskan projects have concentrated on process-oriented research, that is, how coastal systems respond to driving forces and how these systems vary in time, whereas Canadian projects have concentrated more on documenting distributions of resources (i.e. documenting the spatial variations in resource distributions). As such, the two research approaches are complementary, particularly for the Canadian Beaufort Sea where a detailed shore-zone inventory now exists (i.e. this study).

3.2.1 Canadian Beaufort Sea Coastal Studies

There have been numerous small-scale observational studies conducted in the Canadian Beaufort Sea but few large-scale or long-term research programs. Observations by Mackay (1959, 1960, 1963a, 1963b, 1966, 1971, 1972, 1975) provided the first modern-day descriptions of Beaufort Sea coastal processes. In these papers, Mackay documented that permafrost, in particular ground-ice, resulted in unique arctic coastal mass-wasting processes and drew attention to the rapid coastal retreat of the area. Large-scale regional reconnaissance studies of the Yukon Coast were conducted in 1972 (McDonald and Lewis, 1973) and continued through 1974 and 1975 (Lewis and Forbes, 1974) with a major process-oriented study conducted in the Kay Point-Babbage River area between 1974 and 1977 (Forbes, 1981).

The study by Forbes remains the only multi-year process-oriented study conducted in the Canadian Beaufort Sea. Facility siting studies for Gulf Canada Resources Limited have been conducted for the Stokes Point area of the Yukon Coast and the McKinley Bay area of the Tuktoyaktuk Peninsula (Baird and Associates, 1983; Readshaw, 1982). Harper and Penland (1982) developed a sediment dynamics model for the Beaufort Sea shelf that also provided background on coastal processes in the region.

Significant results from these programs include:

- the Beaufort Sea shelf has undergone rapid submergence over the past 10,000 years and there is abundant geomorphological evidence that the transgression is continuing at the present time (Forbes, 1980; Lewis, 1985),

- much of the coast is undergoing large annual retreat (Table 3.3),

- erosion landforms are common in the form of coastal cliffs with unique arctic mass-wasting processes (ground ice slumps and block falls) (Mackay, 1966; McDonald and Lewis, 1973; Lewis and Forbes, 1974; Harry, 1985),

- massive ice and pore ice are common in coastal cliffs and indicate that even though coastal retreat may be rapid, there may be little sediment released because of the extremely high ice contents (Mackay, 1966; 1971; 1972; Harry, 1985),

- barrier islands and spits provide the principal coastal sediment sink, and these features are comprised of gravelly sand (McDonald and Lewis 1973; Lewis and Forbes, 1974),

- the smaller rivers of the Yukon coast do not contribute much sand and gravel to the coast; most is retained within the river, and silt and clay comprises the main sediment component reaching the coast (McDonald and Lewis, 1973; Forbes, 1981),

- sediment transport directions are primarily controlled by wave approach directions, as indicated in Figure 3.13, and

- a significant proportion of the wave energy, and hence sediment transport, occurs during episodic storm events, (Harper and Penland, 1982).

Table 3.3 Coastal Retreat Rates, Canadian Beaufort Sea Coast (from Harper and Penland 1982).

Location	Maximum (m/yr)	Mean (m/yr)	Source
Tent Is, Yukon T.	27	15	Gill, 1972
Pullen Is, N.W.T.	-	9.2	Forbes & Forbel, 1985
Pelly Is, N.W.T.	13.2	6.3	Forbes & Forbel, 1985
Garry Is., N.W.T.	7.3	2.3	Kerfoot & Mackay, 1972
	1.8	1.2	Forbes & Forbel, 1985
Hooper Is, N.W.T.	2.7	1.5	Forbes & Forbel, 1985
Kay Point	-	1.3	Forbes & Forbel, 1985
Yukon Territory	5	-	Lewis & Forbes, 1974
Yukon Territory	-	1	Mackay, 1963b
Tuktoyaktuk P.	5-8	-	Mackay, 1971
Alaskan Border to Mackenzie R. Delta	2	1	McDonald & Lewis, 1973
Tuktoyaktuk P.	6-9	-	Rampton & Mackay, 1971

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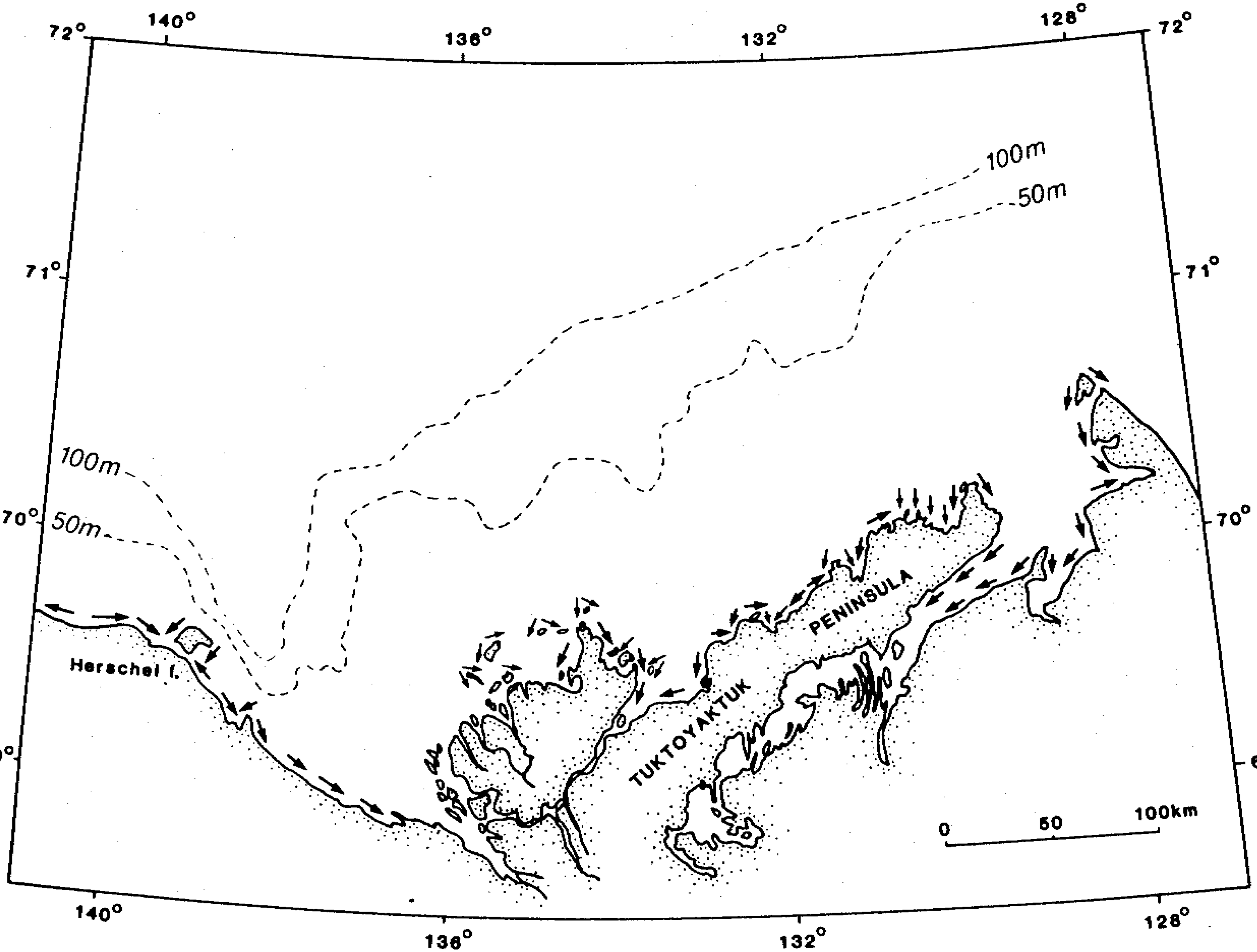

Figure 3.13 Longshore sediment transport directions as indicated by coastal landform orientation.

In summary, the previous studies indicate that much of the Beaufort Sea coast is undergoing rapid coastal retreat, as a result of the recent and ongoing coastal transgression. As such, the majority of coastal landforms are erosional in nature and display unique morphologies as a result of permafrost and massive-ice presence with the sediments. Depositional features such as spits are comparatively rare and are comprised of coarse sediments (sands and/or gravels). The movement of fine sediments from cliff erosion and river input is principally offshore; the movement of coarse sediment (sands and gravel) is principally alongshore. Alongshore sediment movement occurs in episodic pulses during storm events.

3.2.2 Alaskan Arctic Coastal Studies

A wide variety of coastal process studies has been conducted along the Beaufort and Chukchi Sea coasts of Alaska during the past ten years. Principal research groups have included the Coastal Studies Institute of Louisiana State University, the U.S. Geological Survey and the NOAA Outer Continental Shelf Environmental Assessment Program. The Alaskan research programs have tended to be process-oriented, focusing on physical linkages and temporal variations in processes rather than the inventory-oriented approach used in Canada, which has focused on spatial distributions of resources. Not all studies are cited in this review and the reader may wish to consult Gatto (1980), Owens and Harper (1983) and Woodward-Clyde Consultants (1981b) for further references.

The Beaufort Sea coast of Alaska is similar in some respects to the Canadian Beaufort Sea coast. Coastal sediments are unconsolidated except for permafrost, coastal retreat rates are high (Cannon, 1979; Hopkins and Hartz, 1978; Lewellen, 1970; 1977), ground ice is common (Lewellen, 1970) and sediment transport processes are dominated by high energy storm events (Hume and Schalk, 1967; Nummedal, 1979). Differences between the two coasts include: barrier islands in the Canadian Beaufort Sea are less common (Cannon, 1979; Short, 1979), cliff heights are higher in Canada than

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in Alaska (Hartwell, 1973) and coastal mass-wasting processes appear to be topographically controlled in Alaska (Harper, 1978a; Owens et al, 1981).

Process-related studies have documented alongshore sediment transport rates along the Alaskan Beaufort Sea coast in the range of 2,000 - 5,000 m^3/yr (Wiseman et al, 1973) and observations by Nummedal (1979) at Point Barrow suggest that 5,000 m^3 was transported in a single storm event. Multiple recurved spits on offshore barrier islands support the observation that sediment transport is predominantly storm-dominated.

Studies of barrier islands along the Alaskan Beaufort Sea coast have indicated that these islands are retreating in a south-westward direction at rates in excess of 5 m per year (Figure 3.14). Short (1979) has documented a westward migration of barrier islands in the order of 40 m/yr. It is important to note, however, that the islands are maintaining the same subaerial size, despite the rapid retreat. Reimnitz, (pers. comm. 1983) has suggested that ice scouring in nearshore areas, where there is always an onshore-directed sediment push, may be a significant process in supplying offshore sediments to the island. This theory is supported by observations of ice-push boulder piles in the Camden Bay area of the Beaufort Sea (Barnes and Ross 1979). From observations on Byam Martin Channel in the High Arctic, McLaren (1981) argues strongly that onshore transport of sediment by ice is a significant component of the overall sediment supply, and he notes that observations by Hume and Schalk (1967) in the Alaskan Beaufort Sea support this contention.

The coastal process observations have important implications for artificial islands and structures in the Beaufort Sea. Barnes and Ross (1979) note that five to ten metres of erosion occurred on the Prudhoe Bay causeway during a few storm events and that almost half of an abandoned artificial drilling island disappeared during the same storm. During one open water season, the artificial island Niakuk had an estimated 30,000 m^3 (30% of total volume) of material eroded and reworked (Barnes and Ross, 1979; Barnes and Reiss, 1982). Unnaturally steep design slopes may have contributed to the anomalously high transport rates. Sediment sample surveys around the island suggest that gravel material was transported only short distances from the island.

Storm surges have also been well documented for the Alaskan Beaufort Sea coast (Reimnitz and Maurer 1979) and Chukchi Sea coast (Woodward-Clyde Consultants, 1985). Measurements of storm surge elevations, using the log debris line as an index of maximum water levels, indicate surge elevations between 1.5 and 3.4 metres above mean sea level occurred during a 1970 storm event on the Beaufort Sea coast (Reimnitz and Maurer, 1979); historical observations suggest that this storm surge was in the order of a 25 - 100 year event. Similar observations suggest that surges of 2 to 3 metres are common along the northern and central Chukchi Sea coast and are up to 3.8 metres on the southern Chukchi Sea coast (Woodward-Clyde Consultants, 1985). Significant across-lagoon observations were also noted; a range of surge elevations from 0.9 to 3.0 meters over a few kilometres indicates that surges may be very localized. Both reports note that surges are associated with westerly winds and, as a result, west-facing coasts appear to be undergoing more rapid retreat than are east-facing coasts.

Other observations from the Alaskan Beaufort Sea pertinent to potential development in Canada relate to ice interaction with the shore. Ice ride-up is known to occur on the Alaskan Beaufort Sea coast and in some cases has completely overriden barrier islands (Kovacs and Sodhi, 1980; Harper and Owens, 1981) and at least in one case damaged shore structures. Although the process is considered rare (Harper and Owens, 1981), it is considered of sufficient concern to warrant emplacement of ice override ramps at some artificial exploration islands.

A more significant concern is the role of ice in causing seabed scour near the coast (Reimnitz and Kempema, 1982). Ice-wallowing, as the process has been termed, leaves no scour depressions as in the offshore areas, and therefore it is not possible to estimate return periods for the scour

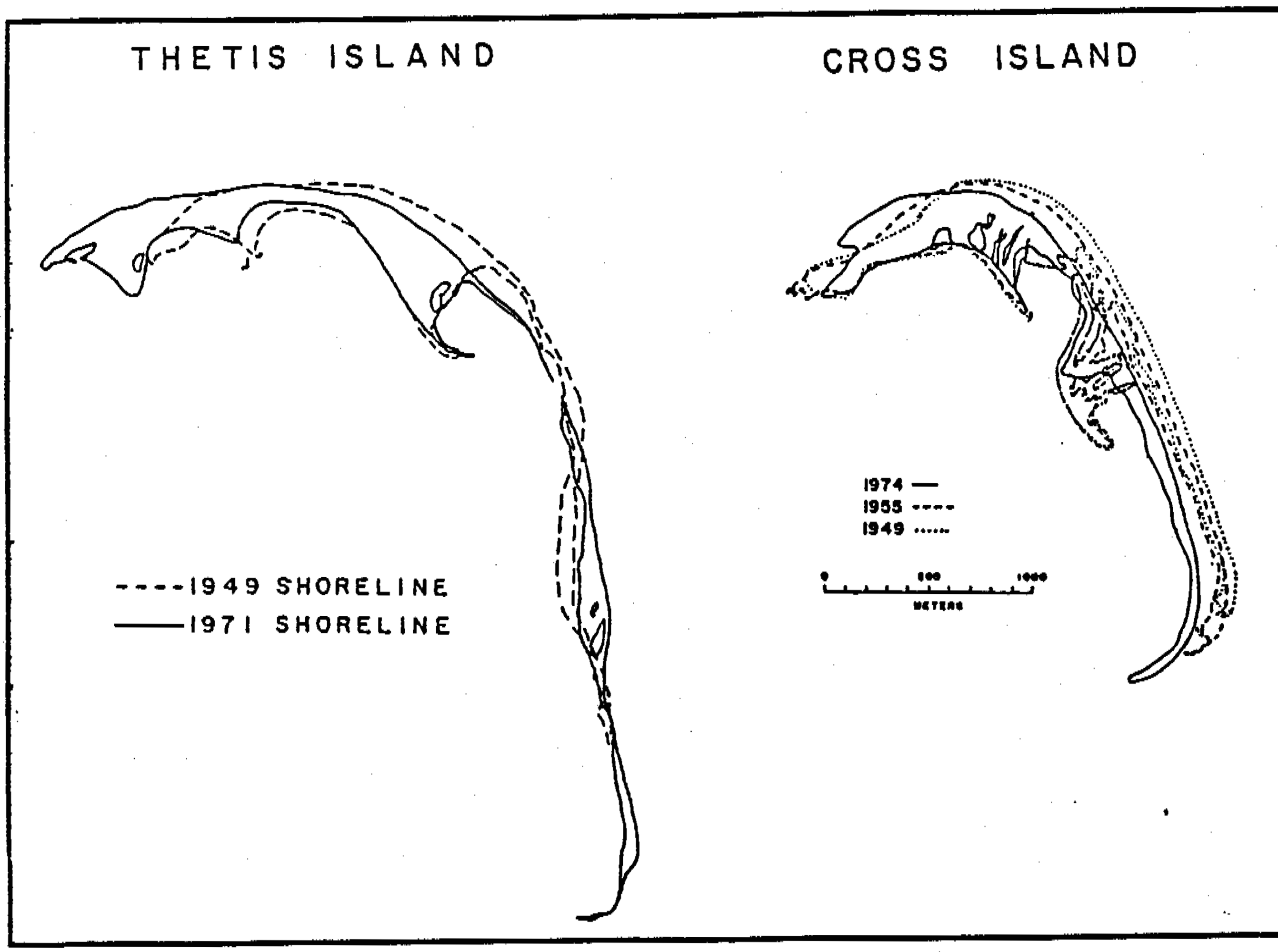

Figure 3.14 Examples of southwestward barrier island migration from the Alaskan Beaufort Sea (from Reimnitz, Barnes and Melchior, 1977).

events. Detailed bathymetric surveys suggest that ice-wallow scours may extend at least 2 to 3 meters below the seabed in the nearshore (in 4 to 5 m water depths).

The distribution of permafrost on the coast and in the nearshore is not well documented. Measurements of the frost-table on beaches near Peard Bay, Alaska indicate that the frost table increases in depth throughout the summer to a maximum of approximately 0.7 meters in the backshore and 1.4 metres near the waterline (Owens and Harper, 1977). Offshore permafrost remains near the seabed (less than 5 m below the seabed) to the two metre isobath where the sea ice changes from bottom-fast to land-fast. Borings conducted by Osterkamp and Harrison (1976) indicate that ice-bonded permafrost is as deep as 21 m below the seabed within 500 m from the shore at Prudhoe Bay.

4.0 METHODS

This section describes the methods used in developing new information as part of this project. Because there were no field studies conducted, new information was developed from interpretation of existing data sources, principally in terms of:

- coastal geomorphology
- coastal stability.

Methods used in developing (a) coastal morphology maps and the coastal data base, and (b) coastal erosion or accretion rates are presented within the following sections.

4.1 COASTAL MAPPING

A series of coastal maps with associated computer data base were developed from interpretation of aerial photographs and aerial videotapes. A descriptive classification system was used to categorize the physical coastal resources. This system has been used in a wide variety of coastal mapping studies, including several for the arctic (Harper, 1981, Harper and Sawyer, 1983; Harper et al, 1984; Owens, 1980; Owens et al, 1981) and has recently been adapted as the Coastal Information System of the Geological Survey of Canada (Forbes and Fricker, 1984).

4.1.1 Classification System

The Coastal Information System (CIS) uses a mainframe computer (Cyber-178) and data base system (System 2000) to catalogue coastal information into a digital format. The entire Canadian shoreline is subdivided into 13 **regions** of which the Beaufort Sea is one. The coastline is further subdivided into **localities** (or subregions) and each of the localities is subdivided into **segments** (Table 4.1; Figure 4.1); segments are typically in the order of 200 m to several kilometres in length. This approach provides a rationale for systematically mapping the coastline into manageable geomorphic units which are amenable to storing in a computer data base.

Each segment can be further divided into **zones** (nearshore, foreshore and backshore) and **features** can be mapped within each zone to document detailed across-shore morphology and substrate types.

Other important aspects of the classification system are:

- coastline position data, where the ends of each segment are defined by geographic coordinates,
- documentation data, which records the data sources used,
- environmental data, which includes information on wave exposure and other oceanographic processes.

These data were originally intended to be entered directly into the computer by the mapper using a menu-driven data entry program. Although the program was eventually developed for Dobrocky's in-house DEC PDP 11/34 computer, it was not available through much of the project and shore-zone information was entered directly onto coding sheets (Table 4.2) and later entered by a data entry operator.

Coastal morphology was characterized as either a cultural feature or natural feature, and coastal substrates were characterized as either cultural or natural as well (Table 4.3). A glossary was developed which allowed computer codes to be entered, thereby minimizing data entry time, but which allowed readable English to be output on hard copy tables (Table 4.4).

Although the coastal data base records a high level of detail, summary data is required for maps to maintain a comparatively simple uncluttered map format. For this reason a series of coastal types were defined after the detailed mapping had been completed (see Section 5.1); these coastal types represent a collection of coastal features and substrates that are

Table 4.1 Geomorphic Subdivision of the Beaufort Sea Coastal Region.

COASTAL REGION		LOCALITIES	NUMBER OF SEGMENTS
	1.	Baillie Islands	50
	2.	Liverpool Bay (Wood Bay)	61
	3.	Southeastern Liverpool Bay	31
	4.	Eskimo Lakes	-
	5.	Western Liverpool Bay	108
	6.	Cape Dalhousie to McKinley Bay	70
Beaufort Sea	7.	Tuktoyaktuk to McKinley Bay	141
	8.	Kugmallit Bay	85
	9.	Richards Island	248
	10.	Central Mackenzie Delta	120
	11.	Southern Mackenzie Delta	27
	12.	Yukon Coast	85

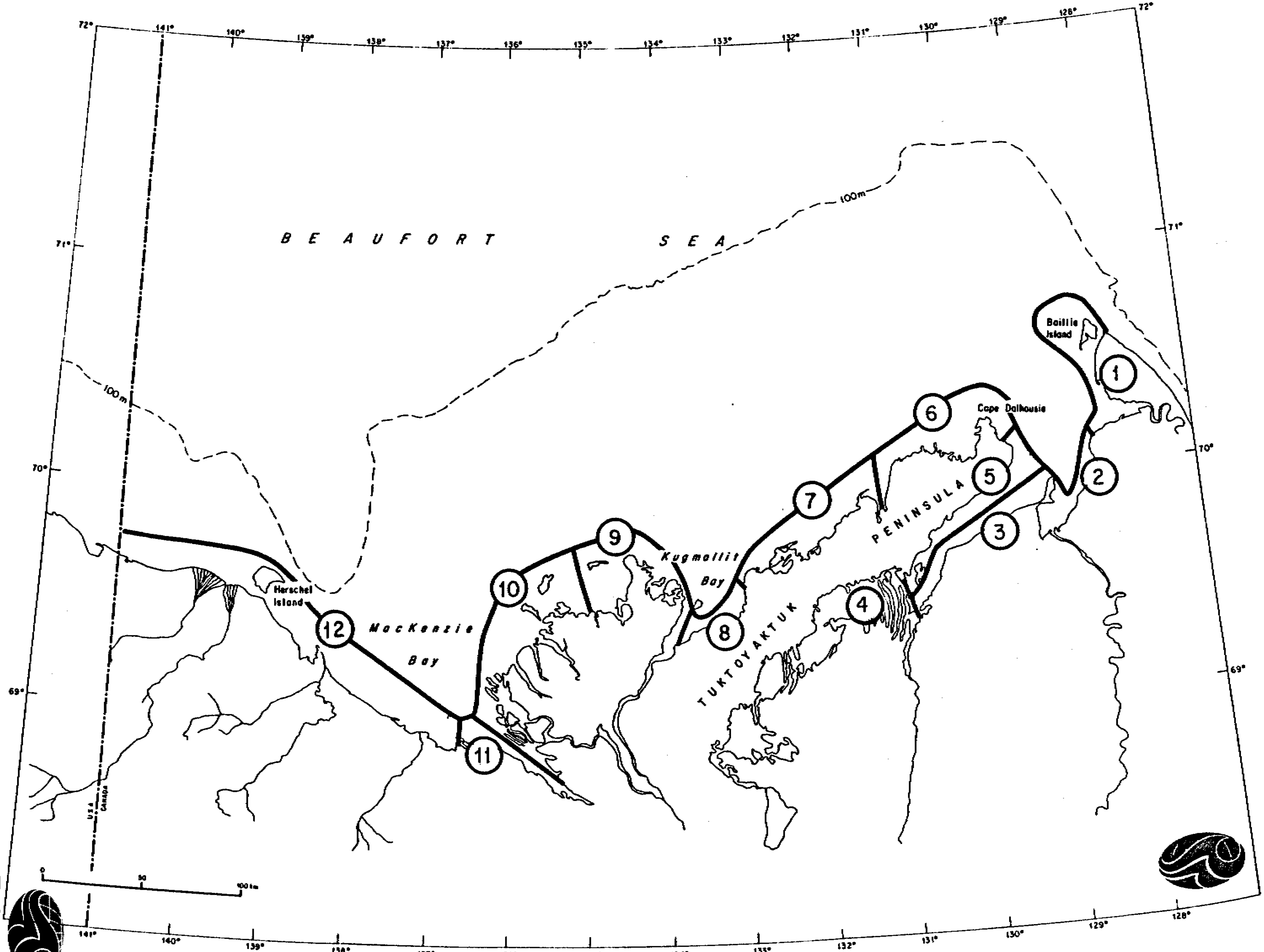

Figure 4.1 Coastal localities or subregions defined for the Canadian Beaufort Sea.

Country :		Project No :	1-766
Region :	20	Date :	9 ~~March~~ Feb 1985
Locality :	10	Mapped By :	P.D. Rainer
unit :	59	Scale :	1:50,000
NTS sheet :	107 C/5 west		
START :	7155543		
END :	7154550		
Length :	1.3 Km.		

Data Sources 1: P, A23477-33, 73
2: V, AGC-BS-6
3:
4:
5:

PE	LENGTH	coll	unit	comp	Morphology	Material	COMMENTS	% Length	Height	Width	Area	Ratio
P		5	B	1	B	Csg		P90				
			A	1	B	Csg		P90				
			A	2	Br	Csg Bl	MULTIPLE RECURVE SPIT COMPLEX	P70				
			A	3	F	Csg Bl	washover	P70				
			A	4	Ae	Csg					0.01	
			A	5	Af	Csg	Airstrip	P20				
✓			B	1	R	Csg	tidal inlet, behind spit	P10				
			A	1	L	Csg						
			A	2	m	Csm	Supratidal, head of Lagoon					

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Table 4.2 Example of Shore-zone Coding Sheet Used to Temporarily Record Data Prior to Computer Entry

Table 4.3 List of Feature and Materials Terminology (after Forbes and Fricker, 1984)

FEATURE TERMINOLOGY

Cultural

BREAKWATER
BRIDGE
CABLE
CAUSEWAY
CHANNEL (with comment RECTIFIED in c224)
CRIBWORK
CULVERT
DAM
DOLPHIN
DYKE
EXCAVATION (including dredge channel, gravel pit, &c)
FILL (including road or dump fill)
FRAME (including shellfish culture or net frame)
HABITATION
PIPE (including intake, outfall, pipeline)
PLANT (e.g. industrial, commercial, waste treatment, &c)
PIER
RAMP (launching ramp, haulup frame)
ROAD
WHARF (dock, quay)
WALL (bulkhead, sea or retaining wall, revetment)

Natural

BAR (type in c224: e.g. SWASH, LINEAR, CRESCENTIC, TRANSVERSE; also number: e.g. MULTIPLE LINEAR, 2 CRESCENTIC, &c)
BARRICADE (boulder)
BARRIER (BACKshore only; barrier crest)
BEACH (NEAR, FORE, and BACKshore beachface)
BEACH-RIDGE (BACKshore only)
BERM (beachface feature)
BLOCK-FAILURE
CAVE
CHANNEL (FOREshore feature if tidal inlet or estuarine channel, BACKshore if stream, gully, or washover
CLIFF (with maximum height within segment in c227)
CLUSTER (boulder)
CUSP (beachface feature)
DEBRIS-CONE
DELTA (fluvial)
DUNE (aeolian)
EBB-DELTA (tidal)
ESTUARY
FAN (alluvial or debris-flow)
FJORD
FLAT (tidal or supratidal surface)
FLOOD-DELTA (tidal)
FLOOD-PLAIN (fluvial)
LAG-SHOAL
LAGOON
LOW-TIDE-TERRACE
MARSH
MUDFLOW
OUTCROP (rock)
PLATFORM
REEF
RETROGRESSIVE-THAW-FAILURE
ROTATIONAL-FAILURE
SLOPE
STACK
TALUS
TERRACE (low-tide, alluvial, &c)
VENEER (material less than 1 m thick)
WASHOVER (deposit)

MATERIALS TERMINOLOGY

Cultural

CONCRETE
GRAVEL
SAND
STEEL
WOOD

Natural

MUD ($d<63\mu m$)
SAND ($63<\bar{d}<2000\mu m$)
PEBBLE ($2<d<64mm$)
COBBLE ($64<d<256mm$)
BOULDER ($d>256mm$)
GRAVEL ($\bar{d}>2mm$)
DIAMICTON
PEAT
WOOD
ICE
ROCK

Table 4.4 Example of Data Base Output

Region 20 BEAUFORT SEA
Locality 7
Segment 1

Project Identification: 1-T66
Date: 850220
Mapped By: Doug Reimer
Scale 1:50,000

NTS Sheet: 107 B/13 East
Start (UTM): 9WVN190530
End (UTM): 9WVN184535

Total Segment Length: 0.90 km

Data Sources: Vertical aerial photograph, No.A22306-70
Aerial videotape, No.AGC-DS4 (1984)

TYPE	ZONE	COMPONENT	Morphology	Material	Comments	Length (km)	Height (m)	Width (m)	Area (sq.km)
P	C	1	Bar	Sand	Multiple transverse	0.90(100%)			
	B	1	Beach	Sand		0.90(100%)		5	
	A	1	Beach	Sand		0.90(100%)			
		2	Aeolian deposit	Sand	Partially vegetated	0.90(100%)	2		

Region 20 BEAUFORT SEA
Locality 7
Segment 2

Project Identification: 1-T66
Date: 850220
Mapped By: Doug Reimer
Scale 1:50,000

NTS Sheet: 107 B/13 East
Start (UTM): 9WVN184535
End (UTM): 9WVN182532

Total Segment Length: 0.40 km

Data Sources: Vertical aerial photograph, No.A22306-70
Aerial videotape, No.AGC-DS4 (1984)

TYPE	ZONE	COMPONENT	Morphology	Material	Comments	Length (km)	Height (m)	Width (m)	Area (sq.km)
P	C	1	Beach	Sand		0.40(100%)			
	B	1	Beach	Sand		0.40(100%)		3	
	A	1	Cliff	Sand,peat		0.40(100%)	2		

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repetitive from segment to segment. As such, coastal types represent a generalization of the more specific map data. In addition to the coastal types, the following features were noted directly on the shore-zone character maps:

- longshore transport directions,
- the location of ground ice slumps or retrogressive thaw failures,
- storm log debris lines,
- permanent inlets or ephemeral inlets, and
- segment identification numbers to key map segments to the computer data base.

This information provides a sufficient level of detail for use on 1:50,000 scale maps without creating clutter.

4.1.2 Data Sources

In addition to those sources cited in Section 3.0, several other sources were used to provide coverage of the entire Beaufort Sea coastline. These include:

- aerial videotapes collected by the Geological Survey of Canada during July of 1984,
- aerial videotapes collected by Dome Petroleum Ltd. during August 1980 and September 1981,
- National Air Photo Library aerial photographs from the 1950's and 1970's, and
- aerial photos collected by Gulf Canada Resources Ltd. during 1982.

The aerial videotape coverage is schematically illustrated in Figure 4.2. The imagery was collected at altitudes of less than 200 m (Owens, 1982) and as such provides a high level of detail of shore-zone character. Features the size of boulders are usually easily resolved. A commentary on the audio sound-track provides additional detail on sediment size characteristics and on shore-zone width and cliff heights. The aerial videotape imagery provided the primary mapping source.

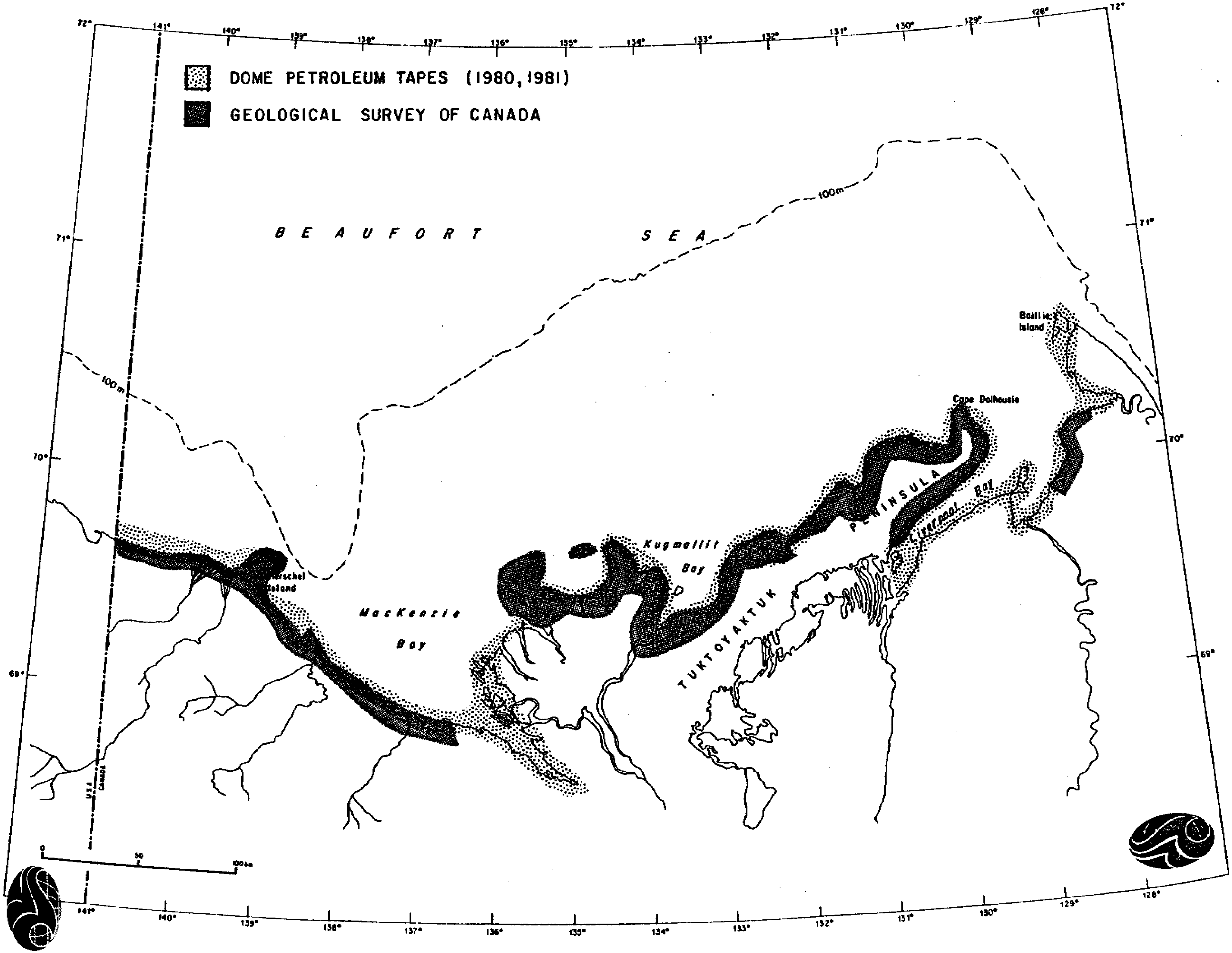

Figure 4.2 Coverage of aerial videotapes used in the mapping program.

The vertical aerial photographs (Figure 4.3) were used where no videotape imagery existed. The scale of the vertical photographs (approx. 1:60,000) limited the amount of morphology and substrate detail that could be derived from them.

4.2 COASTAL STABILITY ESTIMATES

Coastal erosion and accretion was estimated by comparing similar distances on 1950's and 1970's air photographs (Figure 4.3). A magnifying (10x) optical comparator, readable to 0.1 mm, was used to measure the distances. On two comparative photographs a geographically common inland point was selected and in most cases, distances perpendicular to the coast were measured to the cliff top, cliff base, and waterline. The measurements were used to calculate annual coastal erosion or accretion rates for the approximate twenty year period. The final erosion estimate obtained from a particular location was derived by averaging the rates of the cliff top and base; these were considered to be the most reliable estimates of coastal stability. If the measurements to either the cliff top or base were not recorded, then only the one measurement was used to calculate the final retreat rate for that location; if neither was recorded, the waterline rate was used (Appendix 1).

Some deviations from these procedures occurred. In a few cases it was not possible to align the measuring scale perpendicular to the coastline on both photographs where erosion had altered the coastline orientation. In these cases, the magnifying scale on the later photos was aligned to approximate the measurement angle on the early photographs. Measurements were not recorded where restrictions such as snow, indistinct cliff edges, or poor resolution were encountered.

Tests were undertaken to assess measuring error and photographic distortions. An estimate of variance was conducted to test for measurment accuracy. Distances to the cliff top, cliff base, and waterline were measured three times for ten locations. The variance was consistantly less than 1%. A simple range test was conducted to evaluate photographic

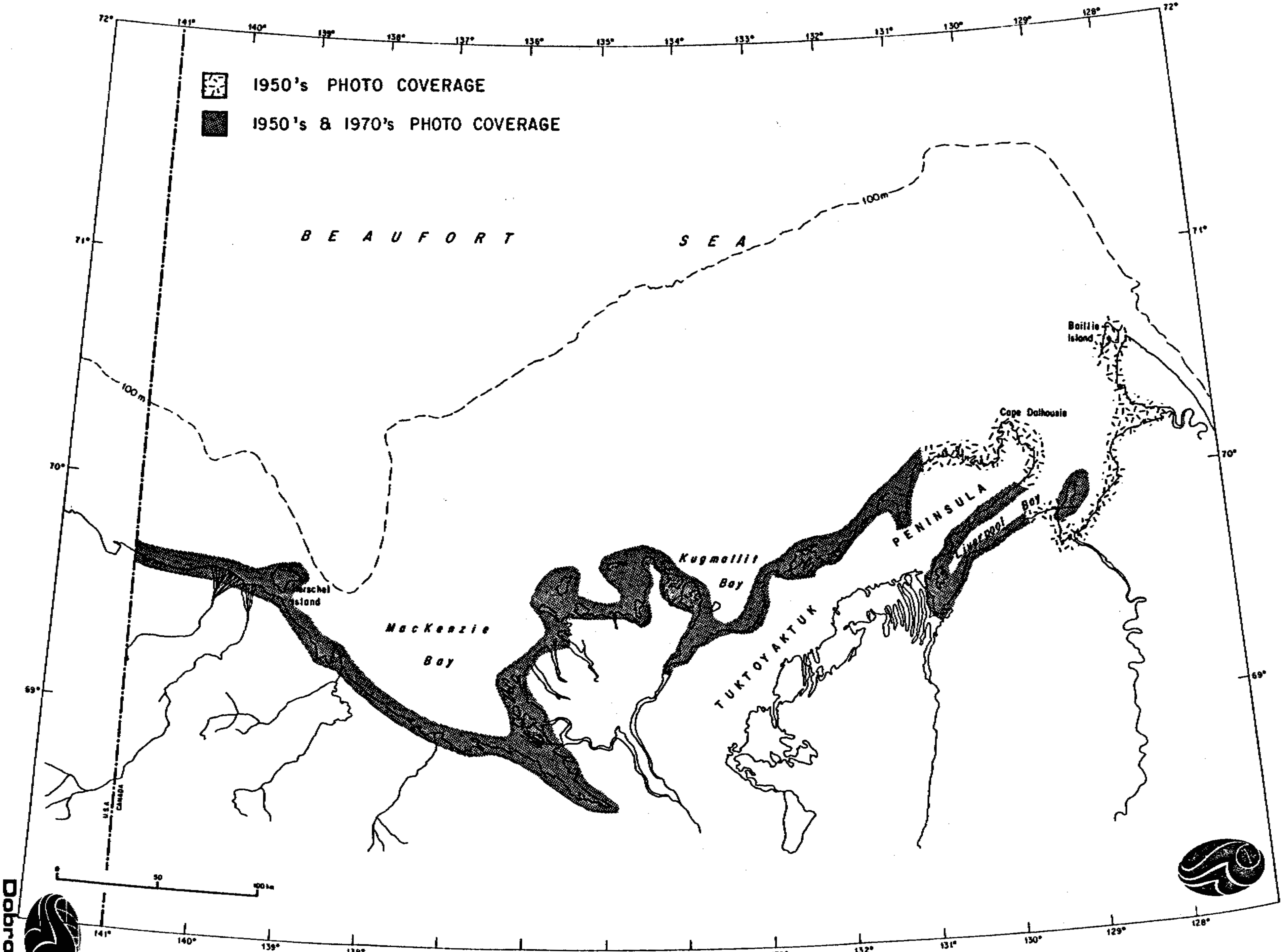

Figure 4.3 Coverage of vertical aerial photographs used in the study.

distortion. Distances were measured across ten random inland lakes on the 1:50,000 maps, the 1950's, and 1970's photographs. The range error between the photographs and maps was less than 10% for all but one measurement (less than 15%); this higher range value was accounted for by the fact that the line delineating a lake is 0.3 mm thick and that features on maps are generalized when transferred from photographs. The range error between the photograph sets was consistantly less than 5% indicating that the effect of photographic distortion on this measurement technique was acceptable.

Individual measurement locations and rates of change are indicated on the 1:50,000 scale morphology maps. Summary maps used only those values for locations on the outer coastline (i.e. Figure 5.18). Measurements published by McDonald and Lewis (1973) are not included in the Appendix but are indicated on the summary maps. Unpublished measurements made by C.P. Lewis using an overlay method were calculated to determine annual retreat rates for the Tuktoyaktuk and McKinley Bay areas (Appendix 1). Averages were calculated for 25 km segments and the 12 localities.

5.0 RESULTS

The entire coastline of the Beaufort Sea from the Alaskan/Yukon border to Cape Bathurst was mapped on 1:50,000 scale maps, with a few exceptions, and resource information entered into the computer data base. The extent of mapped area is illustrated in Figure 5.1. Approximately 2,500 km of coastline and 1,000 segments were recorded (Section 5.1). Each segment represents an average of four to five coastal features in the data base and the average length is approximately 200 m. Over 1,000 coastal stability measurements were made as part of this study and these were combined with previous measurements by McDonald and Lewis (1973) to provide a comprehensive assessment of coastal stability in the southern Beaufort Sea (Section 5.2). Information on concurrent nearshore wave climate studies (Philpott, 1985) and previous coastal process studies (Section 3.0) are used to develop coastal dynamics models for the Canadian Beaufort Sea (Section 5.3).

5.1 COASTAL MORPHOLOGY

5.1.1 Definition of Coastal Types

On completion of the coastal mapping phase, coastal segments were reviewed for repetitive sequences of across-shore components. An example of a repetitive sequence is: narrow gravel beaches backed by erosional, high ice-rich cliffs. Such a sequence is then defined as a repetitive **coastal type**. Six repetitive coastal types are defined for the study area (Table 5.1); these types categorize the entire shoreline and because they were defined after the mapping was completed, they represent a generalization of site specific data. Two coastal modifiers, commonly occuring features and groups of features that are associated with more than one coastal type, are also identified. Examples of these coastal types are illustrated in photographs (Figure 5.2 to 5.9).

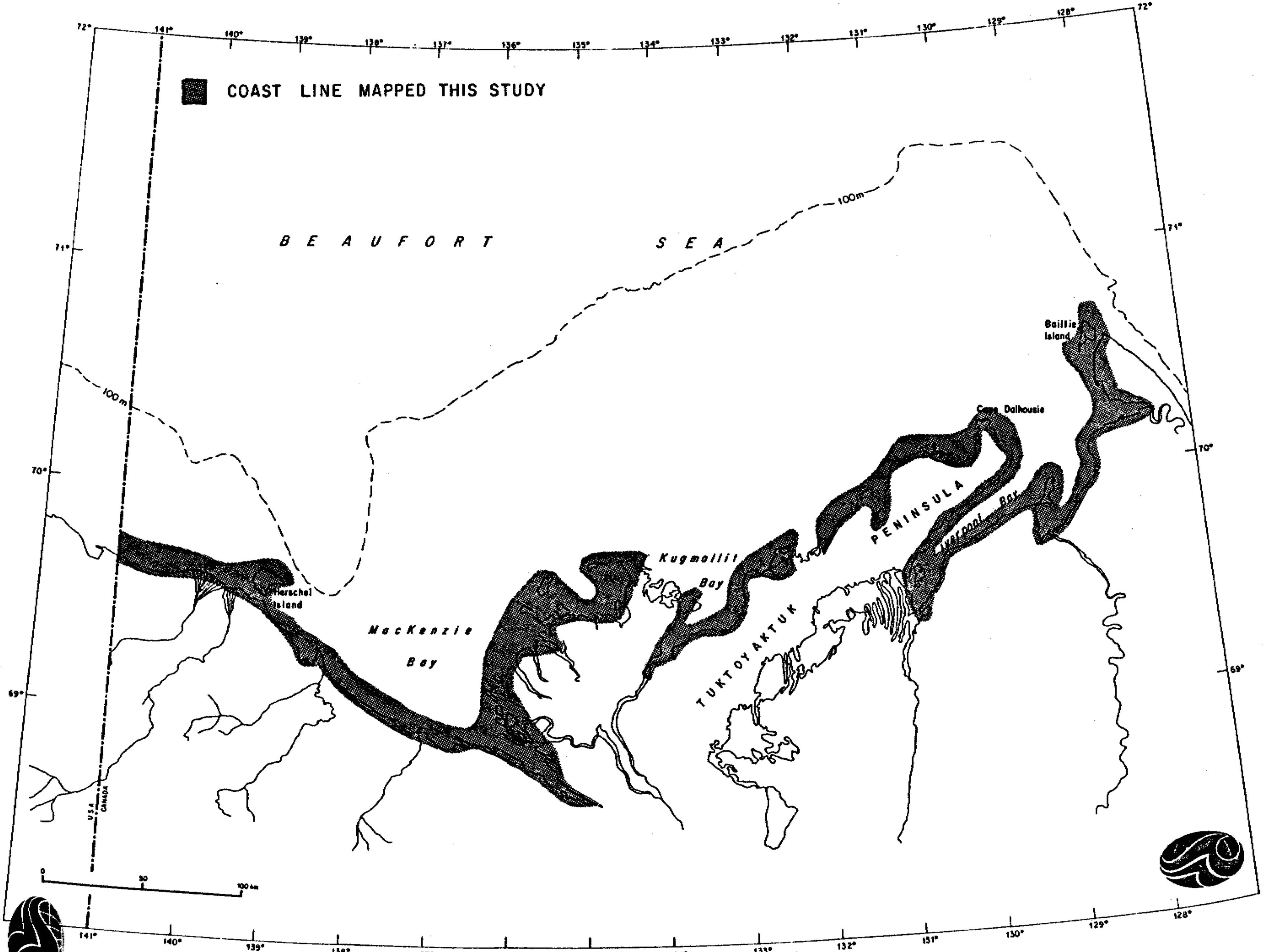

Figure 5.1 Extent of coastline mapped in this study.

Table 5.1 Description of Coastal Types and Modifiers

EROSIONAL COASTAL TYPES

Ice Poor Cliffs - coastal cliffs, usually low to moderate relief fronted by narrow beaches (< 15 m) of sand/gravel material; mass-wasting dominated by debris slides and surface wash erosion; cliff materials usually sands or gravelly sands capped by peat; moderate to low retreat (< 1 m/yr).

Ice-Rich Cliffs - coastal cliffs, usually moderate to high relief (5 - 15 m) fronted by narrow gravelly sand beaches; upper cliff sections typically show retrogressive thaw failures indicating ice-rich material; mudflows from failures frequently flow across beaches; retreat rates are moderate (0.5 to 1.0 m/yr).

Low Tundra Cliffs - low coastal cliffs (< 1 m relief) fronted by narrow sand or sand and gravel beaches; cliffs commonly show a veneer of sediment on tundra; log lines common landward of cliff edge; retreat moderate to high (1 to 2 m/yr).

Inundated Tundra - submerged tundra extending into nearshore and foreshore areas; low relief areas from highly crenulated coastlines; beaches are narrow to non-existent although wide intertidal and subtidal flats commonly found in association; organic-rich areas common; high coastal retreat.

ACCRETIONAL LANDFORMS

Barrier Beaches and Spits - sand to gravelly sand barrier beaches of variable width depending on wave exposure (widths 20 - 200 m); wider spits usually associated with high wave exposure; multiple recurved spits cause local width increases; relief low (< 1.5 m); with lagoons and/or estuaries which commonly contain a wetland fringe; dunes are rare; spit stability determined by retreat of anchoring headlands; barrier islands comparatively stable.

Intertidal Flats, Wetland and Channel Complexes - usually associated with deltas; flats are typically very wide (up to several kilometers) and comprised of sands, muddy sands and/or organics; commonly low erosional scarp cut into peat at or near the high water line; coastlines are complex and highly crenulated with flats on the outer coast, and channels and wetlands to landward.

COASTAL MODIFIERS

Multiple Nearshore Bars/Flats - low gradient nearshore areas; usually sandy; often with multiple low amplitude nearshore bars; commonly associated with low wave exposure areas.

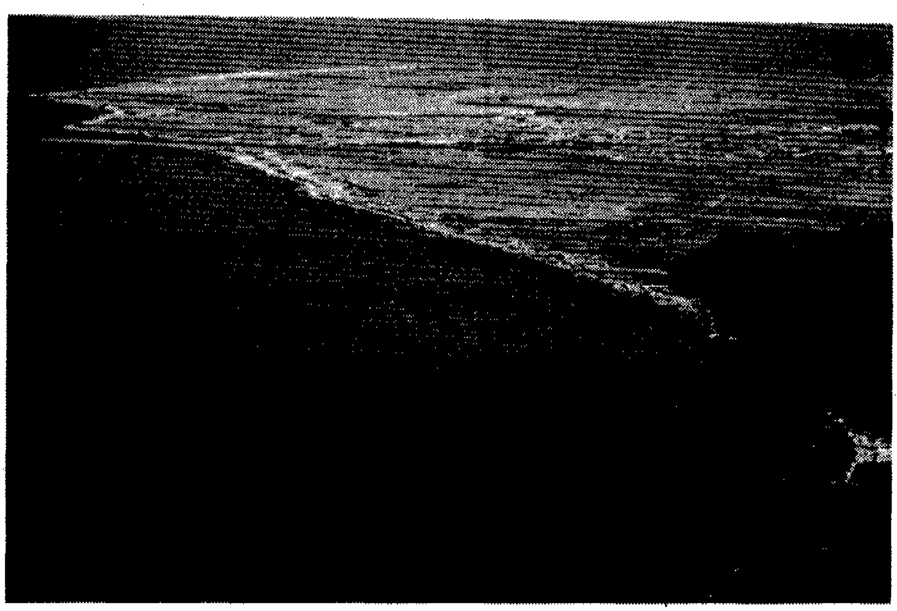

Figure 5.2 Photograph of ice-poor cliffs near the Running River, Yukon Territory.

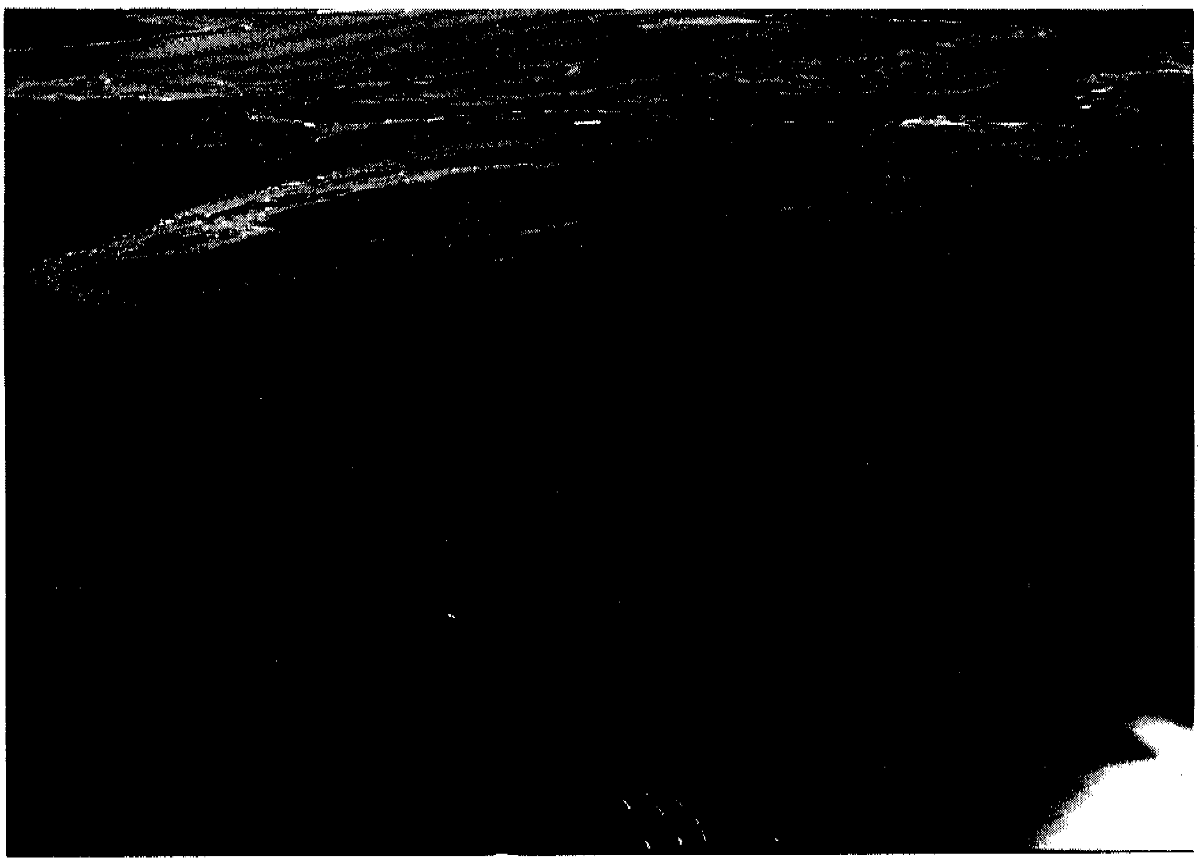

Figure 5.3 Aerial photograph of ice-rich cliffs, southwest of Tuktoyaktuk.

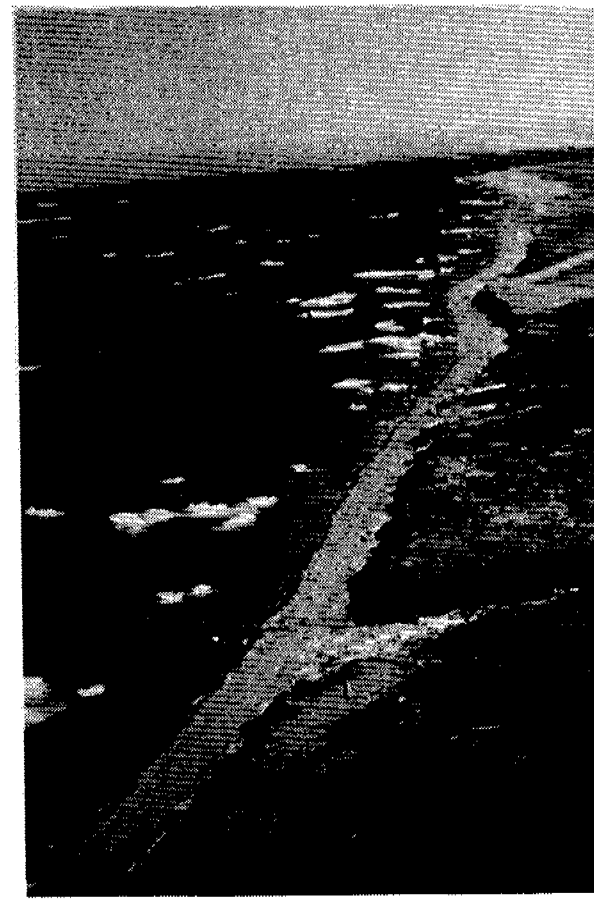

Figure 5.4 Photograph of low tundra cliffs at Komakuk Beach, Y.T. These cliffs are common in areas of the Tuktoyaktuk Peninsula in locally in other sections of the coast.

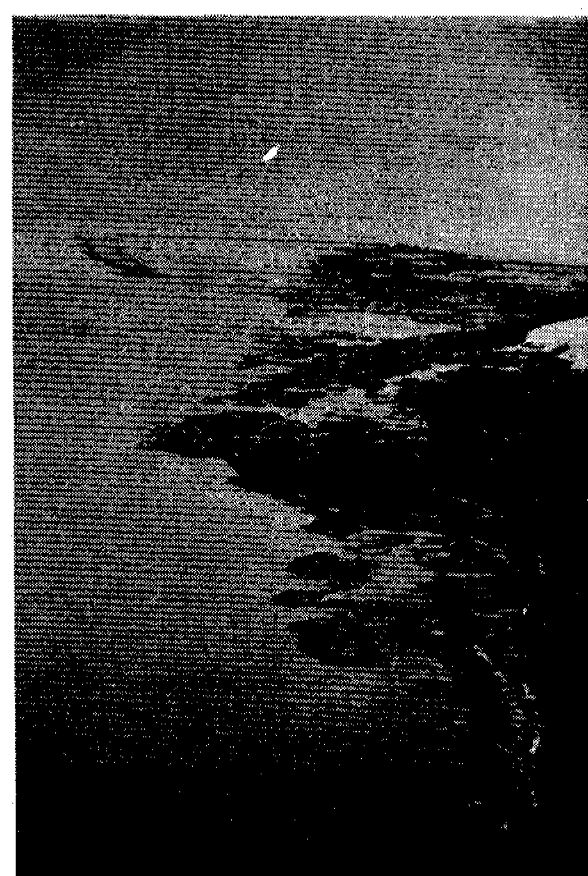

Figure 5.5 Photograph of inundated tundra to the northeast of Tuktoyaktuk, typical of areas found on the northern end of the Tuktoyaktuk Peninsula.

Figure 5.6a Photograph of a sandy barrier spit near the Spring River, Y.T.

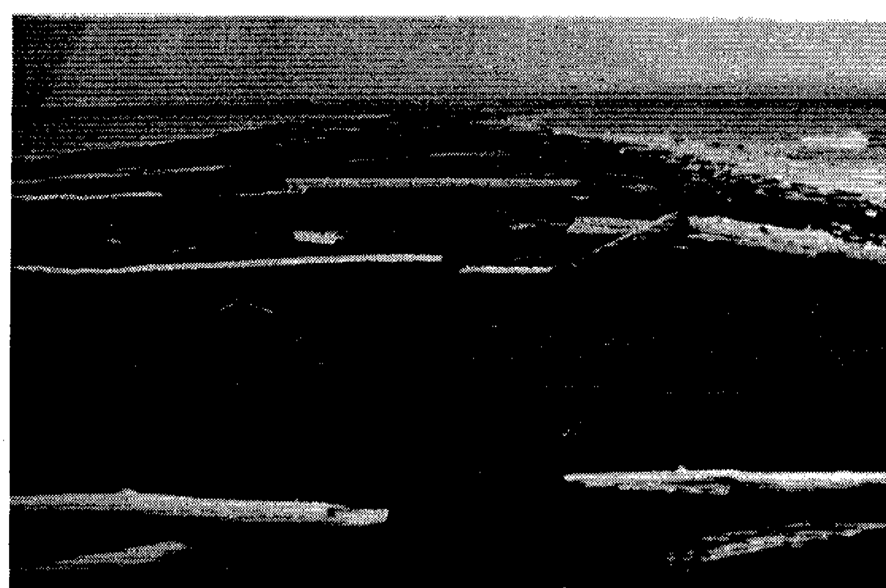

Figure 5.6b Photograph of a gravelly sand barrier spit (Kay Point Spit) on the Yukon Coast.

Figure 5.7 Photograph of a flat-marsh-channel complex from the Blow River.

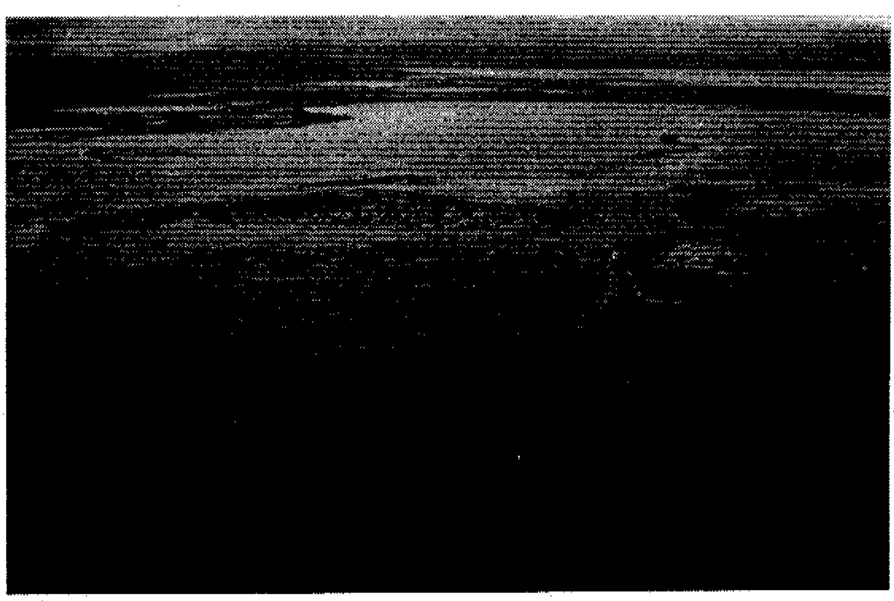

Figure 5.8 Details of marsh-mudflat complex (Babbage River, Y.T.).

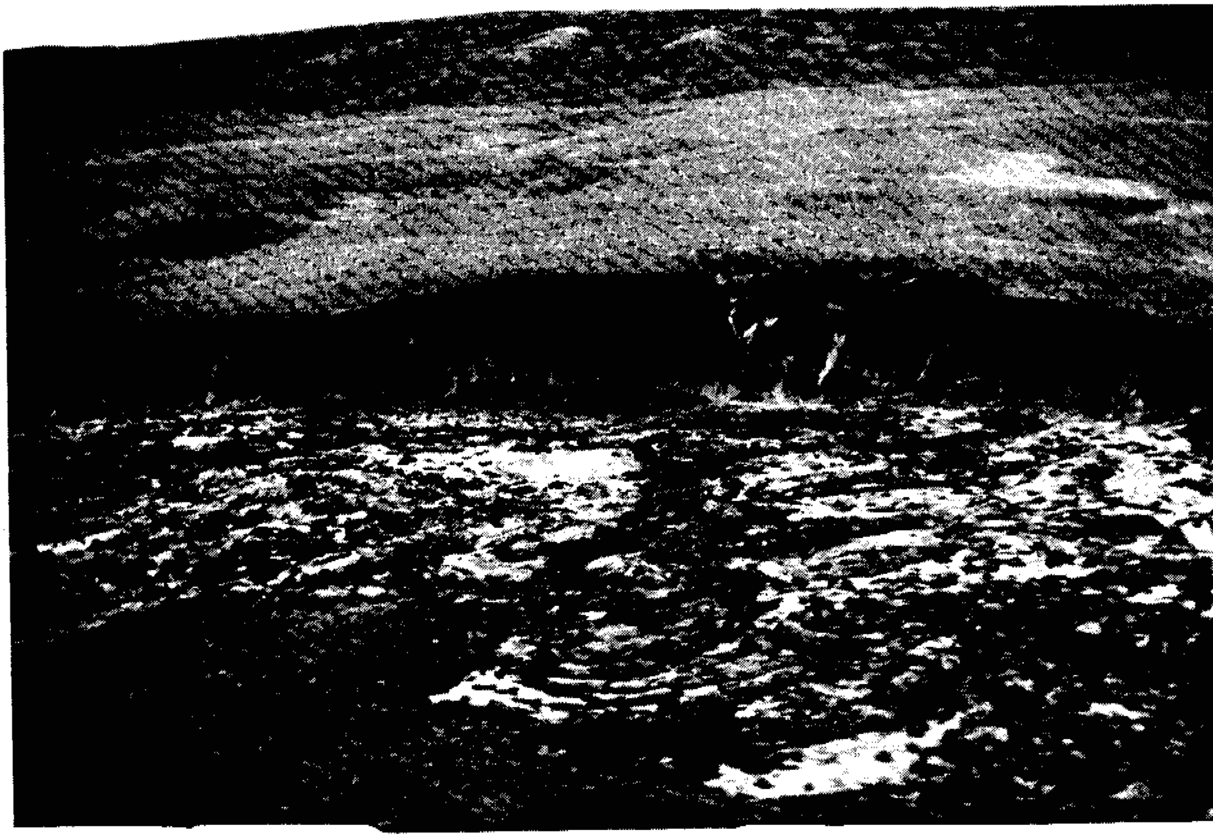

Figure 5.9 Photograph of a retrogressive thaw failure (originally defined as ground-ice slump by Mackay, 1966). Note vertical ice wedges and horizontal massive ice beds.

5.1.2 Distribution of Coastal Types

The occurrence of coastal types by locality (or subregion) is summarized in Table 5.2. It is evident that erosional coastal types comprise the majority of the coastal areas mapped (63%). Of the remaining 37%, the flat channel-wetland complex comprises 18% and stability analyses show that even much of this apparently accretional landform is undergoing rapid coastal retreat. It is also important to note that barrier spits and islands, which are accretional landforms, may still be undergoing rapid retreat, particularly where anchoring headlands are undergoing retreat.

Ice-poor cliffs are most common along western Liverpool Bay, the western coast of the Tuktoyaktuk Peninsula and parts of Richards Islands (Figure 5.10). Ice-rich cliffs occur locally throughout the study area but are common along the eastern shores of Liverpool Bay and along the Yukon coast. (Figure 5.11). Low tundra cliffs are most common on the western coast of the Tuktoyaktuk Peninsula, particularly at the north end near Russell Inlet (Figure 5.12). Inundated tundra is commonly associated with low tundra cliffs and is most frequently found along the northeast coast of the Tuktoyaktuk Peninsula (Figure 5.13).

Accretional landforms also occur throughout the study area, but are not common. Barrier spits and islands frequently occur in association with eroding tundra cliffs; they are common along (a) the northeastern shore of Liverpool Bay, (b) the west central portion of the Tuktoyaktuk Peninsula and (c) west of Herschel Island (Figure 5.14). The flat-wetland-channel complexes are principally associated with the modern Mackenzie River delta (Figure 5.15).

Coastal modifiers may be associated with any of the coastal types although multiple bars and flats typically occur in association with the ice-poor tundra cliffs and low tundra cliffs whereas the retrogressive thaw failures occur almost exclusively with ice-rich cliffs. Distributions are illustrated in Figure 5.16 and 5.17.

Table 5.2 Occurrence of Coastal Types and Modifiers (kilometers)

	LOCALITY[1]											
Coastal Type	1	2	3	5	6	7	8	9	10	11	12	TOTAL
Ice poor cliffs	37	14	28	74	64	9	21	67	20	-	70	404 (19%)
Ice rich cliffs	77	57	54	66	-	1	4	26	36	-	83	405 (19%)
Low tundra cliffs	1	8	-	1	144	50	31	27	3	-	18	283 (14%)
Inundated tundra	4	3	-	19	40	42	16	18	8	-	10	161 (8%)
Barrier spits islands	58	34	5	6	36	104	23	39	30	-	87	422 (20%)
Flat, wetland, channel complexes	4	17	-	-	-	-	4	4	216	128	31	403 (19%)
<u>Coastal Modifier</u>												
Multiple bars, flats	21	25	82	116	131	139	5	64	-	-	7	590 (28%)
Active retrogressive	-	3	1	2	-	-	1	6	5	-	13	31 (2%)
Stable thaw failures	-	3	10	16	-	-	2	6	9	-	6	53 (3%)
TOTAL COASTLINE MAPPED	180	133	87	165	285	205	98	183	314	128	299	2077
UNMAPPED[2]			24	3		46	32	254	166		1	526

2 see Figure 4.1.
1 no videotapes available and airphotos not of sufficient resolution for mapping.

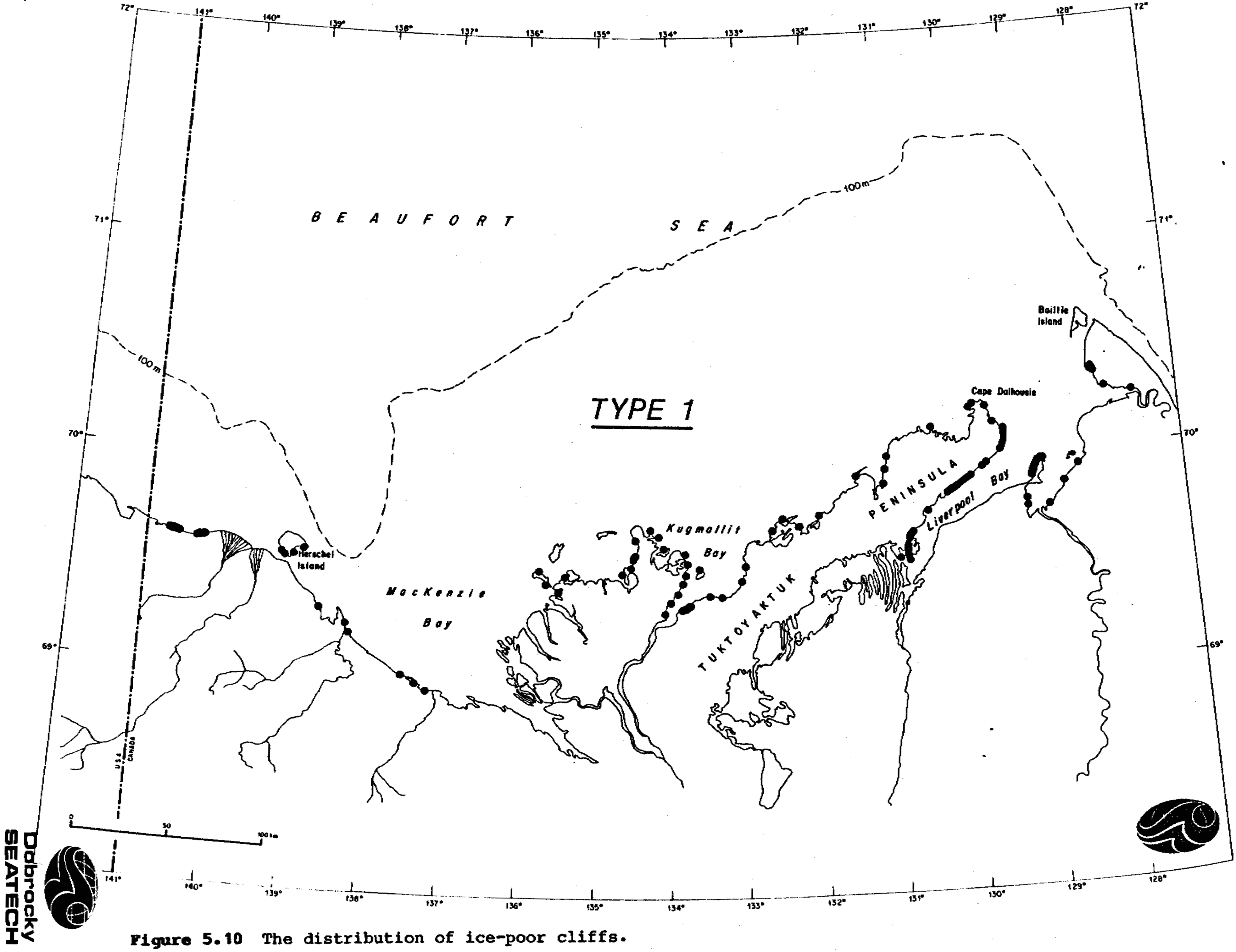

Figure 5.10 The distribution of ice-poor cliffs.

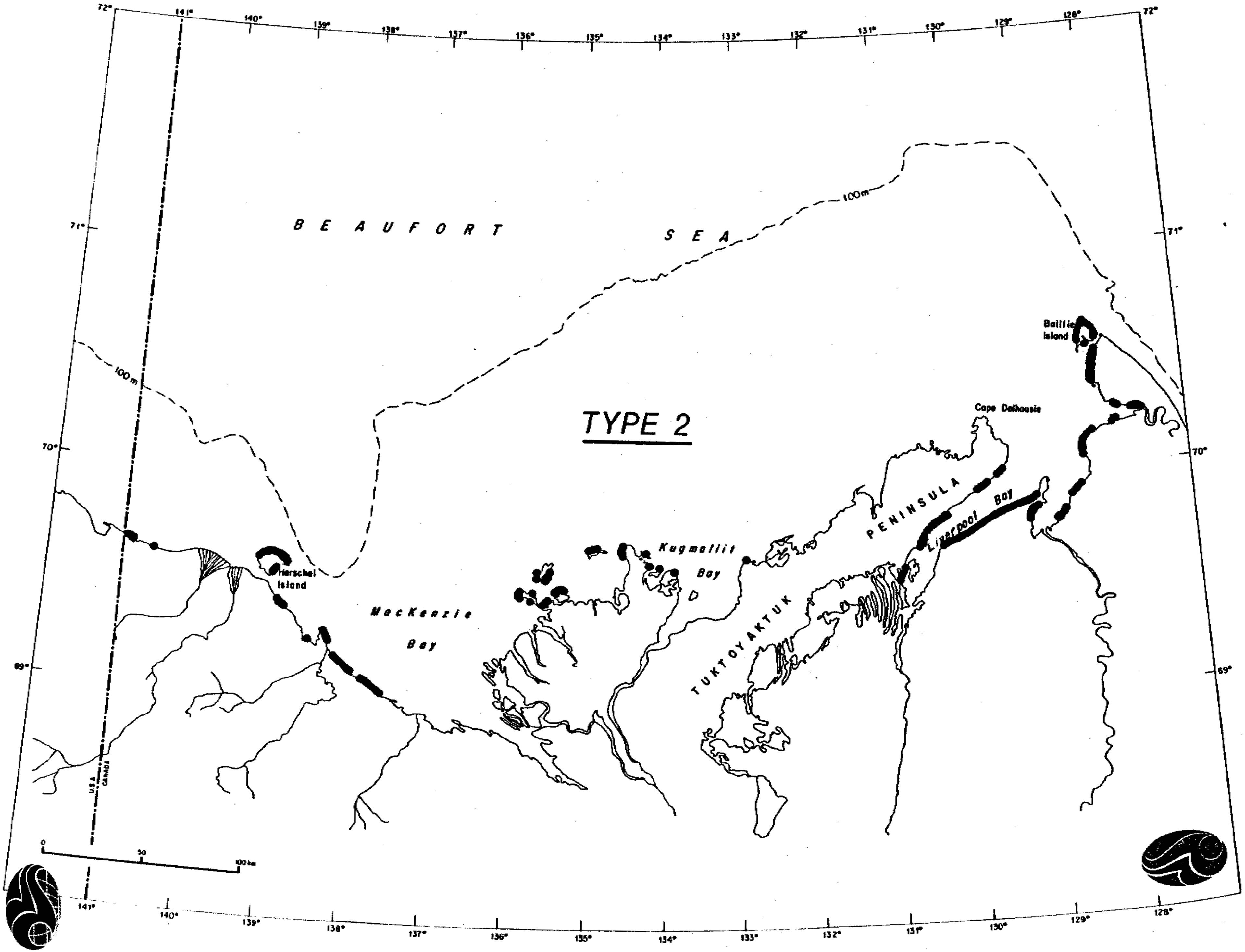

Figure 5.11 The distribution of ice-rich cliffs.

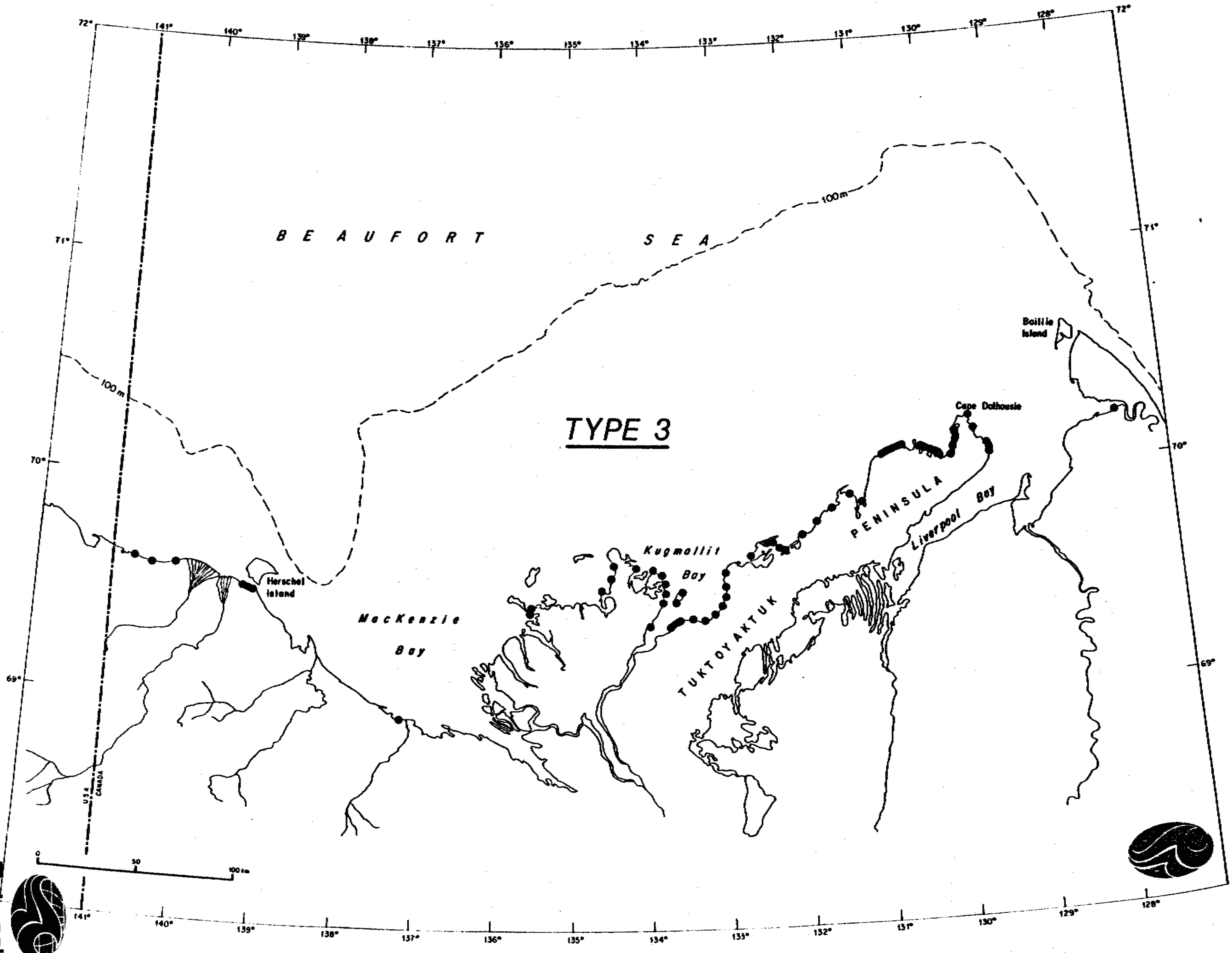

Figure 5.12 The distribution of low tundra cliffs.

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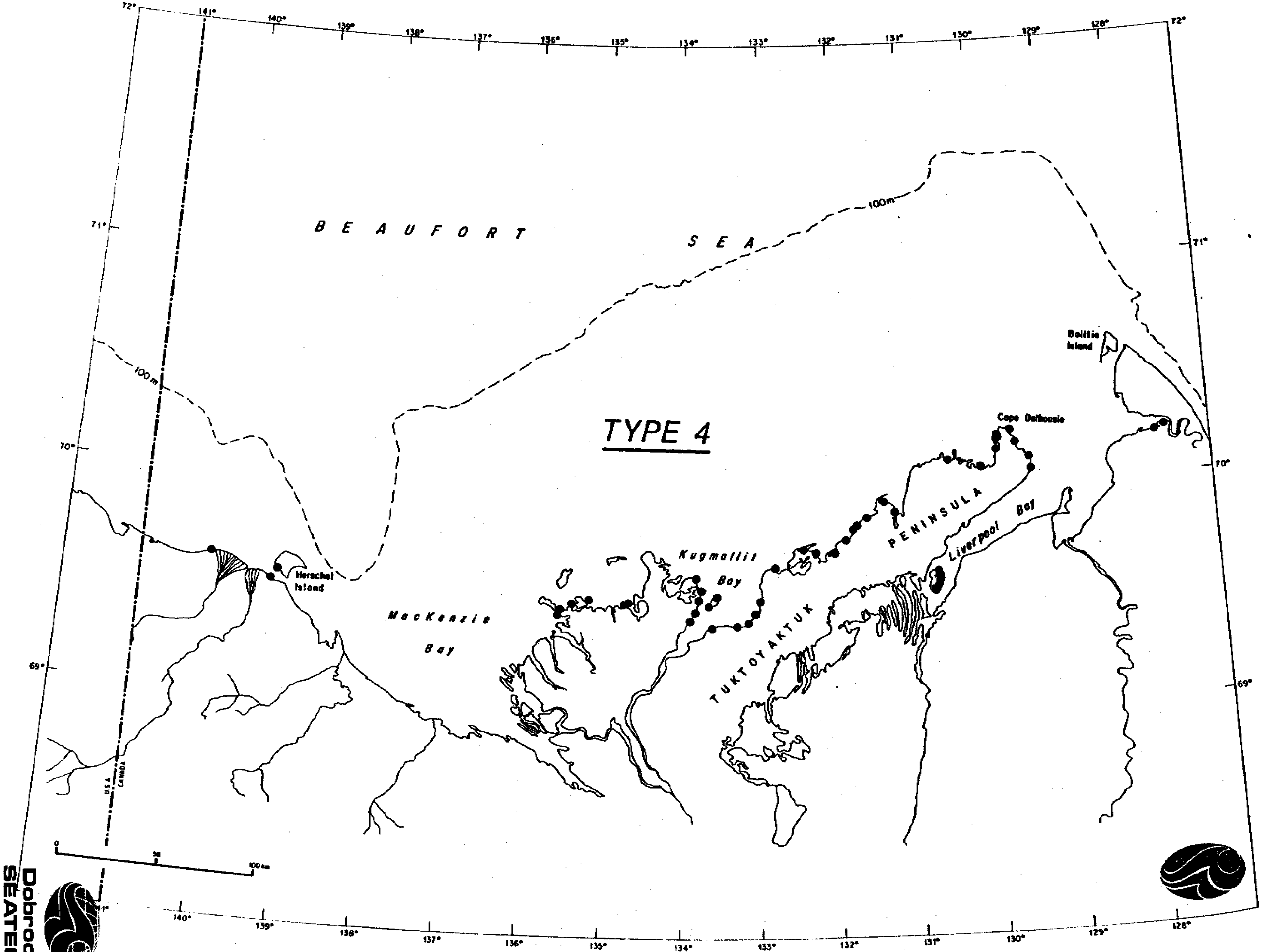

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Figure 5.13 The distribution of inundated tundra.

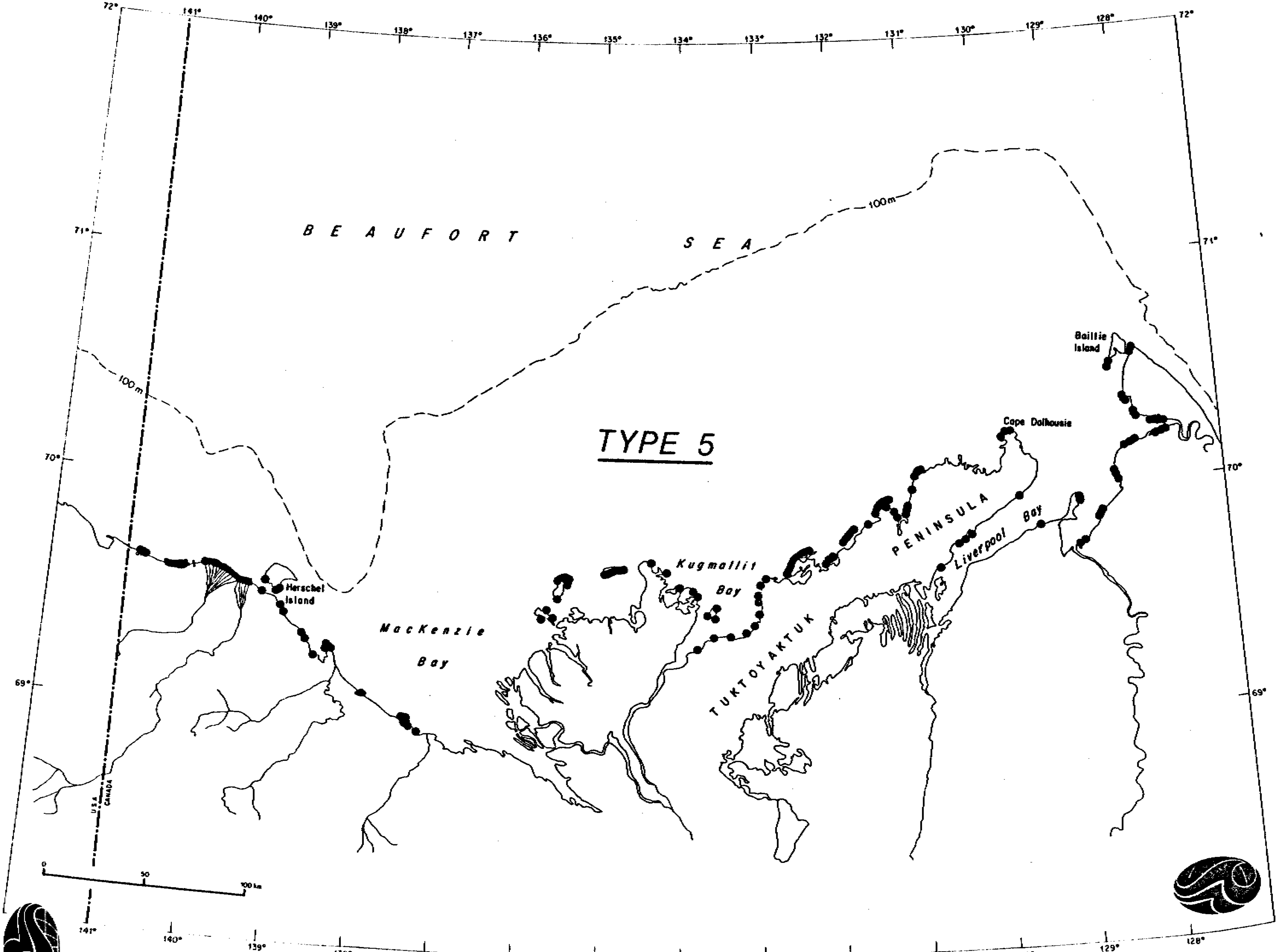

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Figure 5.14 The distribution of barrier islands and spits.

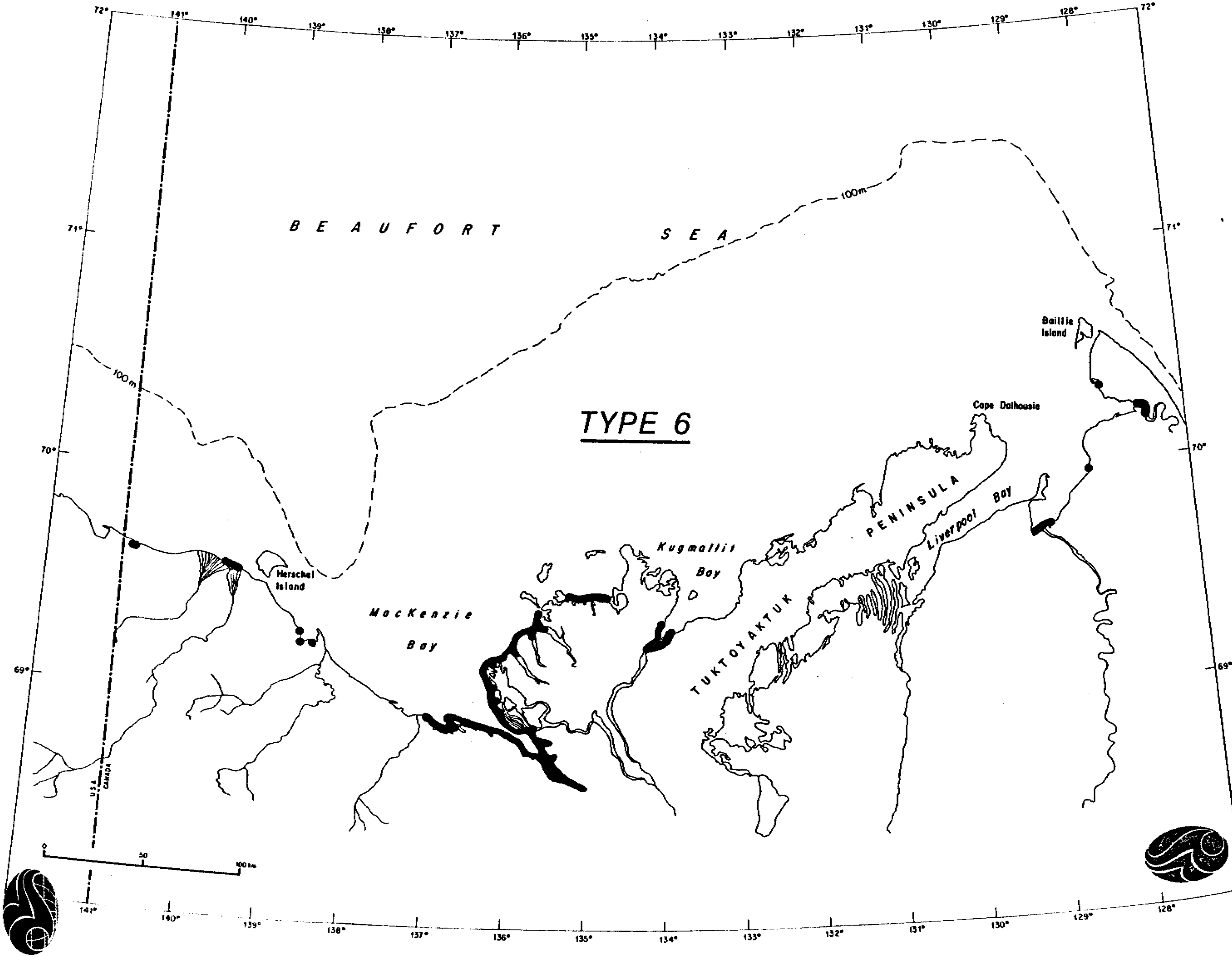

Figure 5.15 The distribution of flat-wetland-channel complexes.

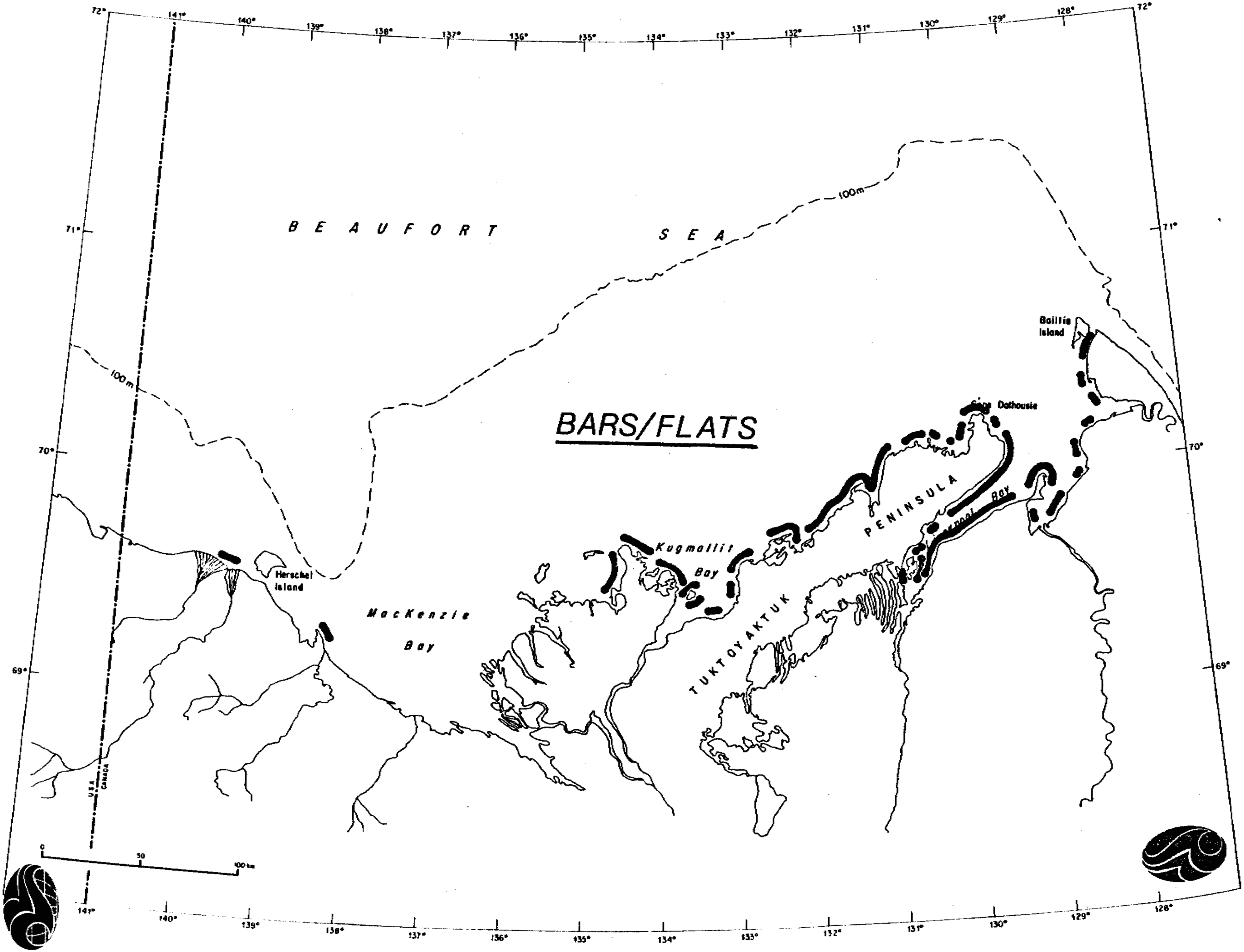

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Figure 5.16 The distribution of multiple nearshore bars and flats.

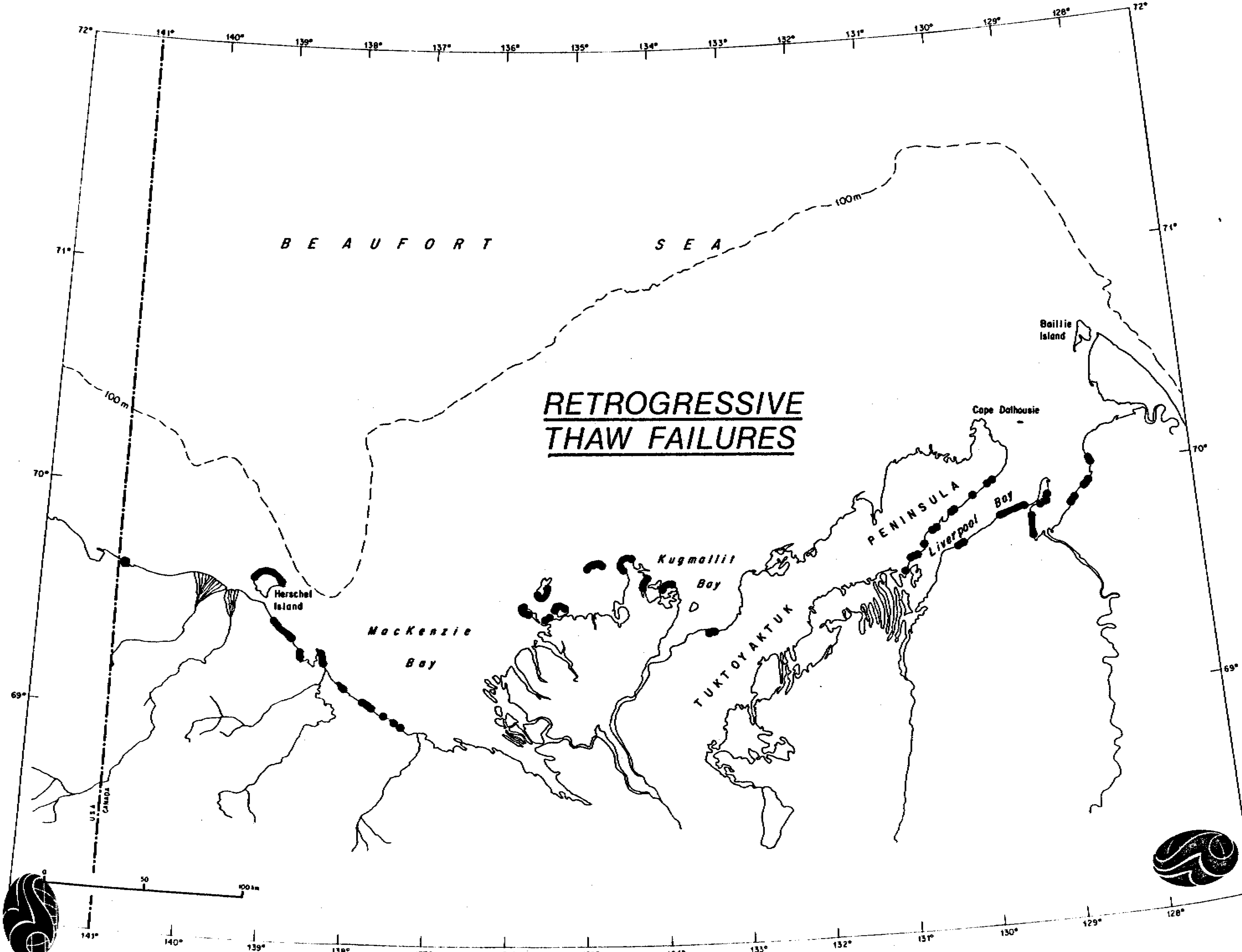

Figure 5.17 The distribution of retrogressive thaw failures.

The coastal types are mapped in detail on the 1:50,000 scale maps included in Appendix 2. An example of the legend and map format is included in Figures 5.18. The reader is referred to these maps for information on specific coastal sites.

5.2 COASTAL STABILITY

5.2.1 Coastal Change Measurements

A total of 989 new coastal stability measurements were made in the study area; each individual measurement is illustrated on the coastal morphology maps (Figure 5.18) and details of the measurements (air photo numbers, rate of change of cliff edge, cliff base) are listed in Appendix 1.

The coastal stability measurements are summarized by locality (outer coast measurements only) in Table 5.3 and schematically illustrated in Figures 5.19 and 5.20. It is emphasized that these measurements are converted to an annual retreat rate to assist in comparisons; year to year coastal retreat probably will vary significantly from these longterm estimates as a result of episodic storm effects.

The results indicate that the study area is undergoing wide-spread retreat with single point measurements in excess of -18 m/yr. Surprisingly, the active areas of the Mackenzie Delta show the highest rate of retreat averaging from -2.1 to -6.1 m/yr (Localities 10 and 11; Figure 5.19). These rates of retreat in the delta are consistent with retreat rates measured in 1976 and estimated from heat flow measurements (Hollingshead et al, 1978).

The most stable areas are those around Richards Island, where average positive changes have occurred over the twenty-year photo interval (Figure 5.20). The Liverpool Bay coastline show high rates of retreat despite relatively low wave exposure. The outer coast of the Tuktoyaktuk Peninsula is undergoing moderate retreat with the exception of the Tuktoyaktuk area itself where mean retreat is in the order of -2.0 m/yr with individual values up to -16.5 m/yr. The Yukon coast appears stable, but in fact, these retreat rates represent comparatively very high sediment erosion

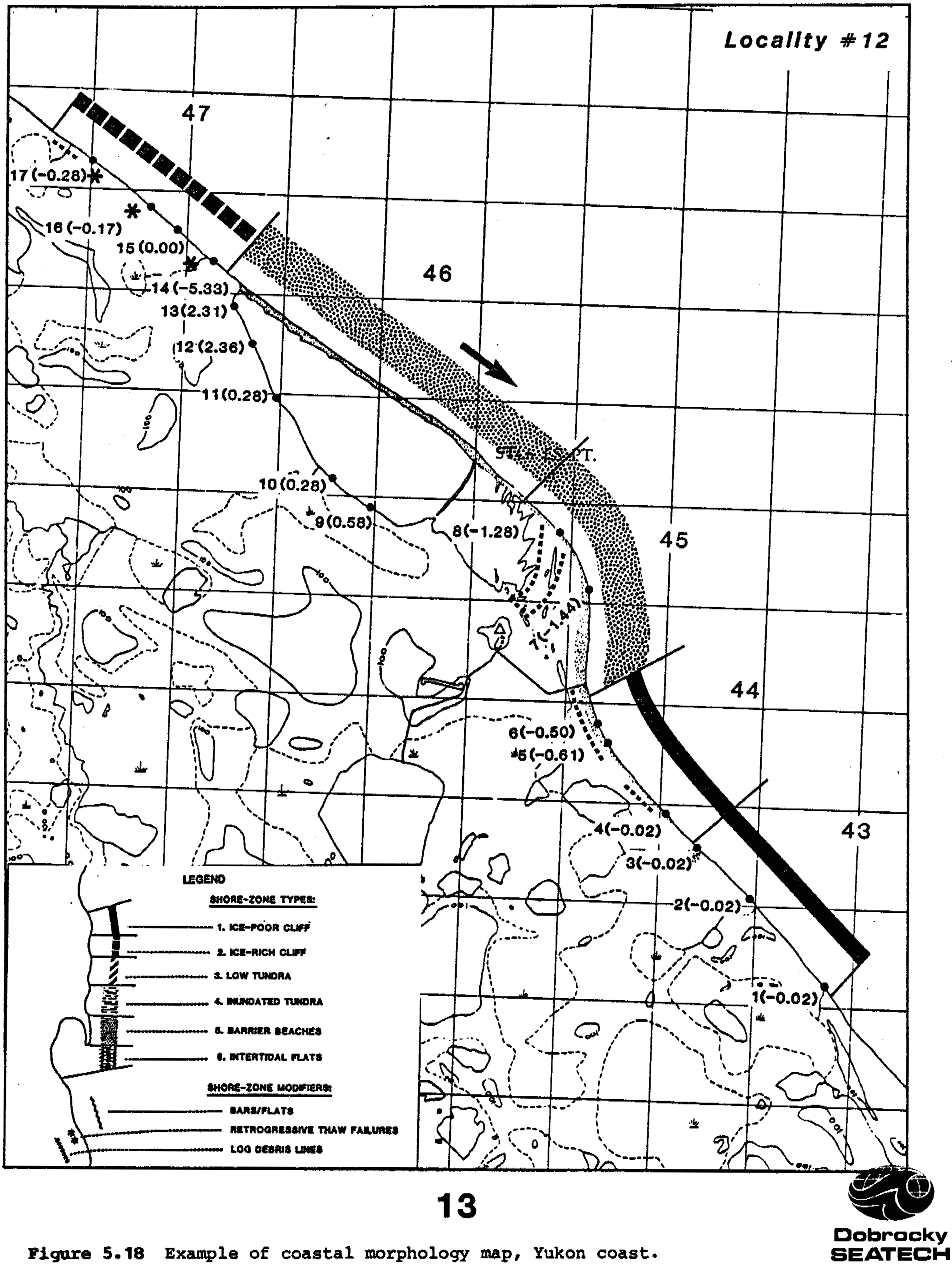

Figure 5.18 Example of coastal morphology map, Yukon coast.

Table 5.3 Coastal Stability Measurement Summaries

Locality	Mean Rate of Change (m/yr)	Maximum Rate of Change (m/yr)	Number of Measurements
1	nm*	-	-
2	-1.1	-3.8	15
3	-1.2	-7.2	29
4	-0.9	-2.9	7
5	-0.8	-4.1	31
6	-0.5	-1.5	11
7**	-1.1	-6.1, +6.3	128
8	-2.0	-16.5	143
9	-0.3	-5.9, +4.9	222
10	-2.1	-12.5	120
11	-6.1	-28.6	127
12***	-0.6	-5.3, +11.3	156

* nm - no measurements

** includes unpublished data from C.P. Lewis

*** includes data from McDonald and Lewis (1973)

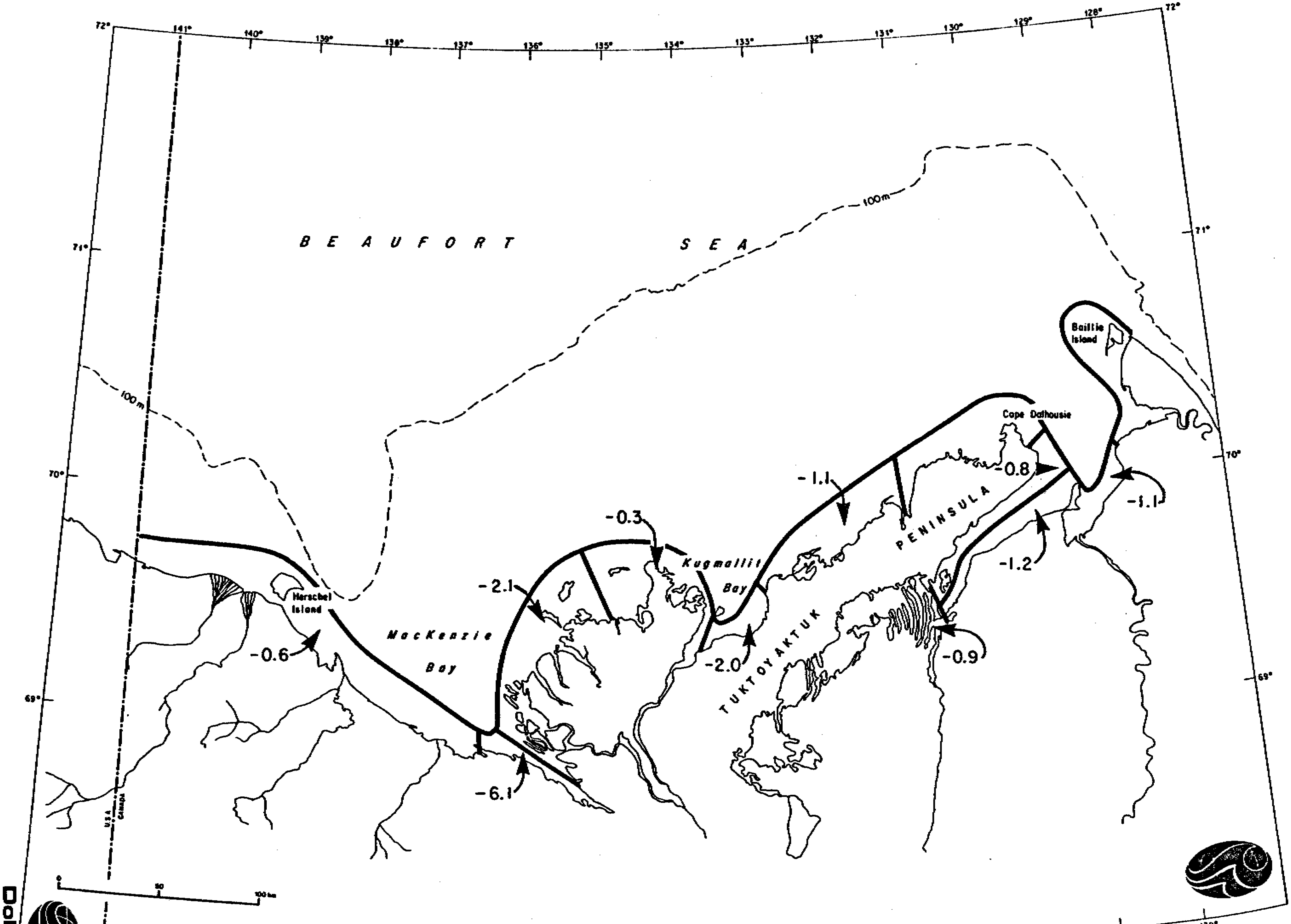

Figure 5.19 Summary of coastal retreat by locality of subregion.

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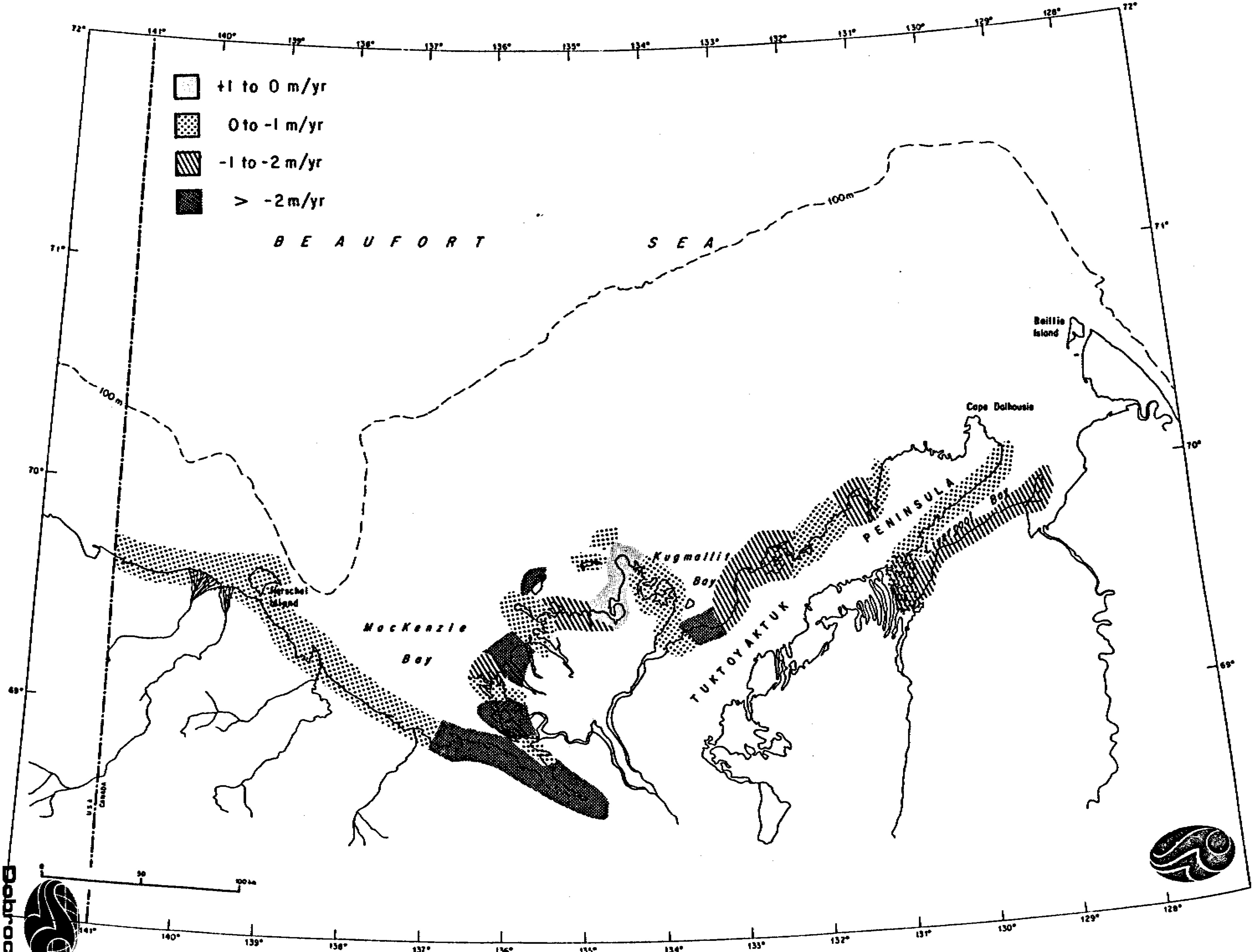

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Figure 5.20 Regional variations in coastal retreat rates as summarized from 25 km segment averages.

rates because the cliffs are so high. Implications of the rapid coastal retreat are discussed in Section 6.0.

5.2.2 Coastal Mass-Wasting Features

Changes in coastal mass-wasting morphologies, particularly retrogressive thaw failures, were documented at ten selected sites over the twenty-year photo interval (1950 to 1970). Qualitative comparisons were also made using the 1984 videotapes. Examination sites are indicated in Figure 5.21 and data are summarized in Table 5.4.

In 9 of the 14 (64%) active retrogressive failures examined, the headwall scarp moved landward at an average rate of 1.7 m/yr (maximum measured rate -4.6 m/yr). Four of the 14 failures (29%) showed no change in headwall position but showed reactivation surfaces lower in the failure. One retrogressive failure did not change over the 20 year photo interval.

Ten of the 14 failures showed significant toe retreat (average toe retreat -1.5 m/yr) whereas three of the failures showed significant accretion (average toe accretion 4.0 m/yr). Implications of these measurements are discussed in Section 6.0.

5.3 COASTAL PROCESSES

The purpose of this section of the report is to summarize relevant points from a concurrent numerical model study of theoretical sediment transport processes in the southern Beaufort Sea (KPCL, 1985b). Neither the final nor draft report were available at time of writing and results are summarized from an interim report (KPCL, 1985b).

The numerical analysis by KPCL (1985b) involved the hindcasting of ten years of wave data for two offshore (deepwater) stations, one in the eastern Beaufort Sea and one in the western Beaufort Sea. Waves were refracted to shore to produce "nearshore" wave climates for seven coastal

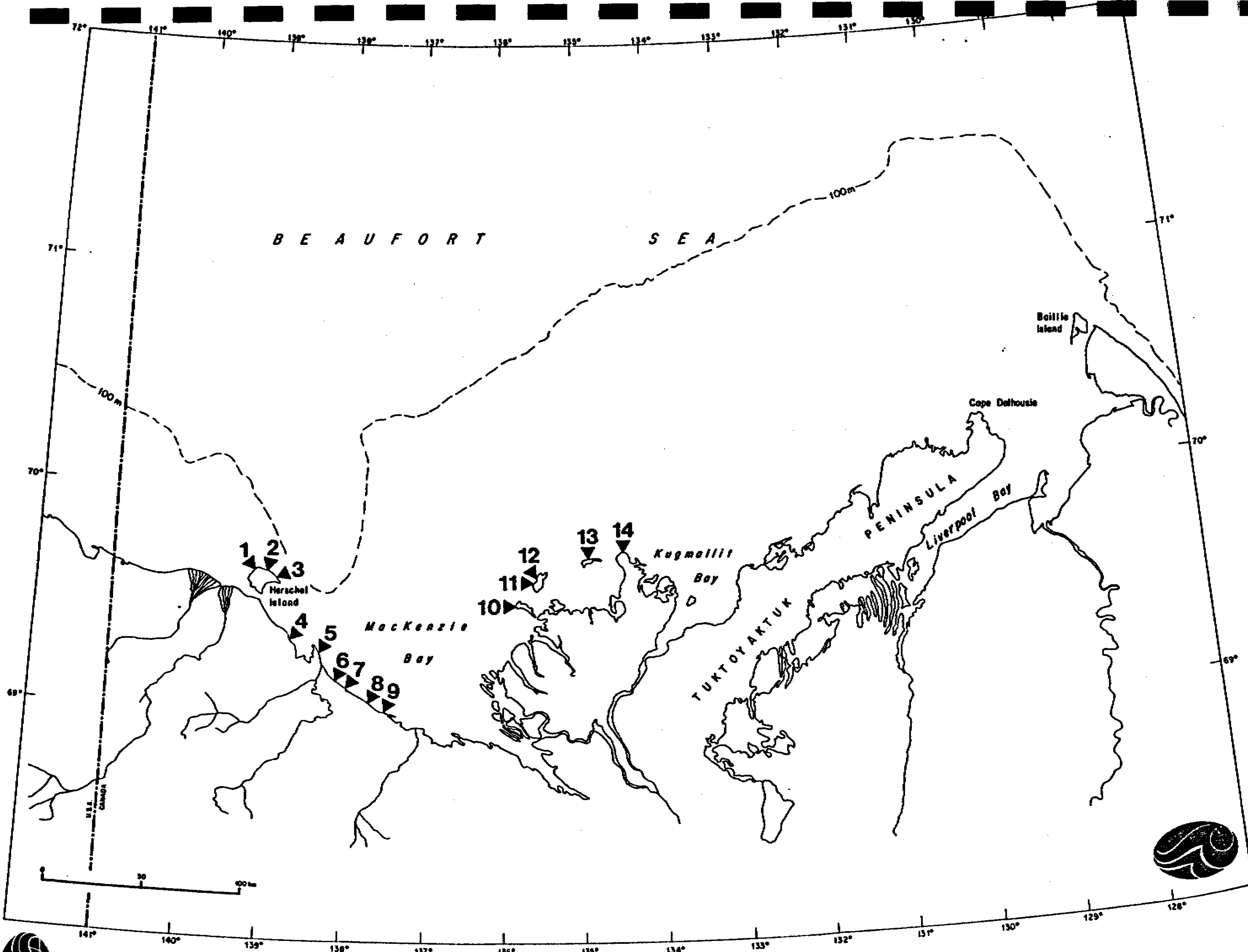

Figure 5.21 Location of coastal mass-wasting sites examined (refer to Table 5.4). See coastal resource maps (Appendix 1) for specific measurement location.

Table 5.4 Rates of Change of Retrogressive Thaw Failures

Location Number	Shorezone (Map-Unit)	Years of Change	Notes	Rate of Headwall Change (m/yr)	Rate of Toe Position Change (m/yr)
1	(9-61)	18	reactivated	N/A	-0.2
2	(10-59)	18	reactivated	N/A	+1.3
3	(11-58)	18	reactivated	N/A	+7.4
4	(14-42)	18	reactivated	N/A	+3.2
5	(15-28)	18	active headwall retreat and toe erosion	-0.2	-3.0
6	(16-25)	18	active headwall retreat and toe erosion	-2.9	-0.9
7	(17-24)	18	active headwall retreat and toe erosion	-1.7	-1.2
8	(17-21)	18	active headwall retreat and toe erosion	-2.4	-0.8
9	(18-17)	18	active headwall retreat and toe accretion	-4.6	+0.3
10	(47-61)	23	active headwall retreat and toe erosion	-1.0	-2.5

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Table 5.4 (continued)

Location Number	Shorezone (Map-Unit)	Years of Change	Notes	Rate of Headwall Change (m/yr)	Rate of Toe Position Change (m/yr)
11	(48-3)	24	no change	0	-0.8
12	(48-6)	24	active headwall retreat and toe erosion	-1.7	-3.2
13	(59-197)	24	active headwall retreat and toe erosion	-0.1	-1.7
14	(59-193)	24	active headwall retreat and toe erosion	-0.3	-0.5

locations. The nearshore wave climate was subsequently used to estimate sediment transport rates, based on numerical models of transport rates as a function of coastal slopes, nearshore sediment size, and wave charactertistics. A comprehensive discussion is provided in KPCL, 1985a.

5.3.1 Longshore Transport

Sediment transport rates, based on model results (KPCL, 1985a), for five sites along the Beaufort Sea coast are listed in Table 5.5 (sites illustrated in Figure 5.22).

In general, computed transport rates appear extremely high in comparison to previous observations (e.g. Wiseman et al, 1973; Nummedal, 1979), however, fetches on the Alaskan coast, where observations were made, are less than the Canadian Beaufort Sea coast. Comparison of results at Stokes Point from similar, although independently derived, models (W.F. Baird and Associates, 1983) suggest maximum net transport rates in the order of 100,000 to 500,000 m^3/yr to the east and the west (i.e. a divergence point exists at Stokes Point). A similar analysis for Atkinson Point indicates net transport rates in the range of 26,000 to 37,000 m^3/yr (Readshaw, 1982). For the Stokes Point analysis, the KPCL approach computes nearly order of magnitude lower rates with significantly different transport patterns than that of W.F. Baird and Associates. In the case of Atkinson Point, the KPCL analysis produces rates nearly a factor of three higher than the Baird analysis.

In another independently computed sediment transport estimate, Forbes (1981) computed sediment transport rates of approximately 22,000 m^3/yr for Kay Point spit (as compared to 40,000 to 50,000 m^3/yr in the KPCL approach; Table 5.5).

The differences are discouraging in that approaches represent tested state-of-the-art analyses, yet produce widely divergent results. Analyses appear to be extremely sensitive to hindcasting effects, refraction effects, nearshore slope assumptions and bottom roughness factors.

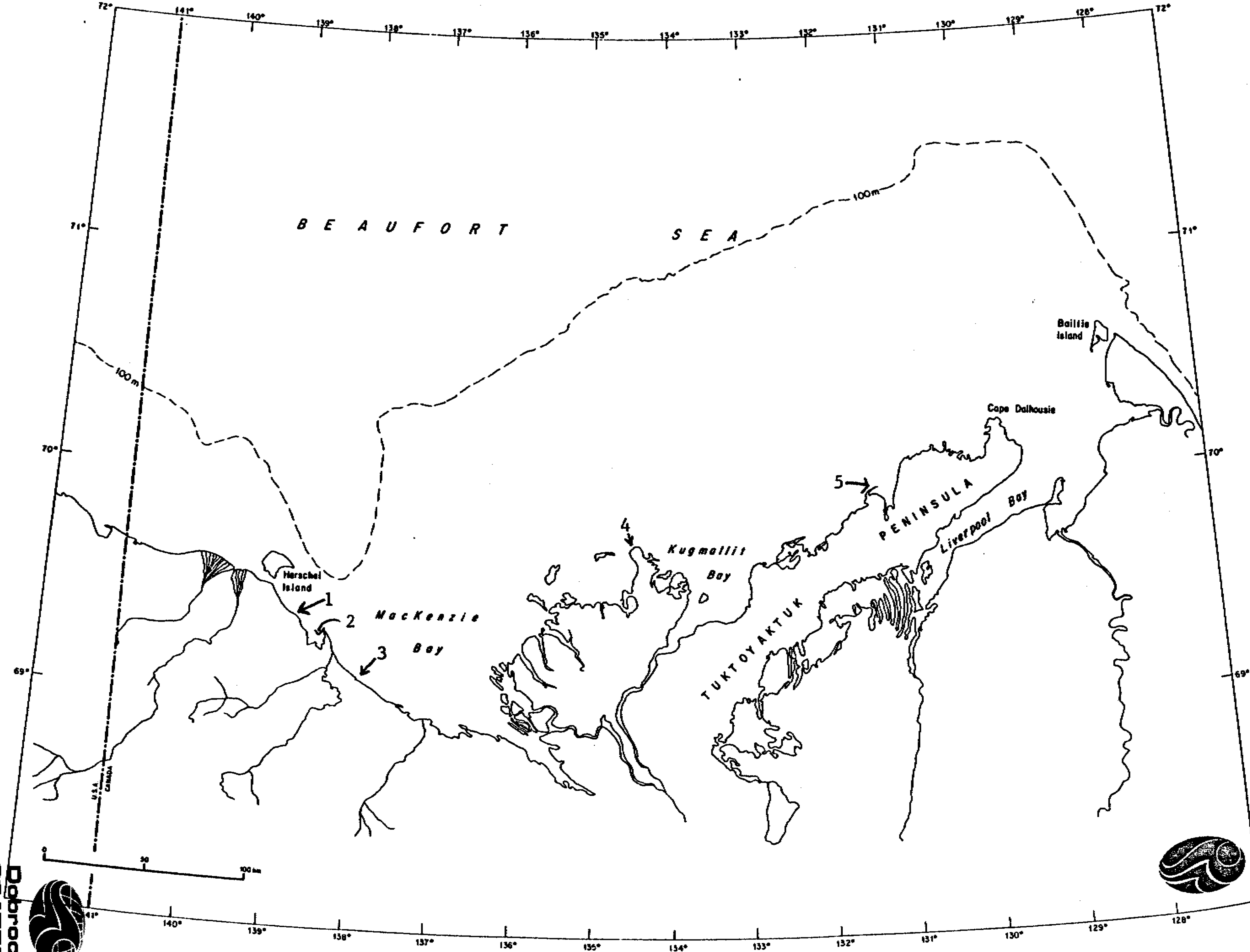

Figure 5.22 Sites where wave hindcast models were used to predict sediment transport (refer to Table 5.5).

Table 5.5 Computed Longshore Sediment Transport Rates for Beaufort Sea Coastal Sites (from KPCL, 1985b)

	Site	Gross Transport Rate (M^3/yr)	Net Transport Rate (M^3/yr)	Net Direction
1.	Stokes Point	32,000	20,000- 32,000	to E
2.	Kay Point Spit	43,000- 50,000	43,000- 50,000	to SW
3.	King Point	27,000- 32,000	9,000	to E
			3,000	to W
4.	North Head	51,000-109,000	50,000-108,000	to S
5.	Atkinson Point	127,000-139,000	92,000-121,000	to NE

An independently derived estimate of transport at King Point provides a qualitative verification of transport rates. Gillie (1985) estimated a total or gross sediment transport rate of 20,000 to 40,000 m^3/yr at King Point based on historical accumulation rates in the King Point spit; approximately 75% of this material is assumed to be derived from the northwest with an additional 25% derived from the southeast. These estimates provide qualitative support for the computed rates (Table 5.5). A more comprehensive sediment transport study is proposed for King Point during the summer of 1985 to verify modelling approaches.

5.3.2 Nearshore Sediment Transport

Little is known about the on-offshore transport of material along the Canadian Beaufort Sea coast, although numerical model results (KPCL, 1985b) provide insight into the width of the transport zone. The analyses suggest that the major portion of longshore sediment transport take place inside the 5.0 m isobath. While this depth does not represent the limit of sediment transport it does provide an index of the zone of transport related to waves alone.

6.0 DISCUSSION OF RESULTS

6.1 REGIONAL COASTAL MORPHOLOGY

The coastal mapping program portion of the project revealed two significant trends with respect to the regional coastal morphology of the Beaufort Sea. These are:

(1) the Beaufort Sea coastal zone is dominated by erosional coastal landforms (60%); an additional 19% of the coast is comprised of delta complexes, which are classically considered accretional landforms, but in the Beaufort Sea are typically undergoing significant erosion.

(2) terrestrial ice, including pore ice and massive ice, is important in influencing morphology and coastal stability along much of the coast.

These conditions are discussed in more detail in the following sections.

The wide-spread distribution and predominance of erosional landforms indicates that more material is being eroded from the coast than is deposited along it with the result that erosional landforms predominate. Of the 20% of accretional landforms that occur regionally, a large proportion occur along the western Beaufort Sea coast, emphasizing the imbalance of erosional landforms, on most of the eastern Beaufort Sea coast.

The predominance of erosional landforms in the Beaufort Sea and the presence of terrestrial ice in coastal sediments are related. Terrestrial ice is dramatically obvious along ice rich cliffs (19% of the coast) and probably very significant along low tundra cliffs, inundated tundra and delta complexes (an additional 41%). The net effect of the high ice contents in the coastal sediments is that a significant component of the tundra surface (up to 70% by volume for low cliffs; Sellman et al, 1975) is comprised of ice. This erosion of a cubic metre of "material" from the coast may produce only a small quantity of <u>sediment</u> that is then available for redistribution into accretional landforms.

It is probably more appropriate to consider the erosional coastal types, which comprise 80% of the total coast, as melting away rather than as eroding away. The presence of terrestrial ice in Beaufort Sea coastal sediments therefore significantly contributes to the regional predominance of erosional landforms.

Recent sea level rise may be an additional factor contributing to the dominance of erosional landforms and is discussed within Section 6.4.

The long linear barrier islands of the western Yukon coast are anomalous in comparison with the remainder of the Beaufort Sea coast. They are accretional landforms and are known to be relatively stable in position. Over the 20 year period between air photos, they showed few changes such as the formation of new inlets or washovers, which suggests they exist in a dynamic equilibrium.

The absence of an obvious sediment supply to these barriers is also of interest. Many of the barriers have rivers draining into the lagoons landward of the barrier but there does not appear to be a mechanism to transport coarse material through the lagoon to the barrier. There is the additional question of why the lagoons have not filled with sediment over the past 5,000 years when sea level reached near present position (Forbes, 1980).

A possible source for the gravelly sand material found in the barrier islands is offshore. The material may be moved onshore by wave action and/or ice push. Reimnitz (pers. comm., 1985) has suggested that the latter process is important in Alaskan barrier island formation and it is assumed to be the dominant mechanism for moving material onshore in the western Beaufort Sea, given the comparatively low wave exposure along this section of coast. The process is discussed more completely in Section 6.4.

6.2 COASTAL STABILITY

The coastal landforms indicate a significant proportion of the coast is eroding. The coastal stability measurements indicate that not only is the coast undergoing regional retreat but that the retreat rates are extremely high. Mean rates of retreat for large coastal segments are for the most part in excess of 1 m/yr and most of the active Mackenzie Delta appears to be retreating at greater than 2 m/yr.

The observation that the active delta areas are retreating very rapidly is surprising because active deltas normally prograde rather than retreat. A large amount of sediment is supplied by the Mackenzie River to the delta, and it is thought that most of this is deposited in shallow water near the delta front (Harper and Penland, 1982). Over the long-term one would expect that this process would lead to the progradation of the delta front.

Two other observations about the coastal stability are of note: (1) the North Head area of Richards Island is one of the most stable coastal areas and (2) the coastal areas of Liverpool Bay have comparatively high rates of retreat considering the low wave exposure. The comparative stability of the North Head area appears to be due to the deposition of fine material advected to the area by Mackenzie River plumes (East Channel and Main Channel plumes). Material is deposited in the form of wide mudflats.

The comparatively high regional retreat rates in Liverpool Bay are surprising in that wave exposure is low and a large proportion of the coast consists of "ice-poor cliffs". The high rate of retreat suggests that many of the cliffs that displayed an "ice-poor" morphology may in fact be "ice-rich" and therefore subject to thermal erosion; field reconnaissance is required to resolve this question.

6.3 COASTAL SEDIMENT TRANSPORT

Results from the numerical modelling studies (W.F. Baird and Associates, 1983; KPCL, 1985b) are of questionable use. The value of 20,000 to 40,000 m^3/yr gross longshore transport, derived from air photo analysis (Gillie, 1985), provides an estimate of transport rates along the Yukon coast. This estimate nearly agrees with numerical model results (KPCL, 1985b); however, comparable model results for other areas are widely divergent (e.g. see Section 5.3.1).

The model results are useful for indicating where sediment transport is likely to occur. The results essentially indicate that most longshore transport due to breaking waves occurs in water depths less than 4 to 5 m. Other computations show that seaward of the 5 m contour, coarse sand material would be suspended less than 20% of the time (Harper and Penland, 1982). As such, most coarse sediment transport (coarser sand and gravel) is likely to be confined to longshore transport events near the coast.

In summary, the following concepts appear valid:

(1) short-term, high energy storm events are responsible for most coastal sediment transport in the Beaufort Sea.

(2) coarse-grain transport is restricted to a comparatively narrow band along the coast (<5 m).

(3) the general absence of offshore bars and presence of many small barrier spits suggests that longshore transport is more important than on-offshore transport with respect to coarse-grain transport.

6.4 CONCEPTUAL MODELS

The previous discussions provide the basis for formulation of models of coastal processes in the Beaufort Sea. The following observations must be accomodated by the models:

(1) the Beaufort Sea coast is undergoing wide-spread regional retreat.

(2) even active deltas, which normally undergo progradation, are retreating rapidly.

(3) coarse-grain sediment transport is confined to a narrow band near the coast and is dominated by alongshore transport rather than on-offshore transport.

(4) barrier islands on the western Yukon coast are stable with no apparent sediment source.

As mentioned previously (Section 6.1), the presence of significant quantities of terrestrial ice in coastal sediments contributes to the net sediment deficiency (i.e. the coast is melting, not eroding).

There is also circumstantial evidence that a relative sea level rise (or regional subsidence) is occurring in the Beaufort Sea. Circumstantial evidence includes: tide gauge data from Tuktoyaktuk (Figure 3.6), the rapid retreat of active delta areas of the Mackenzie River and the absence of significant infilling of lagoon systems along the coast, particularly those of the western Yukon coast. The observations all point to a relative rise in sea level along the coast although this theory remains speculative at present.

During a normal transgressive sequence (Figure 6.1a), erosion of material in the backshore results in a lessening of offshore gradients that in turn lowers wave energy at the coast. The process results in a disequilibrium initially (i.e. the cliff formation) that eventually adjust to an equilibrium where a lower offshore gradient causes a reduction in wave energy at the coast; the reduced wave exposure results in a relatively stable coastal position (i.e. sediment supply balances losses and sediment transport is minimal).

On the Beaufort Sea coast, the presence of terrestrial ice in coastal sediments means that little material is supplied to the offshore and nearshore gradients are not lessened even though rapid coastal retreat is occurring (Figure 6.1b). The process is grossly simplified in Figure 6.1 but probably represents the most reasonable explanation for the wide-scale coastal retreat in the Beaufort Sea.

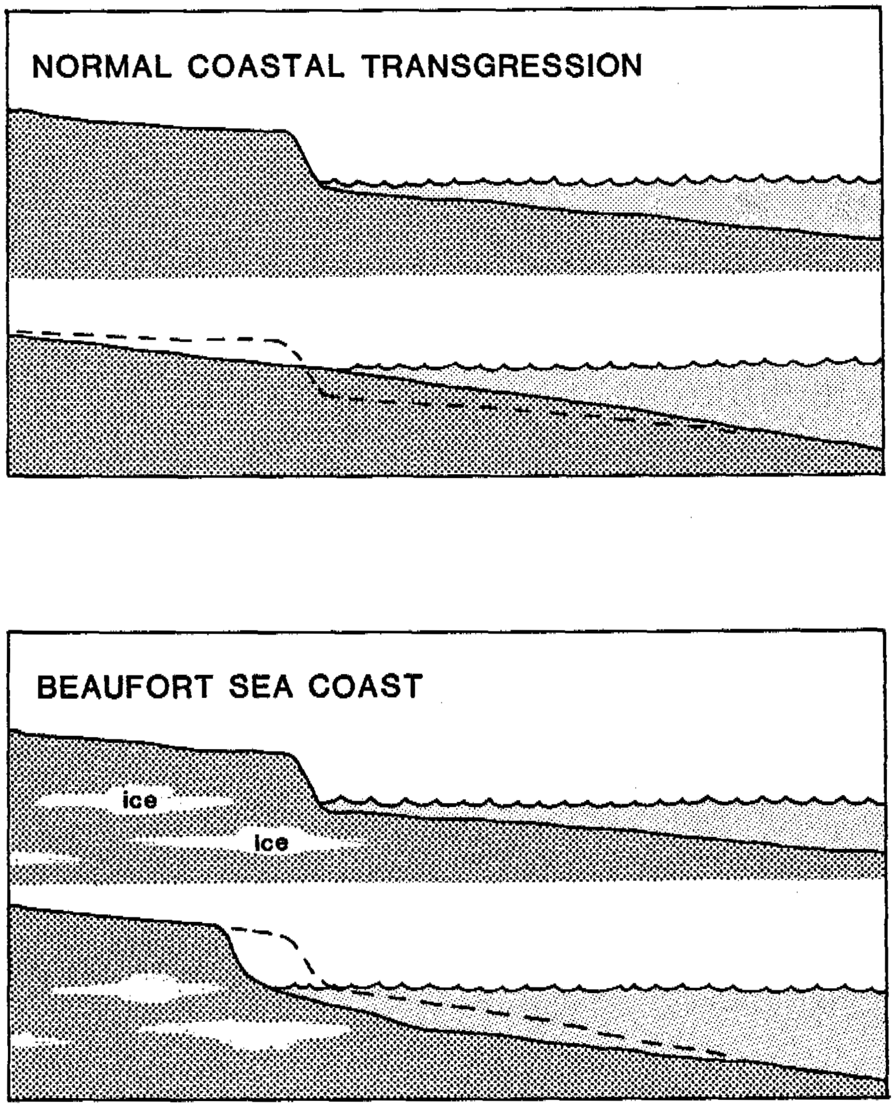

Figure 6.1 (a) In a normal transgression, erosion of backshore material leads to deposition in the nearshore and a lowered coastal gradient.
(b) In the Beaufort Sea, a relative sea level rise and terrestrial ice.

Terrestrial ice in coastal sediments and a possible relative sea level rise are concluded to be the critical factors causing the regional coastal retreat. A specific model is presented for localized processes at erosional coastal sites (Figure 6.2). The coast is eroding due to high ice content and the possible sea level rise. Fine material is lost offshore and does not contribute to reducing the nearshore gradient. Additional thaw subsidence at depth may also contribute to the maintenance of a high coastal gradient. Coarse material is transported primarily alongshore and accumulates in barrier spits or baymouth bars. As the coastline retreats a thin veneer of coarse sediment remains on the seabed as a sand-gravel lag.

A second model is required for the western Yukon coast, where extensive barriers exist (Figure 6.3). Braided streams supply sediment to lagoon systems, but that is not the source of material for the barriers. The wave action is not considered of significant magnitude to transport offshore sediments onshore. Instead ice push against the shore is assumed to result in a net onshore sediment transport. There is evidence for such a process occurring in other areas of the arctic (Barnes and Ross, 1979b; McLaren, 1982).

In this model, it is also assumed that a relative rise in sea level is occurring and the barrier islands represent a transgressive sand envelope migrating over the submergent tundra surface. The sea level rise closely approximates or exceeds sedimentation rates in the lagoons so that the lagoons are not infilled by river runoff.

These two models provide end members of a continuum of processes occurring on the Beaufort Sea coast, and, although they are not adequate to explain all details for specific coastal segments, they do provide a basis for characterizing coastal processes regionally. The models are also important in identifying areas requiring additional research. These include questions about (a) relative sea level rise in the Beaufort Sea, and (b) the significance of ice in sediment transport.

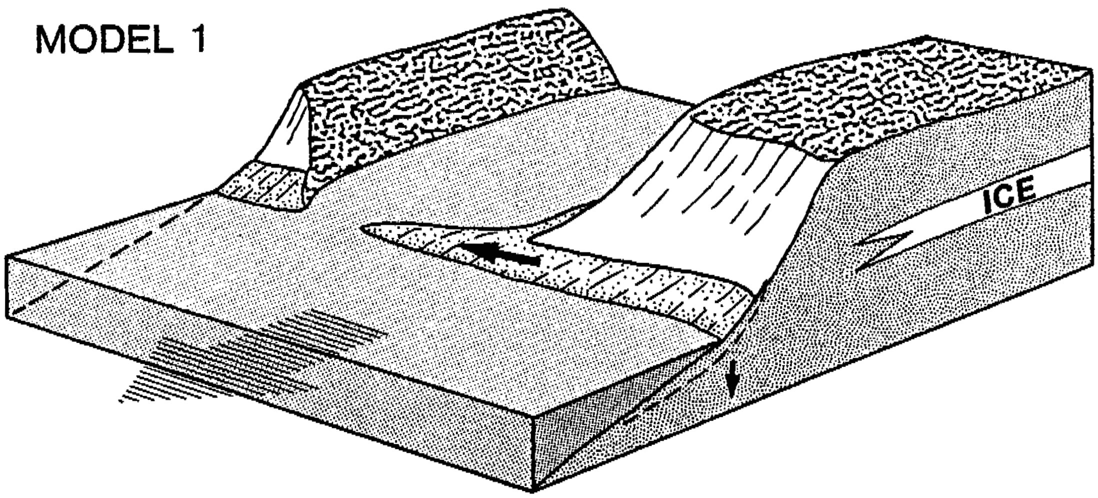

Figure 6.2 Conceptual model for coastal processes along most sections the Beaufort Sea coast. Melting of ice in the coastal sediments contributes to the steepening of the nearshore gradient (indicated by downward arrow), coarse sand and gravel is transported primarily alongshore and is deposited in barrier spits or beaches and fine material is transported offshore in suspension. The net result is a rapidly retreating shore with ephemeral accretional sediment deposits (beaches and barrier spits).

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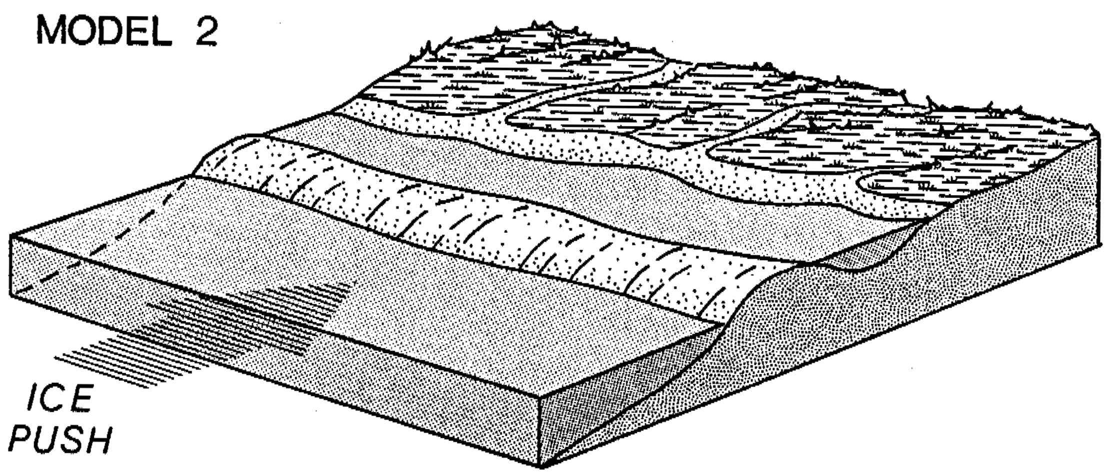

Figure 6.3 Conceptual model for coastal processes along the western Yukon coast. The main component of sand and gravel sediment in the barrier islands is supplied by offshore ice push. Lagoons are prevented from infilling by a possible relative sea level rise.

6.5 REGIONAL DESCRIPTION OF COASTAL ENVIRONMENTS AND APPLICATION OF MODELS

6.5.1 Locality 1, Baillie Islands

This section of coastline is dominated by erosional landforms, primarily ice-rich cliffs (43%) and ice-poor cliffs (20%). Barrier spits (32%) are supplied with material by longshore transport. There are no coastal stability measurements for this section of coast due to the lack of 1970's aerial photographs; it is inferred from the morphology, however, that the coastline is retreating at rates in the range of -1 to -2 m/yr. The high proportion of erosional coastal landforms, particularly ice-rich cliffs, indicates that Model 1 (Fig. 6.2) most appropriately describes the dominant coastal processes of the area.

6.5.2 Locality 2, Liverpool Bay (Wood Bay)

As in the area immediately to the north, this locality is also dominated by erosional landforms with 43% comprised of ice-rich tundra cliffs and 11% comprised of ice-poor tundra cliffs. Sediment transport is dominated by offshore transport of fine material and longshore transport of coarse sediments, which are deposited in the form of barrier spits (26%). Only a few coastal retreat measurements have been made in this locality and they indicate a mean coastal retreat rate slightly greater than -1 m/yr. Model 1 is appropriate to this section of coast and characterizes most of the significant coastal processes.

6.5.3 Locality 3, Southeastern Liverpool Bay

As in other portions of Liverpool Bay, this area is dominated by low relief, erosional landforms; the major component is comprised of ice-rich tundra cliffs (62%) with an additional 32% comprised as ice-poor cliffs. Accretional landforms are almost totally absent (<6%). Coastal retreat rates are in the range of -1 to -2 m/yr, with maximum documented retreat in excess of -7 m/yr. The almost complete lack of depositional landforms suggests that Model 1 is appropriate for this section of coast and also that there is very little coarse sediment in the coastal cliffs (i.e. the ice melts and the remainder of the coastal sediment is primarily fine and lost offshore).

6.5.4 Locality 4, Eskimo Lakes

No coastal mapping was conducted in this area, although the Lakes were separated out as a separate locality to accomodate future mapping efforts. The few coastal retreat measurements that were made near the entrance to the Eskimo Lake suggest typical retreat rates in the range of -1 m/yr, and it is probable that Model 1 applies to much of the Eskimo Lake shoreline.

6.5.5 Locality 5, Western Liverpool Bay

This locality on the eastern shore of the Tuktoyaktuk Peninsula is also dominated by erosional coastal landforms (85%) with approximately equivalent proportions of ice-rich and ice-poor tundra cliffs (40% and 45% respectively); inundated tundra coasts comprise an additional 10%. Barrier spits are short in length and rare (<4%). Over 30 coastal retreat measurements indicate average coastal retreat in the -1 m/yr range with maximum measured rates in excess of -4 m/yr. A large proportion of the coast is fronted by intertidal to subtidal flats with multiple bar systems. The morphology suggests that Model 1 applies to this coast but that the ice contents are lower than in other areas, preventing offshore thaw subsidence. The wide (0.5 to 1-km wide) wave-cut platforms are characteristic of low-wave-exposure coastlines.

6.5.6 Locality 6, Northern Tuktoyaktuk Peninsula

This shoreline is characterized by extensive embayments and very low relief. Over 85% of the shoreline is characterized by erosional coastal landforms. Low tundra cliffs, ice-poor cliffs and inundated tundra (51%, 22% and 14% respectively) are the dominant erosional shoreline types with barrier spits comprising an additional 13%. Unfortunately no retreat measurements were made in this locality due to the lack of sequential air photos, but the morphology suggests that this coast is undergoing very rapid coastal erosion (>2 m/yr?). Model 1 is appropriate to this locality in that shores are primarily erosional and barrier spits are the only accretional landform and are supplied with material from longshore transport. The highly crenulated shoreline in the embayments suggest that retreat is dominated by thermo-erosion and transport of fines, probably organics, offshore. Wave-cut intertidal flats with multiple bar systems are common within many of the embayments.

6.5.7 Locality 7, Central Tuktoyaktuk Peninsula

This section of the coast represents one of the most complex in terms of variety of landforms and is also the most highly developed, with major offshore support bases at McKinley Bay and Tuktoyaktuk. The proportion of accretional and erosional coastal landforms is near equal (51% to 49% respectively). Barrier spits are the major accretional coastal type and low-tundra cliffs (24%) and inundated tundra (20%) are the most common erosional types. The barrier islands are mostly sandy and usually the sediment source is readily apparent in the form updrift, eroding cliffs. Intertidal and nearshore flats with bars are common throughout the area (68% of the shoreline).

Coastal stability measurements indicate an average retreat rate for the area of approximately -1 m/yr, although there are documented accretion rates of up to 6 m/yr and erosion rates of about -6 m/yr.

This locality has a higher proportion of accretional landforms (barrier spits) than do most other localities, but Model 1 is still considered most appropriate; all of the accretional features are derived from longshore transport of sand and gravel eroded from the coastal cliffs - there is no apparent offshore contribution of sediment. The major empayments along the coast appear to be locations of topographic lows in the landscape and as such are likely to have higher cliff ice contents and to erode more quickly (Harper, 1978).

6.5.8 Locality 8, Kugmallit Bay

This section of coast includes the western shore of Kugmallit Bay and, inspite of its location near one of the major distributaries of the Mackenzie River, is dominated by erosional landforms (73%); low-tundra cliffs (32%), ice-poor cliffs (21%) and inundated tundra (16%) are the major erosional coastal types. Barrier islands and spits are the major accretional landform (23%) with less than 5% of the coast classified as flat/wetland/channel complexes. The coastline is generally retreating at -1 to -2 m/yr, however, there is one short section of coast 20 km to the southwest of Tuktoyaktuk (Map 70) retreating at -11 m/yr (n=11). Model 1 is applicable to all of this coast.

6.5.9 Locality 9, Richards Island

Richards Island is a complex section of shoreline located between two of the major distributary channels of the Mackenzie River. As with most other sections of the Beaufort Sea coast, the Richards Island area is dominated by erosional landforms (75%) with ice poor cliffs (15%) and inundated tundra (10%) comprising the remainder. Barrier spits are the principal accretional shore-zone type (21%) and are common along the outer coastline of Richards Island. Coastal stability varies greatly within the locality with some accretional to stable sections of coastline (to the west of North Point) and some rapidly eroding sections (e.g. the outer islands; see Fig. 5.20).

For the most part, Model 1 holds for this coast with the minor difference in the stable areas on the west side of Richards Island; in this area, fine sediments advected from the river plume are deposited in the form of wide intertidal mudflats, apparently contributing to the overall coastal stability even though erosional landforms are present in the backshore.

6.5.10 Locality 10, Central Mackenzie Delta

This section of the Beaufort Sea coast is unique in that it includes the major active channels of the Mackenzie River. As a result, the section is dominated by wetland/flat/channel complexes (69%) with a minor component of barrier spits (10%), primarily concentrated in offshore islands. The remaining 21% of the coast is dominated by ice-poor cliffs (7%), ice-rich cliffs (12%) and minor components of inundated tundra (2%). The surprising feature of this locality is the relatively high coastal retreat rates, typically in the range of -2 m/yr; this is surprising because active delta areas are usually expected to be accretional. As such, Model 1 is still essentially appropriate although there is little coarse sediment to be distributed alongshore, except in the outer islands, and cliffs are not present. However, as mentioned previously, the flat/wetland/channel complexes of the Beaufort Sea are an erosional feature and high ice contents and fine material, mostly organics, are likely to contribute to the rapid retreat. The ultimate sink of the material transported by the river is uncertain, but at present it is clear that the sediment is bypassing the coastal zone.

6.5.11 Locality 11, Shallow Bay (west shore)

This section of coast is the most uniform of the study area in terms of coastal landform distribution. Flat/channel/wetland complexes are the only coastal type that occurs. The section is unique because of its exceptionally high coastal retreat rates; the average retreat rate for the entire locality is -6.1 m/yr with maximum measured retreat rates of -29 m/yr. The exceptionally high retreat is attributed to very low relief of the coast (therefore little sediment volume is eroded despite rapid retreat), high ice content of the sediments and the fine material of the coastal sediments. Model 1 applies to the coast with the modification that there is no coarse material to be redistributed into barrier spits or even beaches.

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6.5.12 Locality 12, Yukon Coast

This is a long linear coast with substantially higher relief (in excess of 50 m in locations) than areas to the east. Erosional landforms are slightly more common than accretional landforms (61% vs. 39% respectively). The two most common erosional coastal types are ice-rich cliffs (28%) and ice-poor cliffs (23%) with barrier islands and spits comprising most of the accretional landforms (29%). Gravelly sand barrier islands make up a unique 50-km long segment of coast immediately to the west of Herschel Island.

Coastal retreat is uniform throughout the locality averaging about -0.5 m/yr (maximum -5.3 m/yr). The compative stability of this coastal segment is due mostly to the high coastal relief (i.e. small amounts of erosion produce large amounts of sediment).

Model 1 applies to most of the Yukon coast, but the stable barrier island segment to the west of Herschel Island has no obvious longshore sediment source. As such, an offshore sediment source is proposed and onshore ice movement of material speculated as the driving process (Model 2). This is the only section of the Beaufort Sea coast that does not fit the standard, transgressive model (Model 1).

6.6 RECOMMENDATIONS FOR FUTURE INVESTIGATIONS

The previous discussions have documented the wide-spread coastal recession of the Canadian Beaufort Sea and have indicated that (a) high coastal ice contents and (b) a speculated, on-going sea level rise are the cause of the high recession rates. However, there is very little quantitative information on either the coastal ice contents or sea level change. Extensive massive ice is readily apparent in the sediments, but this volume has not been quantified as well as in other areas of the arctic (e.g. Harper, 1978, Sellman et al, 1975) and additional regional reconnaisance work remains to be done. Such information on ice content would be extremely useful in quantifying the amount of coastal change that could be attributed solely to "the excess ice effect" (Harper, 1978).

The speculated recent rise in sea level will be much more difficult to quantify, although the regional implications are highly significant, particularly with respect to proposed long-term development within the Beaufort Sea. Limited tide records suggest a relative sea level rise of up to 0.1 m/yr. Long-term, well-documented tide records are essential for resolving this change, but unfortunately the tide record from Tuktoyaktuk is fraught with data gaps and uncertain datum references. Should development plans proceed for hydrocarbon extraction, it is recommended that a reliable tide gauge system be established with a secure datum; this will be important not only in establishing a sea level for use in geological studies but also in assessing engineering problems that may arise from development (e.g. subsidence due to hydrocarbon extraction).

6.7 IMPLICATIONS TO COASTAL DEVELOPMENT

The processes identified as part of this study are extremely dynamic (e.g. coastal retreat rates in excess of 25 m/yr) but do not appear to present insurmountable problems. Potential coastal hazards include: storm surge inundation, coastal erosion, coastal thaw subsidence and in particular instances, coastal sediment transport. Most of these hazards can be easily accommodated in the engineering design with minimum set-back distances, the use of gravel pads to elevate structures, proper permafrost design, etc., providing that they are recognized in the planning phase.

Problems associated with sediment transport are more subtle, and include interruption of longshore transport by shore normal structures (such as causeways), scour around shore structures, trench infilling, etc. Potential impacts are difficult to evaluate because (a) numerical models of sediment transport have significant uncertainties associated with them and (b) field studies of transport are typically expensive and provide only a near instantaneous picture of transport phenomena. As such, design of structures for the beach and nearshore zones is presently subject to considerable uncertainty.

It is anticipated that background data provided by this study will contribute significantly to the rationale evaluation and management of coastal resources in the Beaufort Sea as development continues.

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Coastal Stability Measurement Data

APPENDIX 1

The coastal stability measurement data are summarized on a series of data sheets. The measurements on the data sheets are keyed to the coastal resource maps in Appendix 2 and provide additional detail on the actual measurement interval and variation of rates at a particular site. The following specific information is reported:

- map and point identification numbers,
- year of initial measurement,
- year of subsequent measurement,
- averaged retreat rate of the cliff top over the photo interval,
- averaged retreat rate of the cliff base over the photo interval,
- averaged retreat rate of the waterline position over the photo interval,
- averaged rate of change (combination of above; see Section 4.2).

Most of the data was developed as part of measurements made during this study, but the data sheets also include information from McDonald and Lewis (1973; part of Maps 7, 8, 11, 13, and all of Maps 9, 10, 14 - 17) and from unpublished measurements provided by C.P. Lewis (pers. comm., 1985; part of Maps 71, 82, and all of Maps 72, 80, 81).

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
1	1	51	76	0.000	0.000	-0.440	-0.440
	2	51	76	-0.360	-0.440	-0.520	-0.400
	3	51	76	-1.680	-2.000	-1.800	-1.840
	4	51	76	-2.720	-2.560	-2.040	-2.640
	5	51	76	-1.920	-2.280	0.000	-2.100
	6	51	76	-1.000	0.000	0.000	-1.000
	7	51	76	-1.040	0.000	0.000	-1.040
	8	51	76	-1.360	0.000	0.000	-1.360
	9	51	76	-0.440	0.000	0.000	-0.440
	10	51	76	-0.640	0.000	0.000	-0.640
2	1	51	76	-1.240	-1.280	-1.360	-1.260
	2	51	76	-0.920	-0.960	-1.040	-0.940
	3	51	76	-2.720	-2.560	-0.680	-2.640
	4	51	76	-0.640	-0.920	-0.720	-0.780
	5	51	76	-0.880	-0.960	-0.800	-0.920
	6	51	76	-1.000	-0.800	-0.600	-0.900
	7	51	76	-0.080	-0.120	-0.480	-0.100
	8	51	76	-0.040	0.000	0.000	-0.040
	9	51	76	-0.840	0.000	0.000	-0.840
	10	51	76	0.000	-0.480	-1.000	-0.480
	11	51	76	0.000	-0.640	-0.800	-0.640
3	1	51	76	-0.800	-0.840	-1.200	-0.820
	2	51	76	-1.240	-1.280	-1.360	-1.260
	3	51	76	-1.640	-1.680	-3.120	-1.660
	4	51	76	-2.000	-2.040	-2.360	-2.020
	5	51	76	-2.600	-2.640	-2.720	-2.620
	6	51	76	-0.120	-0.200	-0.520	-0.160
	7	51	76	-1.280	-1.360	-2.000	-1.320
	8	51	76	0.000	-0.080	-1.680	-0.080
	9	51	76	-1.840	-1.520	-1.880	-1.680
	10	51	76	-0.120	0.200	-0.400	0.040
	11	51	76	-1.080	-0.880	-0.680	-0.980
	12	51	76	-1.160	-1.200	-1.040	-1.180
4	1	51	76	0.000	-1.200	-1.480	-1.200
	2	51	76	0.000	-1.200	-1.720	-1.200
	3	51	76	0.000	-1.560	-3.160	-1.560
5	1	54	76	0.000	-1.773	-2.409	-1.773
	2	54	76	0.000	0.000	0.727	0.727
	3	54	76	0.000	-1.682	-0.955	-1.682
	4	54	76	0.000	-1.591	-1.045	-1.591
	5	54	76	0.000	-2.182	-1.909	-2.182
	6	54	76	0.000	-1.682	0.000	-1.682
	7	54	76	-1.318	-1.045	-1.545	-1.182
	8	51	76	0.000	-2.680	-2.120	-2.680
6	1	51	72	-0.476	-1.048	-0.905	-0.762
	2	51	72	-0.571	-0.381	-0.952	-0.476
	3	51	72	0.048	-0.048	-0.048	0.000
	4	51	72	1.048	0.190	0.048	0.619
	5	51	72	-7.571	0.048	1.476	-3.762
	6	51	72	0.000	-0.810	-1.190	-0.405
	7	51	72	0.000	-0.619	-0.429	-0.619
	8	51	72	0.000	1.143	0.429	1.143
	9	51	72	2.667	-2.619	-1.857	0.024
	10	51	72	3.571	1.238	3.000	2.405
7	1	51	72	-0.429	-0.143	-1.190	-0.286
	2	51	72	-0.238	-2.714	-1.810	-1.476
8	1	52	72	-0.550	0.000	0.000	-0.550
	2	52	72	-0.200	0.100	0.050	-0.050
	3	52	72	-0.050	-0.050	-0.100	-0.050
	4	52	72	-1.000	-1.050	-1.050	-1.025
	5	52	72	-0.250	0.000	-0.350	-0.250
	6	52	72	11.300	0.000	11.200	11.300
	7	52	72	-0.250	-0.300	-0.650	-0.275

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
11	1	54	72	-0.222	-0.222	-0.667	-0.222
	2	54	72	0.000	0.056	2.056	0.056
	3	54	72	0.000	0.000	2.833	2.833
	4	54	72	-1.278	-1.278	-0.611	-1.278
	5	54	72	0.000	0.000	-3.444	-3.444
	6	54	72	-2.056	0.000	-2.444	-2.056
	7	54	72	-1.833	-1.833	-1.167	-1.833
	8	54	72	0.000	-1.111	-0.278	-1.111
	9	54	72	-0.333	0.000	-0.056	-0.167
	10	54	72	-0.167	0.000	0.111	-0.167
	11	54	72	0.000	0.000	-0.111	-0.111
	12	54	72	-1.778	0.000	-1.167	-1.778
	13	54	72	0.000	0.000	-0.056	0.000
	14	54	72	-0.167	0.000	0.111	-0.167
	15	52	72	-0.200	0.000	0.300	-0.200
	16	52	72	-0.150	-0.150	0.100	-0.150
	17	52	72	0.000	-0.050	0.500	-0.050
	18	52	72	0.000	-1.100	1.500	-1.100
	19	52	72	0.000	-2.800	-2.200	-2.800
	20	52	72	0.000	2.250	2.800	2.250
	21	52	72	-0.050	-0.050	0.200	-0.050
	22	52	72	-0.200	0.100	0.350	-0.050
12	1	54	72	-0.722	0.000	0.000	-0.722
	2	54	72	0.056	0.000	0.000	0.056
	3	54	72	-0.167	0.000	0.000	-0.167
	4	54	72	-1.333	0.000	0.000	-0.667
	5	54	72	-0.111	0.222	-0.278	0.056
	6	54	72	0.222	-0.167	-0.722	0.028
	7	54	72	-0.222	0.000	0.000	-0.222
	8	54	72	-0.278	0.000	0.000	-0.278
	9	54	72	-0.611	-0.278	-0.389	-0.444
	10	54	72	0.833	-0.722	-0.889	0.056
	11	54	72	0.111	0.000	1.111	0.111
	12	54	72	-0.278	-0.222	-1.111	-0.250
	13	54	72	-0.056	-0.111	-1.333	-0.083
	14	54	72	-0.222	-0.222	-0.778	-0.222
	15	54	72	-0.333	0.000	-0.889	-0.167
	16	54	72	0.111	-0.278	-0.444	-0.083
	17	54	72	-0.056	0.444	0.333	0.194
	18	54	72	0.000	0.000	-1.500	-1.500
	19	54	72	0.000	0.056	-0.222	0.056
13	1	54	72	0.000	-0.611	0.722	-0.611
	2	54	72	0.000	-0.500	1.222	-0.500
	3	54	72	0.000	0.000	-1.444	-1.444
	4	54	72	0.000	0.000	-1.278	-1.278
	5	54	72	0.444	0.722	1.333	0.583
	6	54	72	0.333	0.222	0.833	0.278
	7	54	72	0.278	0.000	0.000	0.278
	8	54	72	2.389	2.333	2.667	2.361
	9	54	72	2.333	2.278	2.611	2.306
	10	54	72	-5.611	-5.056	-5.111	-5.333
	11	54	72	0.000	0.000	0.000	0.000
	12	54	72	-0.167	0.000	0.000	-0.167
	13	54	72	-0.278	0.000	0.000	-0.278
18	1	54	72	-0.667	0.222	0.000	-0.222
	2	54	72	-0.111	-0.111	0.556	-0.111
	3	54	72	0.000	-0.333	1.611	-0.167
	4	54	72	0.000	-0.167	0.889	-0.167
	5	54	72	0.000	-0.444	0.611	-0.444
	6	54	72	-3.889	-1.333	-1.833	-2.611
	7	54	72	0.000	-0.611	0.333	-0.611
	8	54	72	-0.444	0.000	-1.889	-0.444
	9	54	72	-0.833	-0.333	1.944	-0.583

ERODION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
18	10	54	72	-3.222	-2.556	-3.833	-2.889
	11	54	72	0.111	-0.444	0.444	-0.167
	12	54	72	-0.278	0.000	-1.000	-0.278
	13	54	72	-1.111	0.000	-1.833	-1.111
	14	54	72	-0.833	0.000	0.000	-0.833
	15	54	72	-0.778	0.000	0.000	-0.778
	16	54	72	-0.833	0.000	0.000	-0.833
	17	54	72	-0.278	0.000	-0.111	-0.278
	18	54	72	-0.444	-0.167	-0.167	-0.306
	19	54	72	-0.667	0.000	1.222	-0.667
	20	54	72	-0.111	0.000	-0.500	-0.111
19	1	53	72	-0.500	-1.200	-0.100	-0.850
	2	53	72	0.000	-0.750	-0.400	-0.750
	3	53	72	-0.550	-0.800	-0.050	-0.675
	4	53	72	-0.350	0.000	1.000	-0.175
	5	53	72	0.000	0.000	-1.200	-1.200
	6	53	72	-0.600	0.150	-0.300	-0.225
	7	53	72	-0.300	-0.250	-0.500	-0.275
	8	53	72	0.150	-0.300	-0.800	-0.075
	9	53	72	0.550	-0.850	-0.350	-0.150
	10	54	72	0.611	-0.944	-0.389	-0.167
21	1	51	74	0.000	0.000	-1.739	-1.739
	2	53	74	0.000	0.000	-0.273	-0.273
	3	53	74	-0.182	-0.227	0.818	-0.205
	4	53	74	-0.455	0.136	1.227	-0.159
	5	53	74	-0.455	0.182	0.682	-0.136
22	1	53	74	-0.045	0.273	0.773	0.114
	2	53	74	-0.364	0.364	0.545	0.000
	3	53	74	-0.318	0.136	0.591	-0.091
	4	53	74	-3.227	-2.773	-2.273	-3.000
23	1	56	74	-16.778	0.000	-16.778	-16.778
	2	56	74	0.000	0.000	-1.722	-1.722
	3	56	74	0.000	0.000	-7.000	-7.000
24	1	54	74	0.000	0.000	-10.591	-10.591
	2	54	74	0.000	0.000	-9.545	-9.545
	3	54	74	0.000	0.000	-0.955	-0.955
	4	54	74	0.000	0.000	-8.545	-8.545
	5	54	74	0.000	0.000	-4.091	-4.091
	6	54	74	0.000	0.000	-2.182	-2.182
	7	52	74	0.000	0.000	-4.500	-4.500
	8	52	74	0.000	0.000	-3.136	-3.136
	9	52	74	0.000	0.000	-3.773	-3.773
	10	52	74	0.000	0.000	-1.636	-1.636
	11	52	74	0.000	0.000	-5.091	-5.091
	12	52	74	0.000	0.000	-7.364	-7.364
	13	52	74	0.000	0.000	-11.227	-11.227
	14	52	74	0.000	0.000	-10.955	-10.955
	15	52	74	0.000	0.000	-12.273	-12.273
	16	52	74	0.000	0.000	-13.636	-13.636
	17	52	74	0.000	0.000	-9.318	-9.318
	18	52	74	0.000	0.000	-12.227	-12.227
	19	52	74	0.000	0.000	-2.091	-2.091
	20	52	74	0.000	0.000	-3.364	-3.364
	21	52	74	0.000	0.000	-0.500	-0.500
	22	52	74	0.000	0.000	-0.273	-0.273
	23	52	74	0.000	0.000	-0.864	-0.864
	24	52	74	0.000	0.000	-18.318	-18.318
	25	52	74	0.000	0.000	-11.227	-11.227
	26	52	74	0.000	0.000	-8.227	-8.227
	27	52	74	0.000	0.000	-0.409	-0.409
	28	52	74	0.000	0.000	-0.182	-0.182
	29	52	74	0.000	0.000	-0.545	-0.545
	30	52	74	0.000	0.000	-1.455	-1.455

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
24	31	52	74	0.000	0.000	-8.227	-8.227
	32	52	74	0.000	0.000	-0.591	-0.591
	33	52	74	0.000	0.000	-1.636	-1.636
	34	52	74	0.000	0.000	-1.000	-1.000
	35	52	74	0.000	0.000	-0.091	-0.091
	36	52	74	0.000	0.000	-0.364	-0.364
	37	52	74	0.000	0.000	-5.136	-5.136
	38	52	74	0.000	0.000	-2.182	-2.182
25	1	54	74	0.000	0.000	-8.500	-8.500
	2	54	74	0.000	0.000	-4.727	-4.727
	3	54	74	0.000	0.000	-7.136	-7.136
	4	54	74	0.000	0.000	-4.818	-4.818
	5	54	74	0.000	0.000	-10.182	-10.182
	6	54	74	0.000	0.000	-9.682	-9.682
	7	54	74	0.000	0.000	-6.091	-6.091
	8	54	74	0.000	0.000	-13.727	-13.727
26	1	52	73	0.000	0.000	-0.286	-0.286
	2	52	73	0.000	0.000	-2.810	-2.810
	3	52	73	0.000	0.000	-5.667	-5.667
	4	52	74	0.000	0.000	-2.182	-2.182
	5	52	74	0.000	0.000	-5.500	-5.500
	6	52	74	0.000	0.000	-6.136	-6.136
	7	52	74	0.000	0.000	-2.727	-2.727
	8	52	74	0.000	0.000	-4.773	-4.773
	9	52	74	0.000	0.000	-5.455	-5.455
	10	54	74	0.000	0.000	-7.545	-7.545
	11	54	74	0.000	0.000	-5.364	-5.364
	12	54	74	0.000	0.000	-2.227	-2.227
	13	54	74	0.000	0.000	-8.000	-8.000
	14	54	74	0.000	0.000	-7.545	-7.545
27	1	52	73	0.000	0.000	-7.476	-7.476
	2	52	73	0.000	0.000	-12.476	-12.476
	3	52	73	0.000	0.000	-5.095	-5.095
	4	52	73	0.000	0.000	-10.190	-10.190
	5	52	73	0.000	0.000	-5.667	-5.667
	6	52	73	0.000	0.000	-5.857	-5.857
28	1	50	73	0.000	0.000	-10.087	-10.087
	2	50	73	0.000	0.000	-0.783	-0.783
	3	50	73	0.000	-2.174	-6.696	-2.174
	4	50	73	0.000	0.000	-4.783	-4.783
	5	50	73	0.000	0.000	-6.261	-6.261
	6	50	73	0.000	0.000	-4.565	-4.565
	7	50	73	0.000	0.000	-9.043	-9.043
	8	50	73	0.000	0.000	-5.565	-5.565
	9	50	73	0.000	0.000	-1.826	-1.826
	10	50	73	0.000	0.000	-0.957	-0.957
	11	50	73	0.000	0.000	-0.174	-0.174
	12	50	73	0.000	0.000	-4.000	-4.000
	13	50	73	0.000	0.000	-2.435	-2.435
	14	50	73	0.000	0.000	-1.826	-1.826
	15	50	73	0.000	0.000	-3.130	-3.130
	16	52	73	0.000	0.000	-8.619	-8.619
	17	52	73	0.000	0.000	-8.048	-8.048
29	1	50	73	0.000	0.000	-3.130	-3.130
	2	50	73	0.000	0.000	-0.087	-0.087
	3	50	73	0.000	0.000	-1.696	-1.696
	4	50	73	0.000	0.000	-0.348	-0.348
	5	50	73	0.000	0.000	-1.043	-1.043
	6	50	73	0.000	0.000	-2.783	-2.783
	7	50	73	0.000	0.000	-1.826	-1.826
	8	50	73	0.000	-2.696	-5.826	-2.696
	9	50	73	0.000	0.000	-6.435	-6.435
	10	50	73	0.000	0.000	-3.478	-3.478

Dobrocky
SEATECH

ERODSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
29	11	50	73	0.000	0.000	-4.522	-4.522
	12	50	73	0.000	0.000	-4.261	-4.261
	13	50	73	0.000	0.000	-3.391	-3.391
	14	50	73	0.000	0.000	-7.826	-7.826
30	1	50	73	0.000	0.000	-3.217	-3.217
	2	50	73	0.000	0.000	-0.348	-0.348
	3	50	73	0.000	0.000	-28.609	-28.609
	4	50	73	0.000	0.000	-0.174	-0.174
	5	50	73	0.000	0.000	0.000	0.000
	6	50	73	0.000	-0.087	-3.696	-0.087
	7	50	73	0.000	0.000	-1.435	-1.435
	8	50	73	0.000	0.000	-4.870	-4.870
	9	50	73	0.000	0.000	-1.130	-1.130
	10	50	73	0.000	0.000	-1.130	-1.130
	11	50	73	0.000	0.000	-0.957	-0.957
	12	50	73	0.000	0.000	-2.348	-2.348
	13	50	73	0.000	0.000	0.000	0.000
	14	50	73	0.000	0.000	0.087	0.087
	15	50	73	0.000	0.000	-5.043	-5.043
31	1	50	73	0.000	0.000	-1.217	-1.217
	2	50	73	0.000	0.000	-4.174	-4.174
	3	50	73	0.000	0.000	-1.130	-1.130
	4	50	73	0.000	0.000	-1.826	-1.826
	5	50	73	0.000	0.000	-1.391	-1.391
	6	50	73	0.000	0.000	-3.826	-3.826
	7	50	73	0.000	0.000	-19.130	-19.130
	8	50	73	0.000	0.000	-1.391	-1.391
	9	50	73	0.000	0.000	-2.261	-2.261
	10	50	73	0.000	0.000	-1.130	-1.130
	11	50	73	0.000	-0.087	-0.435	-0.087
	12	50	73	0.000	0.000	-0.913	-0.913
	13	50	73	0.000	0.000	-1.304	-1.304
	14	50	73	0.000	0.000	-1.043	-1.043
	15	50	73	0.000	-0.696	-4.783	-0.696
	16	50	73	0.000	-1.913	-2.783	-1.913
	17	50	73	0.000	0.000	-1.478	-1.478
	18	50	73	0.000	0.000	-3.913	-3.913
	19	50	73	0.000	0.000	-0.348	-0.348
	20	50	73	0.000	0.000	-0.174	0.000
32	1	50	73	0.000	0.000	0.870	0.870
	2	50	73	0.000	0.000	-1.913	-1.913
	3	50	73	0.000	0.000	-0.174	-0.174
	4	50	73	0.000	0.000	-0.087	-0.087
	5	50	73	0.000	0.000	-1.130	-1.130
33	1	52	73	0.000	0.000	-0.095	-0.095
	2	50	73	0.000	0.000	-1.478	-1.478
	3	50	73	0.000	0.000	0.696	0.696
	4	50	73	0.000	0.000	0.783	0.783
	5	50	73	0.000	0.000	-2.261	-2.261
	6	50	73	0.000	0.000	-1.565	-1.565
	7	50	73	0.000	0.000	-2.913	-2.913
	8	50	73	0.000	0.000	4.000	4.000
	9	50	73	0.000	0.000	-1.565	-1.565
	10	50	73	0.000	0.000	-0.783	-0.783
	11	50	73	0.000	0.000	-3.304	-3.304
	12	50	73	0.000	0.000	-0.870	-0.870
	13	50	73	0.000	0.000	0.783	0.783
34	1	52	73	0.000	0.000	-10.810	-10.810
35	1	52	74	0.000	0.000	-6.591	-6.591
	2	52	74	0.000	0.000	-5.318	-5.318
	3	52	74	0.000	0.000	-4.045	-4.045
	4	52	74	0.000	0.000	0.455	0.455
	5	52	74	0.000	0.000	-1.455	-1.455

Dobrocky
SEATECH

ERODSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
35	6	52	73	0.000	0.000	1.381	1.381
	7	52	73	0.000	0.000	-1.143	-1.143
36	1	52	72	0.000	0.000	0.700	0.700
	2	52	72	0.000	0.000	-2.700	-2.700
	3	52	72	0.000	0.000	-3.750	-3.750
	4	52	72	0.000	0.000	-1.600	-1.600
	5	52	72	0.000	0.000	-2.000	-2.000
	6	52	72	0.000	0.000	-2.250	-2.250
	7	52	72	0.000	0.000	-2.550	-2.550
	8	52	72	0.000	0.000	-1.300	-1.300
	9	52	72	0.000	0.000	0.300	0.300
	10	52	72	0.000	0.000	0.650	0.650
	11	52	72	0.000	0.000	0.650	0.650
	12	52	72	0.000	0.000	0.900	0.900
	13	52	72	0.000	0.550	6.850	0.550
	14	52	74	0.000	0.000	-1.818	-1.818
	15	52	74	0.000	0.000	-4.500	-4.500
37	1	52	73	0.000	0.000	-2.333	-2.333
	2	52	73	0.000	0.000	-3.619	-3.619
	3	52	73	0.000	0.000	-4.714	-4.714
38	1	52	73	0.000	0.000	-2.810	-2.810
	2	52	73	0.000	0.000	-2.667	-2.667
39	1	52	72	0.000	0.300	0.000	0.300
40	1	52	72	0.000	0.000	-0.050	-0.050
	2	52	72	0.000	0.000	0.100	0.100
	3	52	72	0.000	0.000	-0.750	-0.750
	4	52	73	0.000	0.000	-0.762	-0.762
	5	52	73	0.000	0.000	-0.429	-0.429
	6	52	73	0.000	0.000	-2.381	-2.381
	7	52	73	0.000	0.000	-0.238	-0.238
	8	52	73	0.000	0.000	-4.381	-4.381
	9	52	73	0.000	0.000	-2.905	-2.905
	10	52	73	0.000	0.000	-3.810	-3.810
	11	52	73	0.000	0.000	-4.619	-4.619
41	1	52	73	0.000	0.000	-1.571	-1.571
	2	52	73	0.000	0.000	-1.810	-1.810
	3	52	73	0.000	0.000	-3.810	-3.810
	4	52	73	0.000	0.000	-3.714	-3.714
	5	52	73	0.000	0.000	-2.190	-2.190
	6	52	73	0.000	0.000	-3.905	-3.905
	7	52	73	0.000	0.000	-3.048	-3.048
	8	52	73	0.000	0.000	-2.190	-2.190
	9	52	73	0.000	0.000	-1.381	-1.381
	10	52	73	0.000	0.000	-0.381	-0.381
	11	52	72	0.000	0.000	3.150	3.150
	12	52	72	0.000	0.000	0.200	0.200
	13	52	72	0.000	0.000	-1.350	-1.350
	14	52	72	0.000	0.000	-1.950	-1.950
43	1	52	73	0.000	0.000	0.333	0.333
	2	52	73	0.000	0.000	-12.476	-12.476
	3	52	73	0.000	0.000	-6.476	-6.476
	4	52	73	0.000	0.000	-4.000	-4.000
	5	52	73	0.000	0.000	-0.286	-0.286
	6	52	73	0.000	0.000	-5.381	-5.381
	7	52	73	0.000	0.000	-6.048	-6.048
	8	52	73	0.000	0.000	-5.095	-5.095
	9	52	73	0.000	0.000	-8.857	-8.857
	10	52	73	0.000	0.000	-7.143	-7.143
45	1	50	73	-2.087	0.000	-6.870	-2.087
	2	50	73	0.000	0.000	-6.087	-6.087
	3	50	73	0.348	0.000	-0.522	0.348
	4	50	73	0.000	0.000	-1.826	-1.826
	5	50	73	0.000	0.000	-1.826	-1.826

Dobrocky
SEATECH

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
45	6	50	73	0.000	0.000	-4.609	-4.609
46	1	50	73	0.087	-0.609	0.000	-0.261
	2	50	74	-0.167	0.000	0.000	-0.167
	3	50	74	-0.917	0.000	-4.917	-0.917
	4	50	73	0.000	0.000	-2.522	-2.522
	5	50	73	0.000	0.000	-0.696	-0.696
	6	50	74	0.000	0.750	-6.000	0.750
47	1	50	73	0.000	-1.826	-2.348	-1.826
	2	50	73	0.000	0.000	-1.565	-1.565
	3	50	73	0.000	0.000	-0.174	-0.174
	4	50	73	0.000	0.000	-0.609	-0.609
48	1	50	74	-0.500	0.000	-0.750	-0.500
	2	50	74	0.000	0.000	-1.250	-1.250
	3	50	74	0.000	0.000	-0.083	-0.083
	4	50	74	0.000	0.000	0.417	0.417
	5	50	74	-7.167	0.000	-9.000	-7.167
	6	50	74	0.000	0.000	-4.833	-4.833
	7	50	74	0.000	0.000	-5.417	-5.417
	8	50	74	0.000	0.000	0.000	0.000
50	1	50	73	-0.783	-0.696	0.000	-0.739
	2	50	74	0.000	0.000	-0.500	-0.500
	3	50	73	0.000	-0.435	-4.696	-0.217
	4	50	73	-0.783	0.000	-2.609	-0.783
52	1	50	73	-1.304	0.000	-1.304	-1.304
	2	50	73	0.000	0.000	-2.087	-2.087
55	1	50	74	0.000	0.000	0.500	0.500
	2	50	74	-1.083	-1.000	0.000	-1.042
57	1	50	74	0.333	0.000	0.000	0.333
	2	50	74	0.500	0.000	0.000	0.500
	3	50	74	0.000	0.000	-0.333	0.000
	4	50	74	0.000	0.000	-0.167	0.000
	5	50	74	-0.250	0.000	0.000	-0.250
	6	50	74	0.083	-0.083	0.000	0.000
58	1	50	74	-0.583	-1.583	0.000	-1.083
	2	50	74	-0.750	0.000	-12.000	-0.750
	3	50	74	0.000	0.000	0.000	0.000
	4	50	74	0.583	0.000	0.000	0.583
	5	50	74	0.000	-0.083	0.000	-0.083
59	1	50	74	-0.833	0.000	4.583	-0.833
	2	50	74	1.000	0.250	0.000	0.625
	3	50	74	-0.083	0.000	-0.583	-0.083
	4	50	74	0.667	0.000	0.000	0.667
	5	50	74	4.917	0.000	0.000	4.917
60	1	50	74	0.167	0.000	0.250	0.167
	2	50	74	-0.167	-0.250	-2.250	-0.208
	3	50	74	-0.833	0.667	0.333	-0.083
	4	50	74	0.000	0.000	0.083	0.083
	5	50	74	0.000	0.000	0.000	0.000
	6	50	74	0.000	0.000	1.083	1.083
	7	50	74	-0.125	0.000	0.000	-0.125
	8	50	74	0.000	0.000	0.333	0.000
	9	50	74	0.417	0.000	0.000	0.417
	10	50	74	0.083	0.000	0.000	0.083
	11	50	74	-1.250	0.000	0.000	-1.250
	12	50	74	-0.083	0.000	0.000	-0.083
	13	50	74	0.000	0.000	0.250	0.250
	14	50	74	-0.083	0.000	-0.958	-0.083
	15	50	74	0.083	-0.083	-0.083	0.000
	16	50	74	0.250	-0.333	-0.333	-0.042
	17	50	74	-0.083	0.000	-0.250	-0.083
	18	50	74	-0.167	0.000	-3.583	-0.167
	19	50	74	-0.333	0.000	-0.500	-0.333
	20	50	74	-1.417	-0.667	-4.000	-1.042

Dobrocky SEATECH

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
60	21	50	74	0.000	0.000	0.000	0.000
	22	50	74	-0.250	0.000	0.000	-0.250
	23	50	74	1.083	0.000	-2.333	1.083
	24	50	74	0.000	0.000	-1.500	-1.500
	25	50	74	-1.583	0.000	-1.750	-1.583
	26	50	74	-0.833	0.000	-1.500	-0.833
	27	50	74	0.667	0.667	-3.333	0.667
	28	50	74	0.667	0.000	1.250	0.667
	29	50	74	0.083	0.000	-2.833	0.083
	30	50	74	-0.167	0.000	-1.833	-0.167
	31	50	74	-0.417	-0.333	-0.333	-0.375
	32	50	74	0.000	0.000	-1.333	-1.333
	33	50	74	-0.667	0.000	-2.083	-0.667
	34	50	74	-0.250	0.000	0.000	-0.250
	35	50	74	0.667	0.000	0.000	0.667
	36	50	74	0.000	0.000	-0.667	-0.667
	37	50	74	1.167	0.000	1.000	1.167
	38	50	74	0.000	0.000	-0.333	0.000
	39	50	74	-0.250	0.000	0.000	-0.250
61	1	50	74	-0.042	-0.333	-0.167	-0.187
	2	50	74	-0.667	-0.417	-1.583	-0.542
	3	50	74	-0.417	-0.500	-0.500	-0.458
	4	50	74	0.000	0.000	-6.083	0.000
	5	50	74	-0.583	-0.500	-0.500	-0.542
	6	50	74	-0.250	0.000	-0.250	-0.250
	7	50	74	0.000	0.000	-0.083	0.000
	8	50	74	-0.667	-0.667	-0.333	-0.667
	9	50	74	0.083	0.000	0.000	0.083
	10	50	74	0.167	0.000	-0.167	0.167
	11	50	74	1.167	-0.167	0.167	0.500
	12	50	74	-0.167	0.000	-1.500	-0.167
	13	50	74	0.417	0.250	0.250	0.333
	14	50	74	-0.333	-0.250	-0.500	-0.292
	15	50	74	-0.500	-0.417	0.000	-0.458
	16	50	74	-0.083	0.000	-0.250	-0.083
	17	50	74	-0.167	-0.333	-0.167	-0.250
	18	50	74	0.083	0.333	-0.917	0.208
	19	50	74	0.000	0.000	0.083	0.000
	20	50	74	0.000	0.083	0.417	0.042
	21	50	74	-0.583	-0.500	-18.833	-0.542
	22	50	74	0.417	0.000	0.000	0.208
	23	50	74	0.083	0.000	-0.750	0.083
	24	50	74	0.000	-0.083	-2.500	-0.042
	25	50	74	-0.250	-0.792	0.000	-0.521
	26	50	74	-0.083	0.000	0.250	-0.083
	27	50	74	-0.250	-0.250	-1.500	-0.250
	28	50	74	0.083	0.000	-1.667	0.083
62	1	50	74	-0.667	0.000	-0.500	-0.667
	2	50	74	0.000	0.000	-2.250	-2.250
	3	50	74	0.417	0.000	0.250	0.417
	4	50	74	-0.333	-0.333	-0.083	-0.333
	5	50	74	-0.917	0.000	-0.250	-0.917
	6	50	74	-0.750	0.000	0.000	-0.750
	7	50	74	-2.500	0.000	-2.750	-2.500
	8	50	74	-0.333	0.000	0.083	-0.333
	9	50	74	3.417	0.000	3.750	3.417
	10	50	74	0.167	0.000	-0.333	0.167
	11	50	74	-0.417	-0.583	-1.917	-0.500
	12	50	74	0.000	0.083	-1.083	0.042
	13	50	74	-0.750	-0.250	0.667	-0.500
	14	50	74	0.000	-0.667	-0.833	-0.667
	15	50	74	0.000	0.083	-0.333	0.083
	16	50	74	-0.833	-0.750	-0.750	-0.792

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
69	2	50	73	-0.087	0.000	0.000	-0.087
	3	50	73	-0.783	-6.087	-6.391	-3.435
	4	50	73	-0.174	0.000	-0.435	-0.174
	5	50	73	-0.348	-0.348	-0.435	-0.348
	6	50	73	-0.870	-0.783	-0.870	-0.826
	7	50	73	-0.174	-0.261	-0.565	-0.217
	8	50	73	0.000	0.000	-2.609	0.000
	9	50	73	-0.609	0.870	0.261	0.130
	10	50	73	-0.087	0.087	-0.870	0.000
	11	50	73	-0.522	0.174	-1.565	-0.174
	12	50	73	-0.348	-1.130	-0.870	-0.739
70	1	50	73	-0.435	-0.087	-2.870	-0.261
	2	50	73	-11.565	0.000	-11.696	-11.565
	3	50	73	-8.174	-8.087	-8.435	-8.130
	4	50	73	-7.043	0.000	-7.130	-7.043
	5	50	73	-9.391	0.000	-9.913	-9.391
	6	50	73	-16.522	0.000	-8.348	-16.522
	7	50	73	-10.696	-10.870	-11.043	-10.783
	8	50	73	-9.478	0.000	-9.565	-9.478
	9	50	73	-6.261	0.000	-6.174	-6.261
	10	50	73	0.000	0.000	-3.739	-3.739
	11	50	73	-5.130	0.000	-4.870	-5.130
	12	50	73	-1.043	0.000	-1.217	-1.043
71	1	50	72	0.000	0.000	0.000	-1.727
	2	50	72	0.000	0.000	0.000	-2.273
	3	50	72	0.000	0.000	0.000	-1.818
	4	50	72	0.000	0.000	0.000	-0.682
	5	50	72	0.000	0.000	0.000	0.000
	6	50	72	0.000	0.000	0.000	-3.409
	7	50	72	0.000	0.000	0.000	-2.818
	8	50	72	0.000	0.000	0.000	-1.591
	9	50	72	0.000	0.000	0.000	-0.999
	10	50	72	0.000	0.000	0.000	-1.364
	11	50	72	0.000	0.000	0.000	-0.909
	12	50	72	0.000	0.000	0.000	-4.545
	13	50	72	0.000	0.000	0.000	-0.909
	14	50	72	0.000	0.000	0.000	-1.136
	15	50	72	0.000	0.000	0.000	-0.909
	16	50	72	0.000	0.000	0.000	-0.227
	17	50	72	0.000	0.000	0.000	-0.455
	18	50	72	0.000	0.000	0.000	-0.227
	19	50	72	0.000	0.000	0.000	0.000
	20	50	72	0.000	0.000	0.000	-0.909
	21	50	72	0.000	0.000	0.000	0.000
	22	50	72	0.000	0.000	0.000	-1.136
	23	50	72	0.000	0.000	0.000	-1.591
	24	50	72	0.000	0.000	0.000	-0.909
	25	50	72	0.000	0.000	0.000	-1.591
	26	50	73	-2.696	0.000	-2.783	-2.696
	27	50	73	-2.087	0.000	-1.957	-2.087
	28	50	73	-1.087	0.000	-1.478	-1.087
	29	50	73	-0.783	-1.391	-1.565	-1.087
	30	50	73	-1.130	0.000	-2.174	-1.130
	31	50	73	-2.174	0.000	-2.087	-2.174
	32	50	73	0.000	0.000	-3.478	-3.478
	33	50	73	-0.783	0.000	-1.217	-0.783
	34	50	73	-1.130	-1.043	-2.696	-1.087
	35	50	73	8.174	8.261	4.261	8.217
	36	50	73	0.000	0.000	-5.174	-5.174
	37	50	73	0.435	0.522	-0.348	0.478
	38	50	73	-0.957	-1.217	-1.478	-1.087
72	1	50	72	0.000	0.000	0.000	-0.909
	2	50	72	0.000	0.000	0.000	-0.909

Dobrocky
SEATECH

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
65	3	50	74	0.000	-0.500	-0.667	-0.250
	4	50	74	0.167	0.167	-2.833	0.167
	5	50	74	-0.583	-0.417	-2.500	-0.500
	6	50	74	0.250	0.167	-0.833	0.208
	7	50	74	0.000	-0.750	-1.083	-0.750
	8	50	74	-1.583	-1.417	-7.250	-1.500
	9	50	74	-2.417	-1.917	-6.250	-2.167
	10	50	74	-3.833	0.000	-3.667	-3.833
	11	50	74	-1.667	-1.417	0.000	-1.542
	12	50	74	-1.083	0.000	-1.000	-1.083
	13	50	74	-0.917	-1.167	-1.083	-1.042
	14	50	74	-0.500	0.000	-0.917	-0.500
	15	50	74	-0.167	0.000	-0.500	-0.167
	16	50	74	0.000	0.000	-0.083	-0.083
	17	50	74	-0.583	0.000	-0.917	-0.583
	18	50	74	-1.000	-1.417	-2.750	-1.208
	19	50	74	-0.833	-1.083	-3.167	-0.958
	20	50	74	0.000	0.000	-1.083	-1.083
	21	50	74	-0.833	-0.750	-5.083	-0.792
	22	50	74	-0.500	0.000	1.333	-0.500
	23	50	74	-1.000	-1.167	-4.208	-1.083
	24	50	74	0.000	0.000	-1.333	-1.333
	25	50	74	0.000	0.000	-0.500	-0.500
	26	50	74	-1.417	-2.000	-5.417	-1.708
	27	50	74	-0.333	-0.167	-0.583	-0.250
	28	50	74	-1.500	-2.167	-4.250	-1.833
	29	50	74	-2.417	-2.333	-5.083	-2.375
66	1	50	73	-0.261	0.000	-0.391	-0.130
	2	50	73	0.435	0.174	0.261	0.304
	3	50	73	0.000	0.000	0.000	0.000
	4	50	73	0.000	0.000	-0.870	-0.870
	5	50	73	0.348	0.000	0.435	0.348
	6	50	73	0.000	0.000	-0.696	-0.696
	7	50	73	0.261	0.000	0.000	0.261
	8	50	74	-0.667	0.000	-0.667	-0.667
	9	50	74	-0.833	0.000	-1.083	-0.833
	10	50	74	-0.667	0.000	-0.917	-0.667
	11	50	74	-0.500	0.000	-0.667	-0.500
	12	50	74	-0.083	0.000	-0.250	-0.083
	13	50	74	-0.500	-0.500	-0.583	-0.500
	14	50	74	0.083	0.000	-0.167	0.083
	15	50	74	-0.250	0.000	-0.500	-0.250
	16	50	74	0.000	0.000	-0.167	0.000
	17	50	74	-0.333	0.000	-0.333	-0.333
	18	50	74	0.000	0.000	-0.417	0.000
	19	50	74	0.333	0.000	0.000	0.333
	20	50	74	0.000	0.000	-0.167	-0.167
67	1	50	73	0.087	0.000	-0.261	0.087
	2	50	73	0.522	0.000	0.087	0.522
68	1	50	73	-1.739	0.000	-1.217	-1.739
	2	50	73	-1.478	0.000	0.174	-1.478
	3	50	73	0.000	-0.261	-3.217	-0.130
	4	50	73	0.174	0.000	-0.696	0.174
	5	50	73	0.870	0.435	-8.261	0.652
	6	50	73	0.000	0.000	-0.261	-0.261
	7	50	73	-0.174	-0.435	-0.174	-0.304
	8	50	73	0.261	0.000	-0.174	0.261
	9	50	73	0.174	0.261	0.609	0.217
	10	50	73	0.087	-0.087	2.261	0.000
	11	50	73	0.261	-0.174	0.000	0.043
	12	50	73	0.000	0.000	0.348	0.348
	13	50	73	0.000	0.000	0.435	0.435
69	1	50	73	0.000	0.087	-0.870	0.043

Dobrocky
SEATECH

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
72	3	50	72	0.000	0.000	0.000	-1.136
	4	50	72	0.000	0.000	0.000	0.000
	5	50	72	0.000	0.000	0.000	-1.818
	6	50	72	0.000	0.000	0.000	-2.727
	7	50	72	0.000	0.000	0.000	0.000
	8	50	72	0.000	0.000	0.000	0.000
	9	50	72	0.000	0.000	0.000	-2.273
	10	50	72	0.000	0.000	0.000	-1.500
	11	50	72	0.000	0.000	0.000	-0.455
	12	50	72	0.000	0.000	0.000	-0.455
	13	50	72	0.000	0.000	0.000	0.000
	14	50	72	0.000	0.000	0.000	-0.682
	15	50	72	0.000	0.000	0.000	-0.909
	16	50	72	0.000	0.000	0.000	-0.682
	17	50	72	0.000	0.000	0.000	-0.455
	18	50	72	0.000	0.000	0.000	0.000
	19	50	72	0.000	0.000	0.000	-2.727
	20	50	72	0.000	0.000	0.000	0.000
	21	50	72	0.000	0.000	0.000	0.000
	22	50	72	0.000	0.000	0.000	-0.455
	23	50	72	0.000	0.000	0.000	-0.909
	24	50	72	0.000	0.000	0.000	0.000
	25	50	72	0.000	0.000	0.000	-1.591
	26	50	72	0.000	0.000	0.000	-1.682
	27	69	72	0.000	0.000	0.000	-5.000
	28	50	72	0.000	0.000	0.000	-2.273
	29	50	72	0.000	0.000	0.000	0.000
	30	50	72	0.000	0.000	0.000	0.000
	31	50	72	0.000	0.000	0.000	0.000
	32	50	72	0.000	0.000	0.000	0.000
	33	50	72	0.000	0.000	0.000	-3.636
	34	50	72	0.000	0.000	0.000	-1.318
	35	50	72	0.000	0.000	0.000	-2.273
	36	50	72	0.000	0.000	0.000	0.000
	37	50	72	0.000	0.000	0.000	0.000
	38	50	72	0.000	0.000	0.000	-2.273
	39	50	72	0.000	0.000	0.000	0.000
	40	50	72	0.000	0.000	0.000	-5.455
	41	50	72	0.000	0.000	0.000	0.000
	42	50	72	0.000	0.000	0.000	-5.455
	43	50	72	0.000	0.000	0.000	-0.818
	44	50	72	0.000	0.000	0.000	-2.273
	45	50	72	0.000	0.000	0.000	-0.795
	46	50	72	0.000	0.000	0.000	-2.045
	47	50	72	0.000	0.000	0.000	1.136
	48	50	72	0.000	0.000	0.000	-0.545
	49	50	72	0.000	0.000	0.000	-0.682
	50	50	72	0.000	0.000	0.000	-2.955
	51	50	72	0.000	0.000	0.000	-0.682
	52	50	72	0.000	0.000	0.000	7.909
	53	50	72	0.000	0.000	0.000	-1.364
	54	50	72	0.000	0.000	0.000	-3.182
	55	50	72	0.000	0.000	0.000	-2.727
	56	50	72	0.000	0.000	0.000	-5.682
73	1	50	74	-0.583	-0.875	-0.833	-0.729
	2	50	74	-0.333	-0.583	-0.667	-0.458
	3	50	72	0.000	0.000	0.000	-0.545
	4	50	72	0.000	0.000	0.000	-0.545
	5	50	72	0.000	0.000	0.000	-0.682
	6	50	72	0.000	0.000	0.000	-0.909
	7	50	72	0.000	0.000	0.000	-3.636
	8	50	72	0.000	0.000	0.000	1.364
	9	50	72	0.000	0.000	0.000	-0.227

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
73	10	50	72	0.000	0.000	0.000	-0.545
	11	50	72	0.000	0.000	0.000	-0.455
	12	50	72	0.000	0.000	0.000	-1.227
	13	50	72	0.000	0.000	0.000	-1.136
	14	50	72	0.000	0.000	0.000	-0.909
	15	50	72	0.000	0.000	0.000	3.636
	16	50	72	0.000	0.000	0.000	-1.591
	17	50	72	0.000	0.000	0.000	-1.136
	18	50	72	0.000	0.000	0.000	0.000
	19	50	72	0.000	0.000	0.000	-3.182
	20	50	72	0.000	0.000	0.000	-0.909
	21	50	72	0.000	0.000	0.000	-0.682
74	1	50	74	-1.583	0.000	-2.083	-1.583
	2	50	74	-0.583	-2.000	-1.500	-1.292
	3	50	74	-1.000	-1.667	-1.250	-1.333
	4	50	74	-1.917	0.000	-0.750	-1.917
	5	50	74	-0.833	-1.333	-1.333	-1.083
	6	50	74	-2.333	-1.833	-0.333	-2.083
	7	50	74	-1.250	-1.167	-2.417	-1.208
	8	50	74	0.000	0.000	-1.500	0.000
75	1	50	74	0.500	-0.500	-0.042	0.000
	2	50	74	-0.833	-0.417	2.833	-0.625
	3	50	74	-1.333	-1.667	-2.000	-1.500
	4	50	74	-3.000	0.000	-3.000	-3.000
76	1	50	74	-6.083	0.000	2.750	-6.083
	2	50	74	-0.833	-0.500	-0.250	-0.667
	3	50	74	-0.083	-0.083	-1.250	-0.083
	4	50	74	-0.625	0.000	-0.750	-0.625
	5	50	74	-0.417	0.000	-0.542	-0.417
	6	50	74	0.833	0.750	0.000	0.792
	7	50	74	-4.167	0.000	-4.167	-4.167
	8	50	74	-0.333	0.000	-0.875	-0.333
	9	50	74	-0.167	0.000	0.583	-0.167
	10	50	74	-1.167	0.000	0.167	-1.167
77	1	50	74	-1.083	0.000	-1.333	-1.083
	2	50	74	-3.500	0.000	-4.500	-3.500
	3	50	74	0.000	0.000	-1.667	-1.667
	4	50	74	-0.083	0.000	-0.167	-0.083
	5	50	74	1.250	0.000	-0.167	1.250
	6	50	74	-0.250	0.000	0.250	-0.250
	7	50	74	-0.417	0.000	-1.500	-0.417
	8	50	74	-0.583	0.000	0.000	-0.583
	9	50	74	-0.917	0.000	-0.250	-0.917
	10	50	74	-2.083	0.000	-3.167	-2.083
	11	50	74	-1.000	0.000	-2.583	-1.000
	12	50	74	-0.250	0.000	-0.917	-0.250
	13	50	74	-0.750	0.000	-1.083	-0.750
	14	50	74	-1.417	0.000	-1.250	-1.417
	15	50	74	0.000	0.000	-1.083	-1.083
	16	50	74	-2.000	0.000	-1.333	-2.000
	17	50	74	-2.250	0.000	-1.417	-2.250
	18	50	74	-0.500	0.000	-2.250	-0.500
	19	50	74	-0.167	0.000	-0.250	-0.167
	20	50	74	-3.583	0.000	-3.583	-3.583
	21	50	74	-1.000	0.000	-0.583	-1.000
78	1	50	71	-1.095	-2.667	10.381	-1.881
	2	50	71	-3.000	-2.905	17.476	-2.952
	3	50	71	-3.333	-3.810	6.524	-3.571
	4	50	74	3.500	0.000	-0.167	3.500
	5	50	74	0.417	0.000	-0.500	0.417
	6	50	74	0.000	0.000	-0.167	-0.167
	7	50	74	-0.417	0.833	-3.333	0.208
	8	50	74	-1.958	0.000	-1.083	-1.958

				EROSION RATES (M/YR)			
MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
78	9	50	74	-0.167	0.000	-0.958	-0.167
	10	50	74	-1.000	0.000	0.000	-1.000
	11	50	74	1.083	-0.083	-1.333	0.500
	12	50	74	0.000	0.000	-1.000	0.000
	13	50	74	0.500	0.000	-0.667	0.500
	14	50	74	-0.167	0.000	-1.333	-0.167
	15	50	74	-0.417	0.000	-1.333	-0.417
	16	50	74	-0.417	0.000	-1.000	-0.417
79	1	50	71	-0.143	-0.571	0.000	-0.357
	2	50	71	-0.524	-0.476	0.000	-0.500
	3	50	71	0.000	0.000	2.238	2.238
	4	50	71	-2.714	0.000	2.333	-2.714
	5	50	71	-0.238	0.000	4.381	-0.238
	6	50	71	0.524	0.000	4.571	0.524
	7	50	71	0.000	0.000	6.286	6.286
80	1	50	71	0.000	0.000	0.000	-1.905
	2	50	71	0.000	0.000	0.000	-0.952
	3	50	71	0.000	0.000	0.000	-2.143
	4	50	71	0.000	0.000	0.000	-2.169
	5	50	71	0.000	0.000	0.000	-0.714
	6	50	71	0.000	0.000	0.000	-0.595
81	1	50	71	0.000	0.000	0.000	-1.190
	2	50	71	0.000	0.000	0.000	-2.381
	3	50	71	0.000	0.000	0.000	2.143
	4	50	71	0.000	0.000	0.000	5.952
	5	50	71	0.000	0.000	0.000	0.000
	6	50	71	0.000	0.000	0.000	0.000
	7	50	71	0.000	0.000	0.000	-1.429
	8	50	71	0.000	0.000	0.000	-0.714
	9	50	71	0.000	0.000	0.000	-3.333
	10	50	71	0.000	0.000	0.000	-2.381
	11	50	71	0.000	0.000	0.000	-1.905
	12	50	71	0.000	0.000	0.000	-2.381
	13	50	71	0.000	0.000	0.000	-2.857
	14	50	71	0.000	0.000	0.000	-1.810
	15	50	71	0.000	0.000	0.000	0.000
	16	50	71	0.000	0.000	0.000	-2.619
	17	50	71	0.000	0.000	0.000	-2.381
	18	50	71	0.000	0.000	0.000	-2.143
	19	50	71	0.000	0.000	0.000	-5.476
	20	50	71	0.000	0.000	0.000	0.000
	21	50	71	0.000	0.000	0.000	-2.143
	22	50	71	0.000	0.000	0.000	-1.190
	23	50	71	0.000	0.000	0.000	0.000
	24	50	71	0.000	0.000	0.000	-0.714
82	1	50	71	-1.190	0.000	10.381	-1.190
	2	50	71	-0.429	0.000	8.619	-0.429
	3	50	71	-0.667	0.000	7.095	-0.667
	4	50	71	-0.667	0.000	15.143	-0.667
	5	50	71	0.000	0.000	7.667	0.000
	6	50	71	-0.905	0.000	8.190	-0.905
	7	50	71	-0.571	0.000	5.000	-0.571
	8	50	71	-1.286	0.000	3.048	-1.286
	9	50	71	-3.476	0.000	0.524	-3.476
	10	50	71	-0.524	0.000	-0.524	-0.524
	11	50	71	0.000	0.000	0.952	0.952
	12	50	71	-0.190	0.286	2.524	0.048
	13	50	71	-0.190	0.000	3.143	-0.190
	14	50	71	-0.714	0.000	5.000	-0.714
	15	50	71	-1.333	0.000	10.000	-1.333
	16	50	71	-0.810	0.000	14.524	-0.810
	17	50	71	0.000	0.000	0.524	0.524
	18	50	71	0.000	0.000	0.619	0.619

Dobrocky
SEATECH

EROSION RATES (M/YR)

MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
82	19	50	71	0.000	0.000	0.000	-1.905
	20	50	71	0.000	0.000	0.000	-1.905
	21	50	71	0.000	0.000	0.000	-2.381
	22	50	71	0.000	0.000	0.000	-0.952
	23	50	71	0.000	0.000	0.000	-2.857
	24	50	71	0.000	0.000	0.000	-2.857
	25	50	71	0.000	0.000	0.000	-1.429
	26	50	71	0.000	0.000	0.000	-0.952
	27	50	71	0.000	0.000	0.000	-2.381
	28	50	71	0.000	0.000	0.000	-1.429
	29	50	71	0.000	0.000	0.000	-0.952
	30	50	71	0.000	0.000	0.000	-1.429
	31	50	71	0.000	0.000	0.000	-2.857
	32	50	71	0.000	0.000	0.000	-1.429
	33	50	71	0.000	0.000	0.000	-1.667
	34	50	71	0.000	0.000	0.000	-1.905
	35	50	71	0.000	0.000	0.000	-1.429
	36	50	71	0.000	0.000	0.000	-1.190
	37	50	71	0.000	0.000	0.000	-1.190
	38	50	71	0.000	0.000	0.000	0.000
	39	50	71	0.000	0.000	0.000	-1.190
83	1	50	71	0.000	0.000	-1.524	-1.524
	2	50	71	0.333	0.000	2.524	0.333
	3	50	71	0.000	0.000	5.857	0.000
95	1	50	71	-0.286	0.000	-3.238	-0.286
	2	50	71	-1.524	0.000	-1.667	-1.524
	3	50	71	-0.381	0.000	-0.952	-0.381
96	1	50	71	0.000	0.000	-0.857	-0.857
	2	50	71	0.000	0.000	-0.571	-0.571
	3	50	71	-0.190	0.000	-1.190	-0.190
	4	50	71	-0.238	0.000	-5.000	-0.238
97	1	50	71	-0.619	0.000	-0.857	-0.619
98	1	50	71	-0.905	0.000	-0.286	-0.905
	2	50	71	-4.095	0.000	-3.857	-4.095
	3	50	71	-0.476	-0.476	-0.571	-0.476
	4	50	71	0.000	-0.190	0.000	-0.190
	5	50	71	0.000	0.000	0.000	0.000
99	1	50	71	0.000	0.000	0.381	0.381
	2	50	71	-1.619	0.000	-3.619	-1.619
	3	50	71	-0.619	0.000	1.810	-0.619
	4	50	71	0.000	0.000	-0.619	-0.619
	5	50	71	0.000	0.000	-0.571	-0.571
	6	50	71	-0.190	-0.381	-0.190	-0.286
	7	50	71	0.000	0.000	-0.667	-0.667
	8	50	71	0.000	0.000	-0.190	-0.190
100	1	50	71	-0.952	0.000	1.333	-0.952
	2	50	71	2.952	3.095	4.714	-1.038
	3	50	71	-1.429	-1.381	-2.286	-1.405
	4	50	71	-0.333	-0.190	-0.476	-0.262
	5	50	71	-0.762	0.000	-1.429	-0.762
	6	50	71	0.000	0.000	-0.429	-0.429
	7	50	71	-0.190	0.000	-0.524	-0.190
	8	50	71	-0.048	0.000	0.238	-0.048
	9	50	71	-0.190	0.000	0.000	-0.190
101	1	50	71	-1.381	0.000	1.524	-1.381
	2	50	71	0.000	0.000	-7.143	-7.143
	3	50	71	-1.048	0.000	0.190	-1.048
	4	50	71	0.000	0.000	-0.381	-0.381
102	1	50	71	-0.190	0.000	-0.524	-0.190
	2	50	71	-0.857	-1.048	-1.238	-0.952
	3	50	71	-0.429	0.000	-0.571	-0.429
	4	50	71	-1.000	0.000	-0.571	-1.000
	5	50	71	-1.000	-1.143	-1.143	-1.071

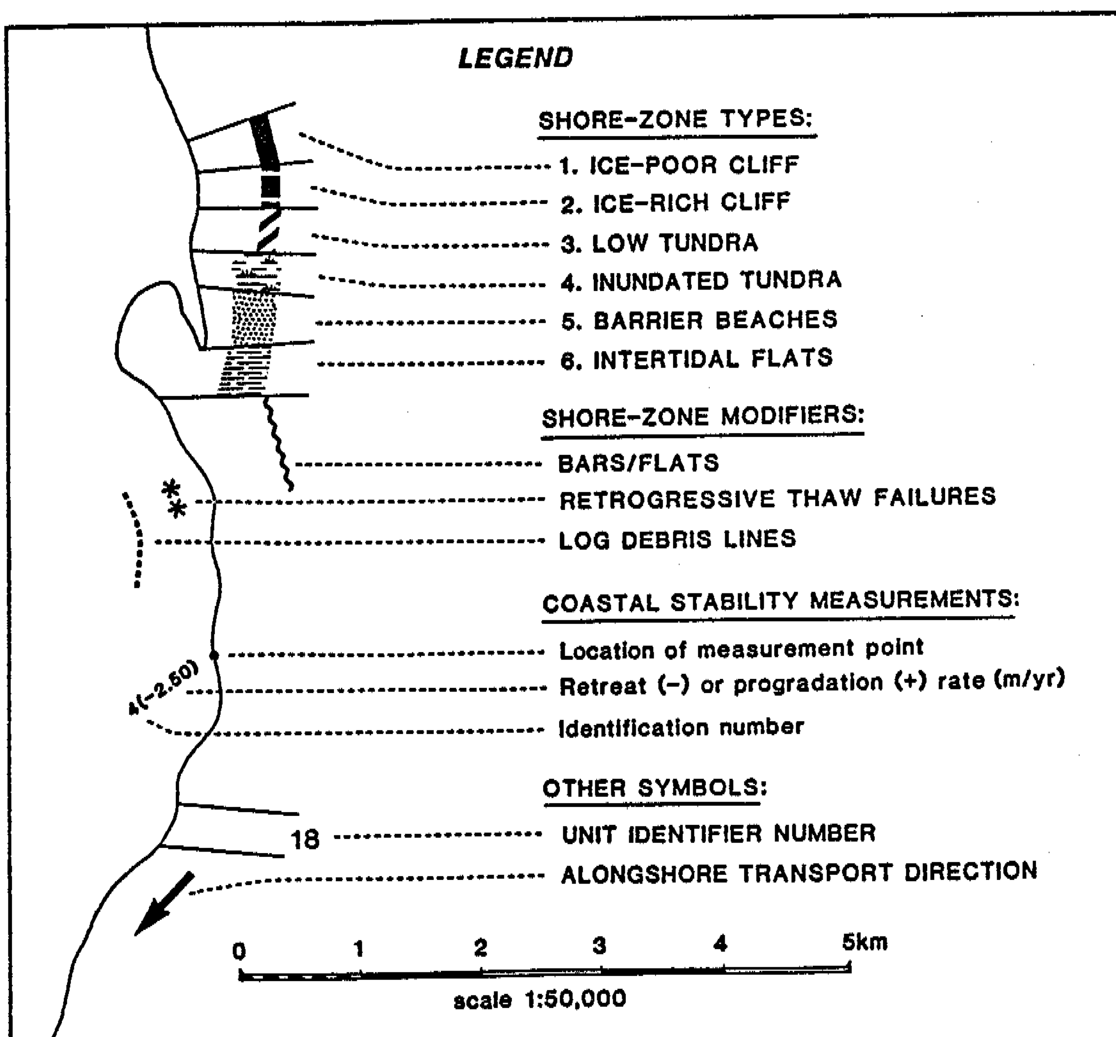
Dobrocky
SEATECH

				EROSION RATES (M/YR)			
MAP#	I.D.	YR 1	YR 2	CLIFF TOP	CLIFF BASE	WATER LINE	CALC MEAN
102	6	50	71	0.000	0.000	-2.905	-2.905
103	1	50	71	-0.571	-0.857	0.000	-0.714
	2	50	71	0.000	0.000	-1.952	-1.952
	3	50	71	-2.143	0.000	-3.190	-2.143
	4	50	71	-1.238	0.000	3.952	-1.238
104	1	50	71	-0.143	0.000	3.238	-0.143
	2	50	71	-0.429	0.000	1.429	-0.429
	3	50	71	-0.857	0.000	-3.714	-0.857
	4	50	71	-1.048	0.000	-0.667	-1.048
105	1	50	71	-0.905	-0.381	-0.619	-0.643
	2	50	71	0.000	-0.667	-1.810	-0.667
	3	50	71	-0.190	0.000	-0.619	-0.190
	4	50	71	0.000	0.000	-2.238	-2.238
	5	50	71	-0.667	-0.333	-5.905	-0.500
	6	50	71	-0.143	0.000	2.905	-0.143
106	1	50	71	-0.286	-0.381	-3.000	-0.333
	2	50	71	0.048	-0.095	-3.286	-0.024
	3	50	71	-0.333	-0.667	-1.667	-0.500
107	1	50	71	-1.286	0.000	-1.238	-1.286
	2	50	71	-2.000	0.000	-0.905	-2.000
	3	50	71	-0.429	-0.333	-0.810	-0.381
	4	50	71	0.000	0.000	-1.524	-1.524
	5	50	71	-2.952	-0.429	-0.286	-1.690
	6	50	71	-0.095	-0.143	-1.762	-0.119
	7	50	71	0.571	-0.857	-2.905	-0.143
	8	50	71	0.000	-7.238	-8.000	-7.238
111	1	50	79	-0.069	0.000	-0.069	-0.069
	2	50	79	0.000	0.000	-0.207	0.000
	3	50	79	-0.828	0.000	-0.897	-0.828
	4	50	79	-0.759	-0.897	-1.034	-0.828
	5	50	79	-0.690	-0.828	-0.552	-0.759
	6	50	79	0.000	0.000	-0.759	-0.759
	7	50	79	-0.345	0.000	-0.966	-0.345
	8	50	79	-0.069	0.000	-0.483	-0.069
	9	50	79	-0.345	0.000	-0.621	-0.345
112	1	50	79	0.000	0.000	-2.172	-2.172
	2	50	79	0.000	0.000	-0.828	-0.828
	3	50	79	-3.586	0.000	-3.724	-3.586
	4	50	79	-3.793	0.000	-3.793	-3.793
	5	50	79	-0.690	0.000	-0.897	-0.690
	6	50	79	-0.621	-0.759	0.000	-0.690
	7	50	79	-0.690	0.000	-0.759	-0.690
	8	50	79	-1.379	-1.517	-1.931	-1.448

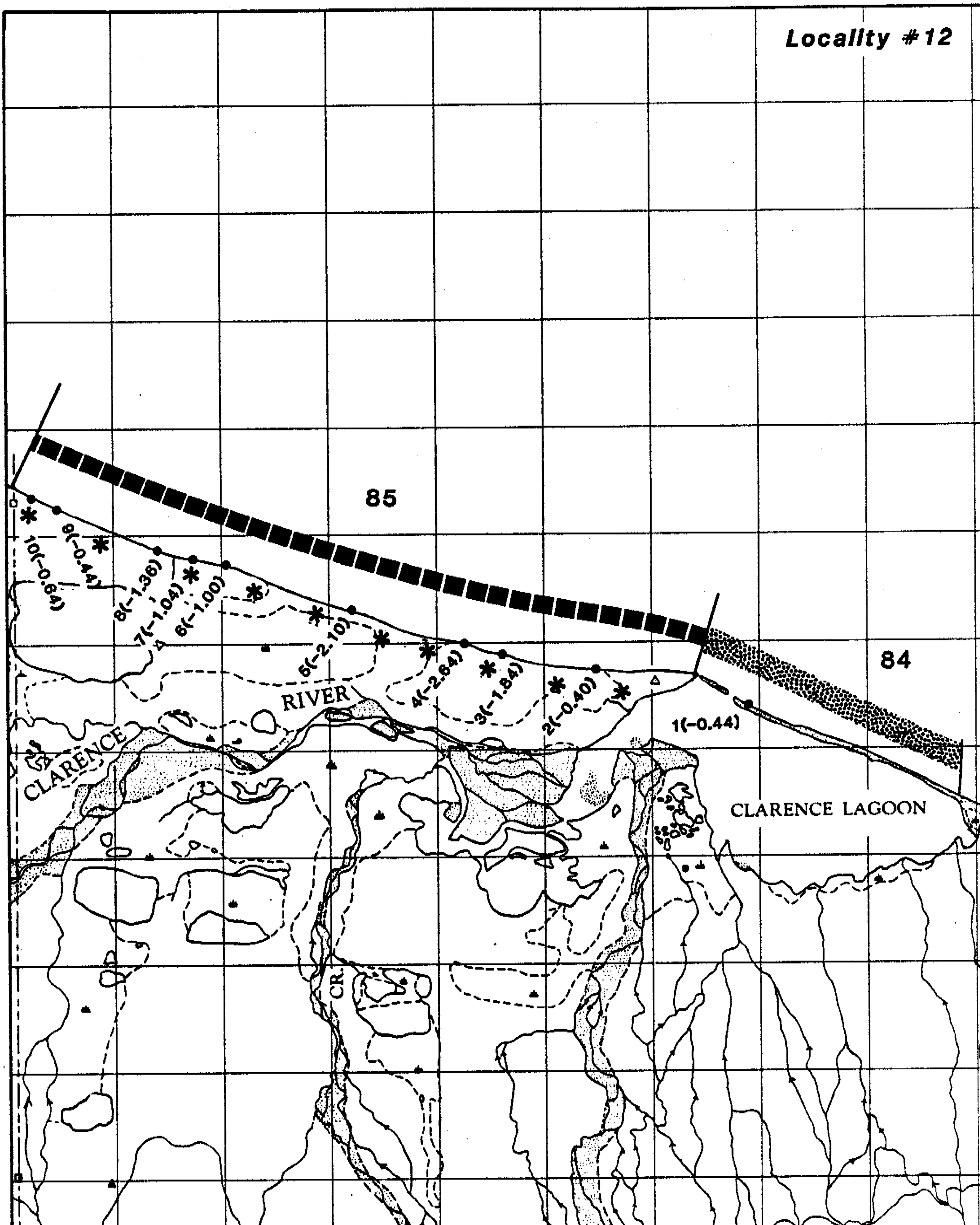
Coastal Resource Maps

Appendix 2 - Coastal Resource Maps

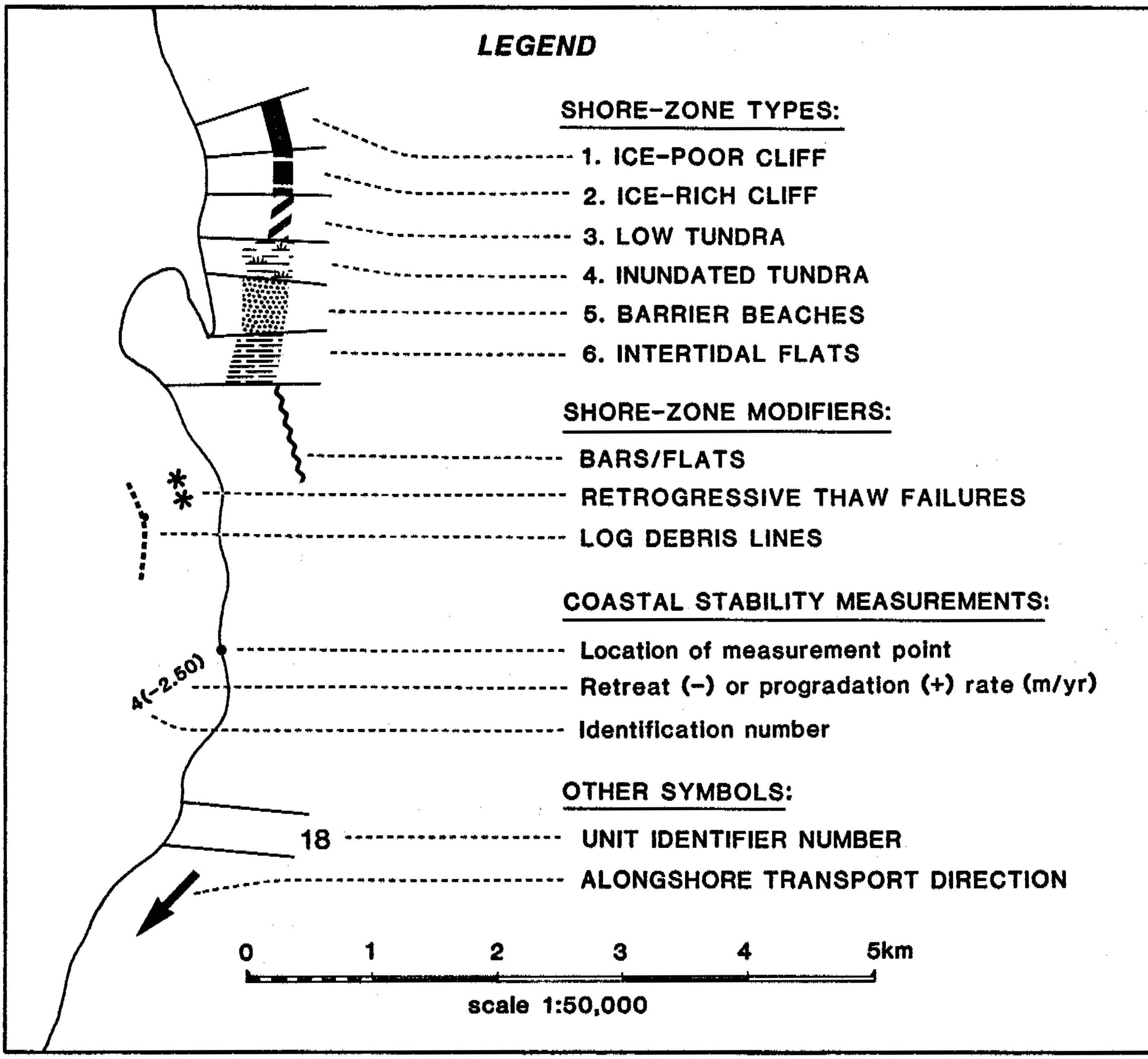
The maps in this appendix include the coastal regions of the Canadian Beaufort Sea from Demarcation Point east to Baillie Islands. The information presented includes (a) shorezone morphology (b) coastal stability measurements, and (c) alongshore transport directions. The symbols and patterns used are presented in the legend below. This legend is included on the page opposite each map along with an index location map for convenience of use. Detailed information relating to coastal stability for each map section can be found in Appendix 1.



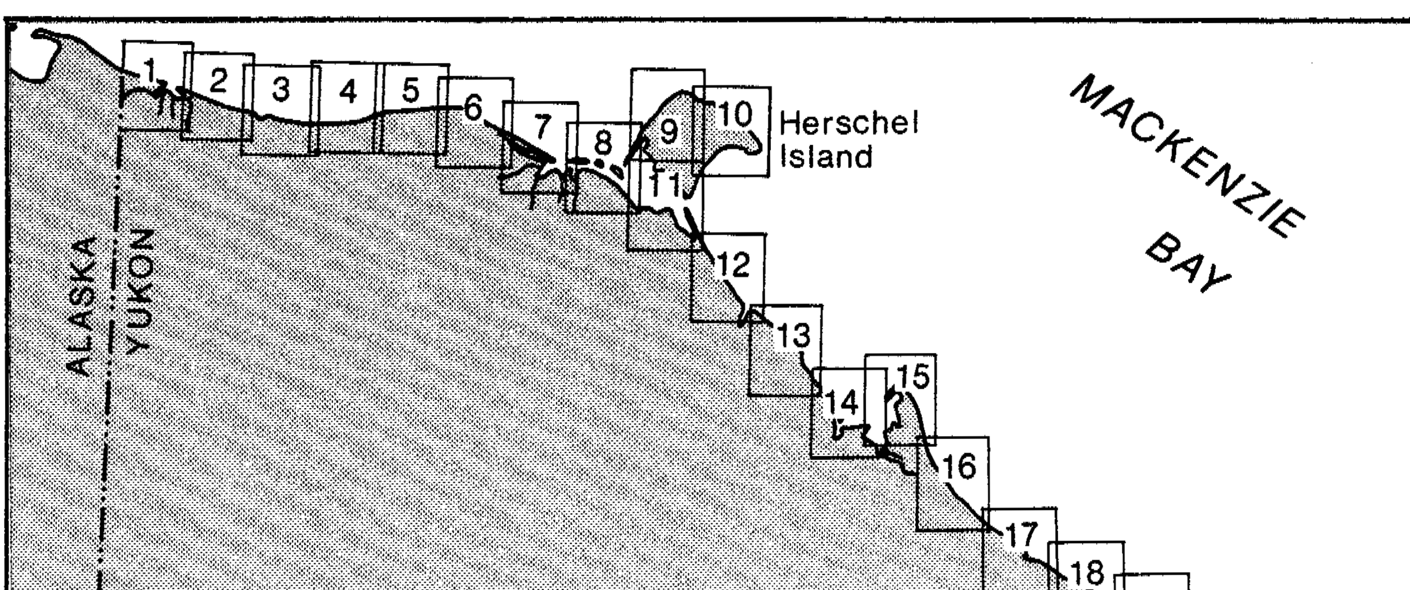
Dobrocky
SEATECH



Locality #12
85
84
10(-0.64)
9(-0.44)
8(-1.36)
7(-1.04)
6(-1.00)
5(-2.10)
4(-2.64)
3(-1.84)
2(-0.40)
1(-0.44)
CLARENCE
RIVER
CLARENCE LAGOON
CR.
100



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



MACKENZIE BAY
Herschel Island
ALASKA
YUKON
1
2
3
4
5
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7
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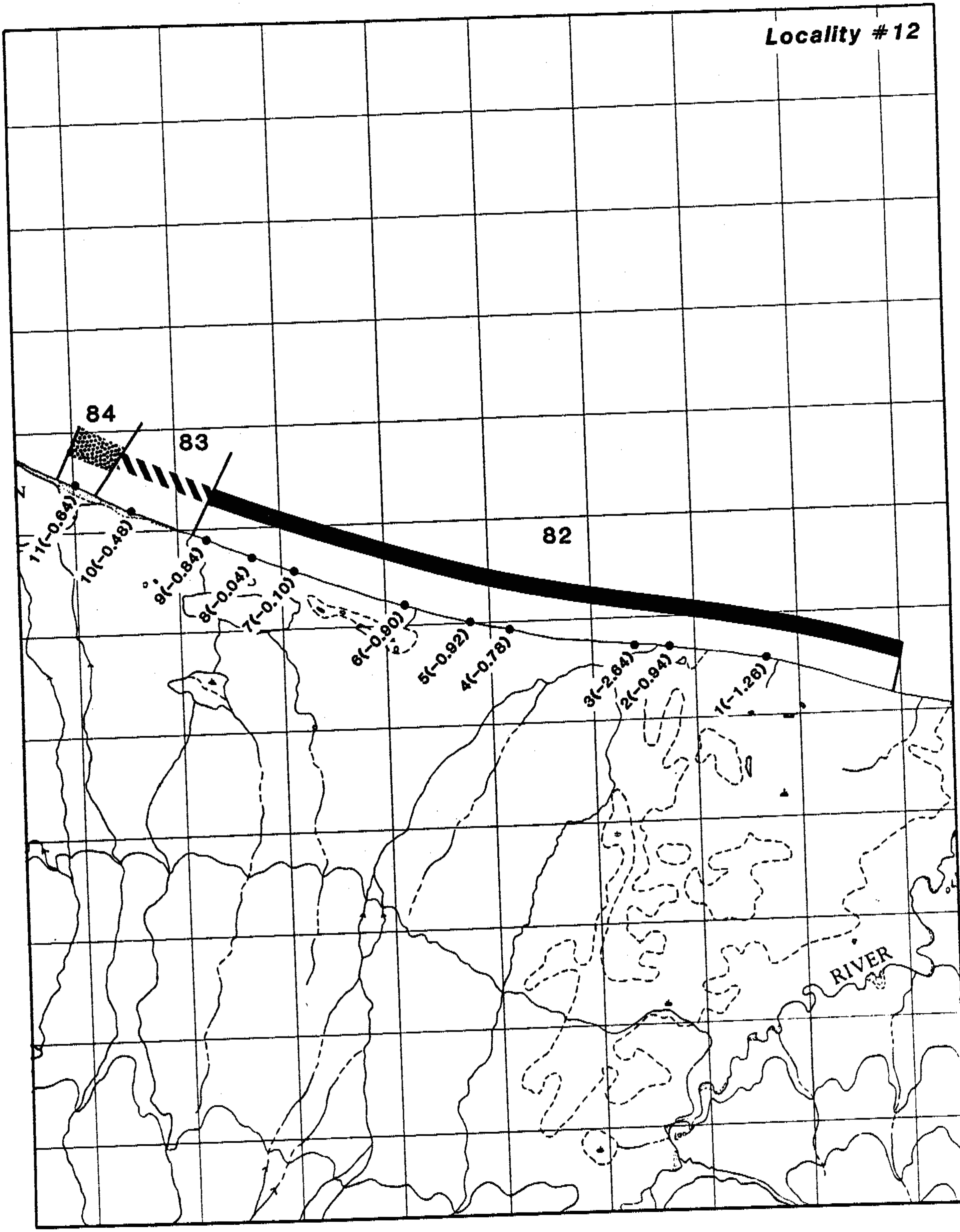
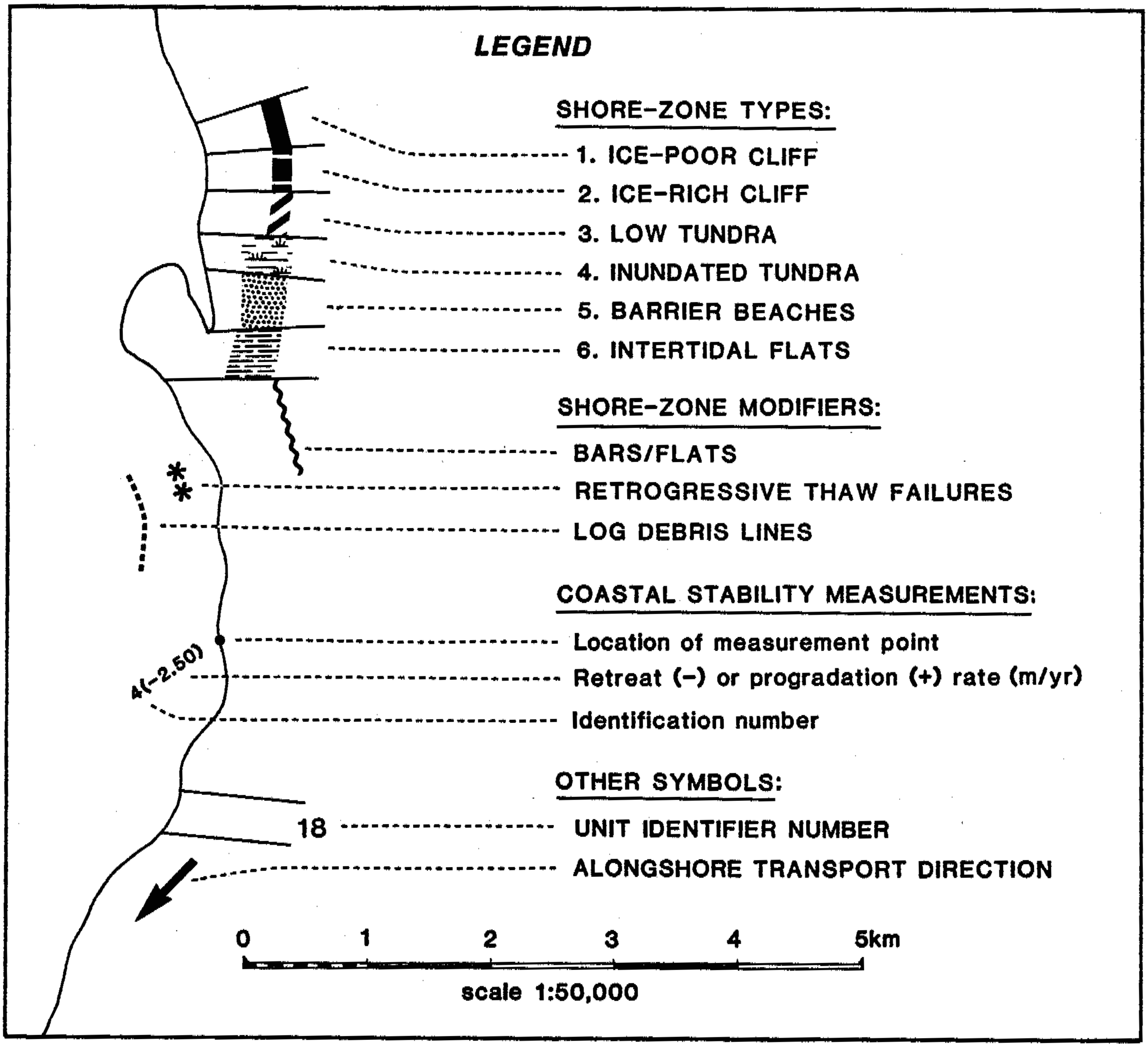
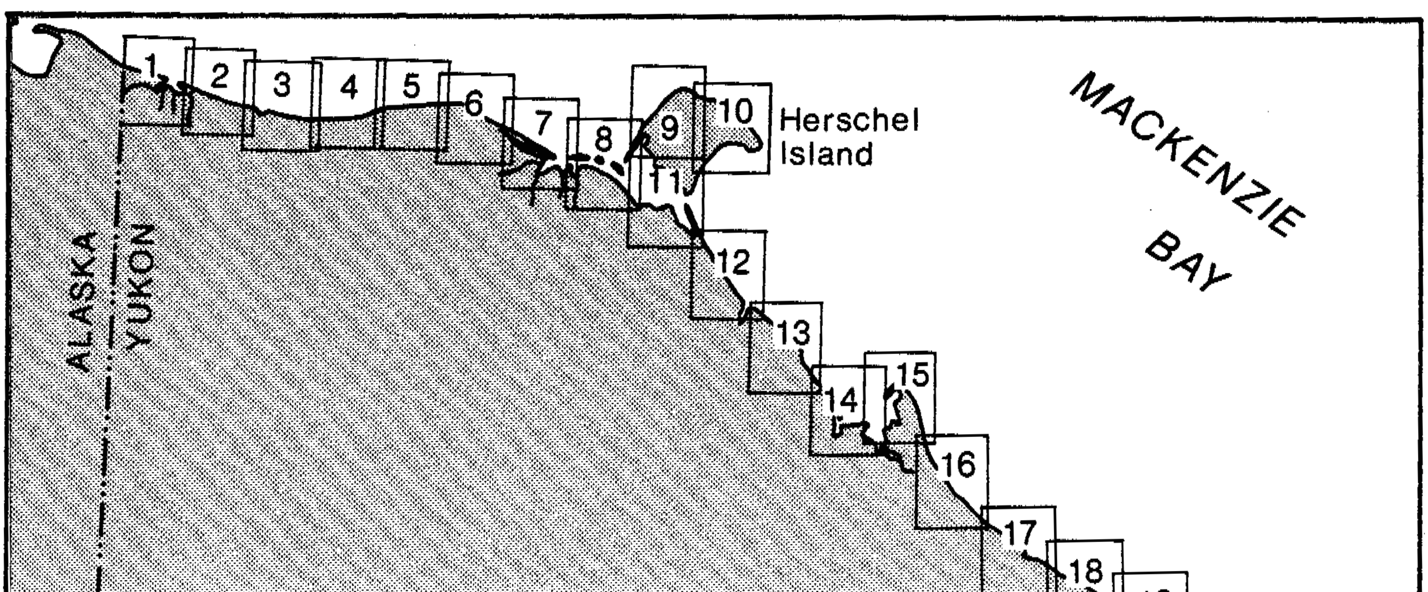
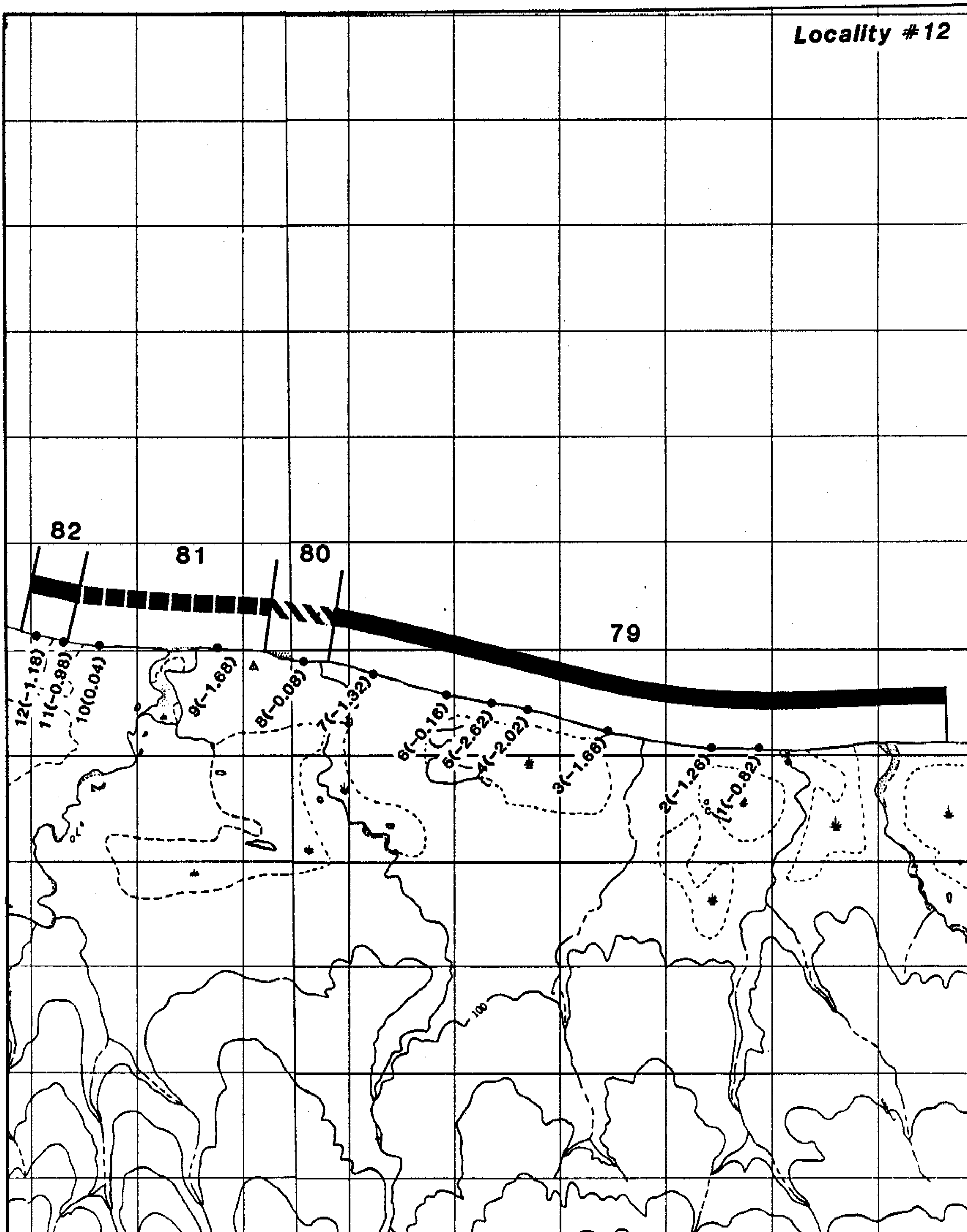
11
12
13
14
15
16
17
18

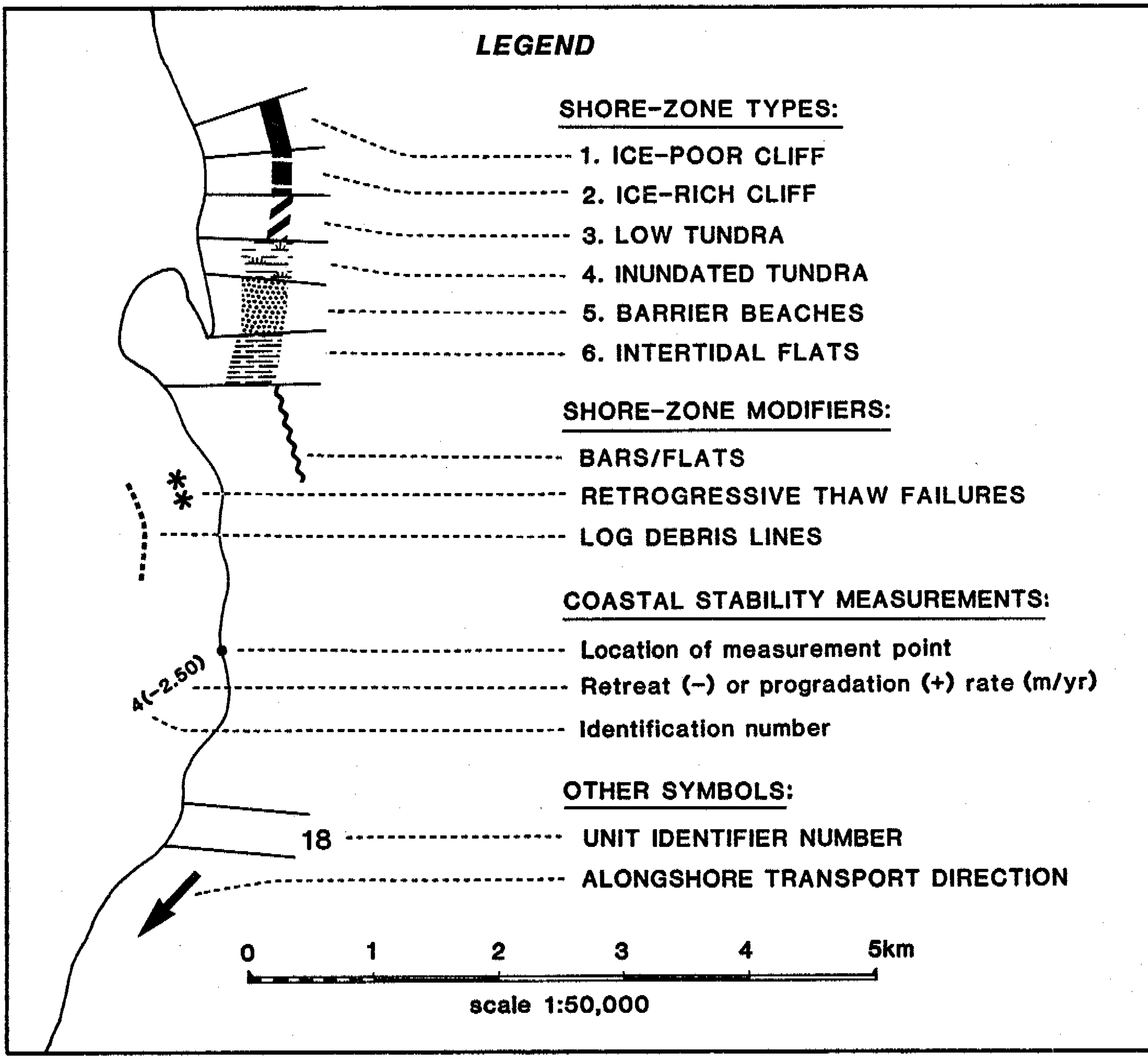

Locality #12
84
83
82
11(-0.64)
10(-0.48)
9(-0.84)
8(-0.04)
7(-0.10)
6(-0.90)
5(-0.92)
4(-0.78)
3(-2.64)
2(-0.94)
1(-1.26)
RIVER


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000

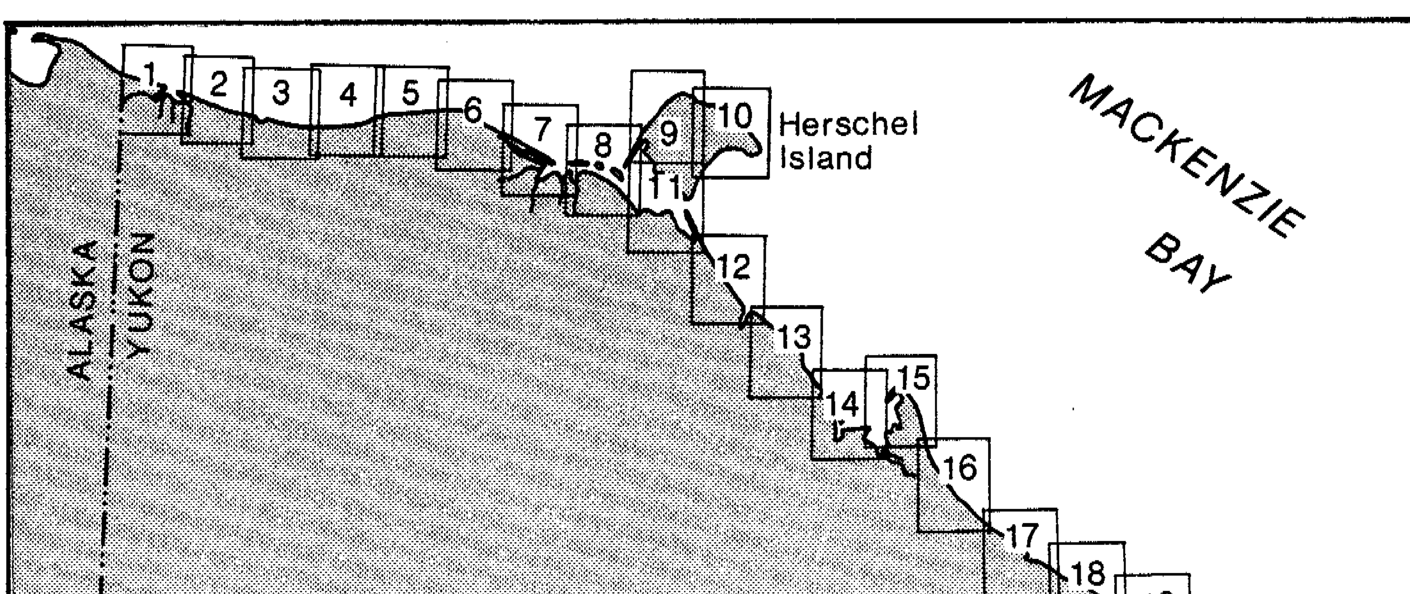

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Herschel Island
MACKENZIE BAY
ALASKA
YUKON



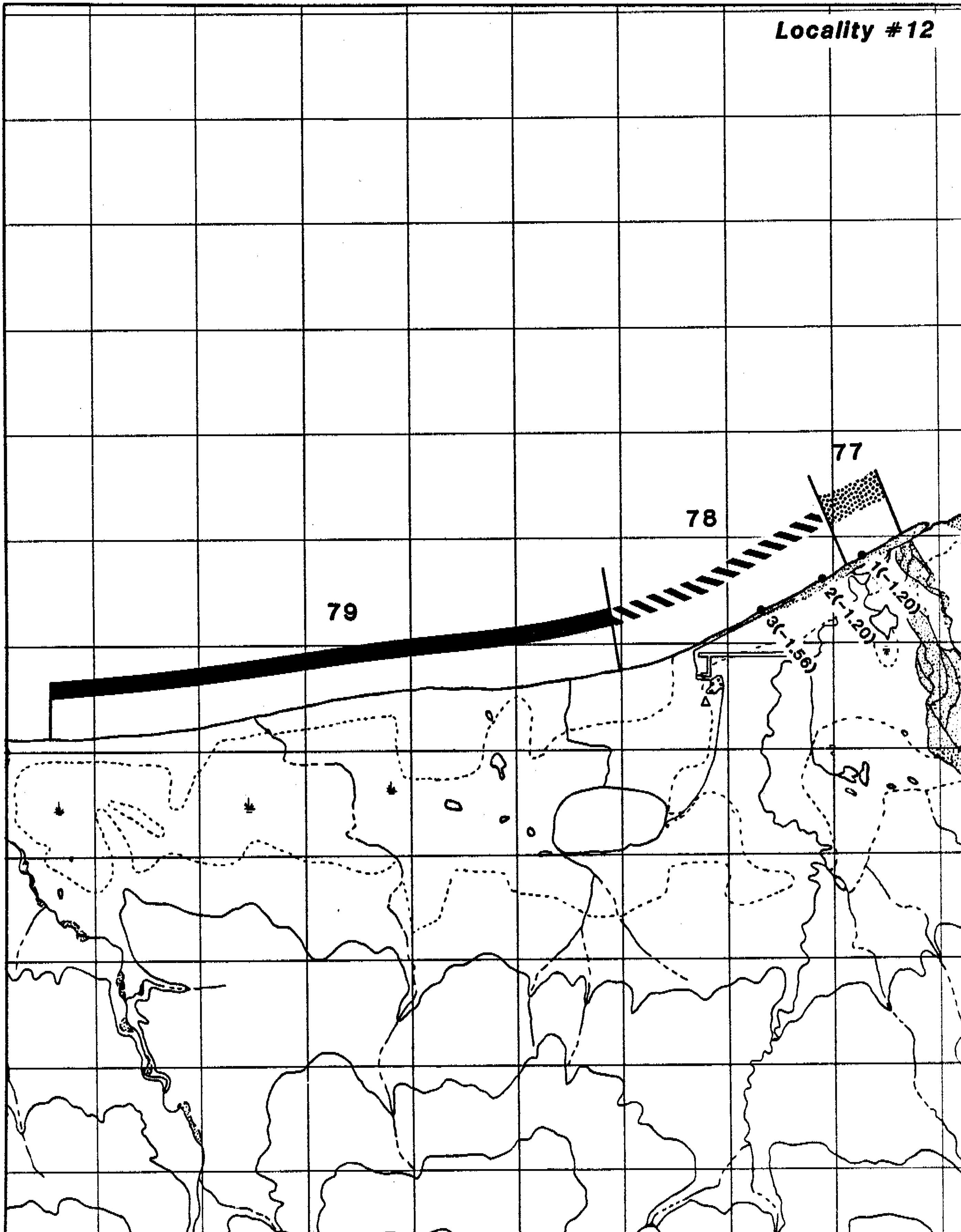
Locality #12
82
81
80
79
12(-1.18)
11(-0.98)
10(0.04)
9(-1.68)
8(-0.08)
7(-1.32)
6(-0.16)
5(-2.62)
4(-2.02)
3(-1.66)
2(-1.26)
1(-0.82)
100

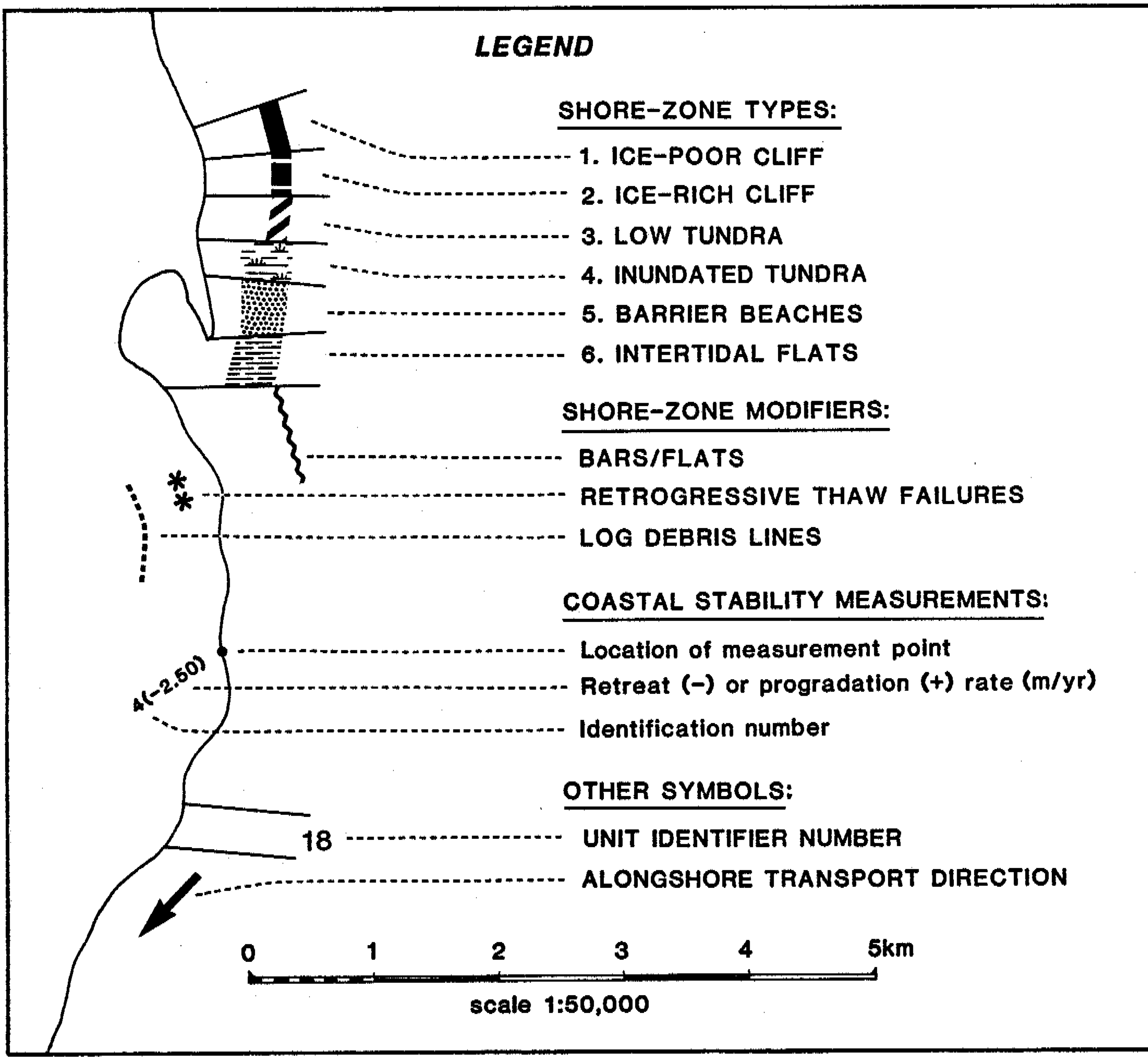


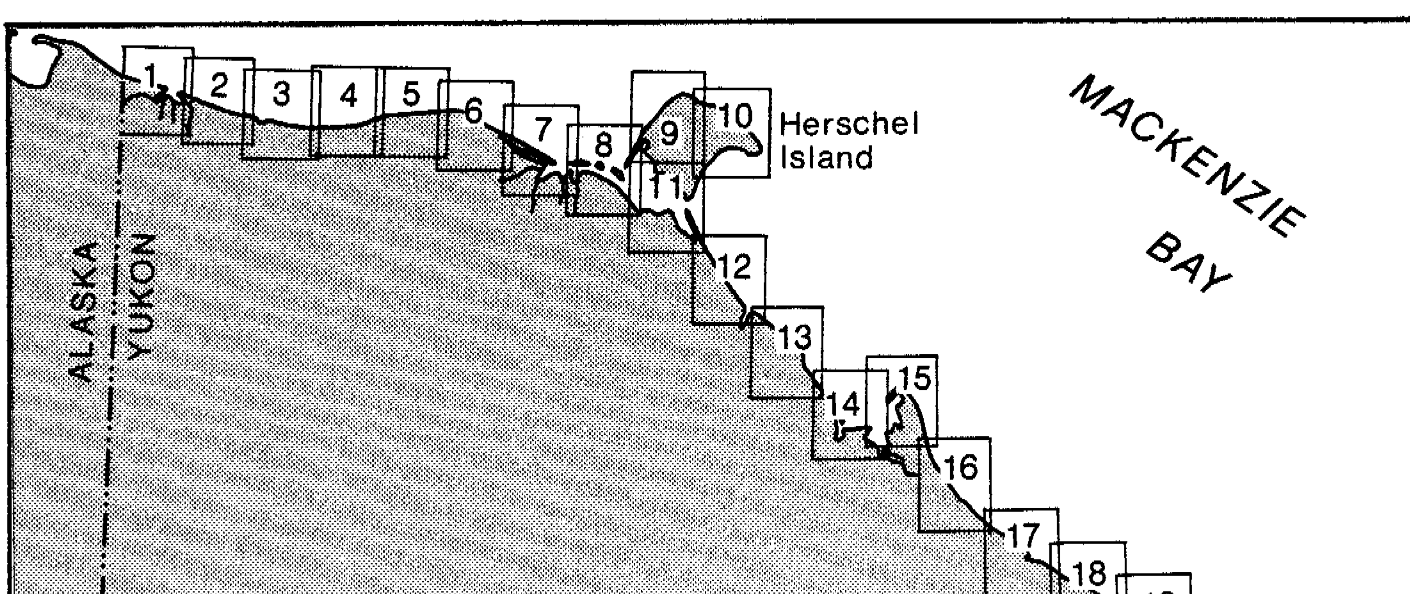
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000

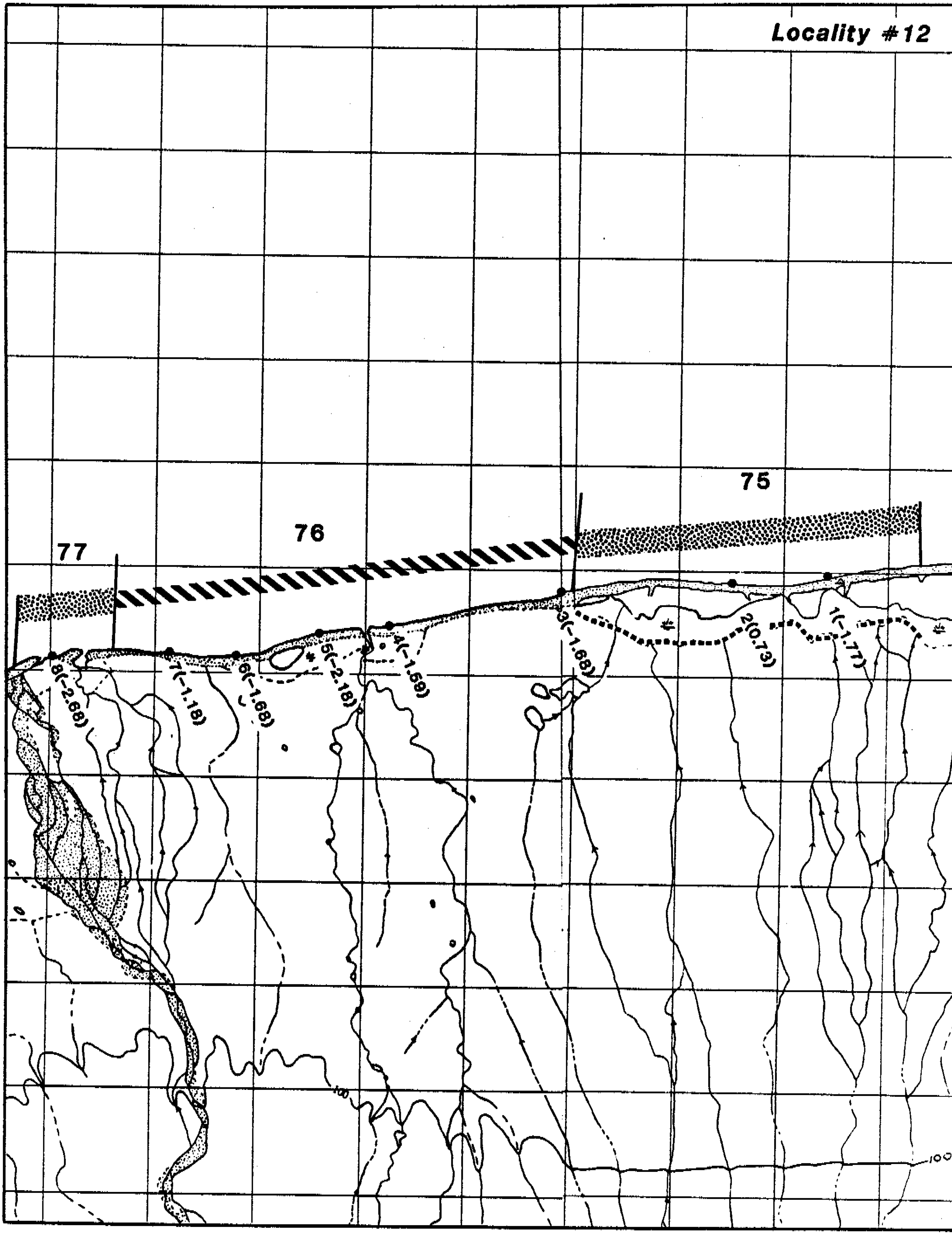


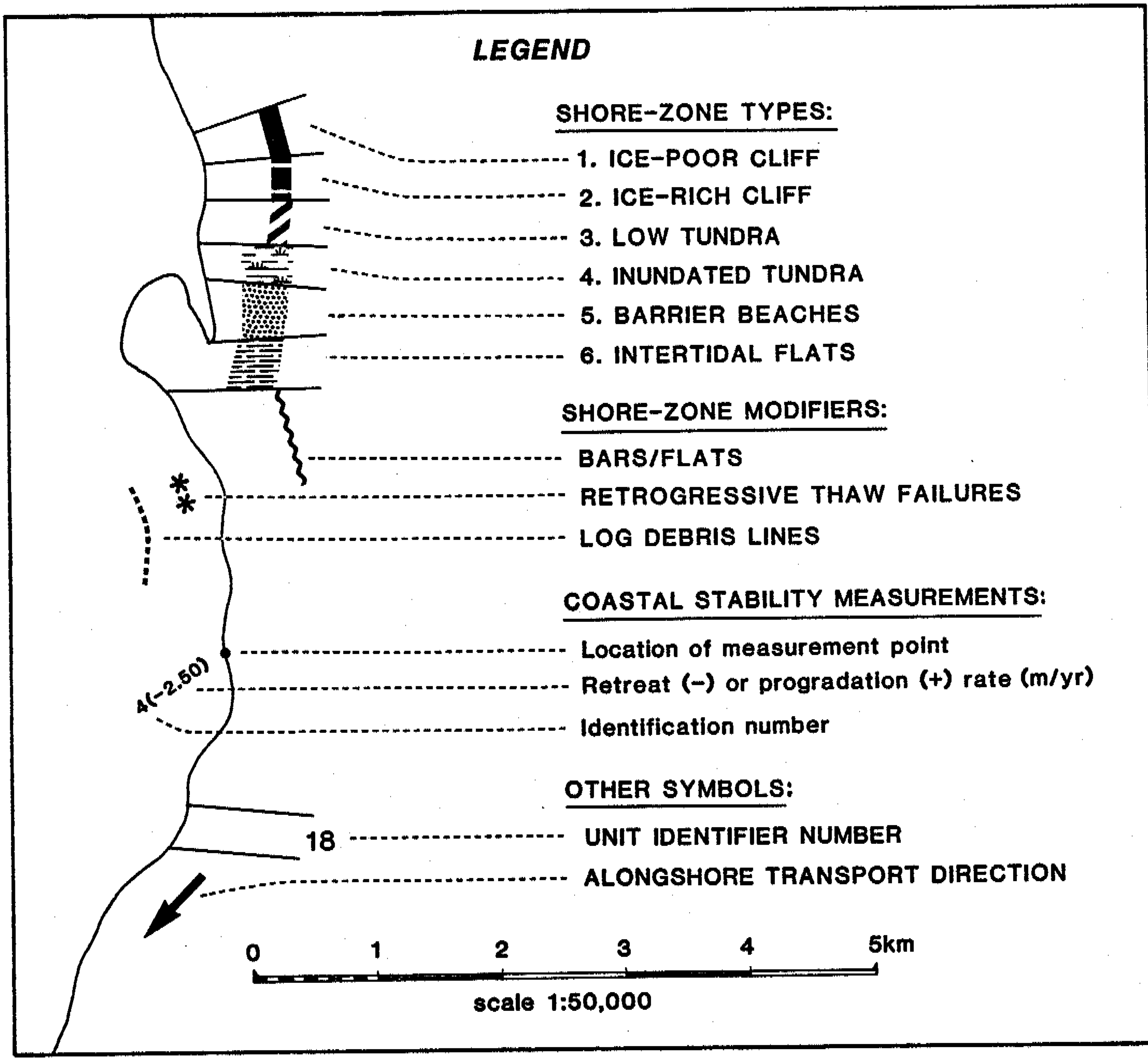
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Herschel Island
MACKENZIE BAY
ALASKA
YUKON

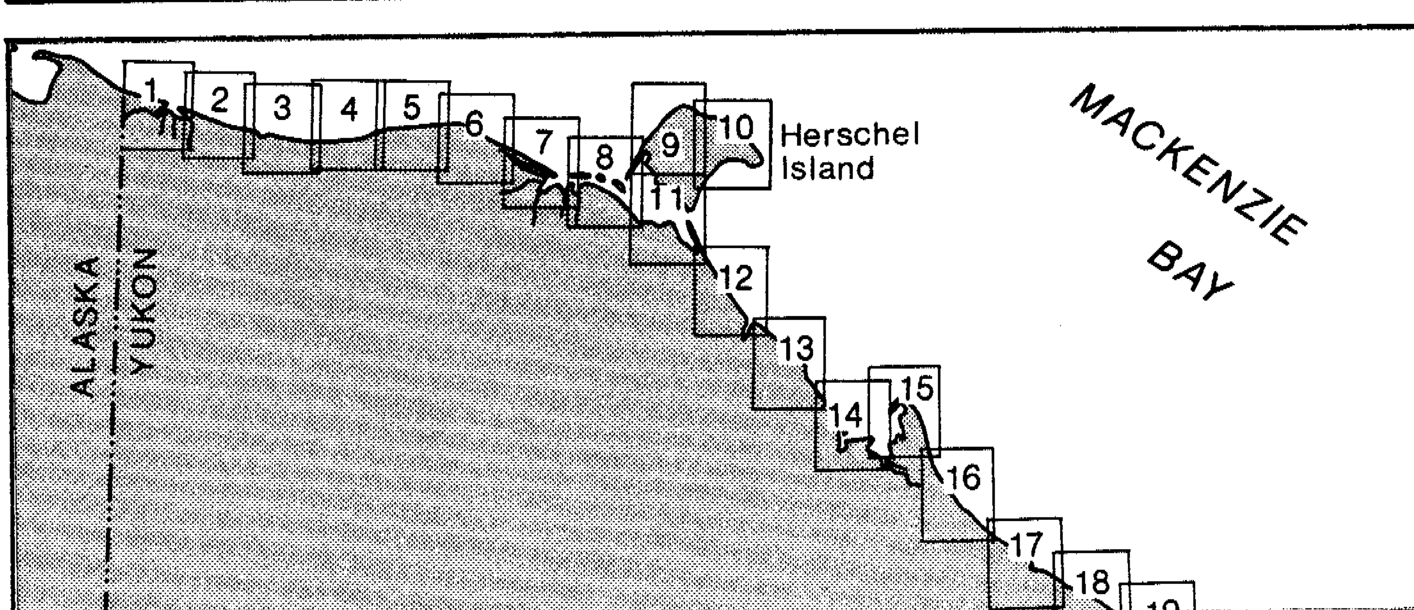

Locality #12
77
78
79
1(−1.20)
2(−1.20)
3(−1.56)

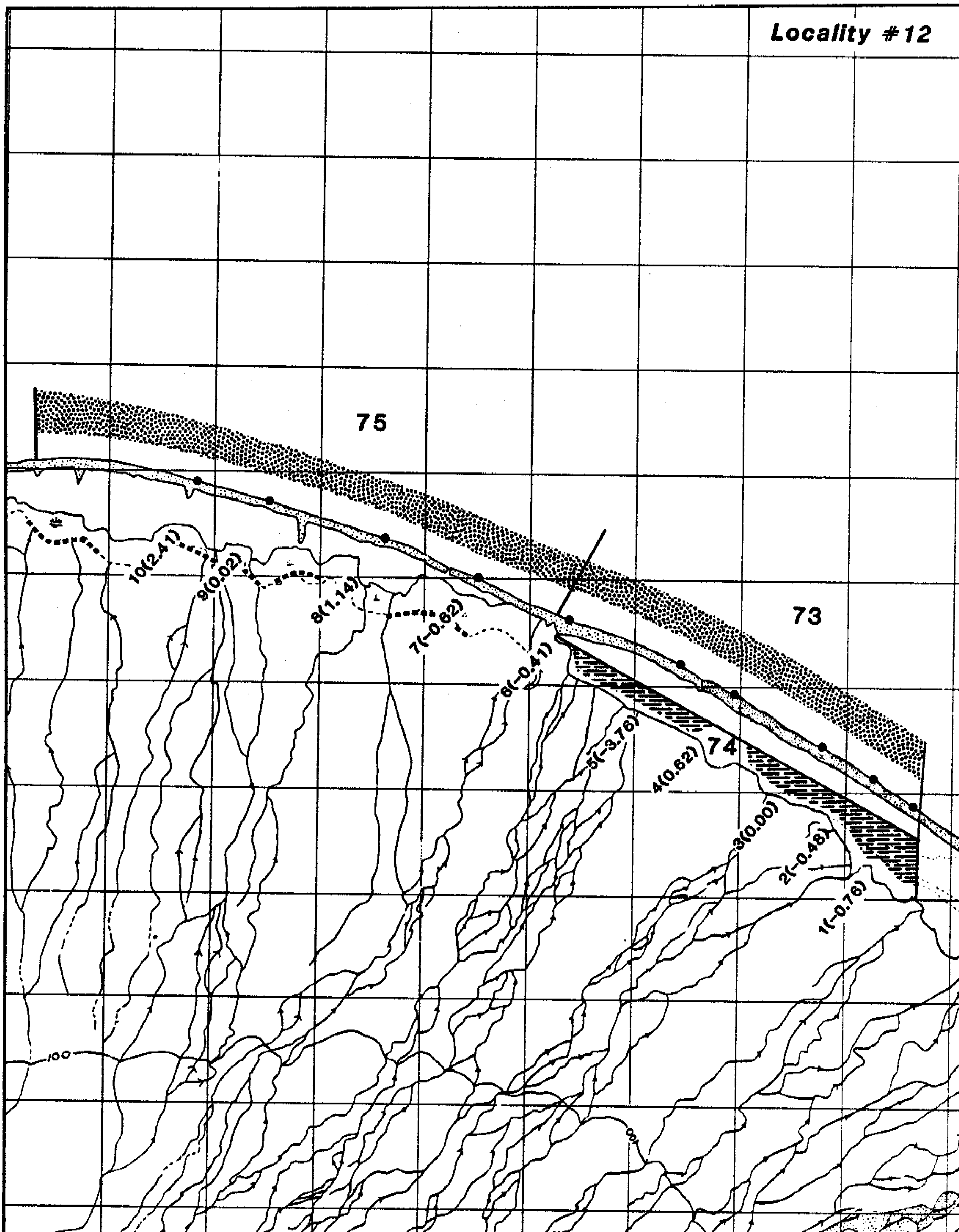

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


1
2
3
4
5
6
7
8
9
10
Herschel Island
11
12
13
14
15
16
17
18
MACKENZIE BAY
ALASKA
YUKON

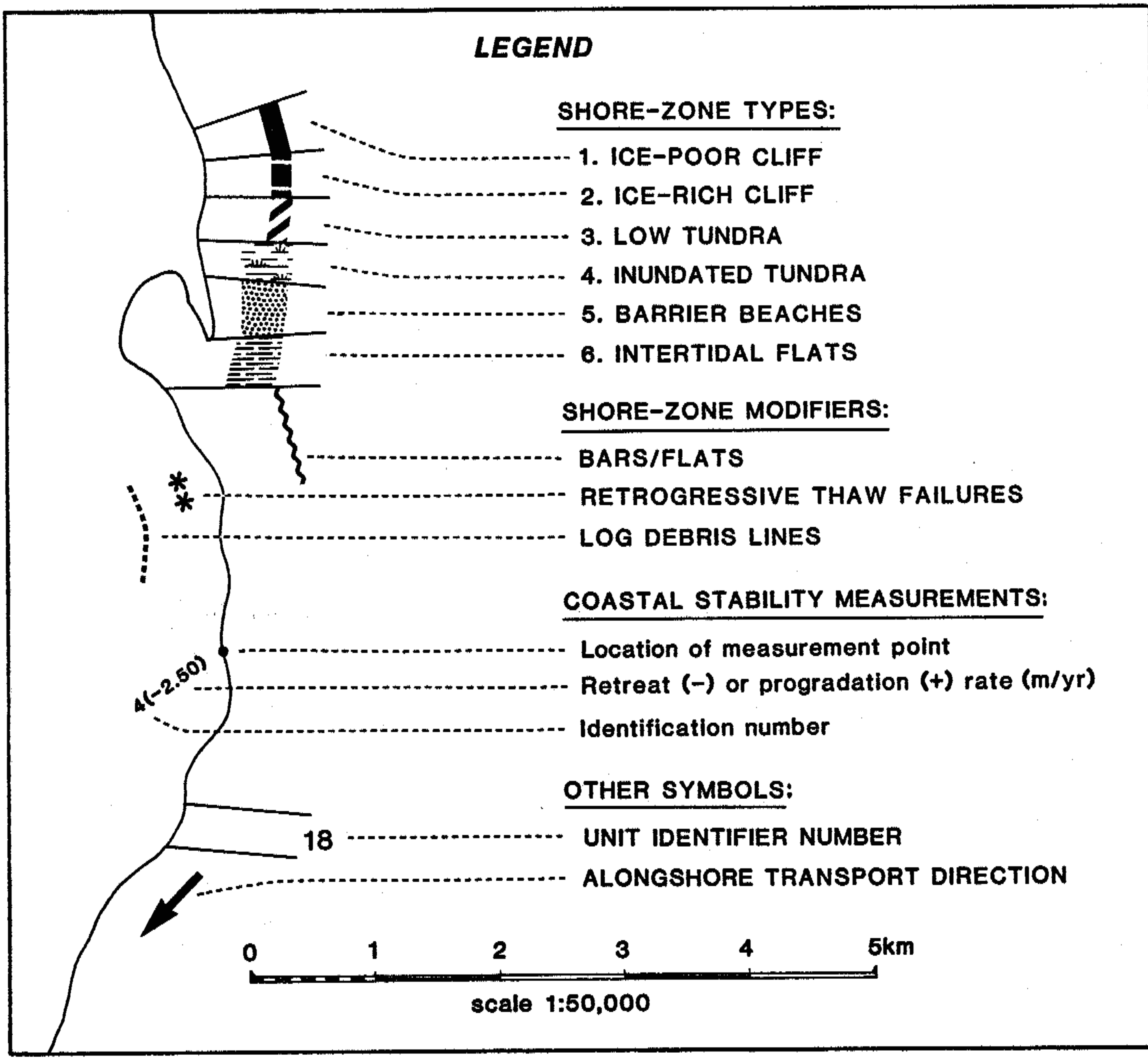

Locality #12
75
76
77
8(−2.68)
7(−1.18)
6(−1.68)
5(−2.18)
4(−1.59)
3(−1.68)
2(0.73)
1(−1.77)
100
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(–2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000

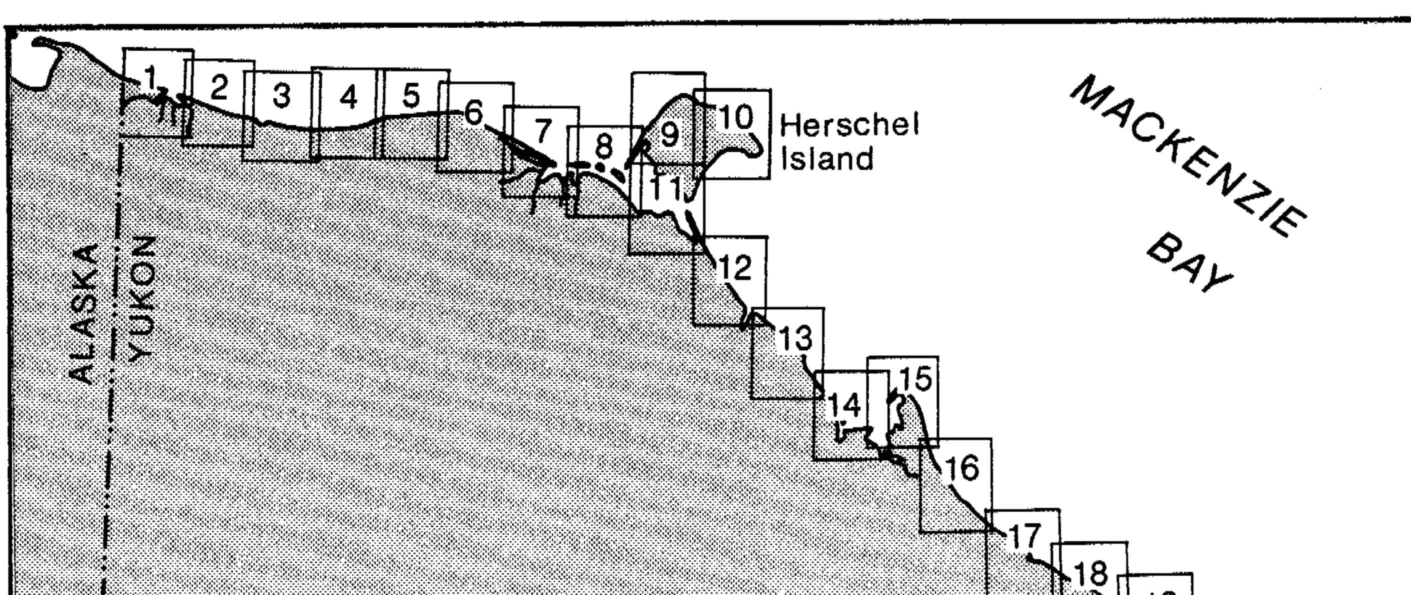

ALASKA
YUKON
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Herschel Island
MACKENZIE BAY



Locality #12
75
73
74
10(2.41)
9(0.02)
8(1.14)
7(-0.62)
6(-0.41)
5(-3.76)
4(0.62)
3(0.00)
2(-0.48)
1(-0.76)
100



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



MACKENZIE
BAY
Herschel
Island
ALASKA
YUKON
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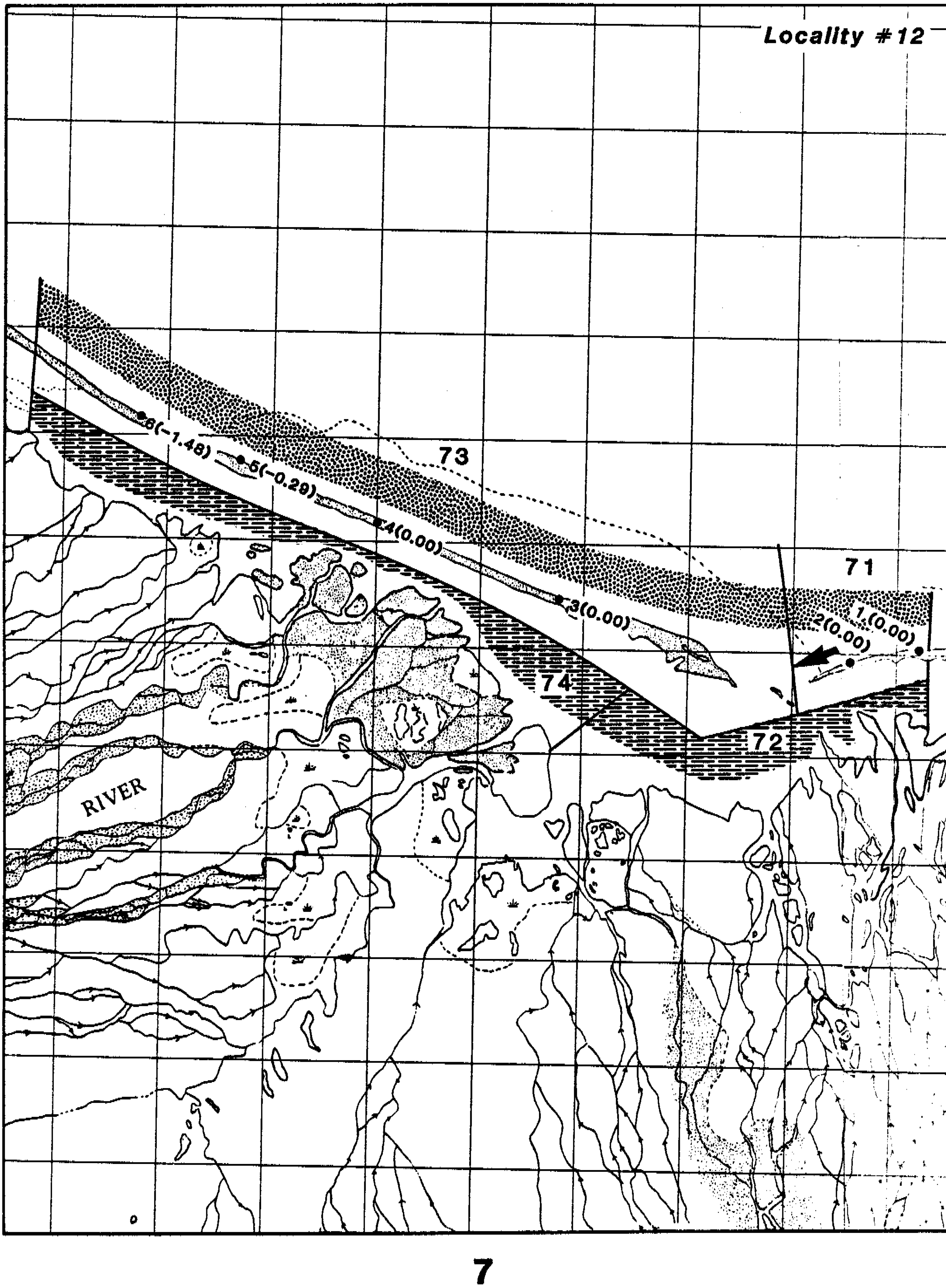
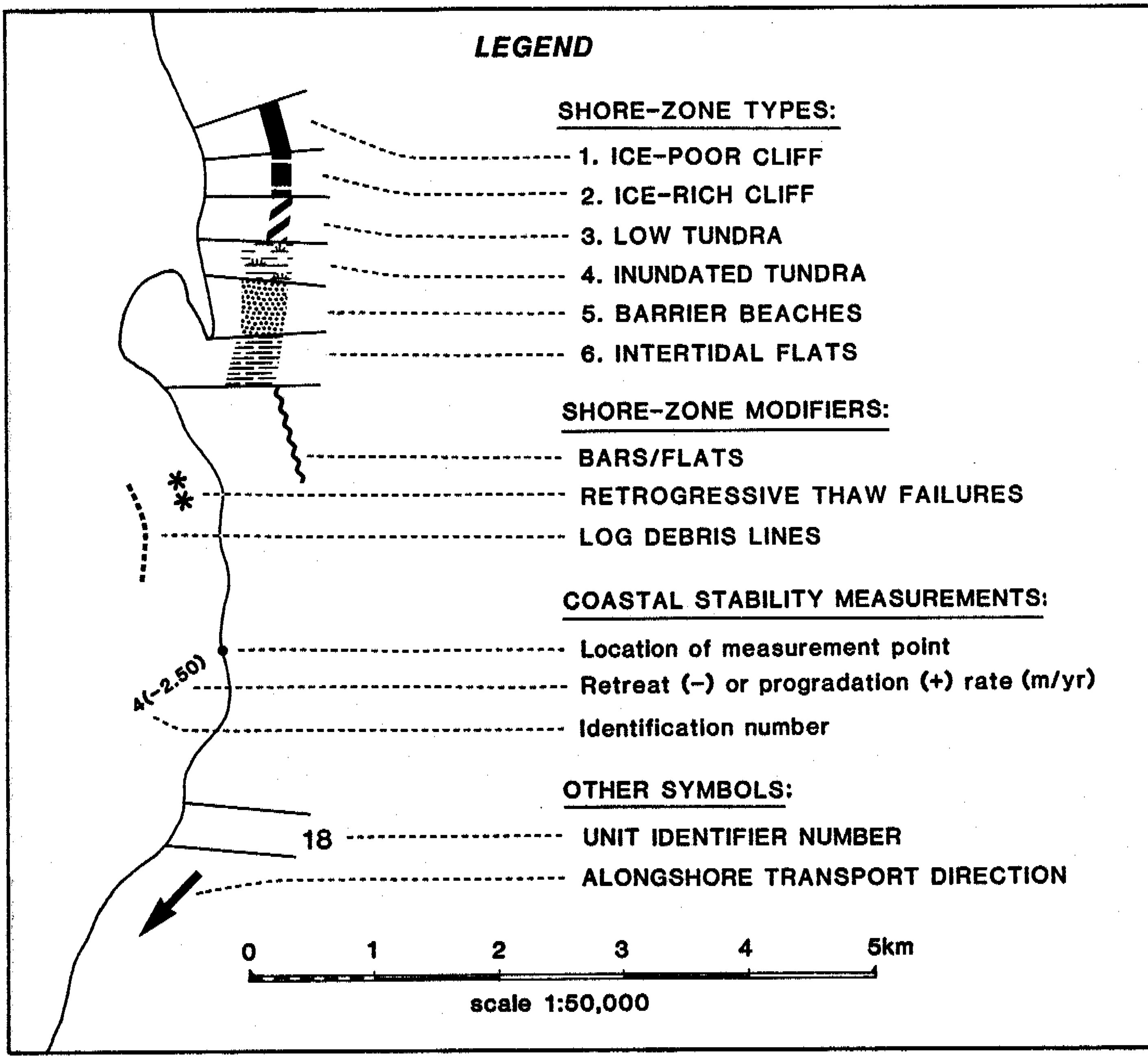
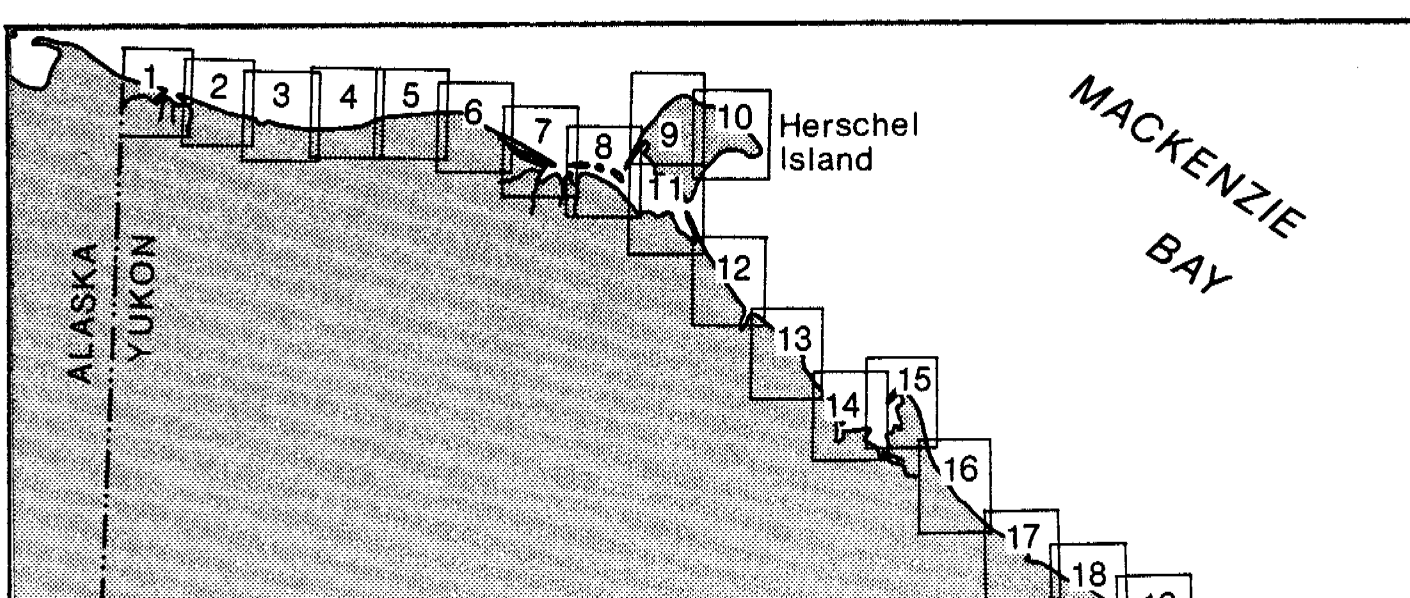
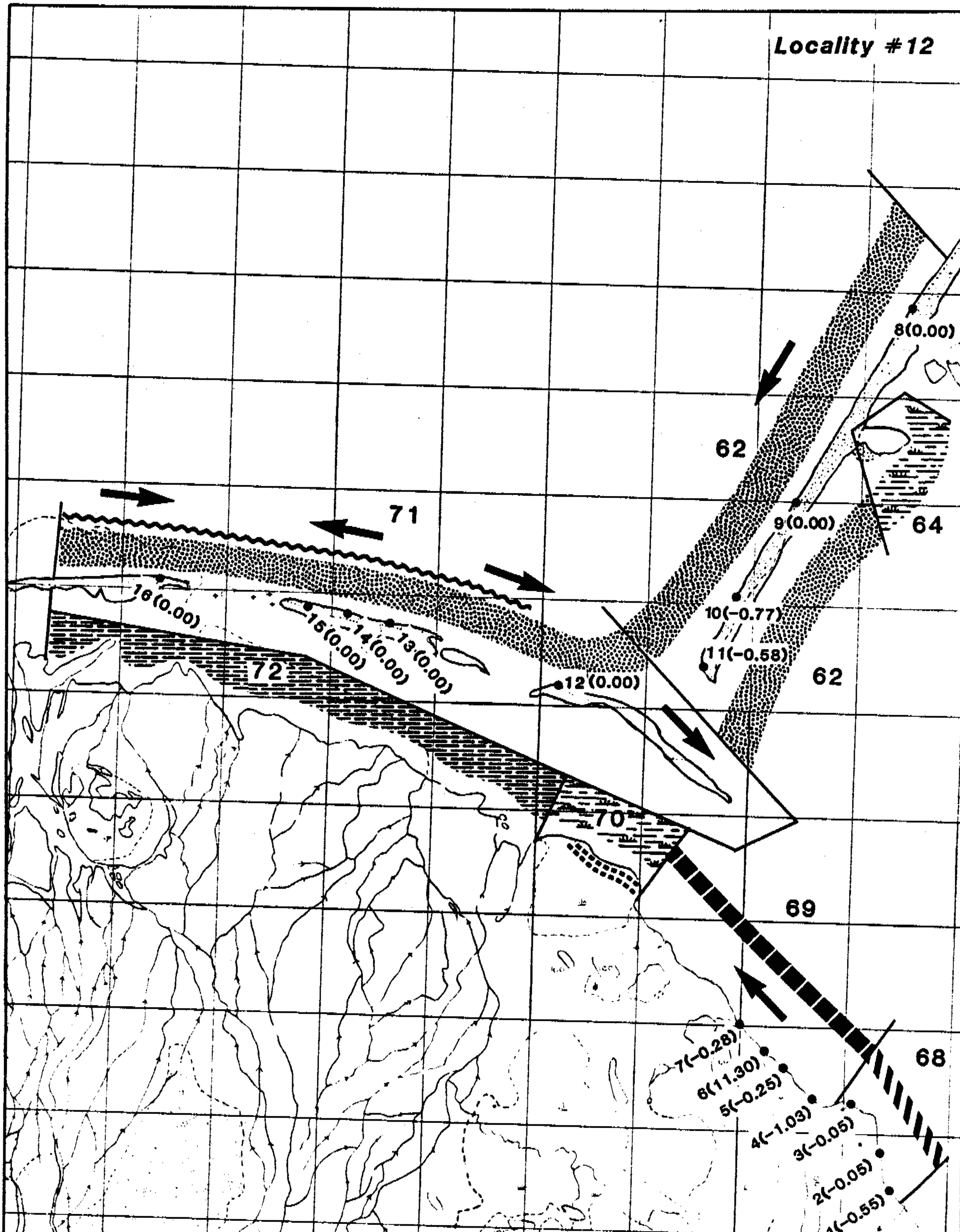
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

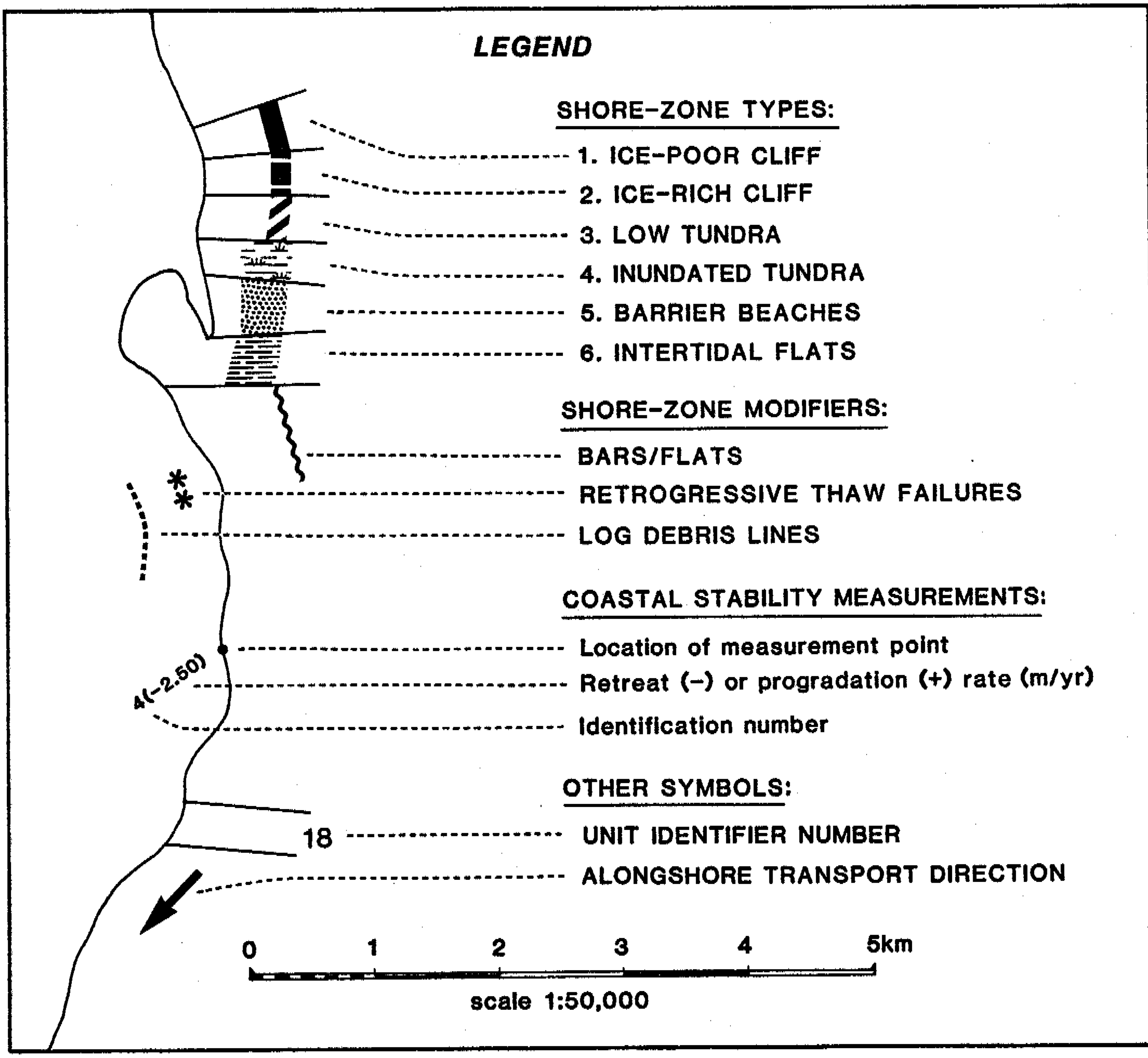

Locality #12
73
71
74
72
6(-1.48)
5(-0.29)
4(0.00)
3(0.00)
2(0.00)
1(0.00)
RIVER

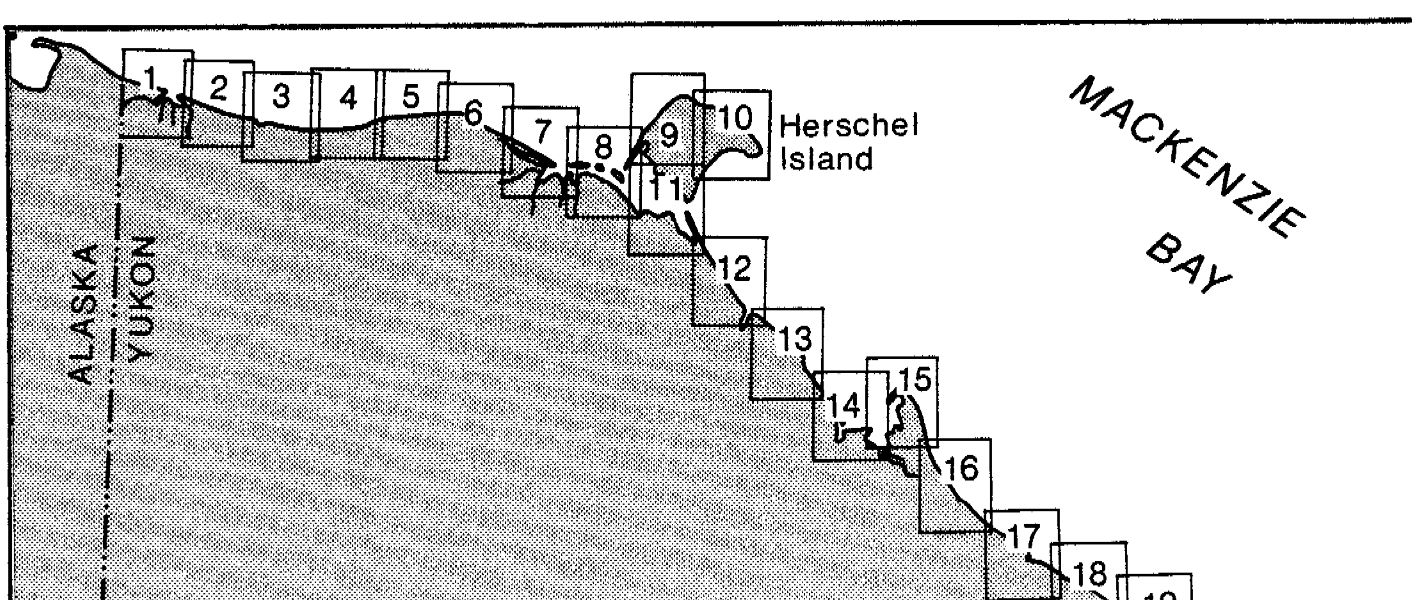

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


ALASKA
YUKON
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Herschel Island
MACKENZIE BAY



Locality #12
8(0.00)
62
64
9(0.00)
71
10(-0.77)
11(-0.58)
62
16(0.00)
15(0.00)
14(0.00)
13(0.00)
72
12(0.00)
70
69
68
7(-0.28)
6(11.30)
5(-0.25)
4(-1.03)
3(-0.05)
2(-0.05)
1(-0.55)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


1
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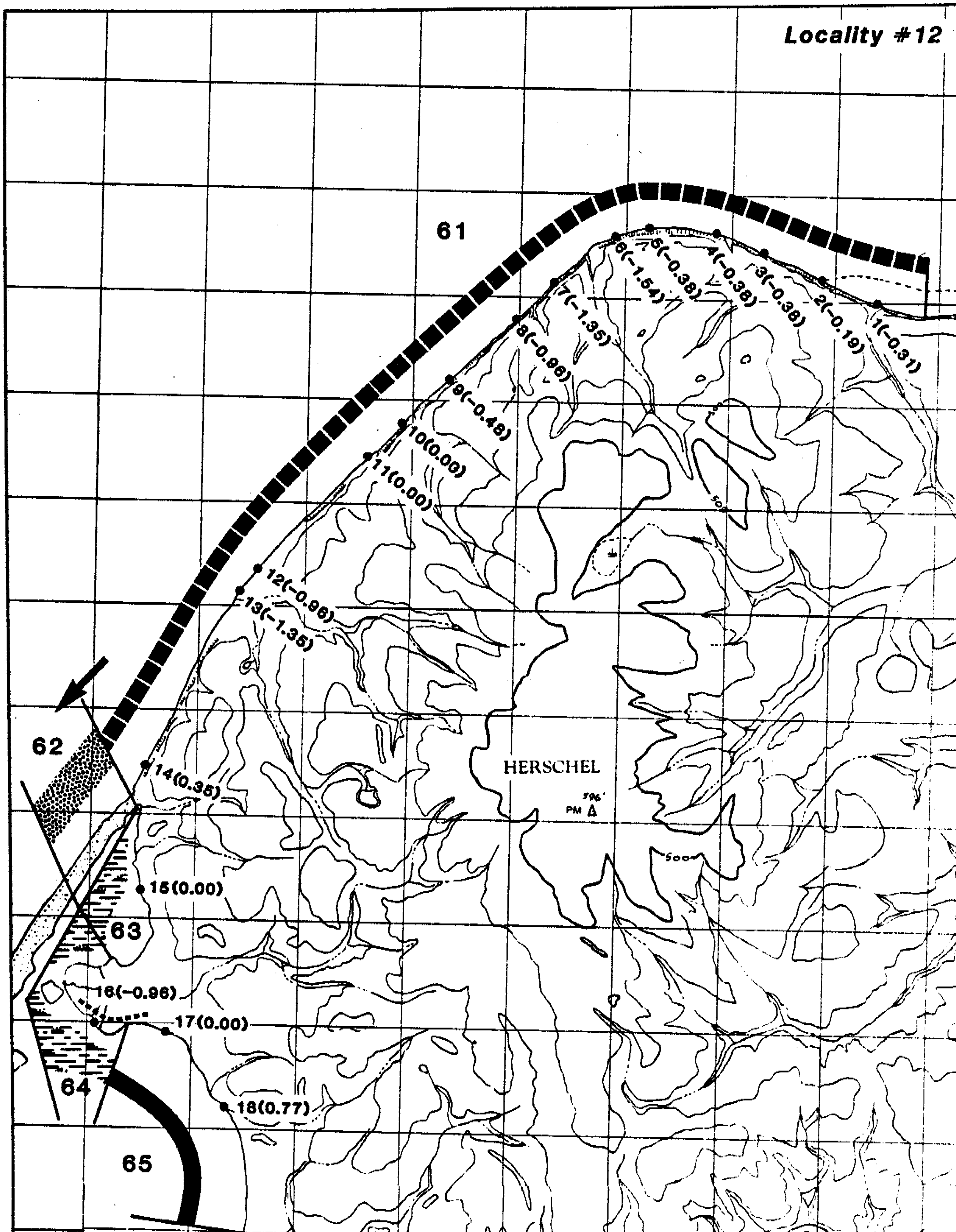
18
Herschel Island
MACKENZIE BAY
ALASKA
YUKON



Locality #12
61
62
63
64
65
HERSCHEL
596'
PM
500
1(-0.31)
2(-0.19)
3(-0.38)
4(-0.38)
5(-0.38)
6(-1.54)
7(-1.35)
8(-0.96)
9(-0.48)
10(0.00)
11(0.00)
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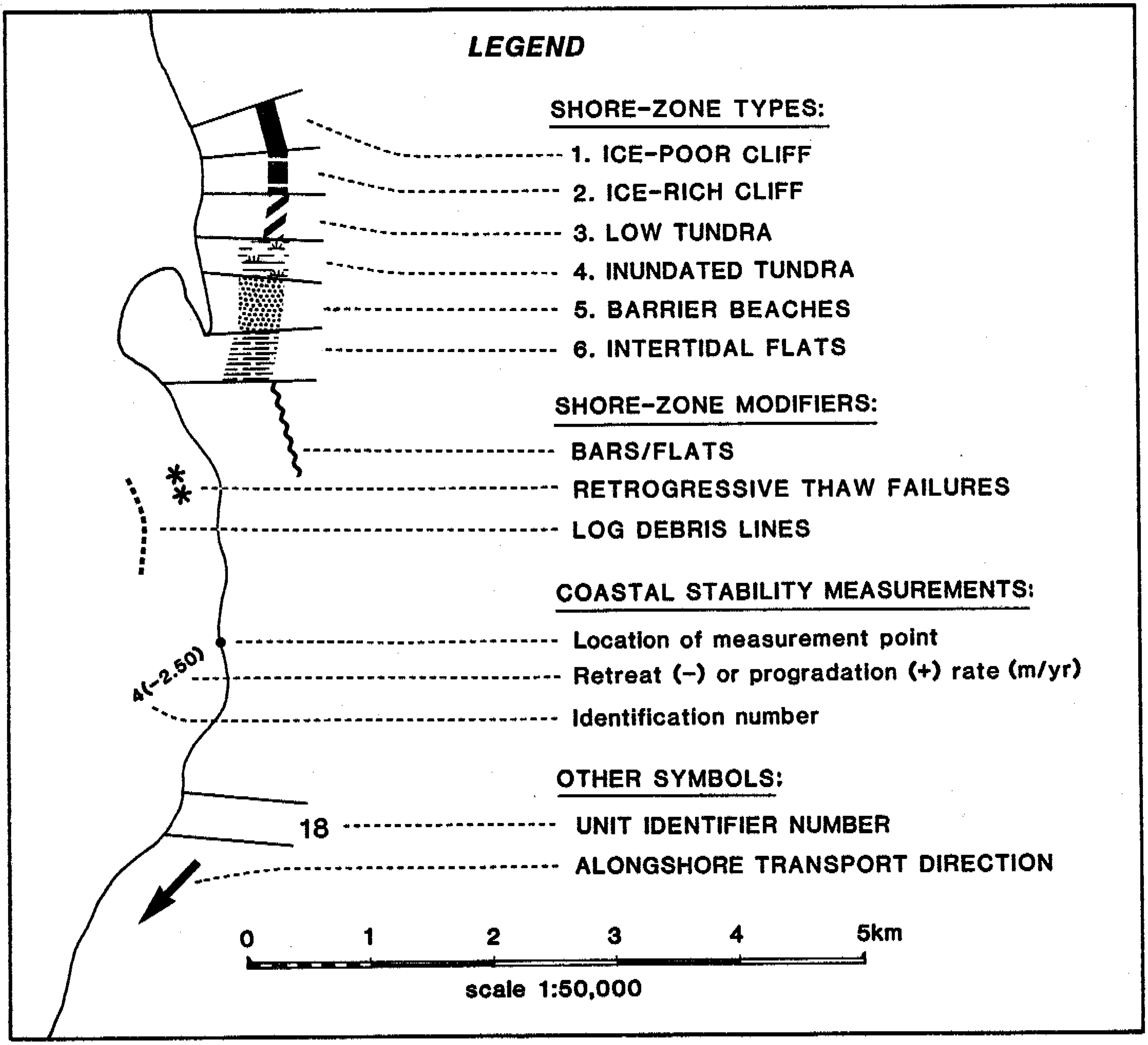
14(0.35)
15(0.00)
16(-0.96)
17(0.00)
18(0.77)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(–2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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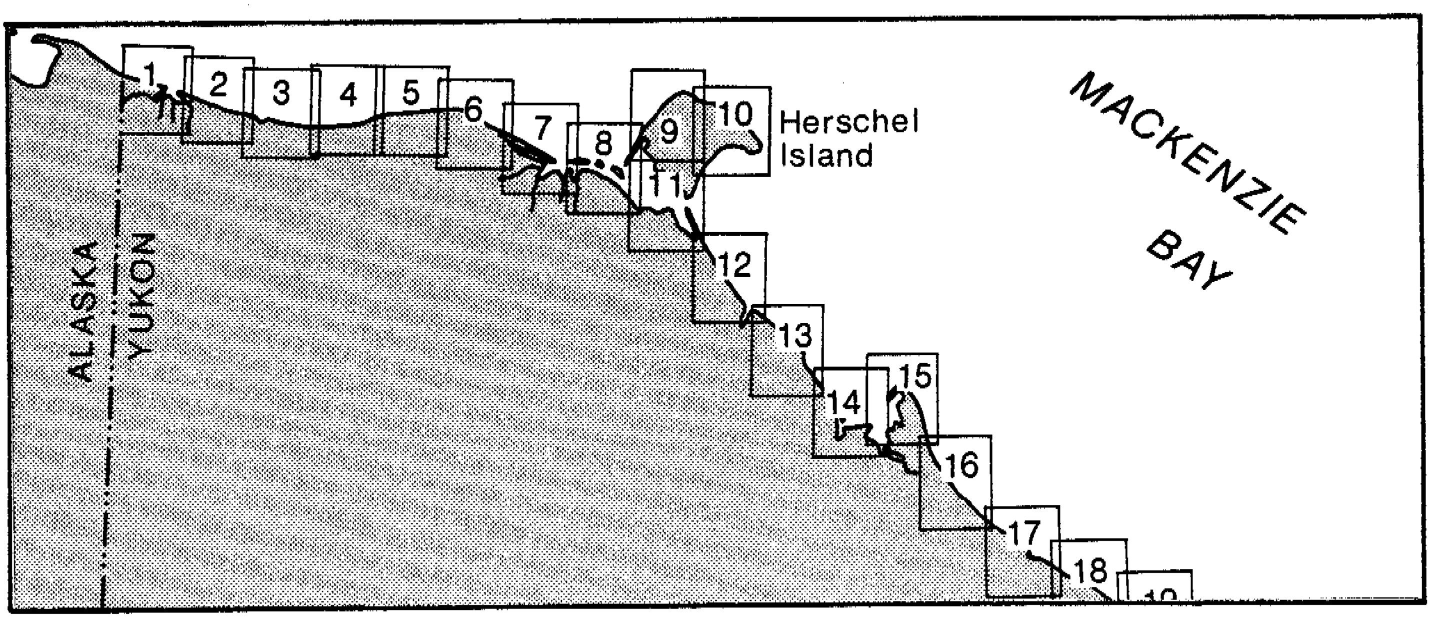
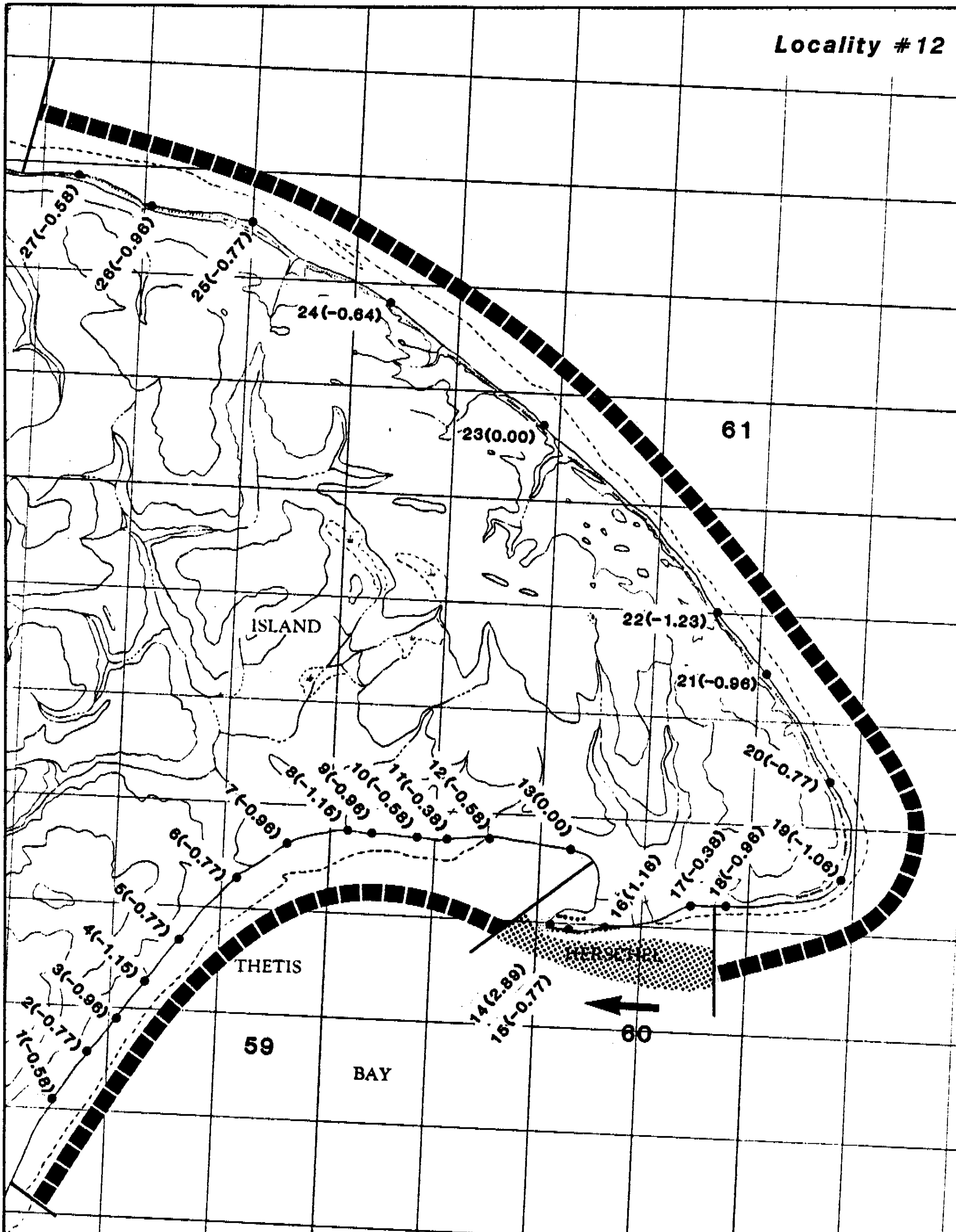
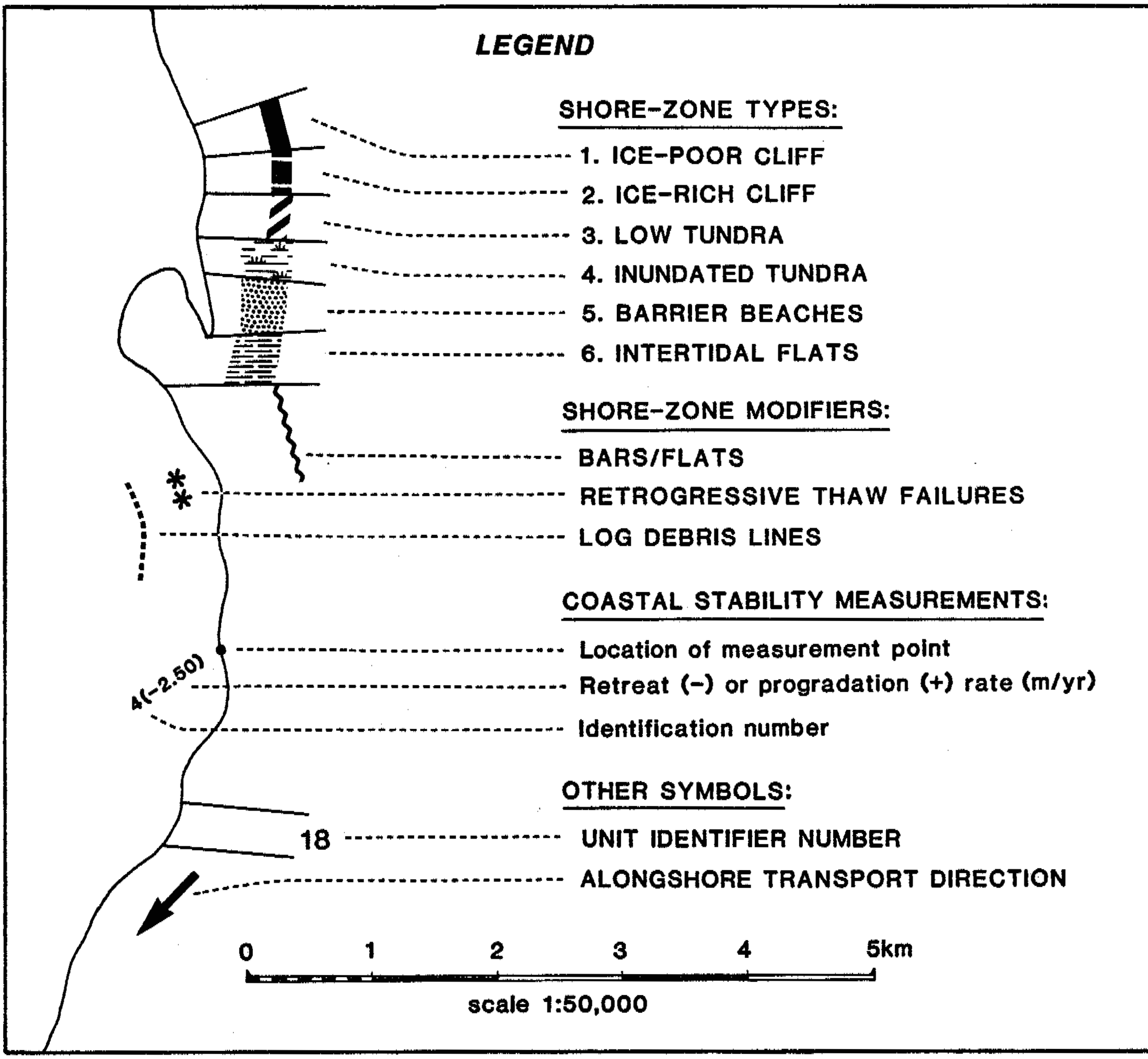
scale 1:50,000


MACKENZIE BAY
Herschel Island
ALASKA
YUKON
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18


Locality #12
61
ISLAND
THETIS
HERSCHEL
59
BAY
60
27(-0.58)
26(-0.96)
25(-0.77)
24(-0.64)
23(0.00)
22(-1.23)
21(-0.96)
20(-0.77)
19(-1.06)
18(-0.96)
17(-0.38)
16(1.16)
15(-0.77)
14(2.89)
13(0.00)
12(-0.58)
11(-0.38)
10(-0.58)
9(-0.96)
8(-1.16)
7(-0.96)
6(-0.77)
5(-0.77)
4(-1.15)
3(-0.96)
2(-0.77)
1(-0.58)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
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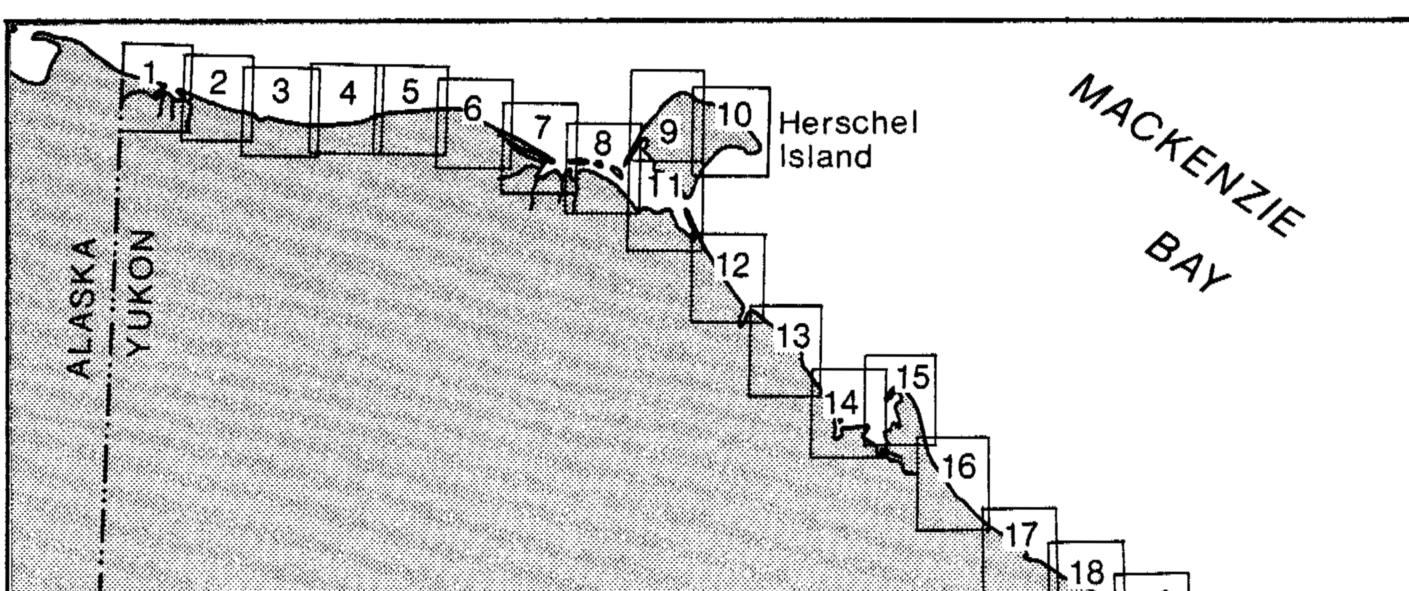
4
5km
scale 1:50,000



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11
Herschel Island
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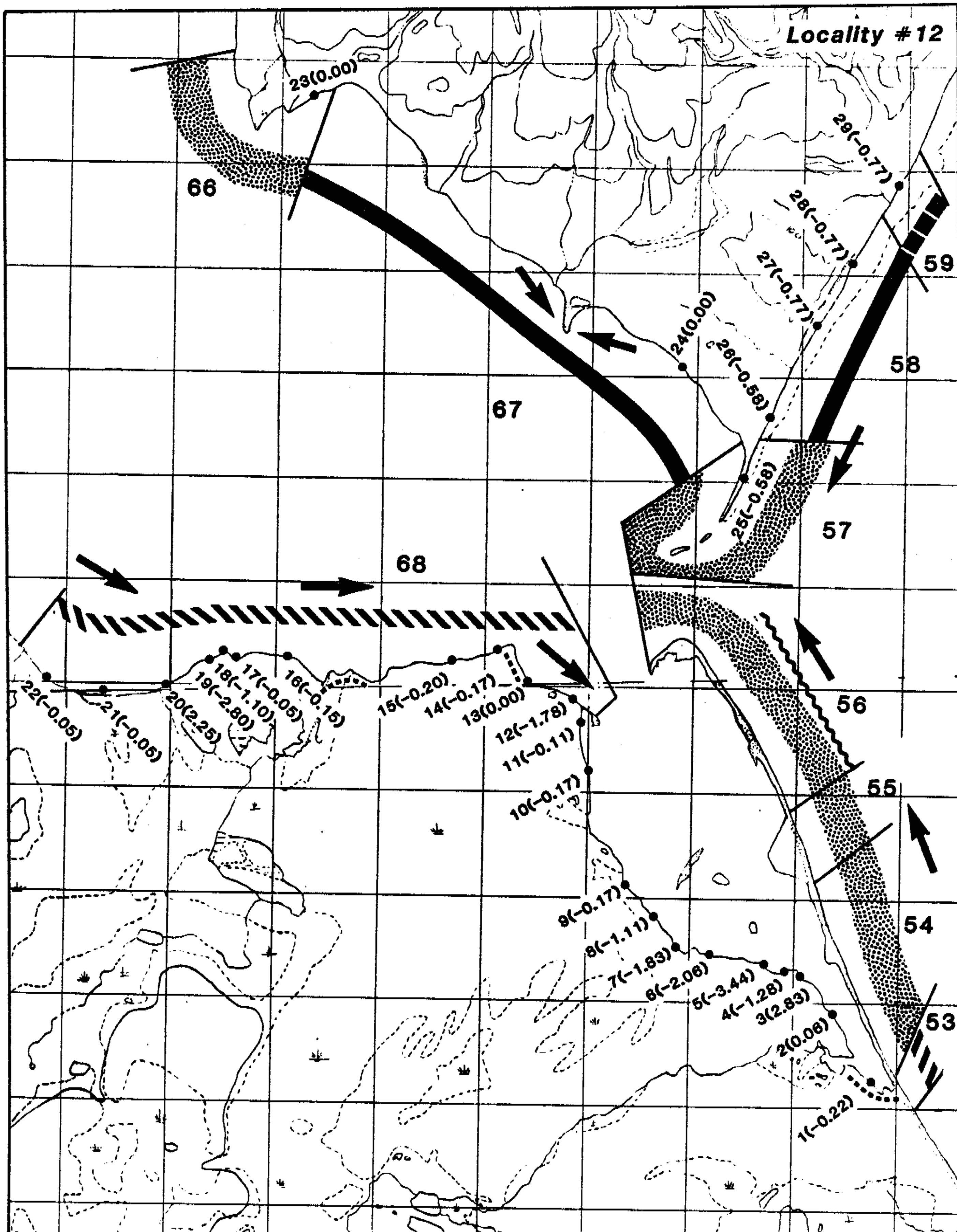
18
MACKENZIE BAY
ALASKA
YUKON


Locality #12
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25(-0.58)
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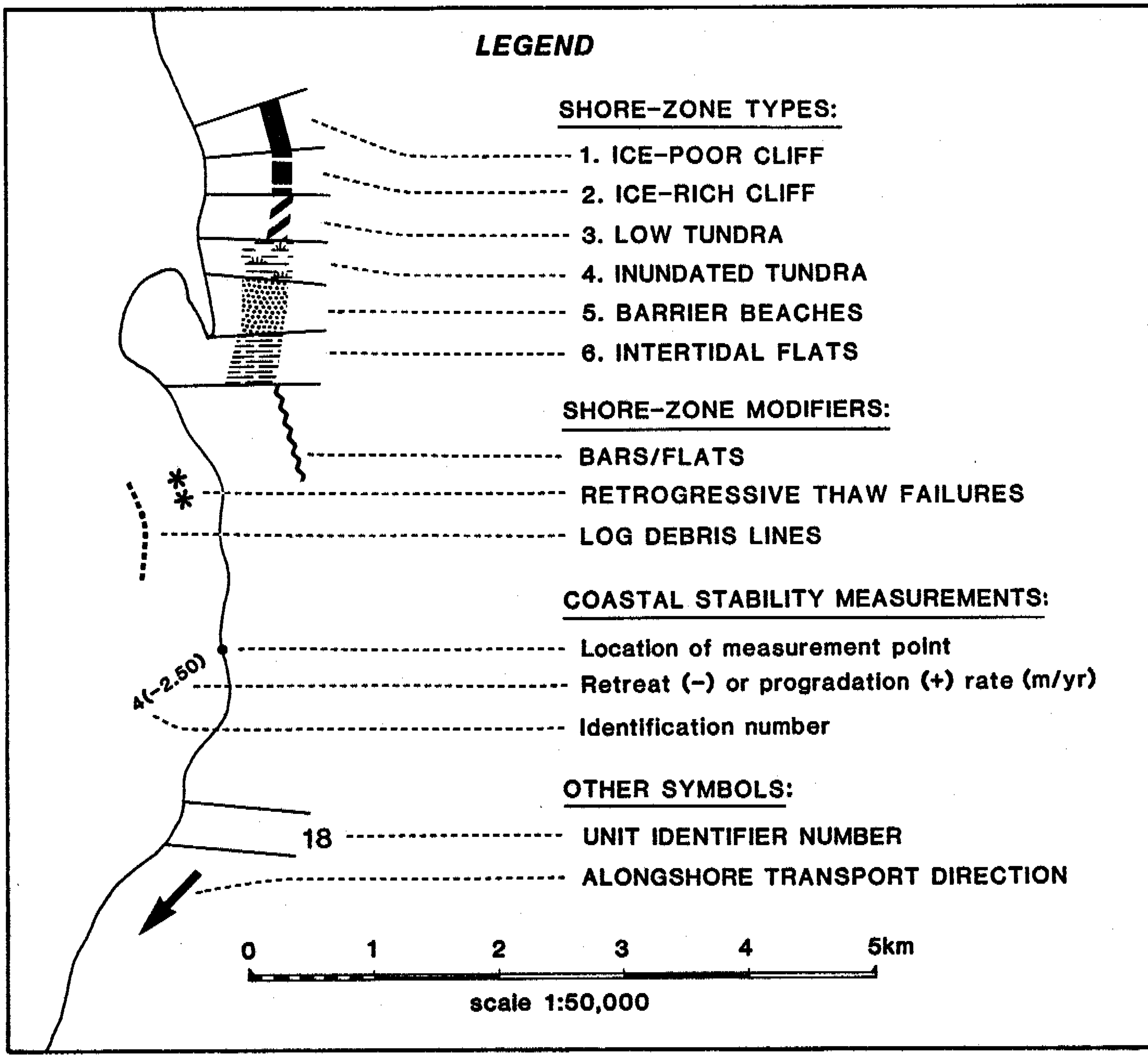
21(-0.05)
20(2.25)
19(-2.80)
18(-1.10)
17(-0.05)
16(-0.15)
15(-0.20)
14(-0.17)
13(0.00)
12(-1.78)
11(-0.11)
10(-0.17)
9(-0.17)
8(-1.11)
7(-1.83)
6(-2.06)
5(-3.44)
4(-1.28)
3(2.83)
2(0.08)
1(-0.22)
66
67
68
59
58
57
56
55
54
53


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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BARS/FLATS
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COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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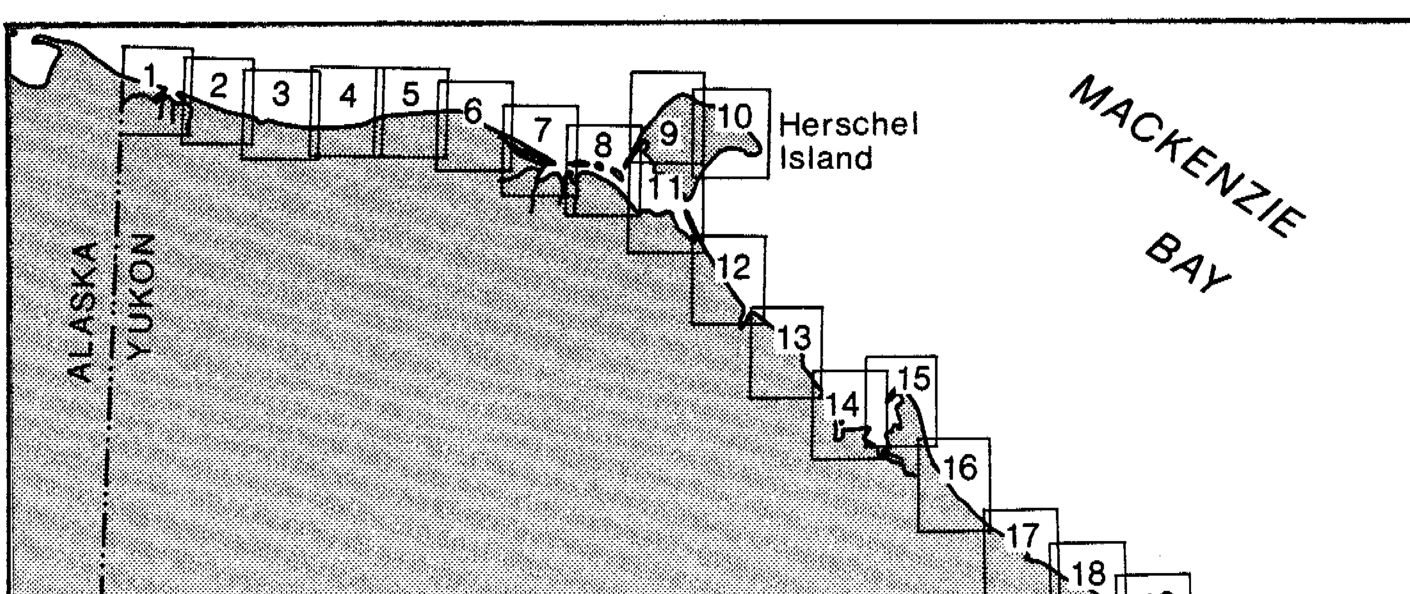
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


ALASKA
YUKON
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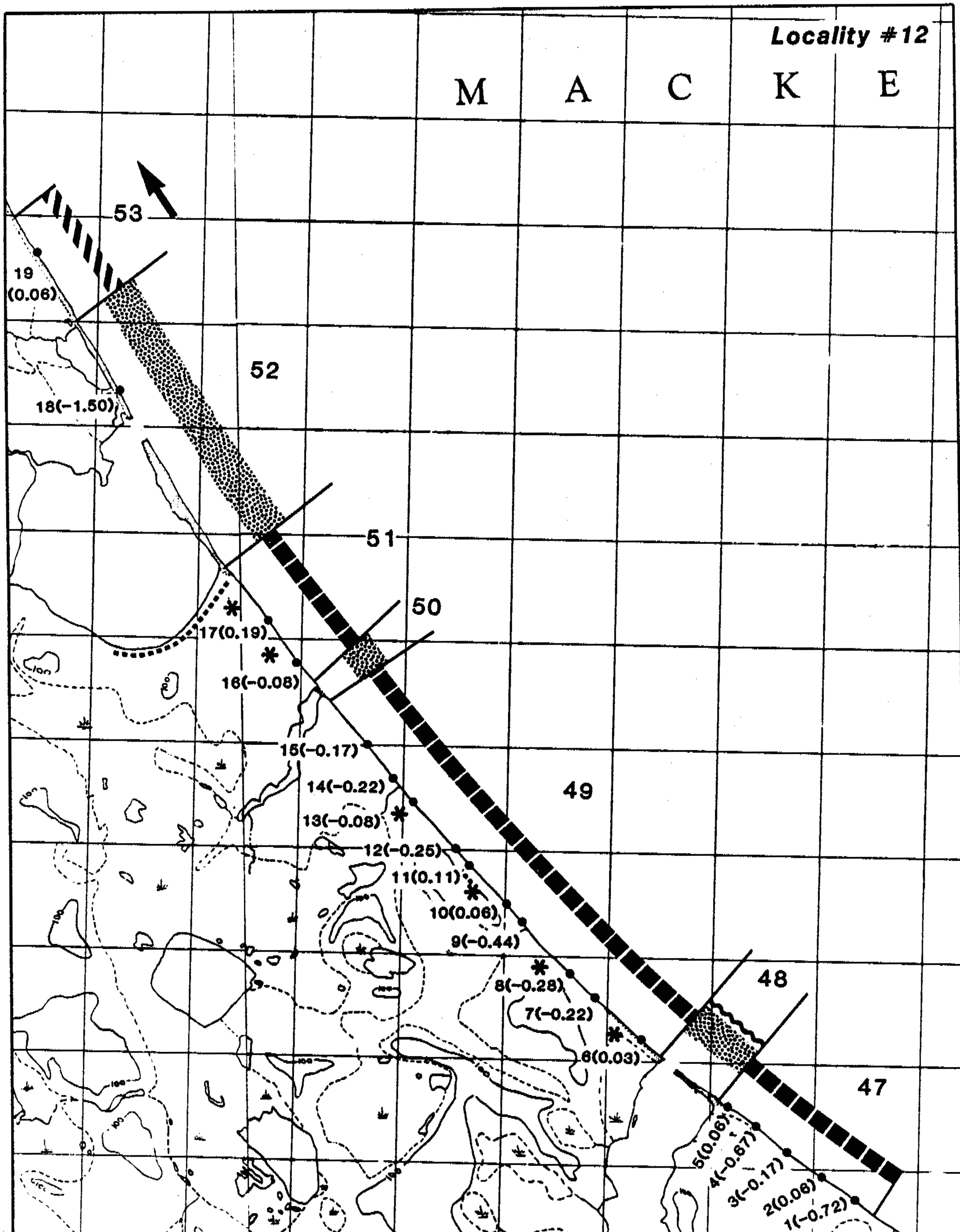
18
Herschel Island
MACKENZIE BAY



Locality #12
M A C K E
53
19
(0.06)
52
18(-1.50)
51
50
17(0.19)
16(-0.08)
15(-0.17)
14(-0.22)
13(-0.08)
12(-0.25)
11(0.11)
10(0.06)
9(-0.44)
49
8(-0.28)
7(-0.22)
6(0.03)
48
47
5(0.06)
4(-0.67)
3(-0.17)
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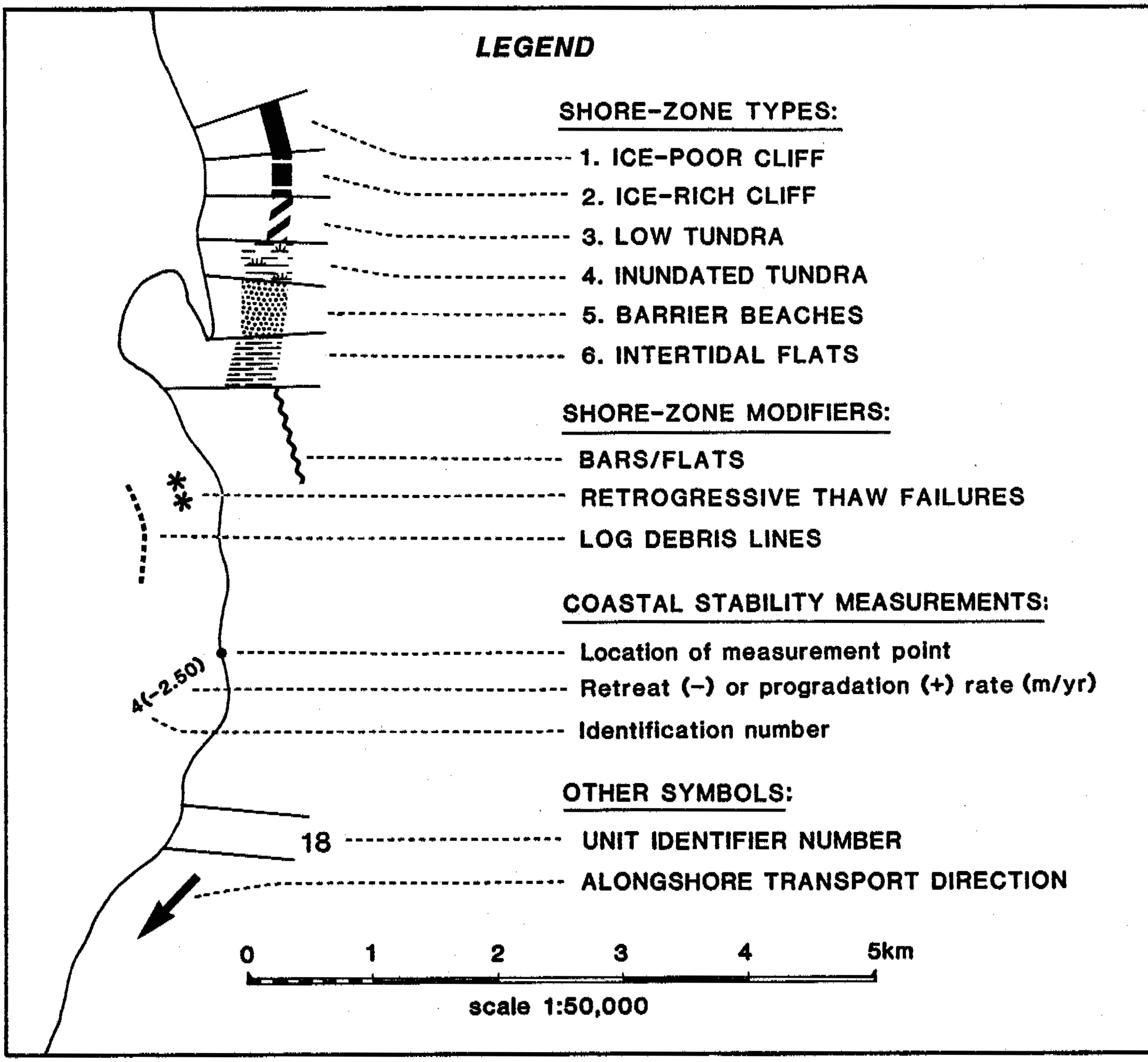
1(-0.72)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
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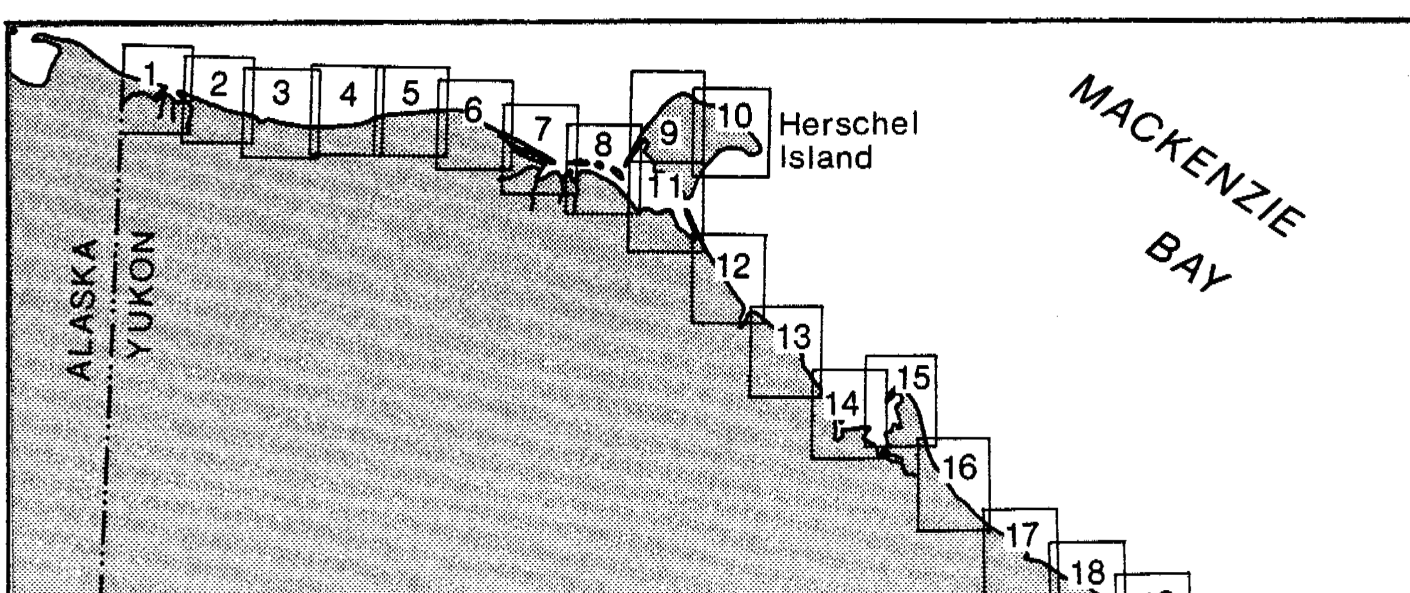
4
5km
scale 1:50,000



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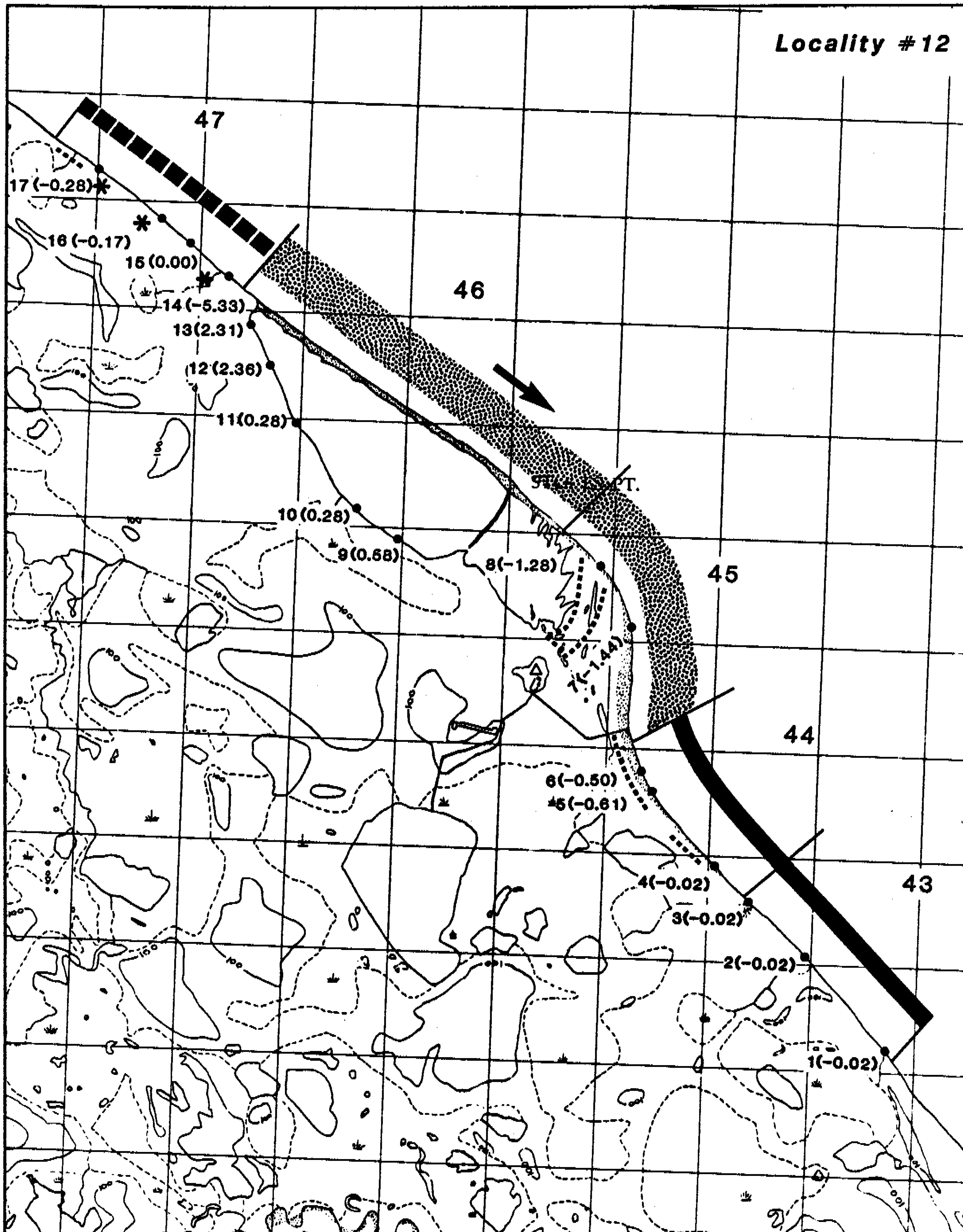
18
Herschel Island
MACKENZIE BAY
ALASKA
YUKON


Locality #12
47
46
45
44
43
17 (-0.28)
16 (-0.17)
15 (0.00)
14 (-5.33)
13(2.31)
12 (2.36)
11(0.28)
10 (0.28)
9(0.58)
8(-1.28)
7(-1.44)
6(-0.50)
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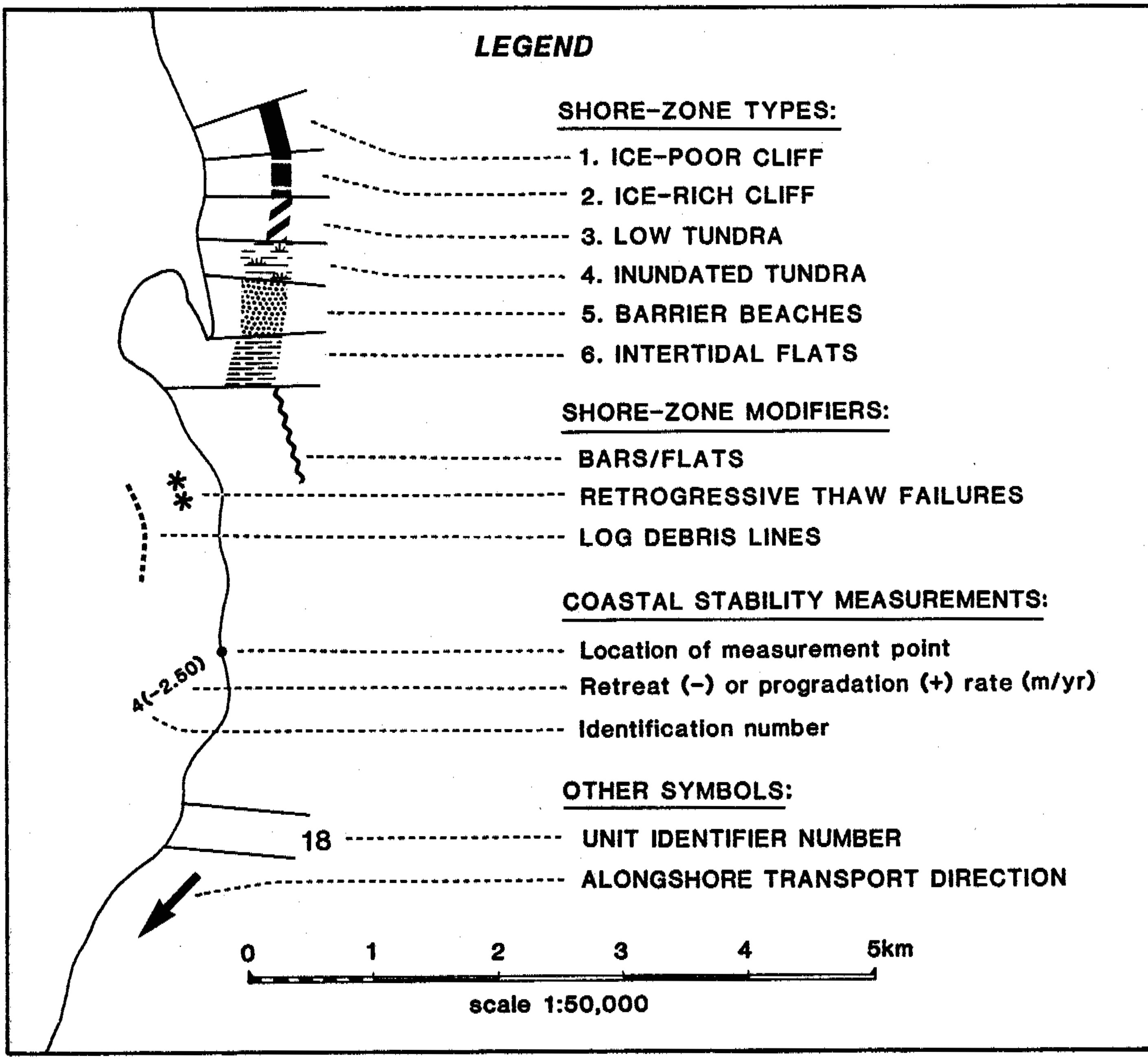
1(-0.02)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
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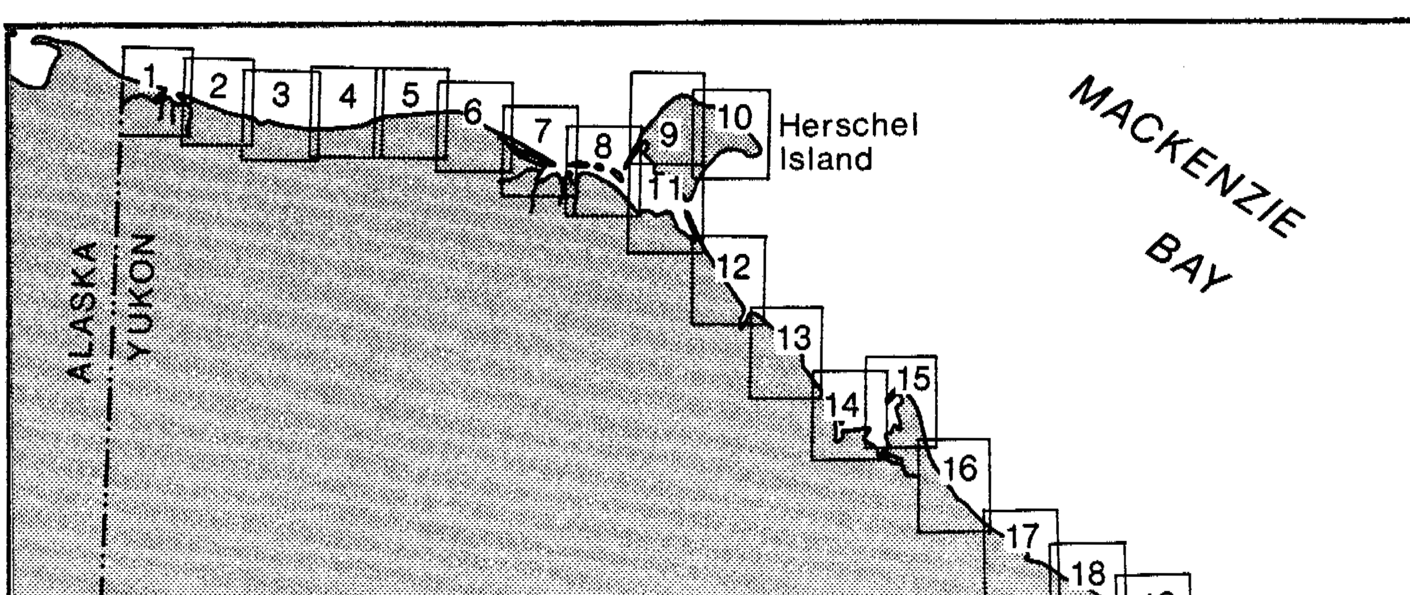
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


ALASKA
YUKON
Herschel Island
MACKENZIE BAY
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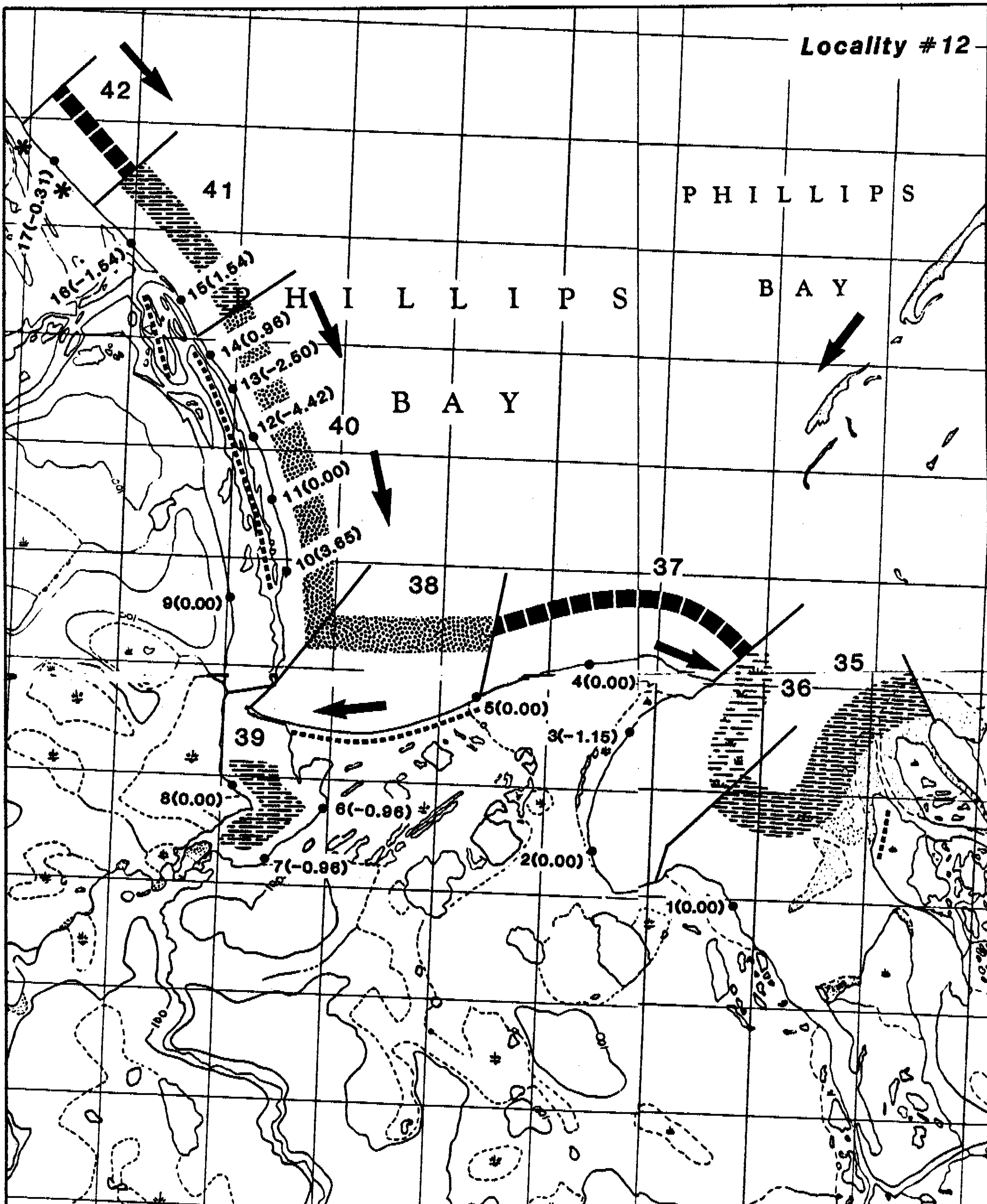
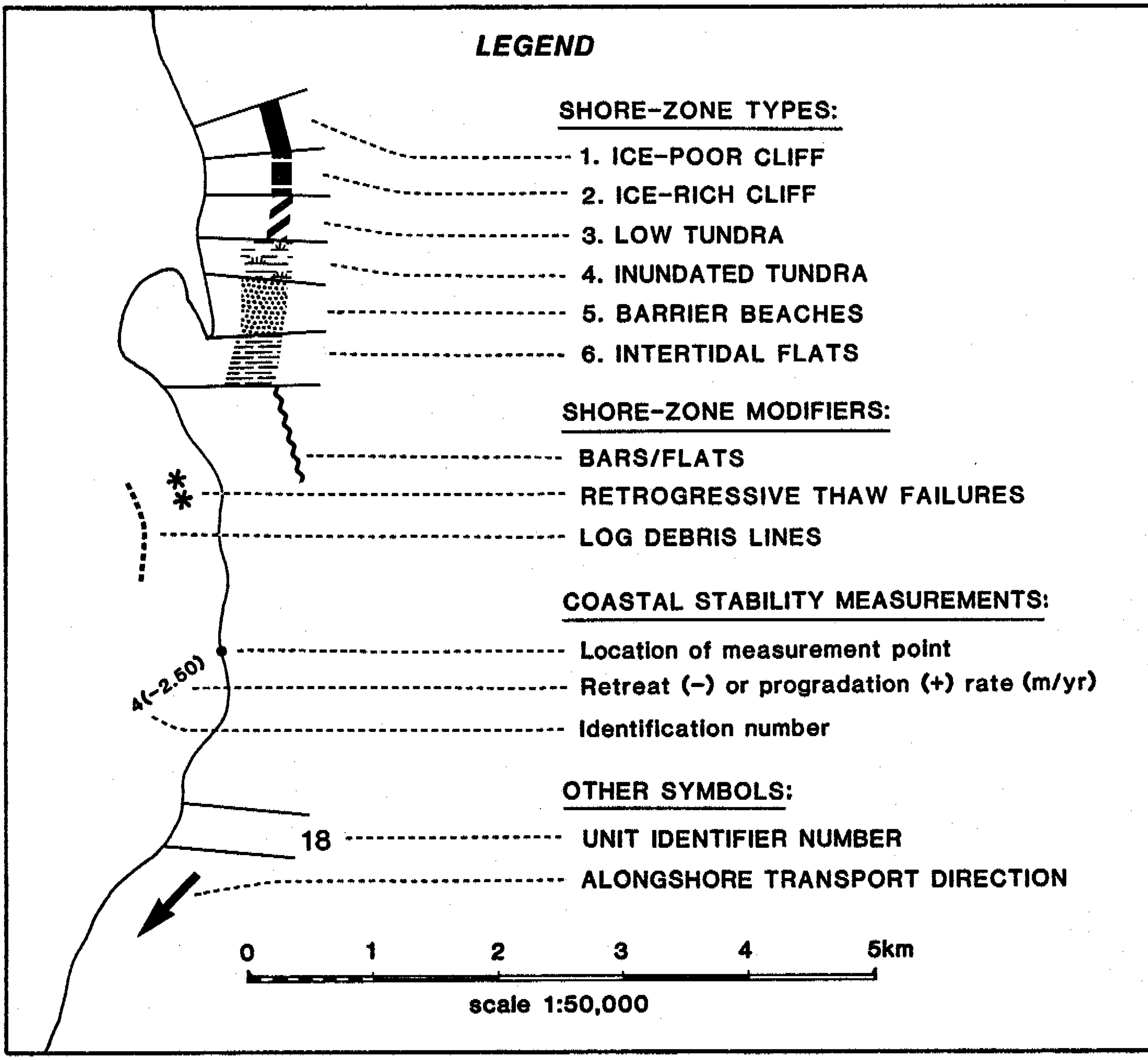


Locality #12
PHILLIPS
BAY
PHILLIPS
BAY
42
41
40
38
37
35
36
39
17(-0.31)
16(-1.54)
15(1.54)
14(0.96)
13(-2.50)
12(-4.42)
11(0.00)
10(3.65)
9(0.00)
8(0.00)
7(-0.96)
6(-0.96)
5(0.00)
4(0.00)
3(-1.15)
2(0.00)
1(0.00)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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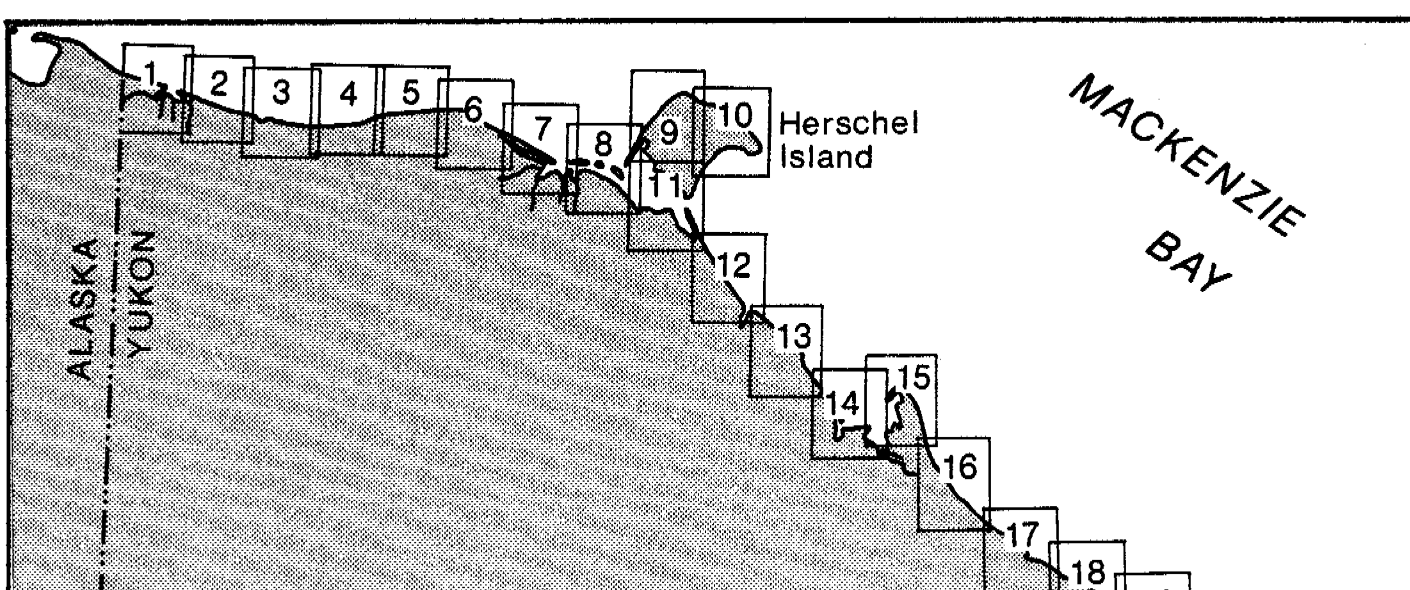
1
2
3
4
5km
scale 1:50,000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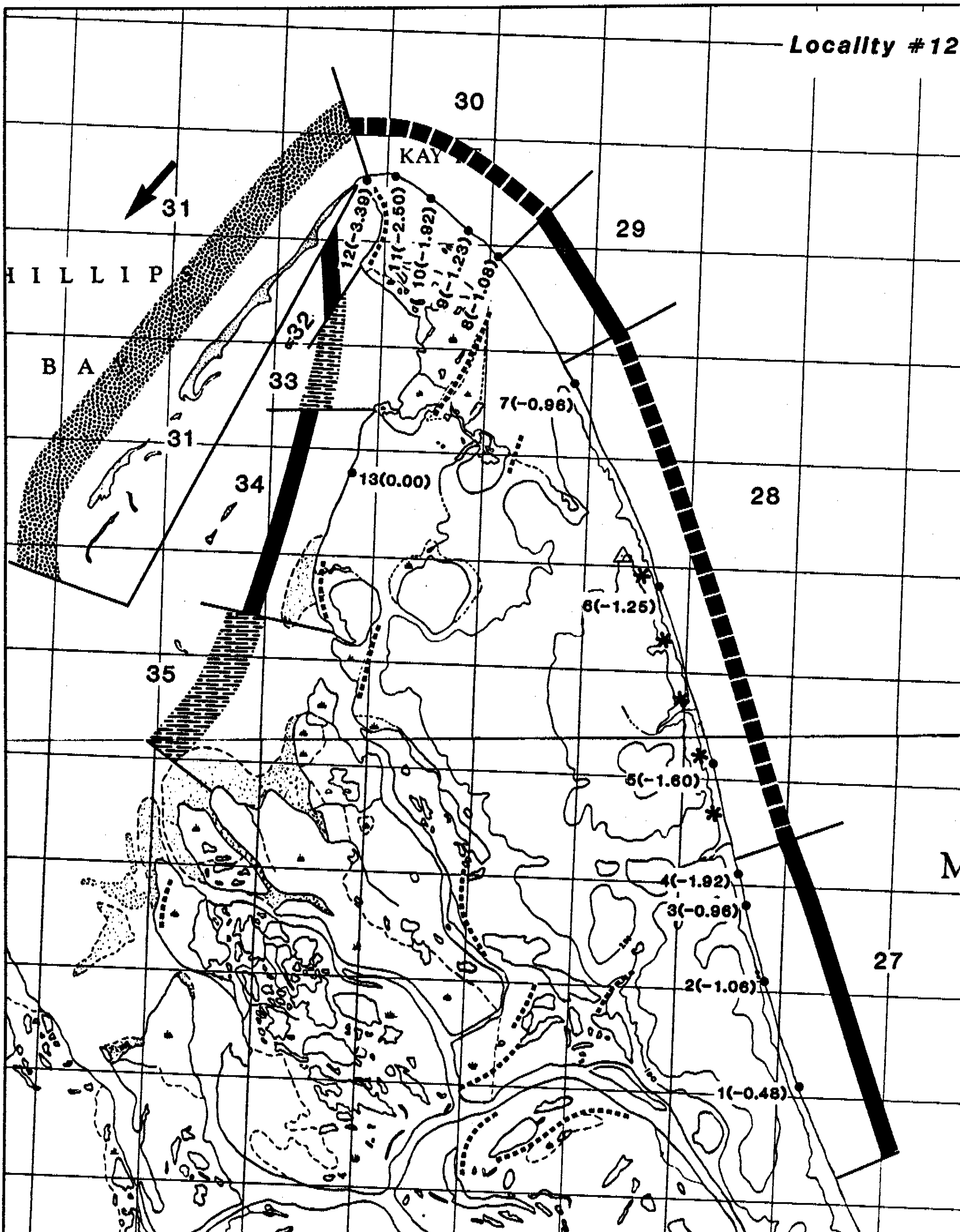
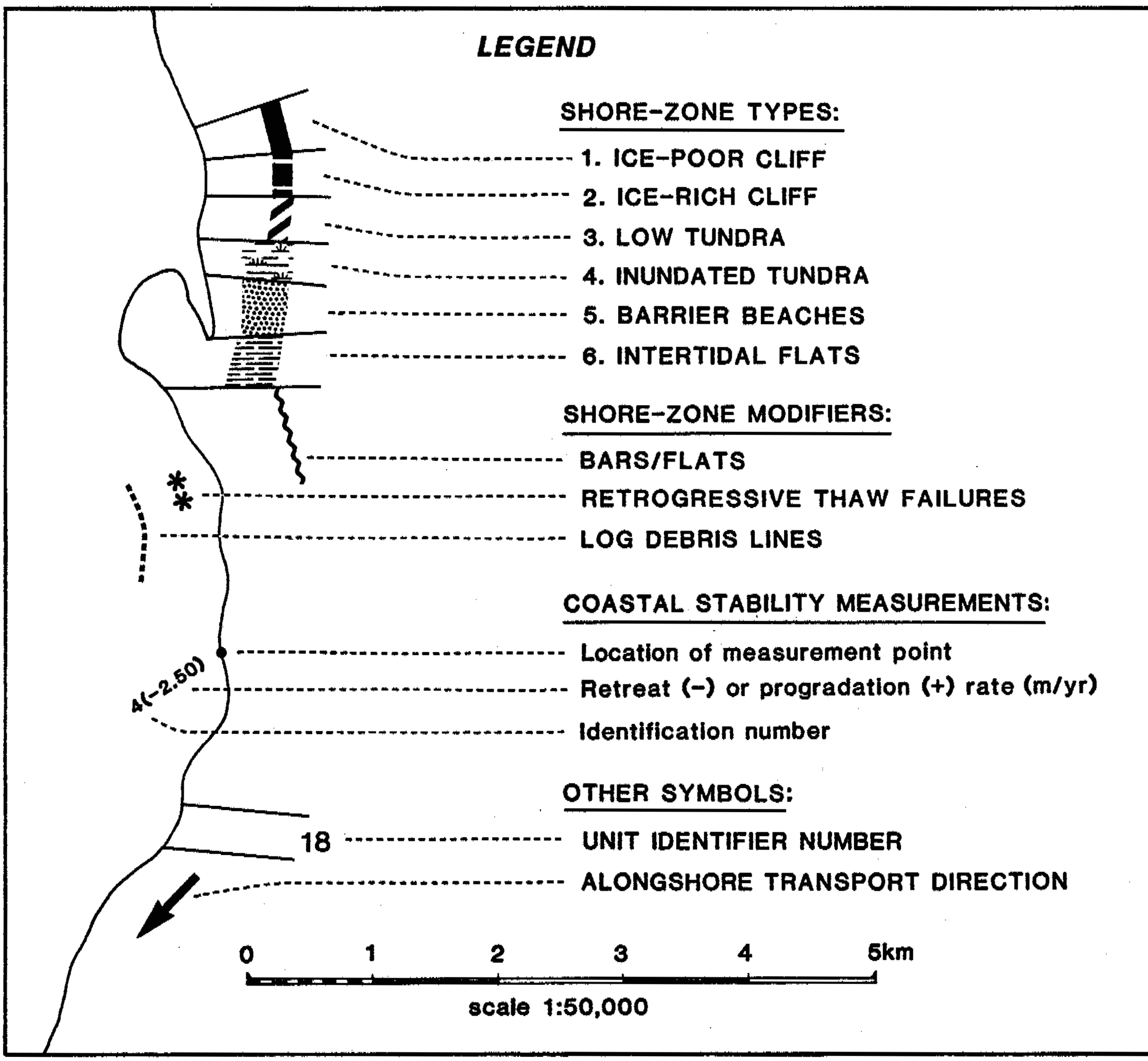
Herschel Island
MACKENZIE BAY
ALASKA
YUKON


Locality #12
30
KAY
31
29
HILLIP
BAY
32
33
31
34
35
28
27
M
12(-3.39)
11(-2.50)
10(-1.92)
9(-1.23)
8(-1.08)
7(-0.96)
13(0.00)
6(-1.25)
5(-1.60)
4(-1.92)
3(-0.96)
2(-1.06)
1(-0.48)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
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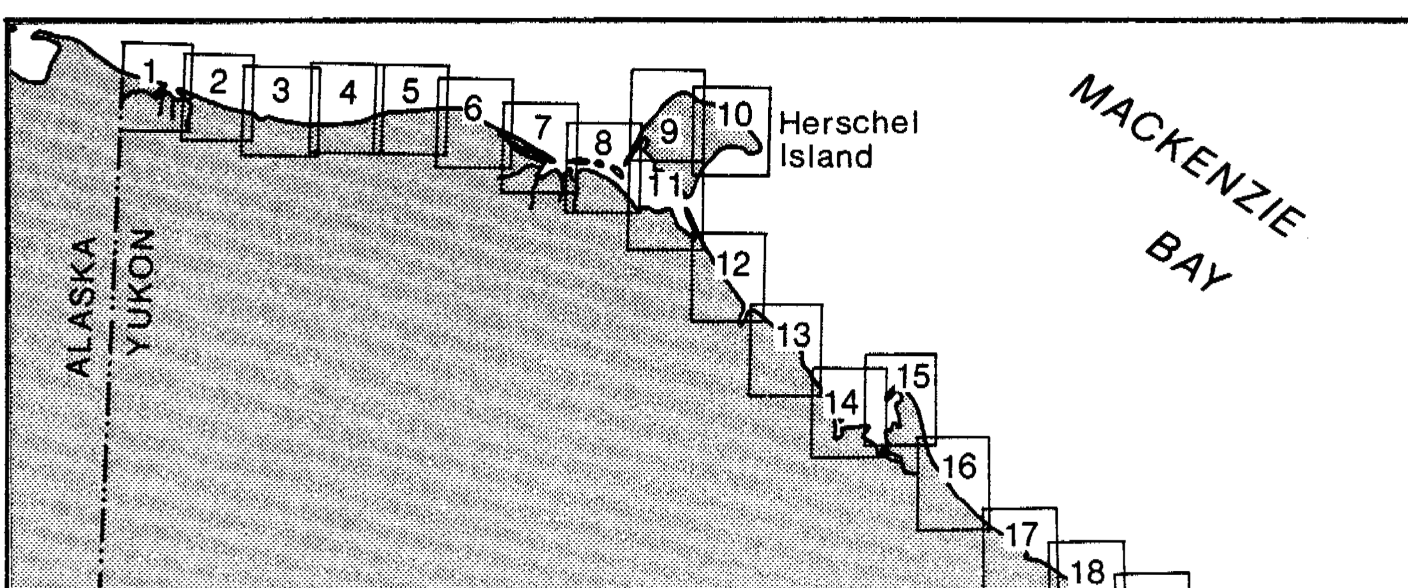
5km
scale 1:50,000



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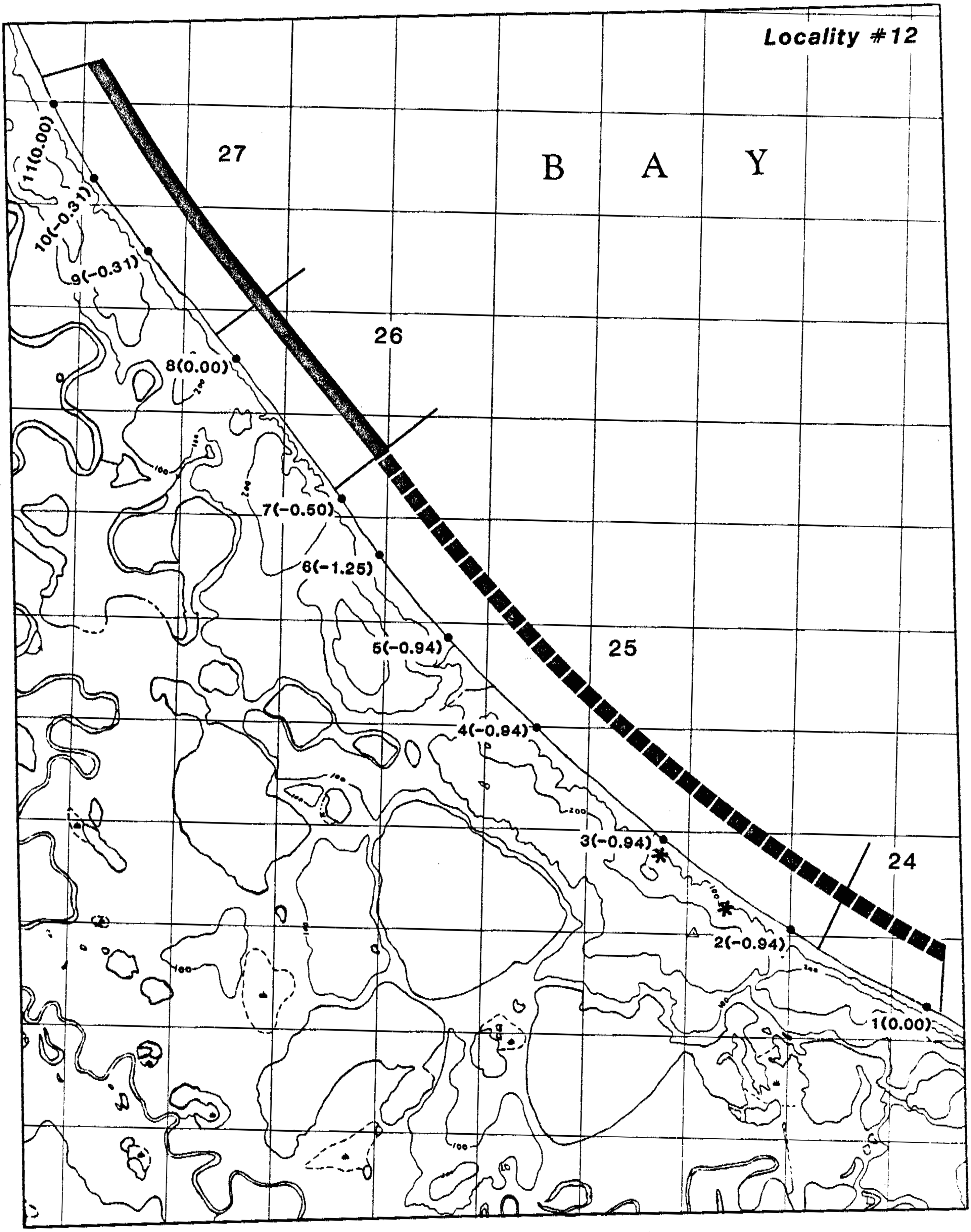
Herschel Island
MACKENZIE BAY
ALASKA
YUKON


Locality #12
B A Y
27
26
25
24
11(0.00)
10(-0.31)
9(-0.31)
8(0.00)
7(-0.50)
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3(-0.94)
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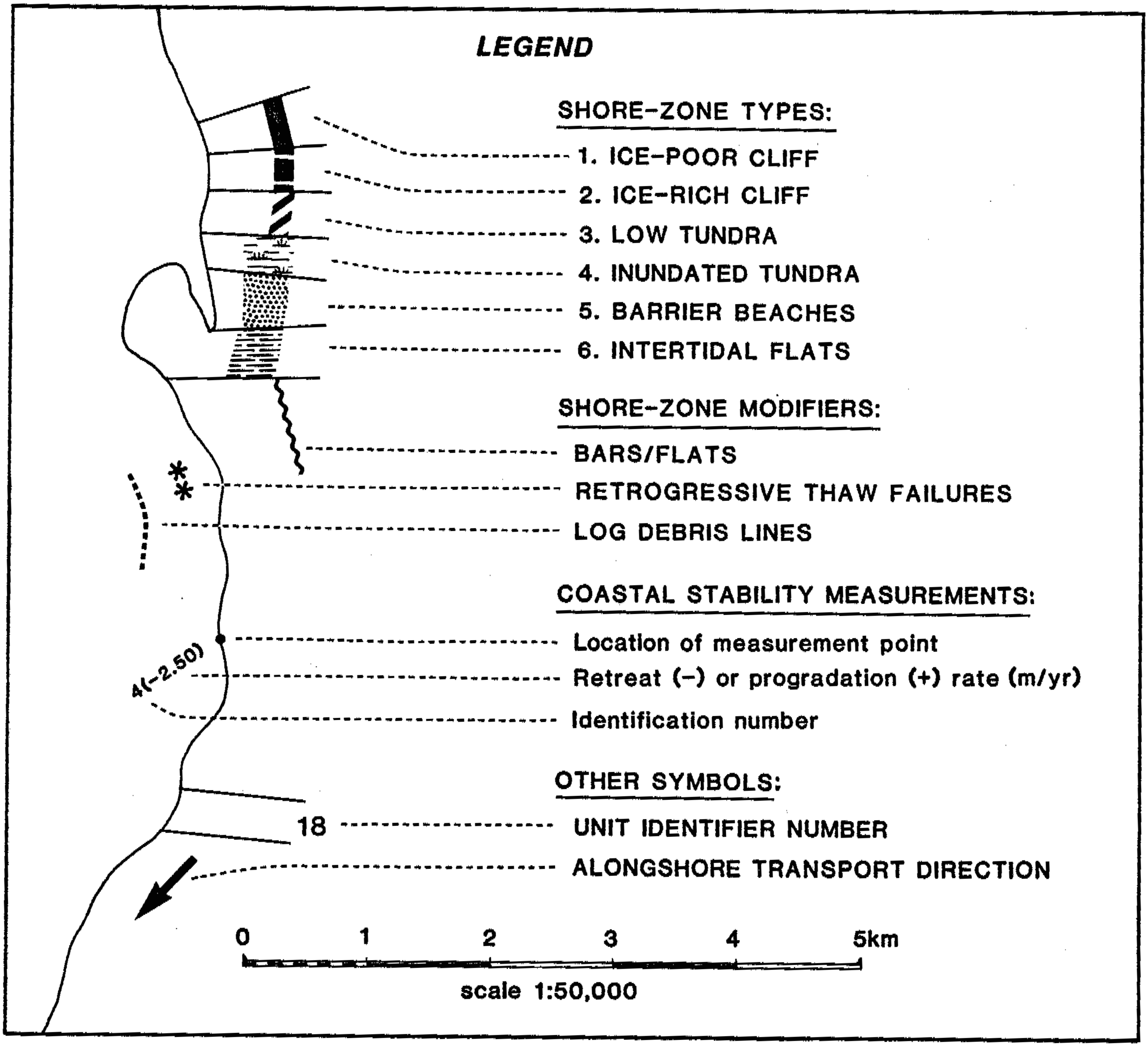
1(0.00)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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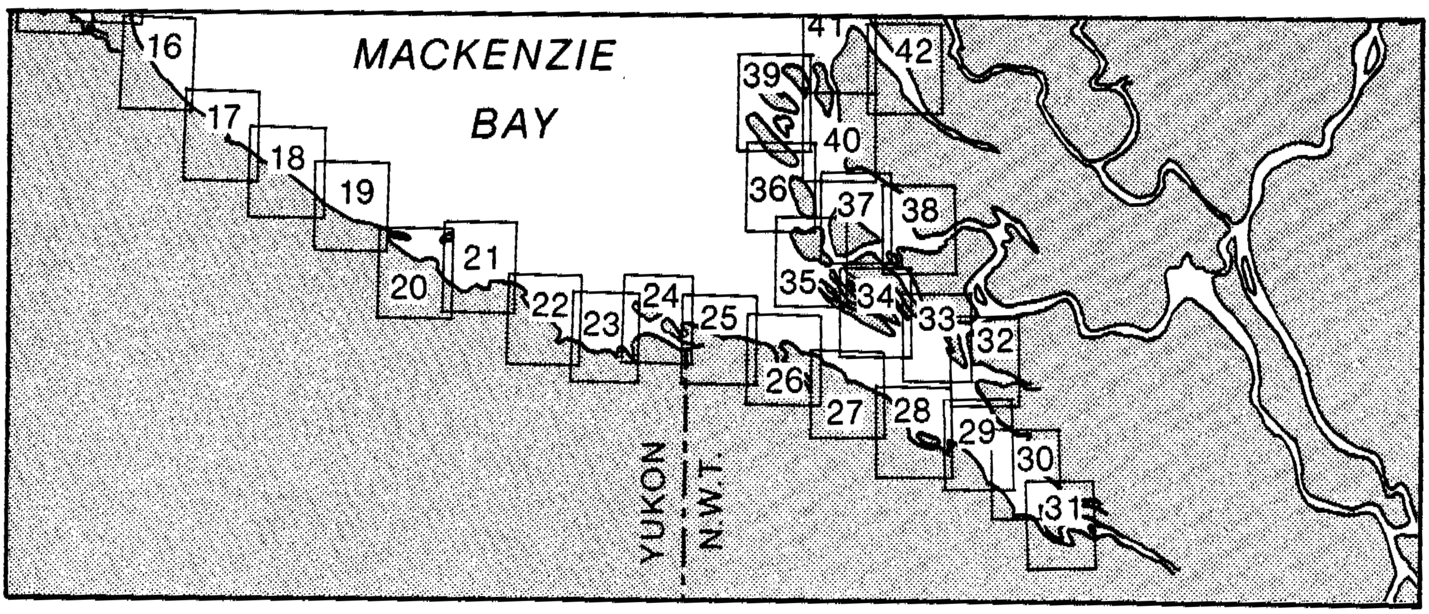
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKENZIE
BAY
16
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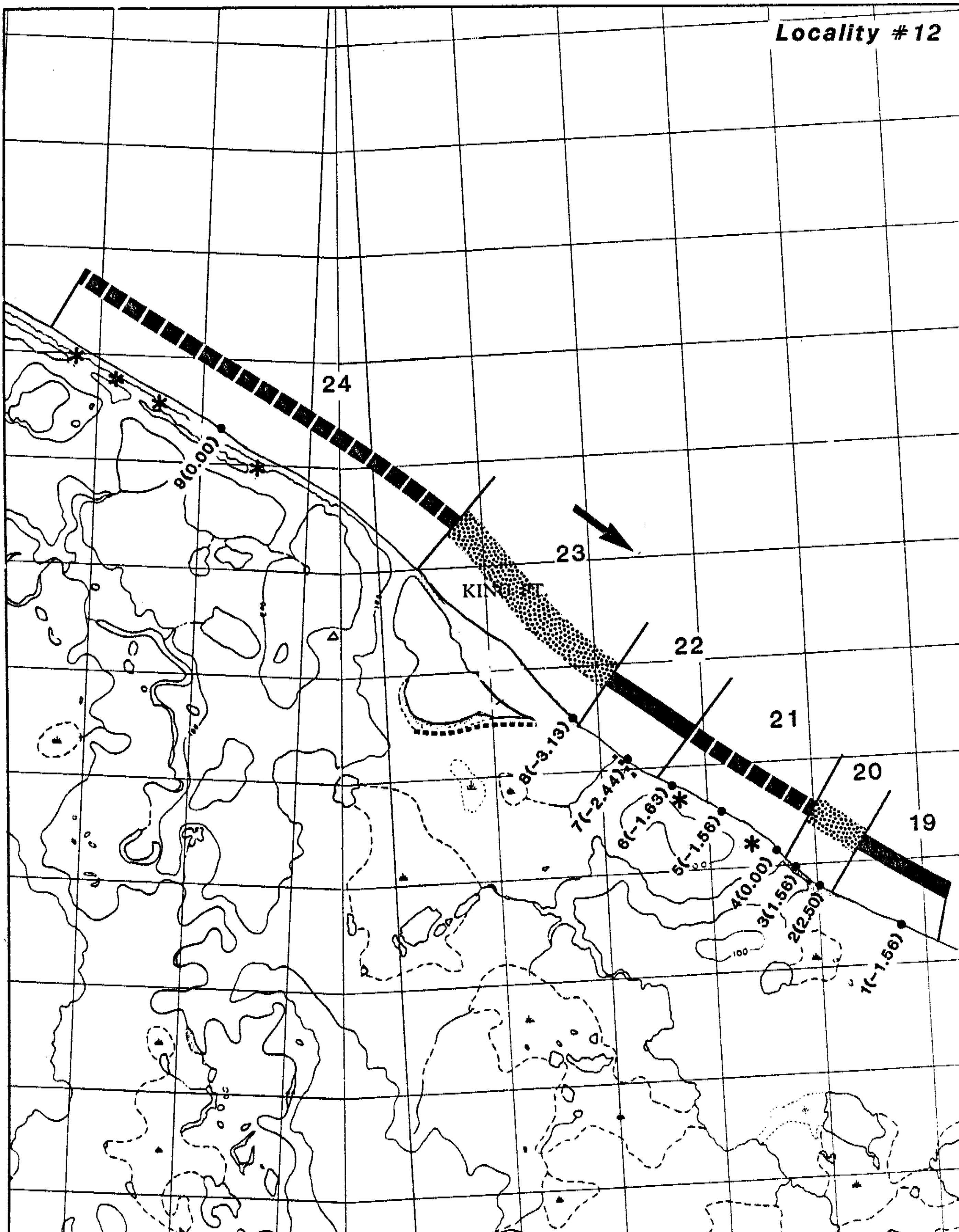
42
YUKON
N.W.T.



Locality #12
24
23
22
21
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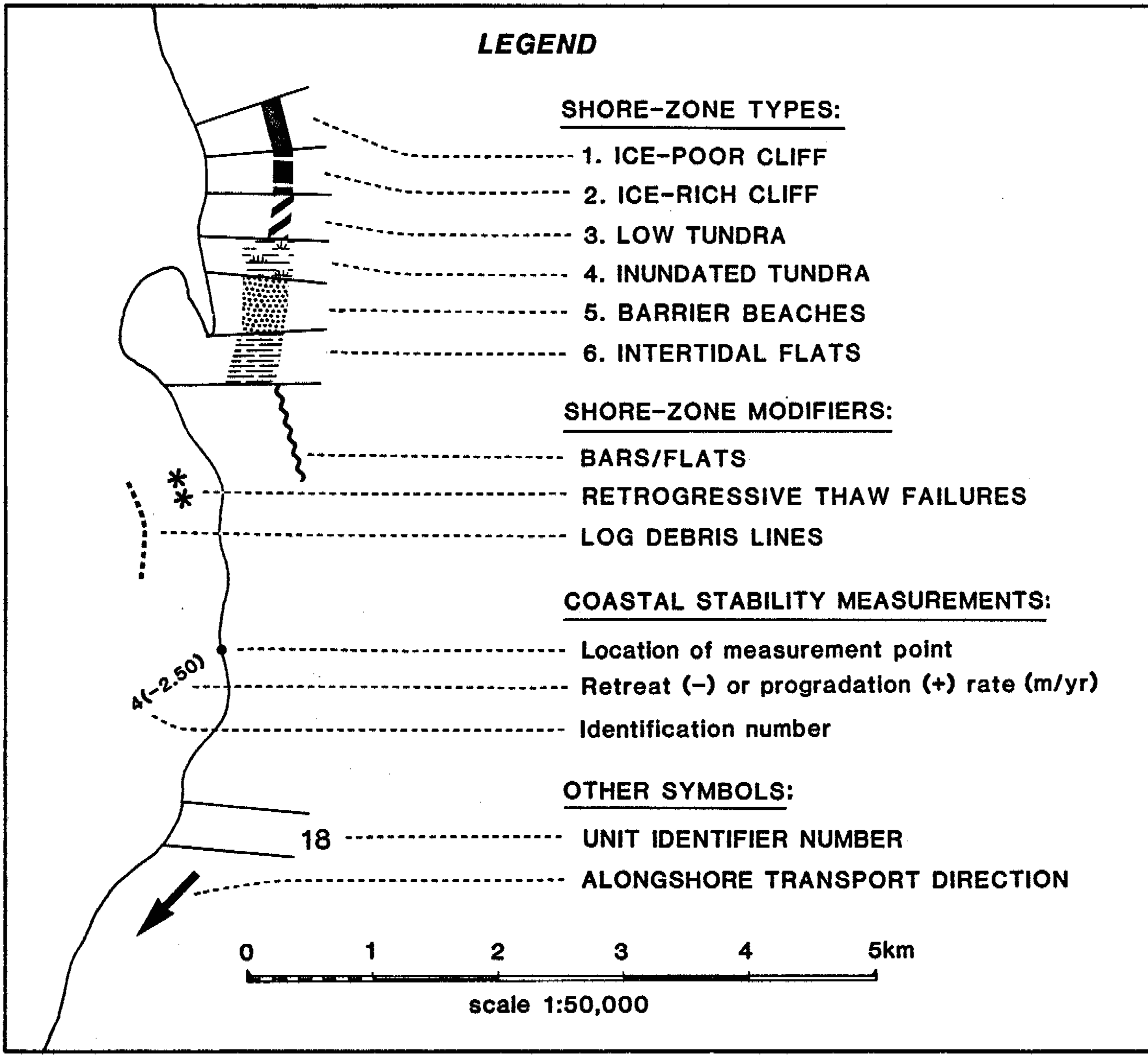
19
KING PT.
9(0.00)
8(-3.13)
7(-2.44)
6(-1.63)
5(-1.56)
4(0.00)
3(1.56)
2(2.50)
1(-1.56)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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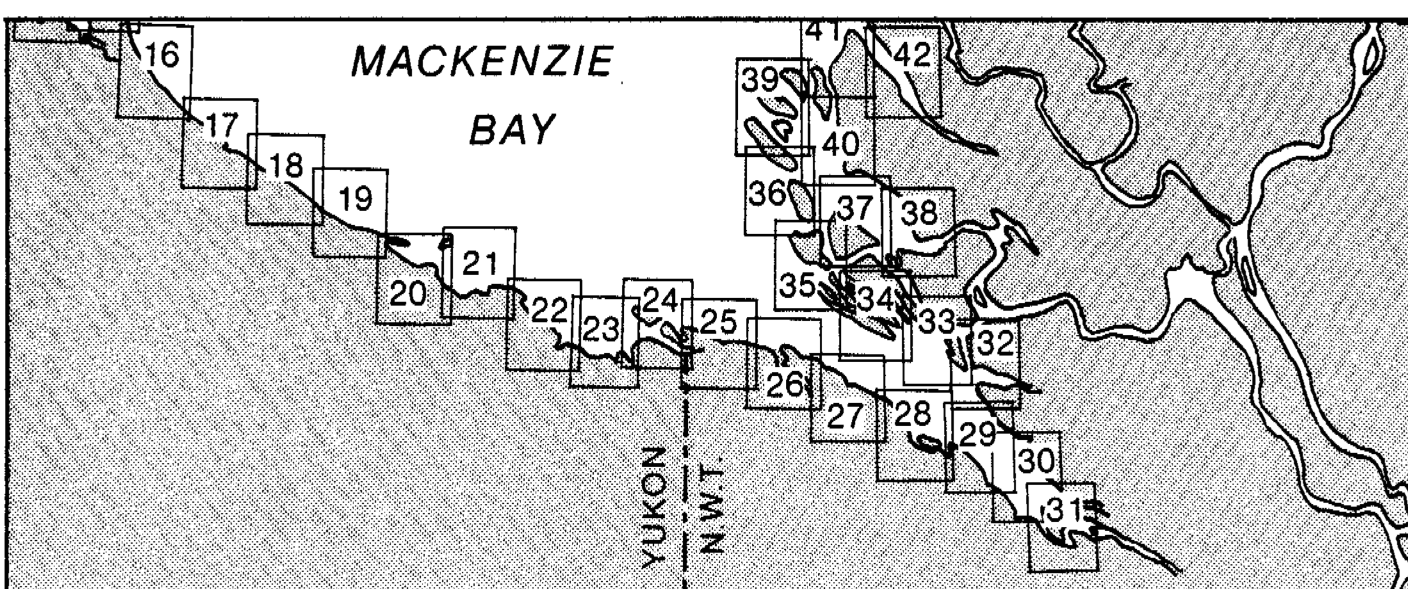
1
2
3
4
5km
scale 1:50,000


MACKENZIE
BAY
YUKON
N.W.T.
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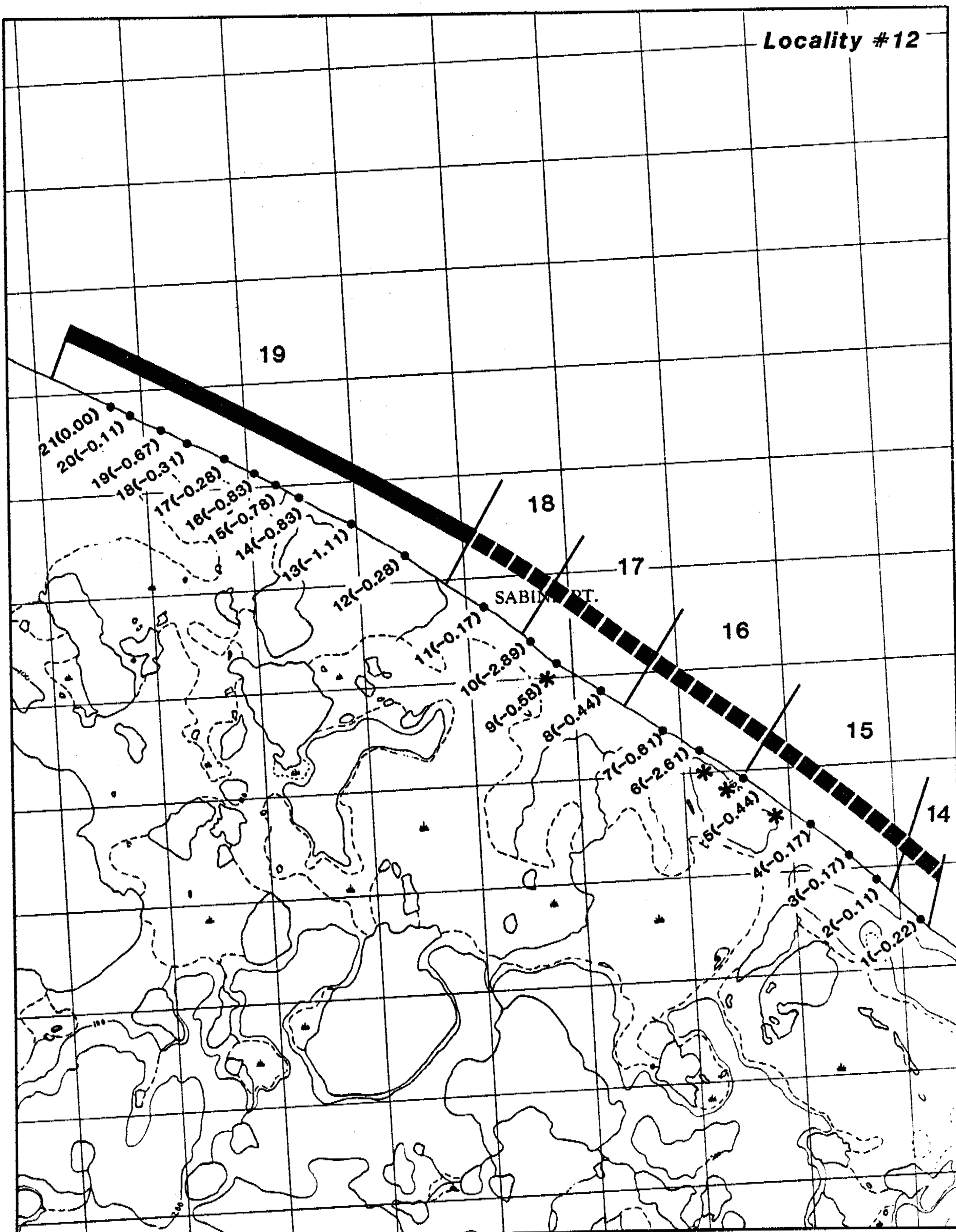

Locality #12
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17
16
15
14
SABINE PT.
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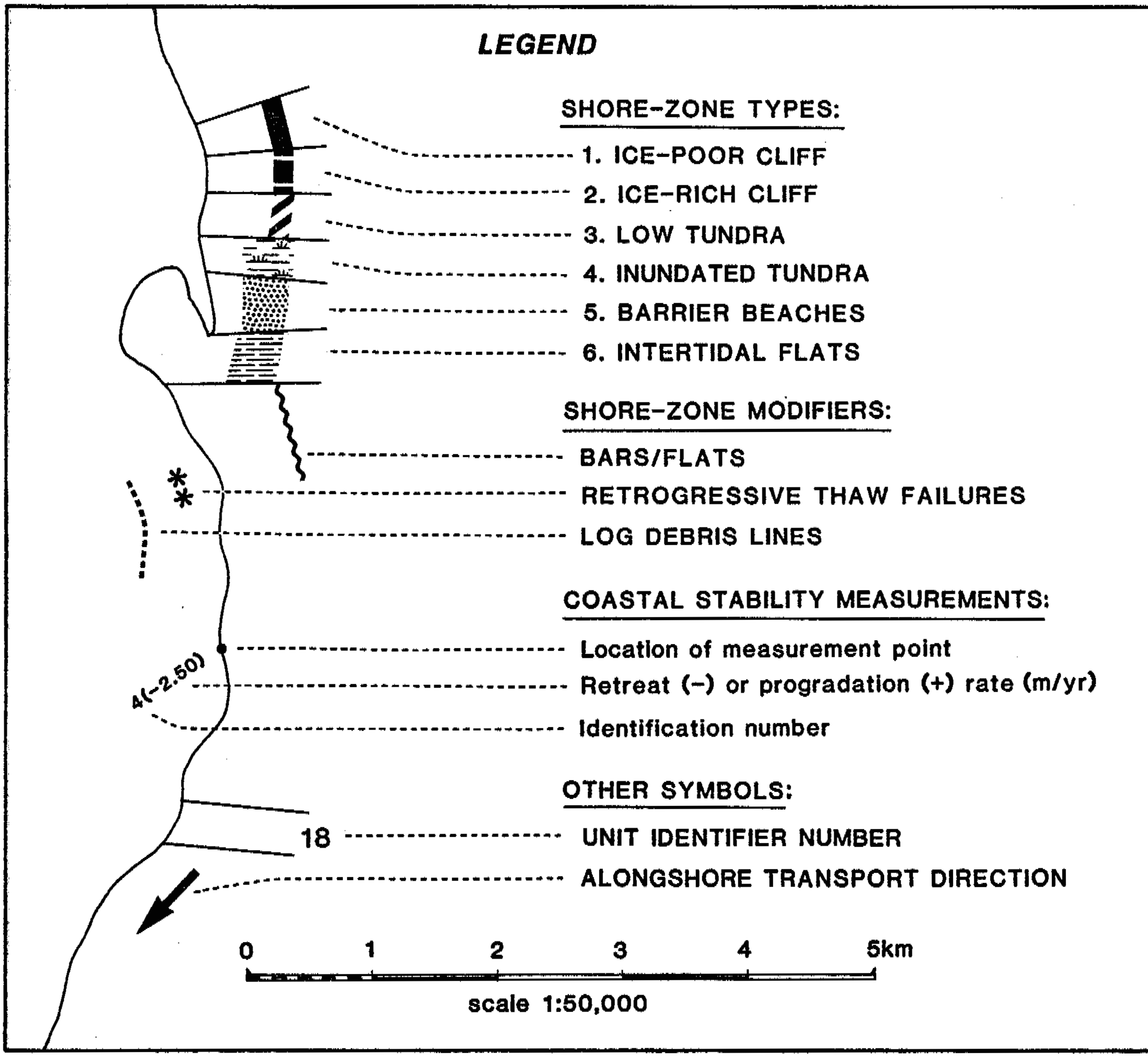
15(-0.78)
14(-0.83)
13(-1.11)
12(-0.28)
11(-0.17)
10(-2.89)
9(-0.58)
8(-0.44)
7(-0.61)
6(-2.61)
5(-0.44)
4(-0.17)
3(-0.17)
2(-0.11)
1(-0.22)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
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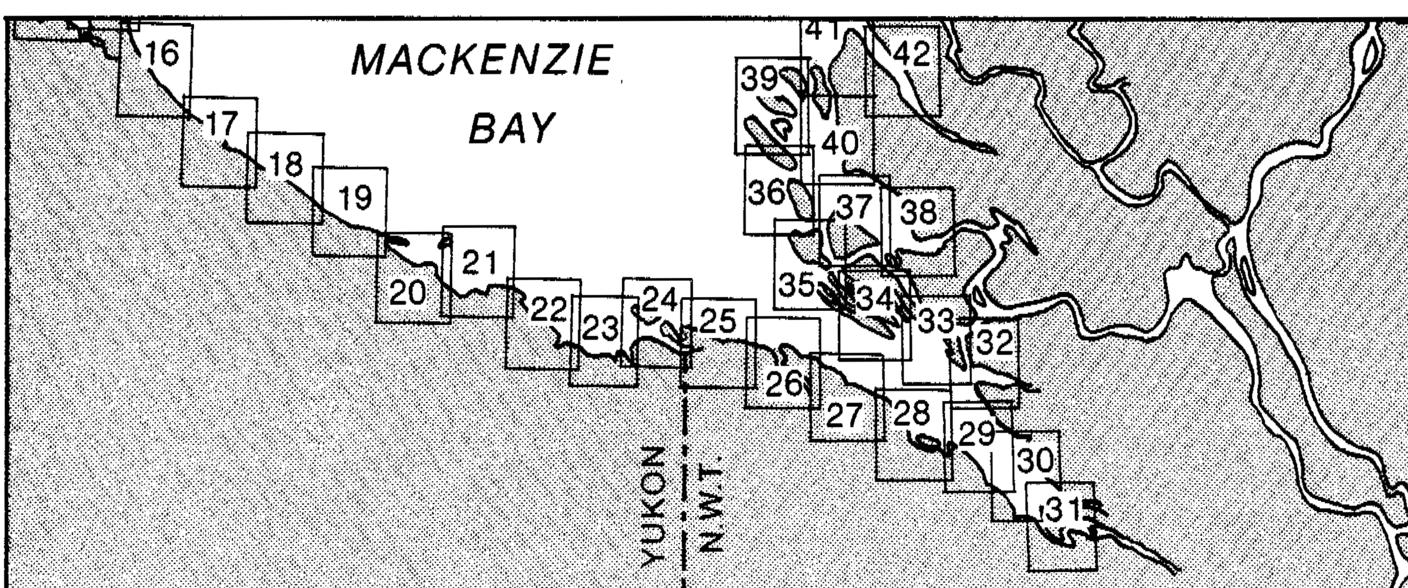
4
5km
scale 1:50,000


MACKENZIE
BAY
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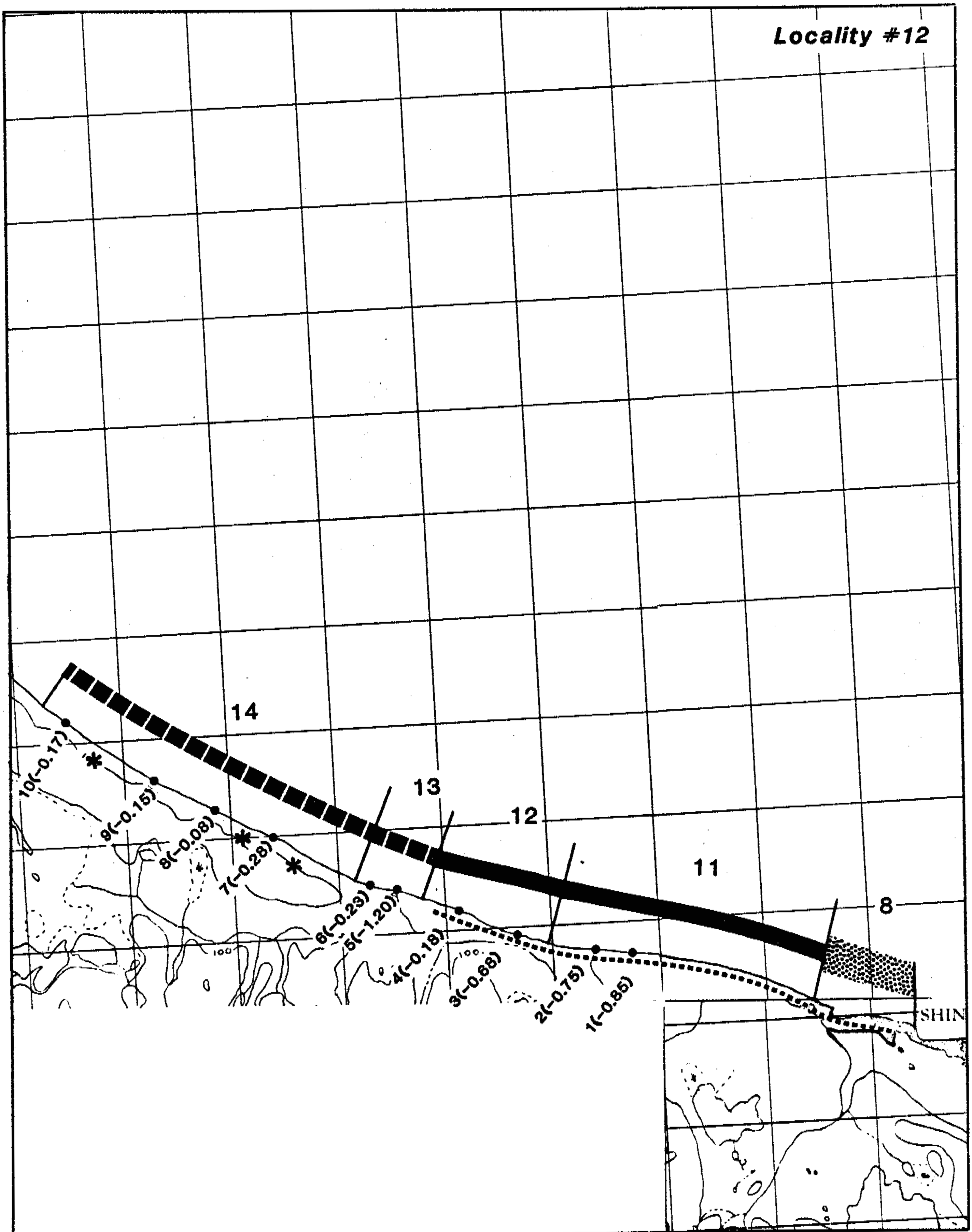
YUKON
N.W.T.



Locality #12
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10(-0.17)
9(-0.15)
8(-0.08)
7(-0.28)
6(-0.23)
5(-1.20)
4(-0.18)
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2(-0.75)
1(-0.85)
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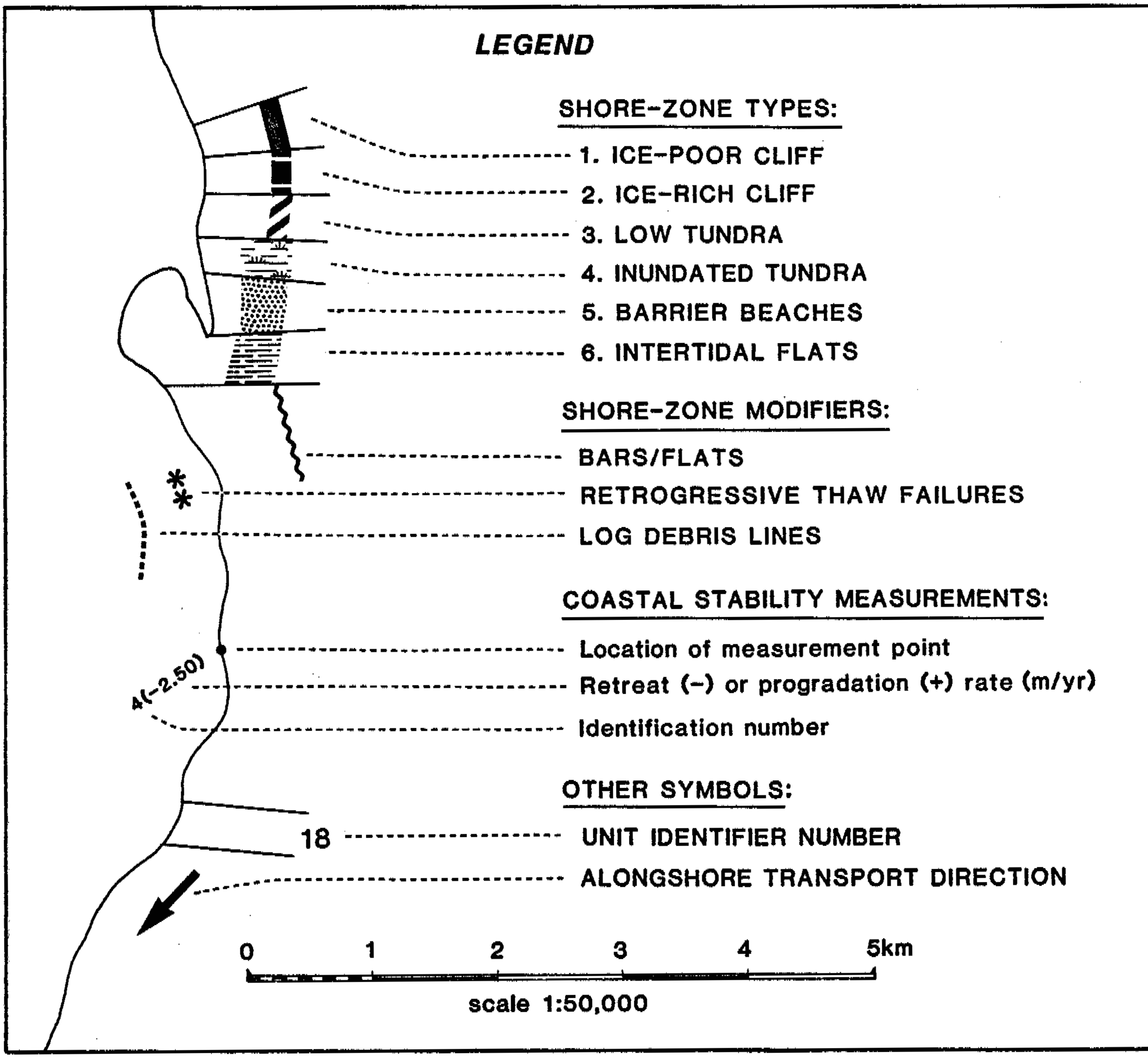
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
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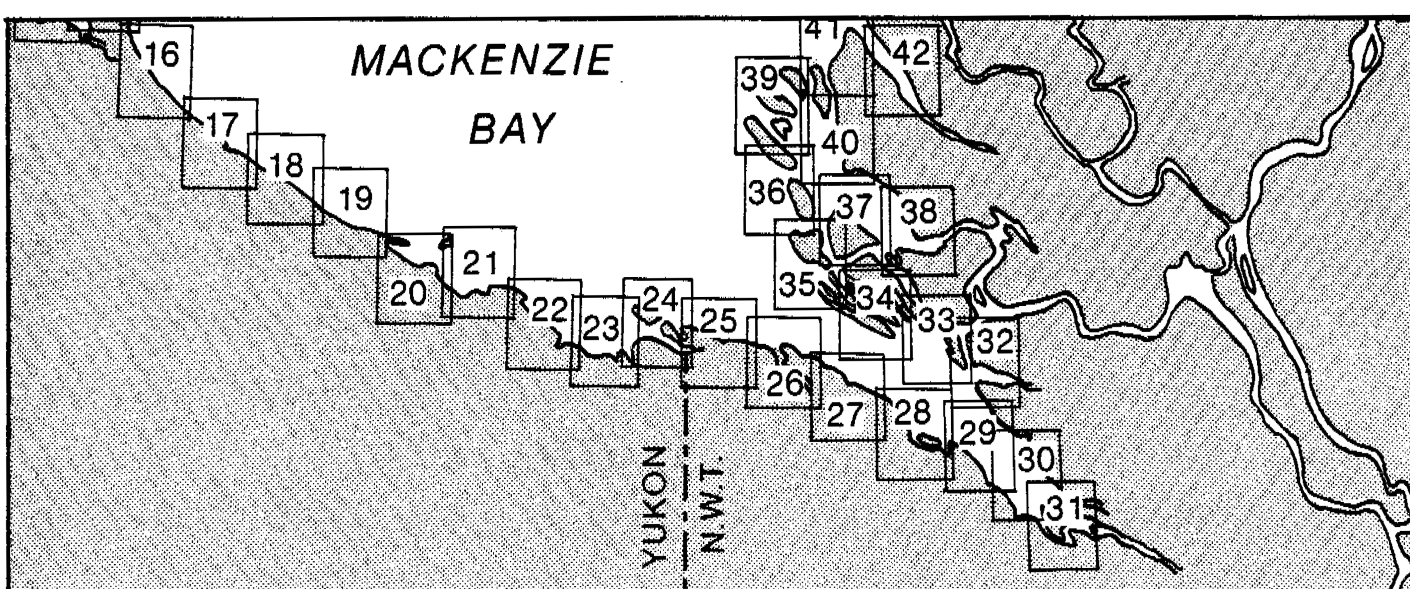
5km
scale 1:50,000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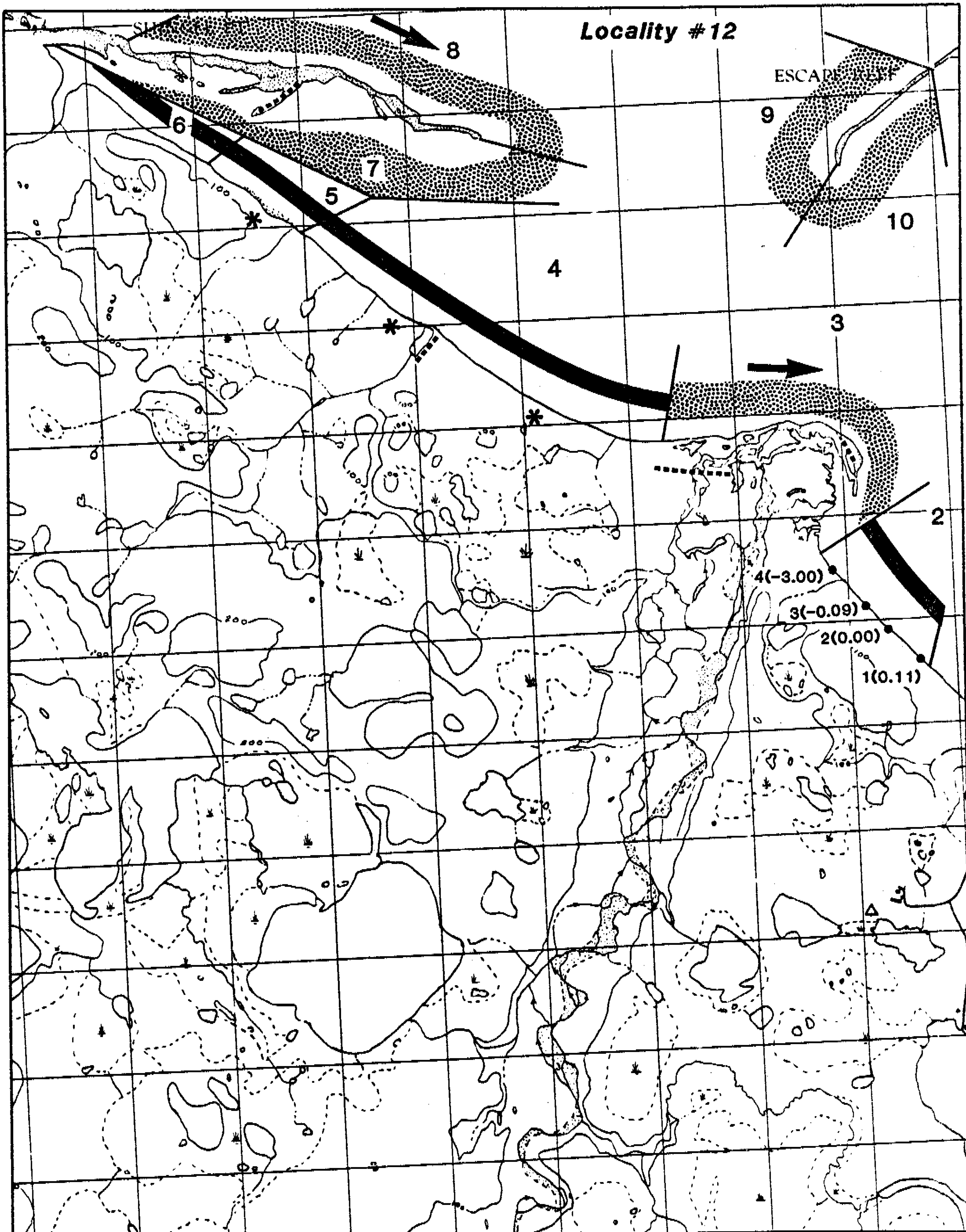
YUKON
N.W.T.


Locality #12
SHINGLE PT
ESCAPE REEF
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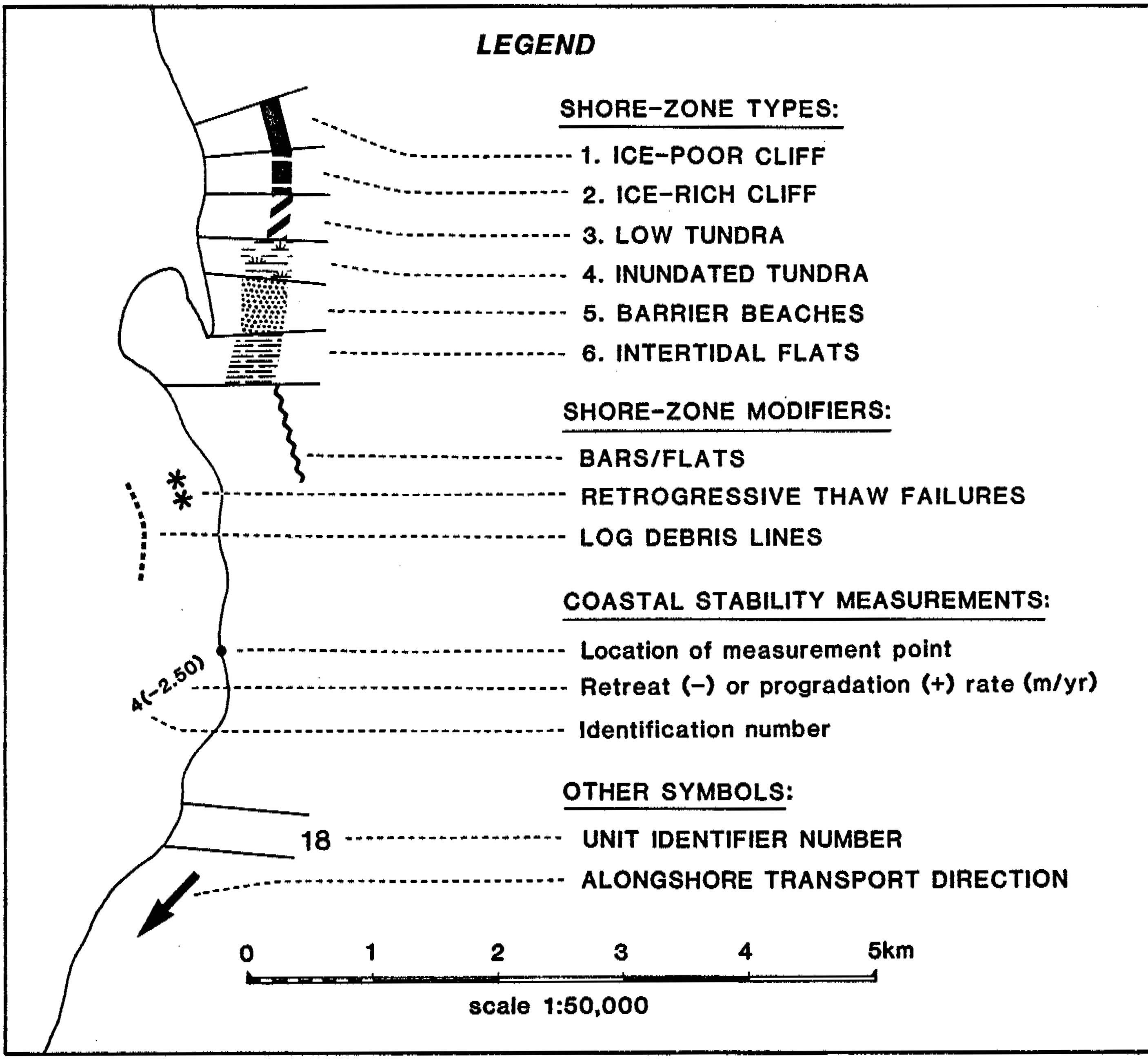
4(-3.00)
3(-0.09)
2(0.00)
1(0.11)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(–2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
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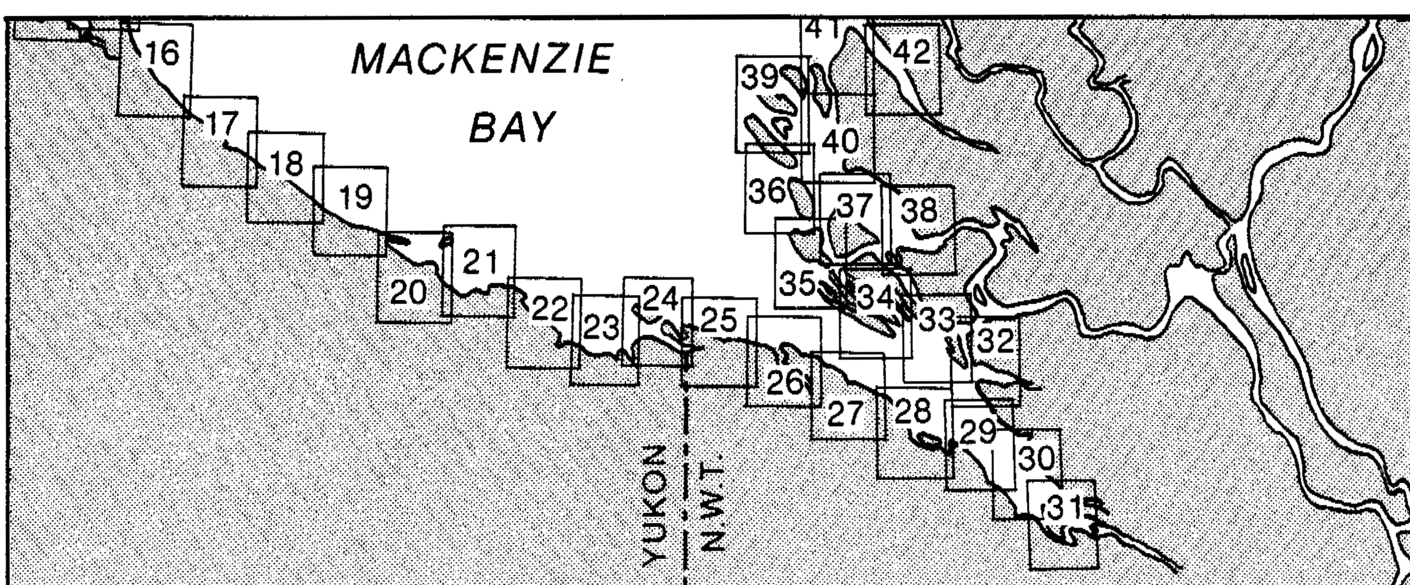
5km
scale 1:50,000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YUKON
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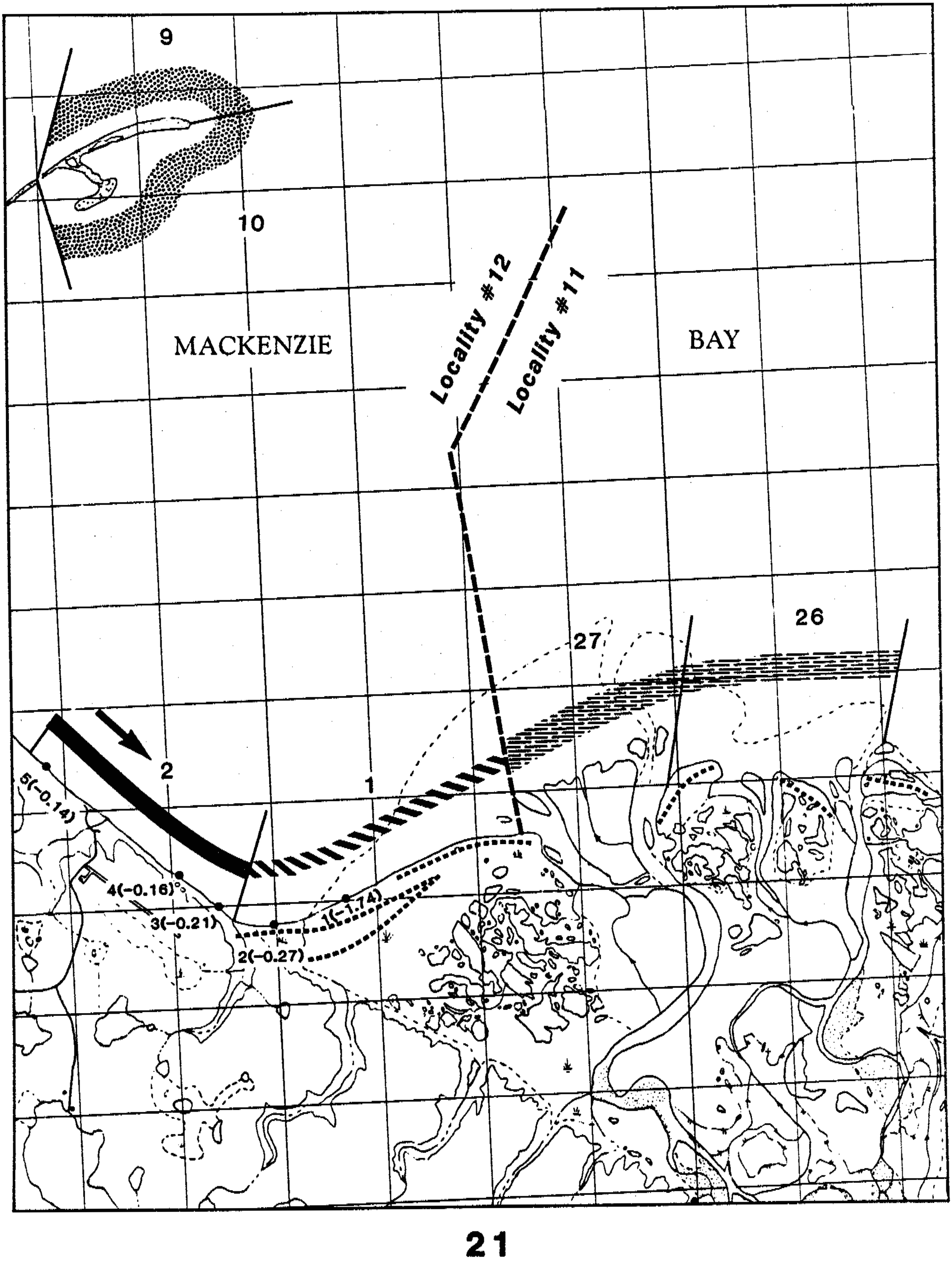
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MACKENZIE
Locality #12
Locality #11
BAY
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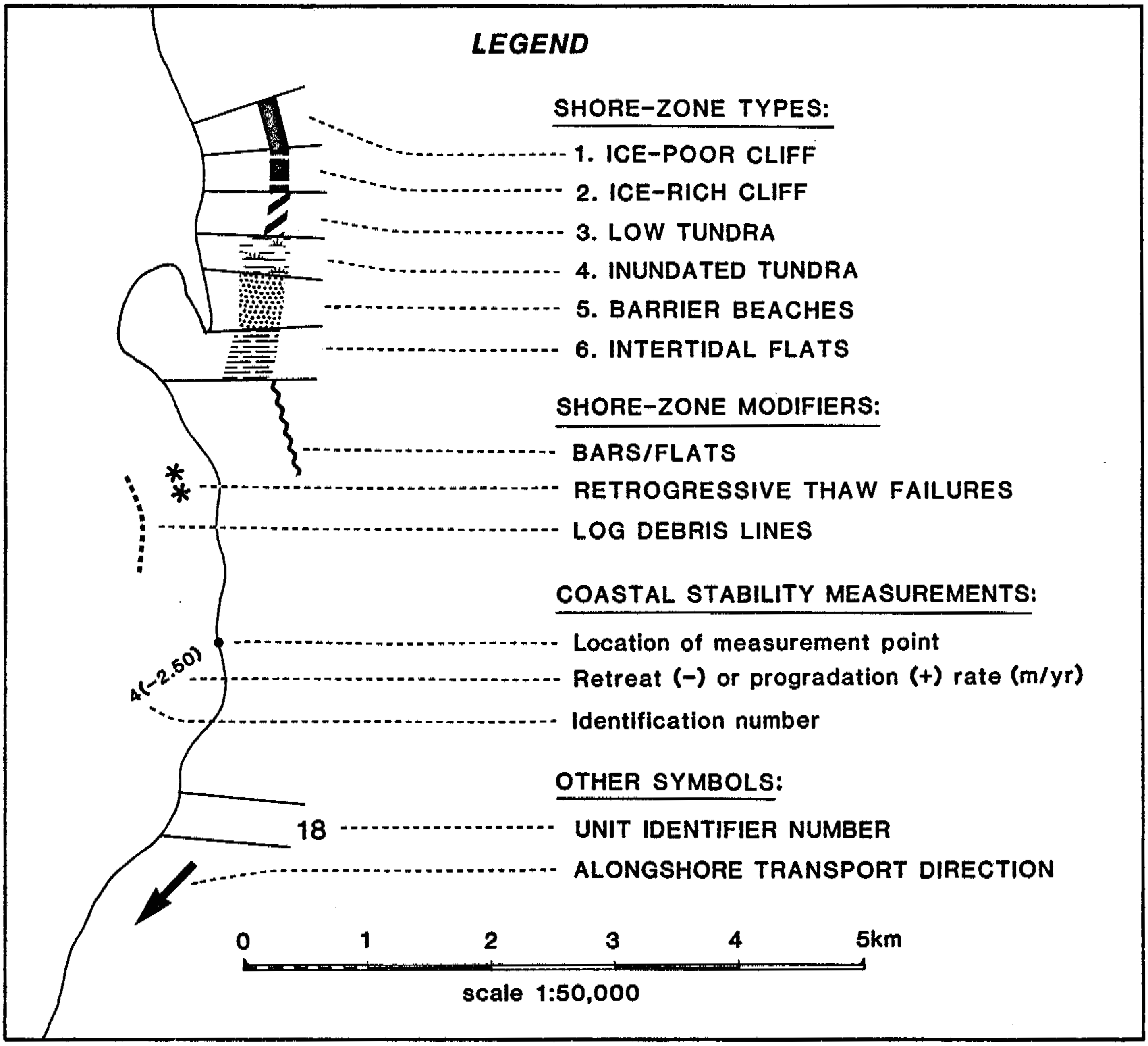
4(−0.16)
3(−0.21)
2(−0.27)
1(−1.74)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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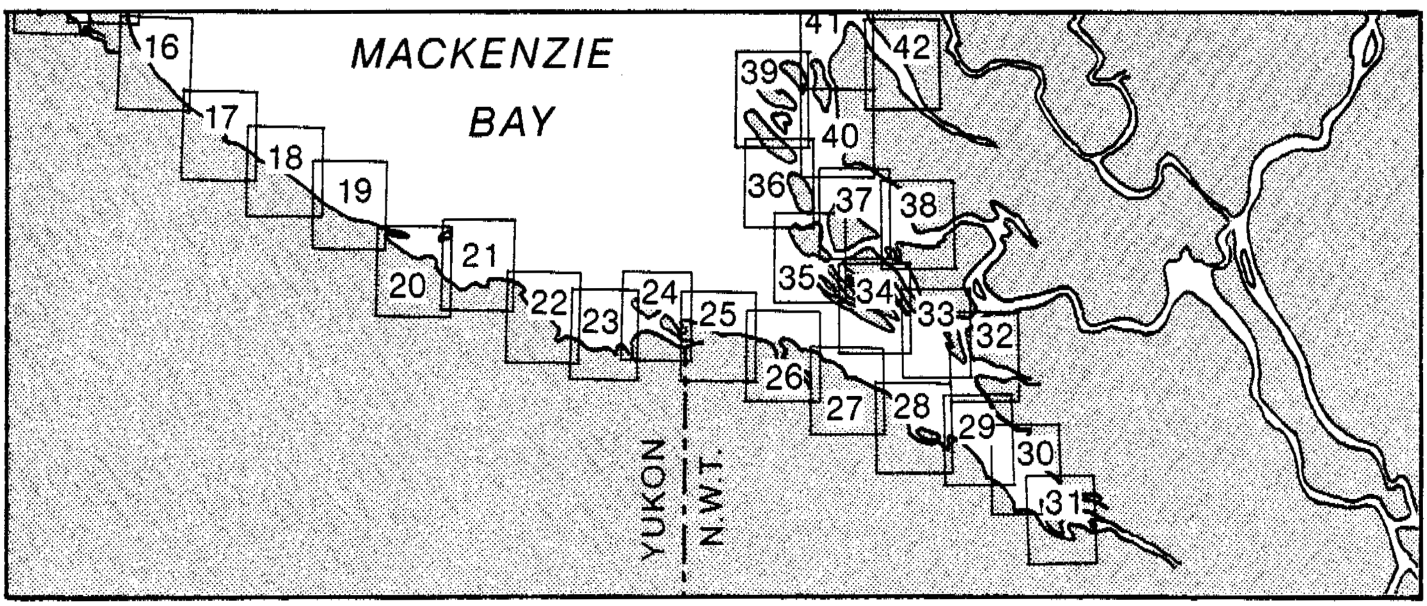
5km
scale 1:50,000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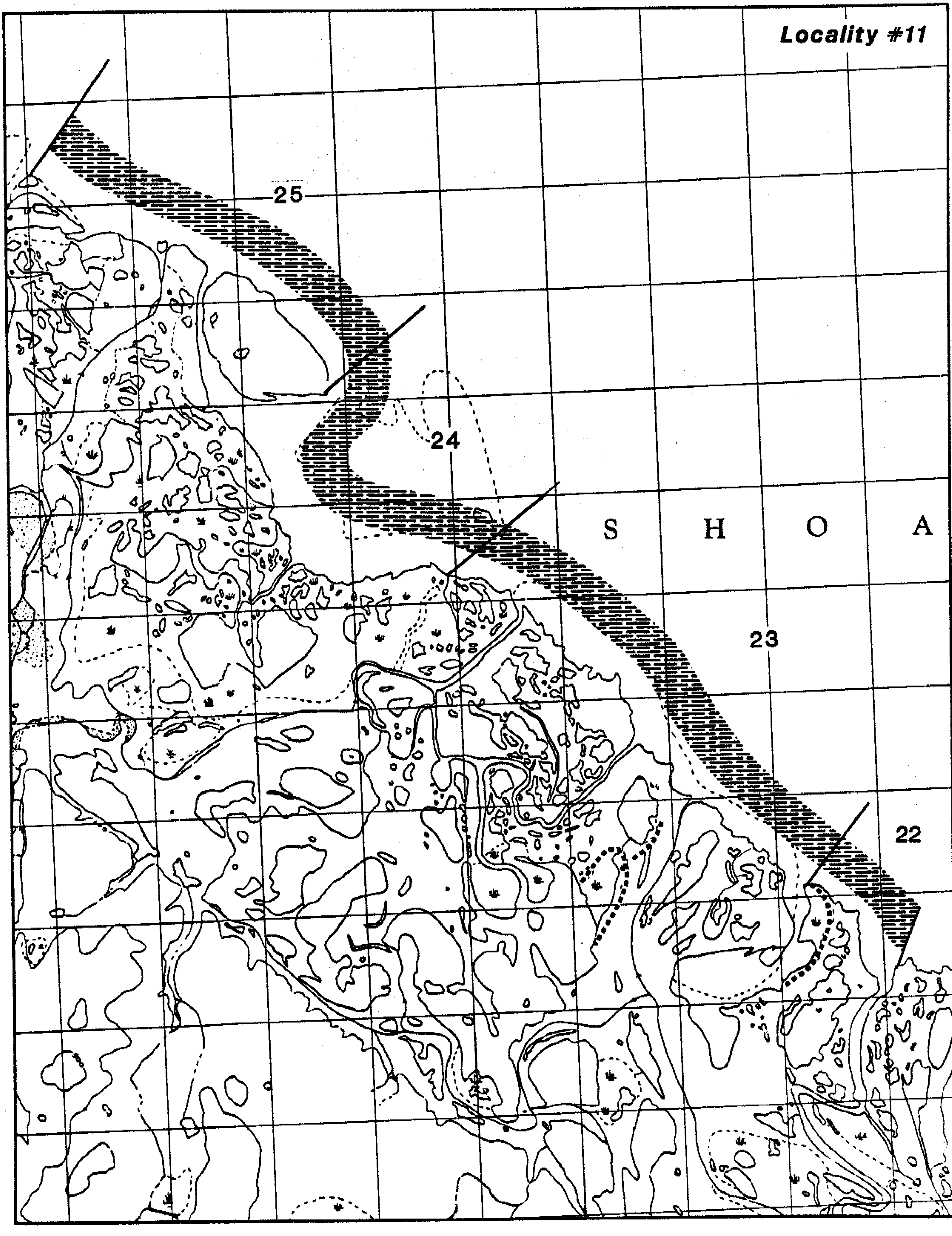
YUKON
N.W.T.


Locality #11
25
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S H O A
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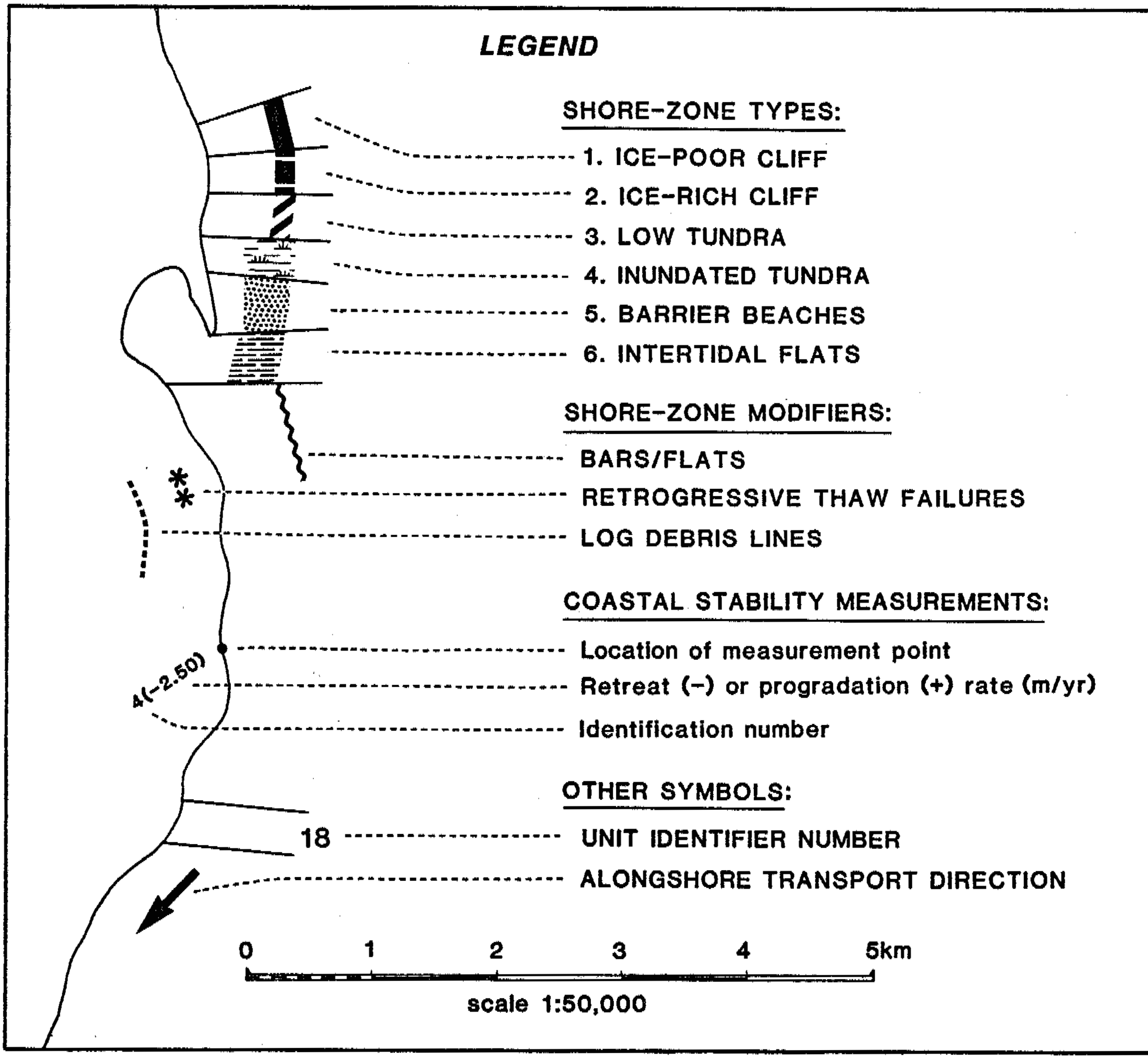
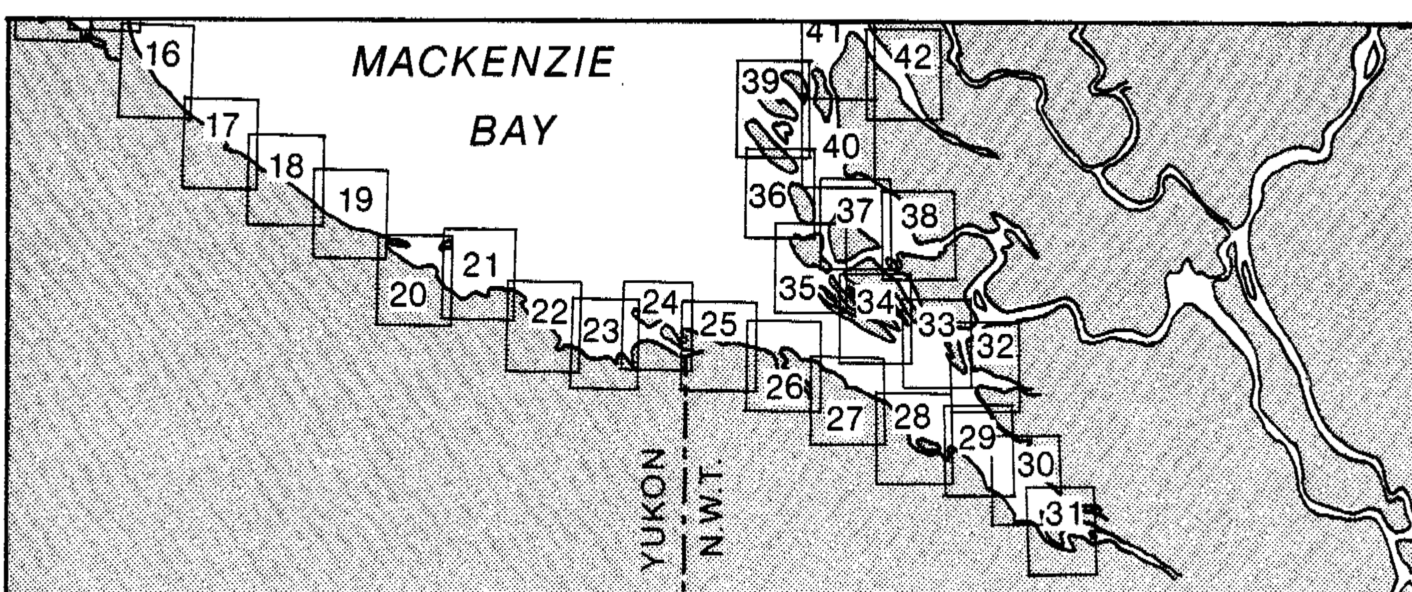


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKENZIE
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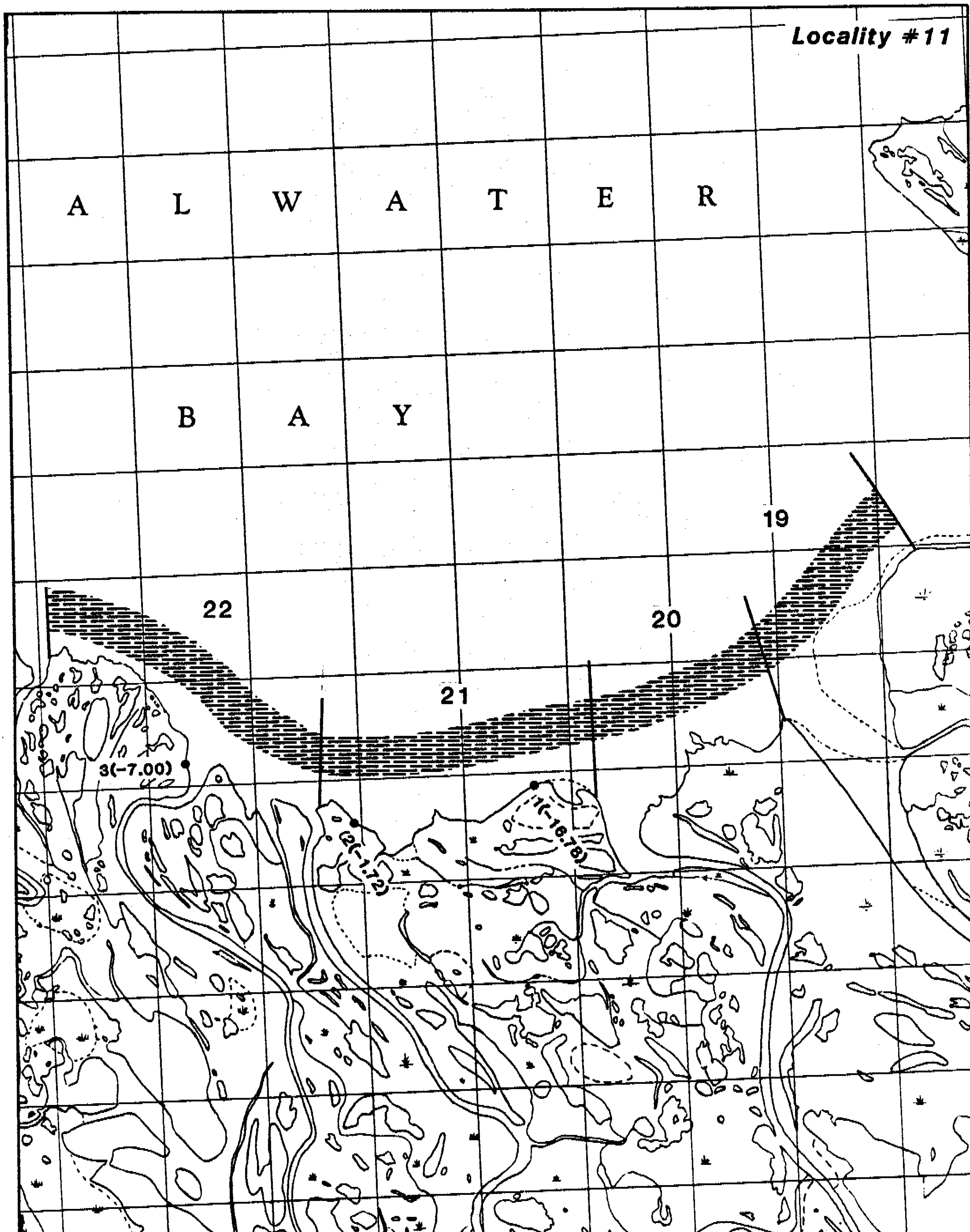
YUKON
N.W.T.


Locality #11
A L W A T E R
B A Y
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22
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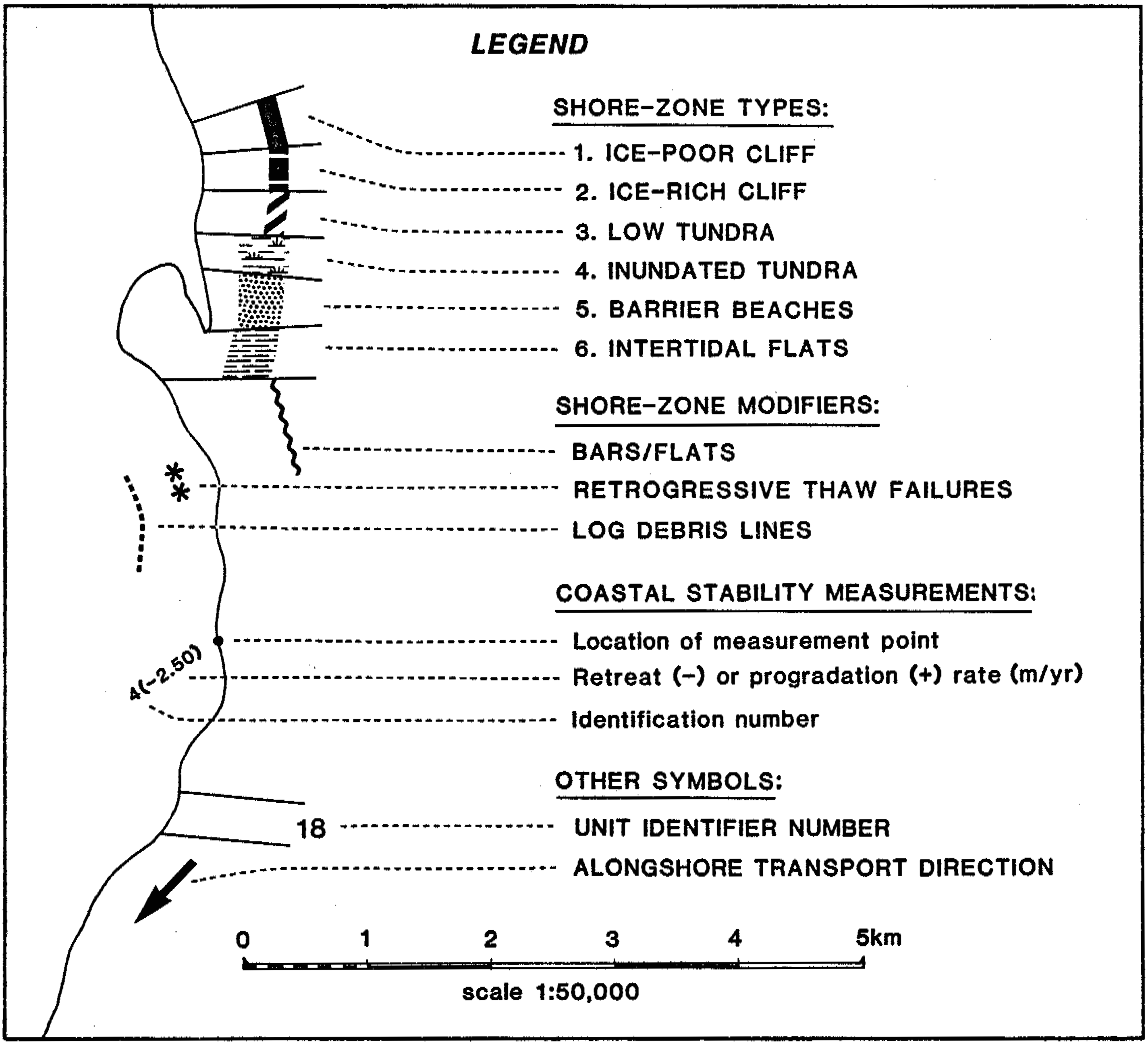
2(-1.72)
1(-16.78)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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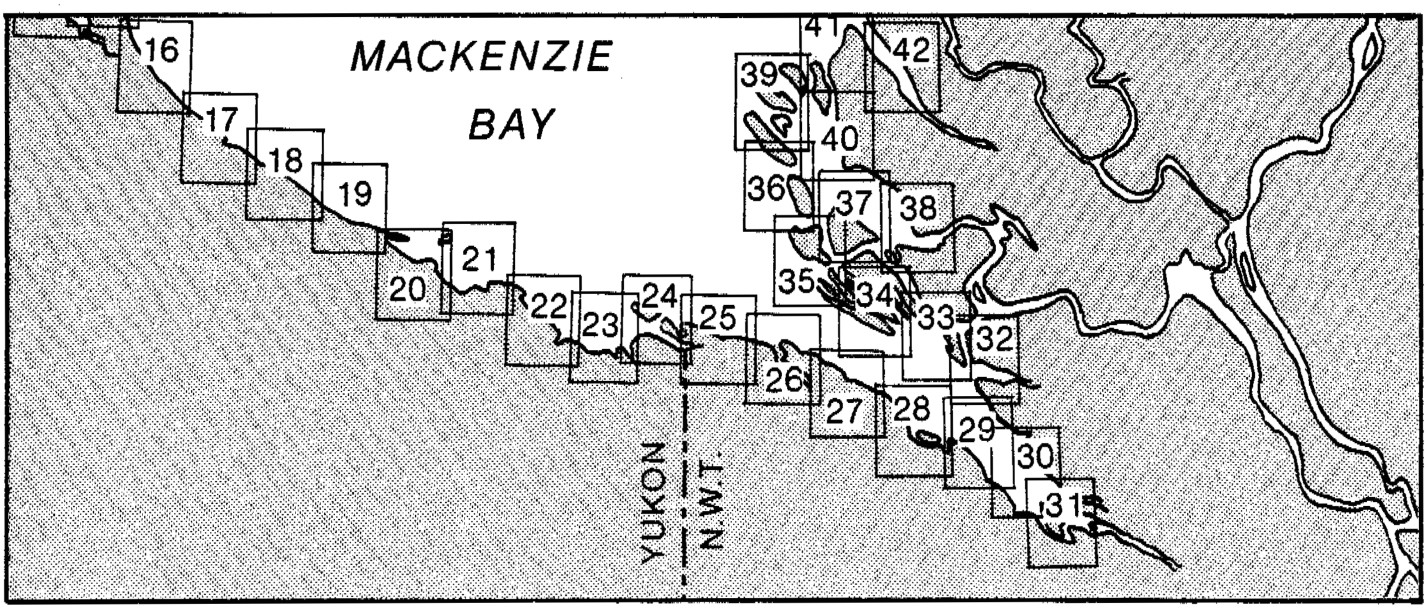
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKENZIE
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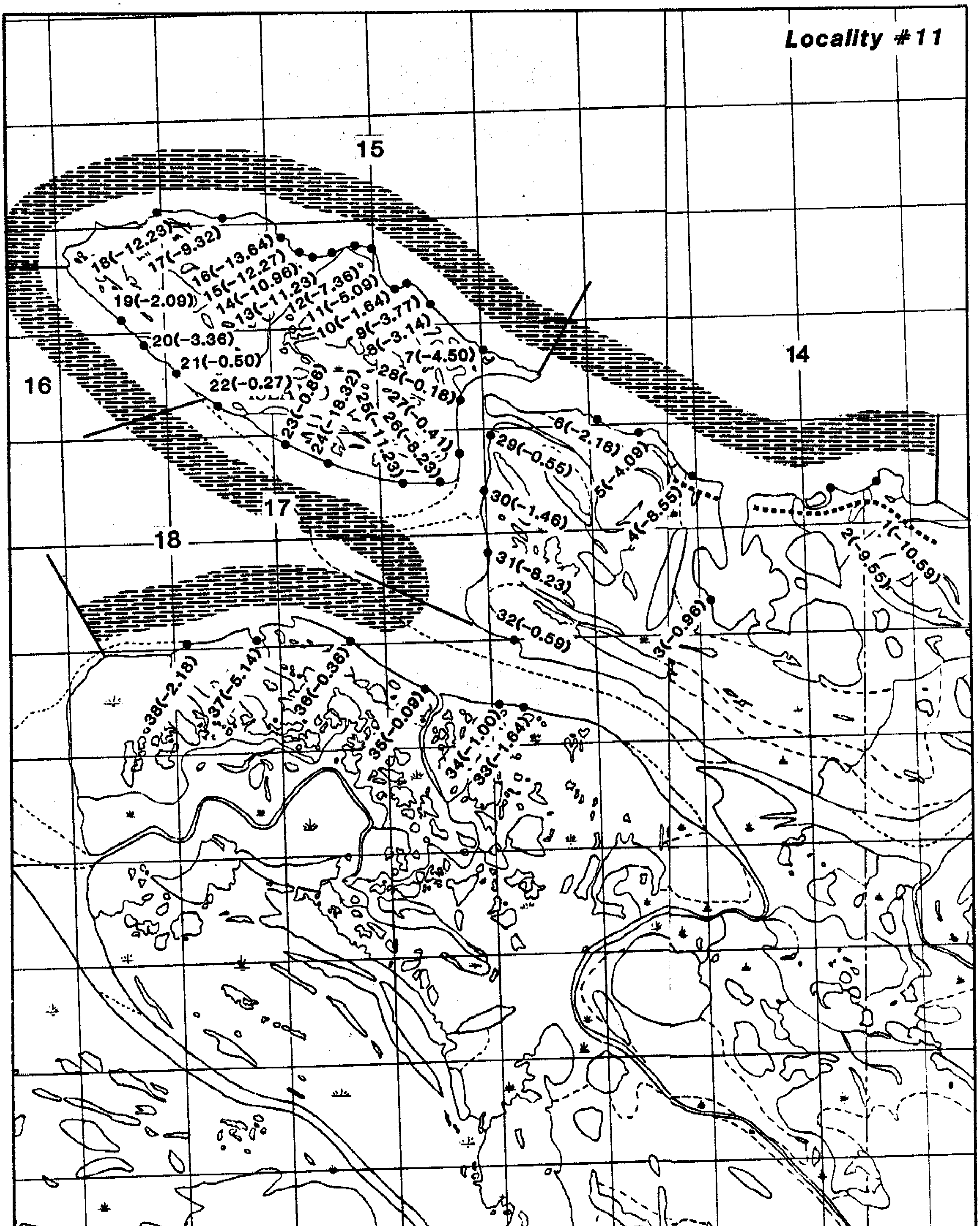
YUKON
N.W.T.
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

Locality #11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8(-3.14)
9(-3.77)
10(-1.64)
11(-5.09)
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22(-0.27)
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25(-11.23)
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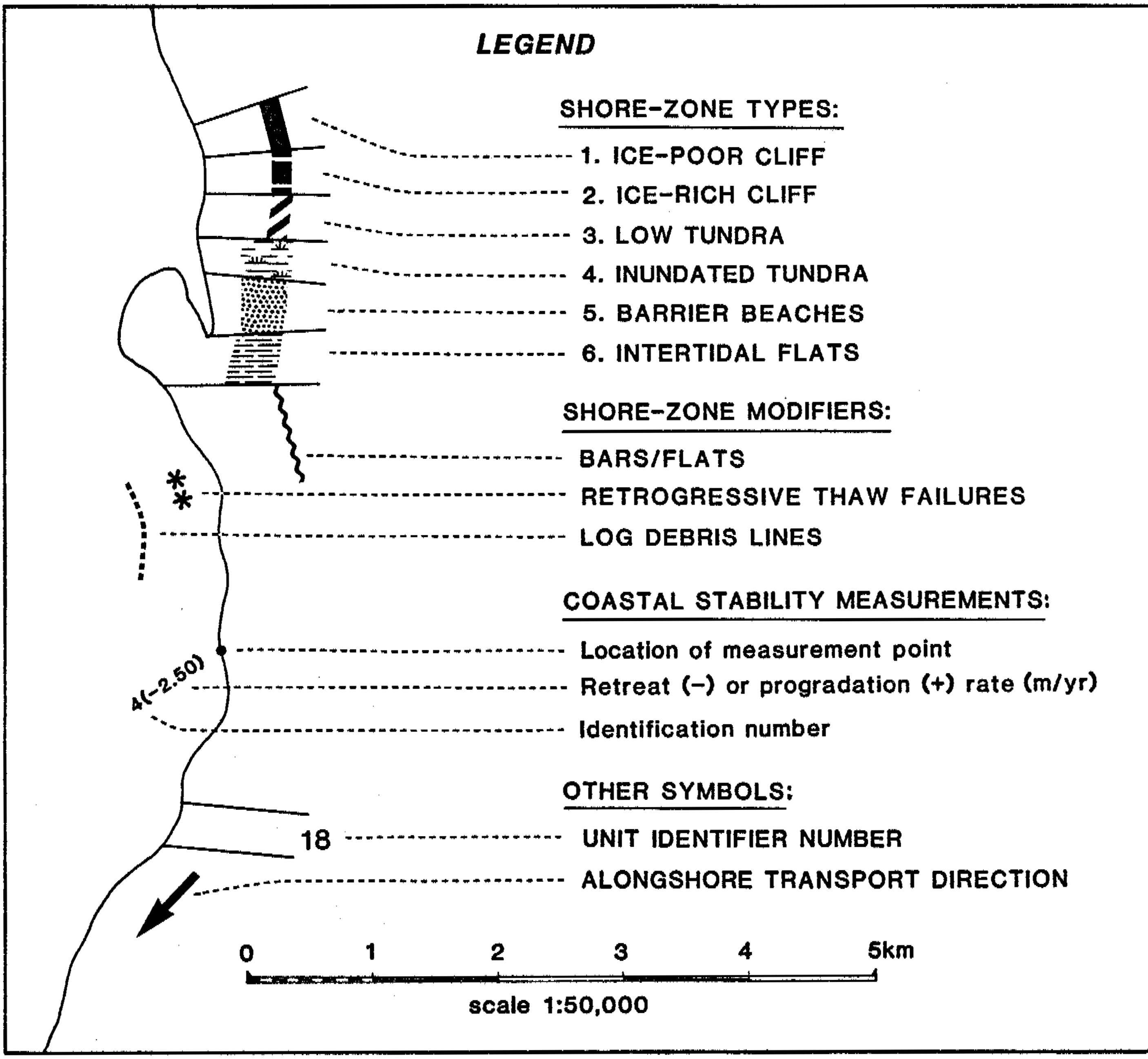
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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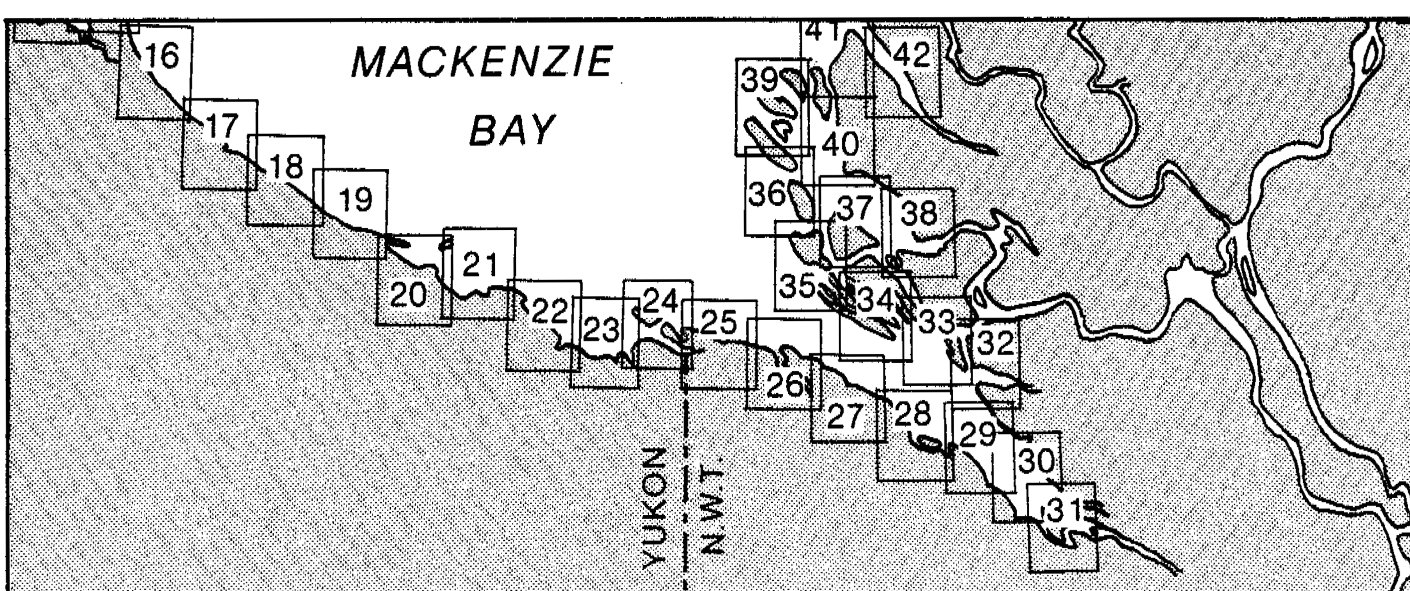
scale 1:50,000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YUKON
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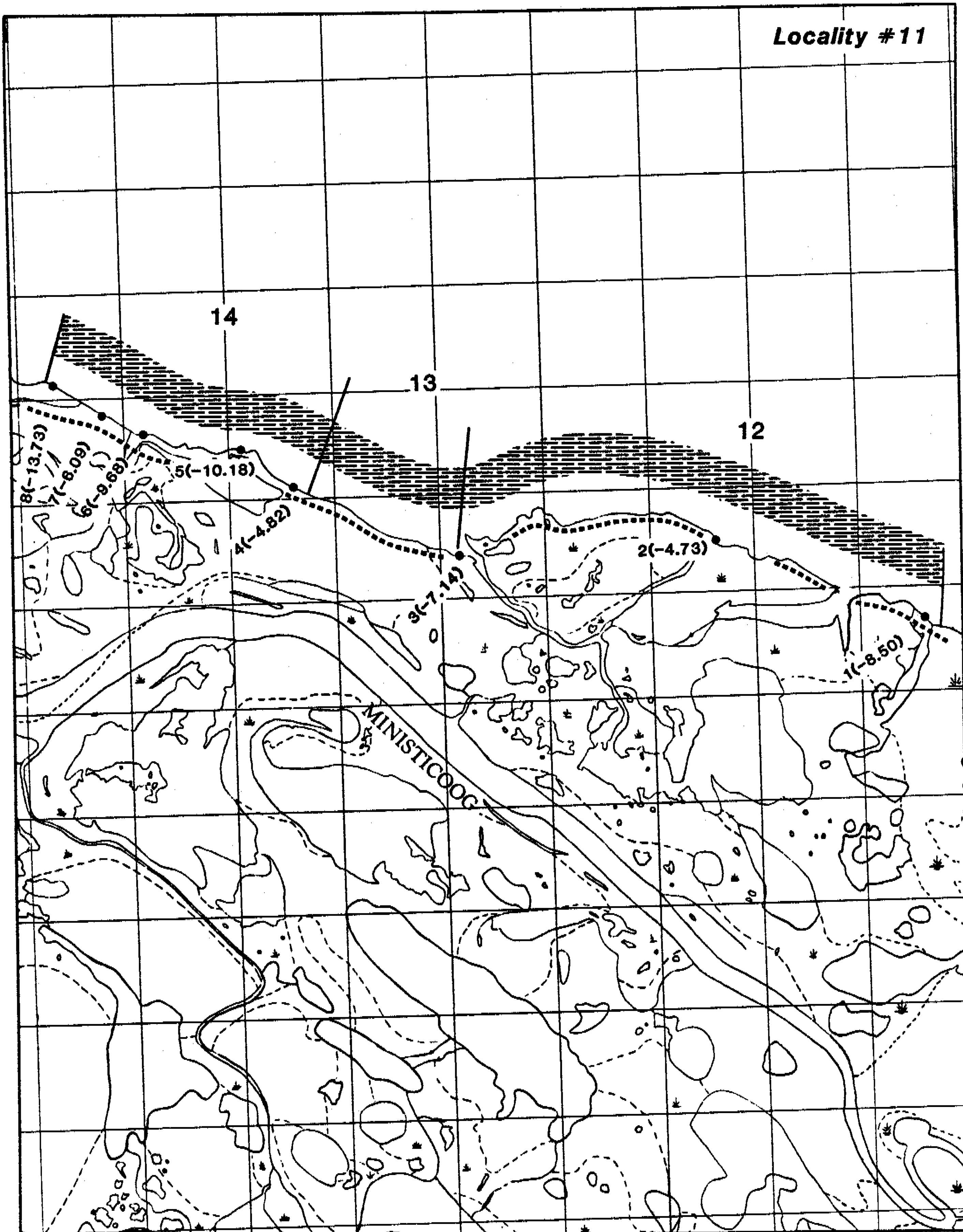

Locality #11
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8(−13.73)
7(−6.09)
6(−9.68)
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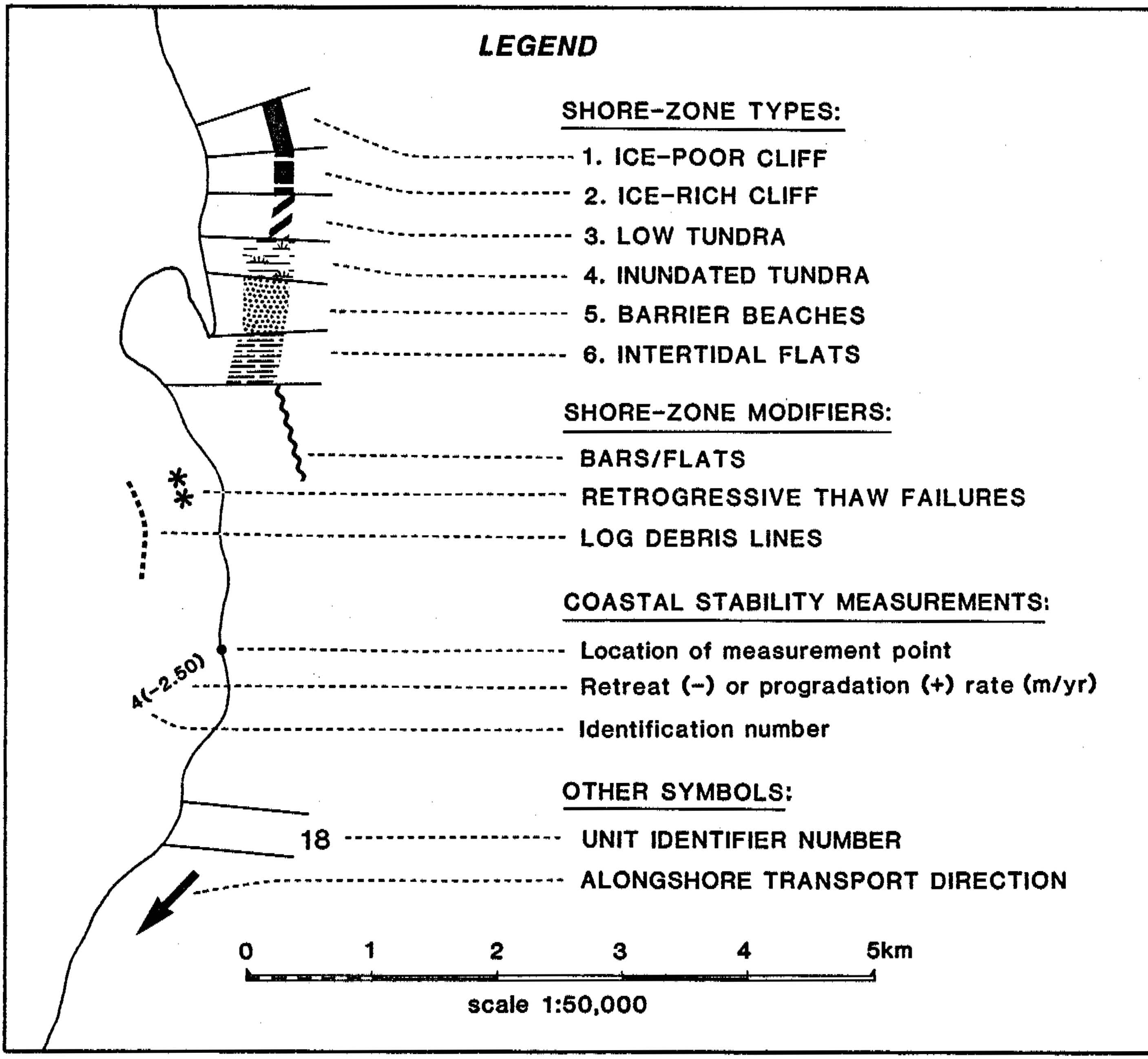
4(−4.82)
3(−7.14)
2(−4.73)
1(−8.50)
MINISTICOOG


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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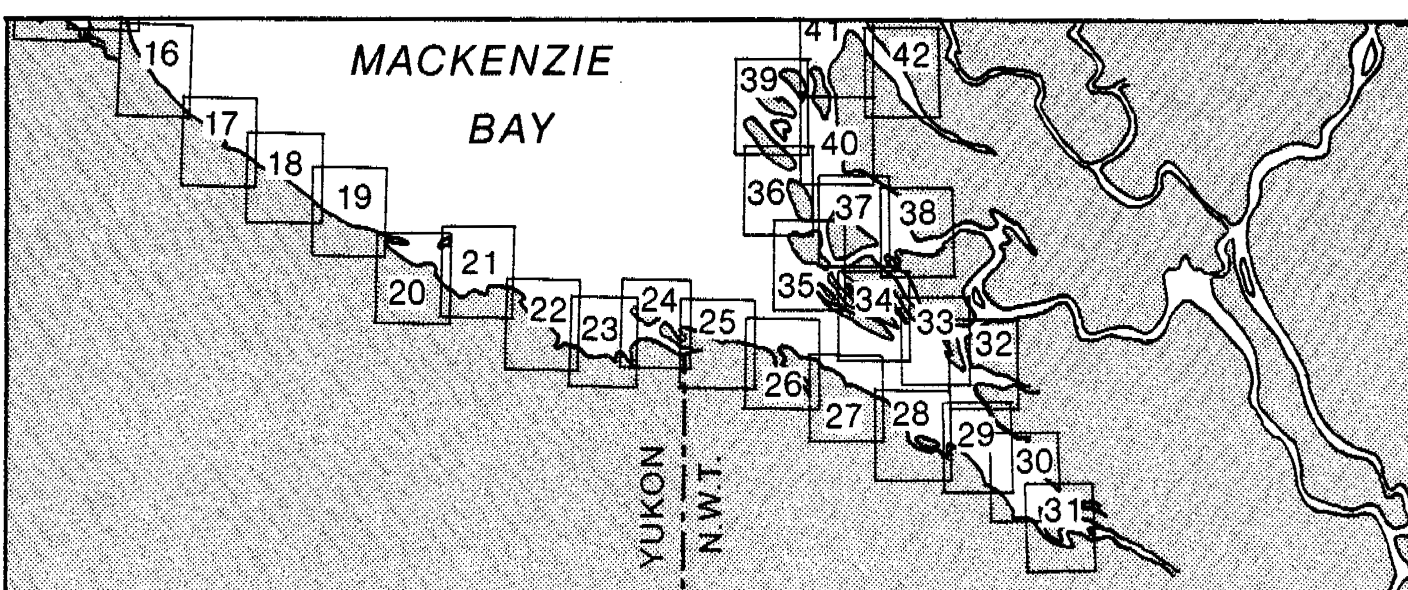
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKENZIE
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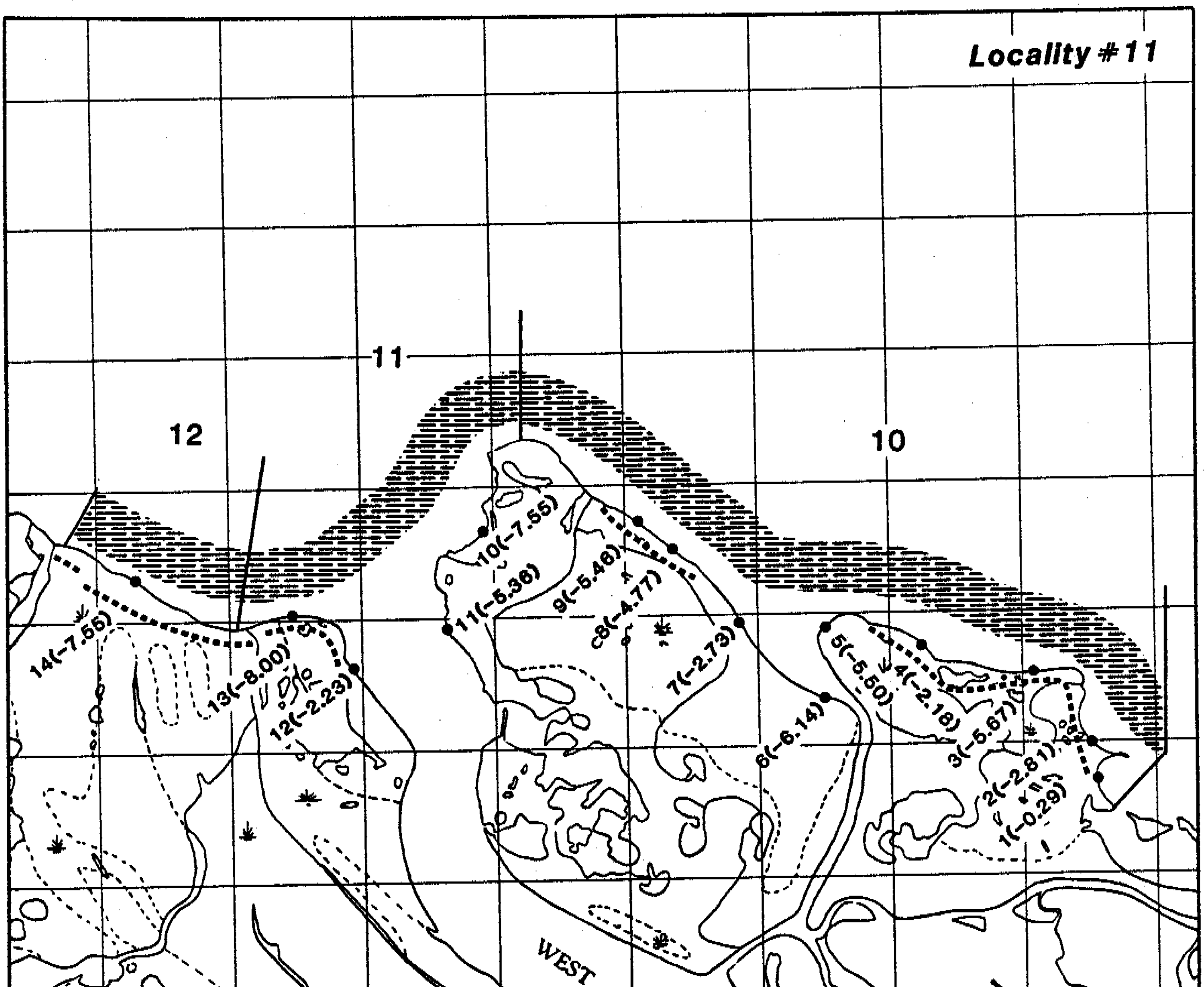
Locality #11
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13(-8.00)
12(-2.23)
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7(-2.73)
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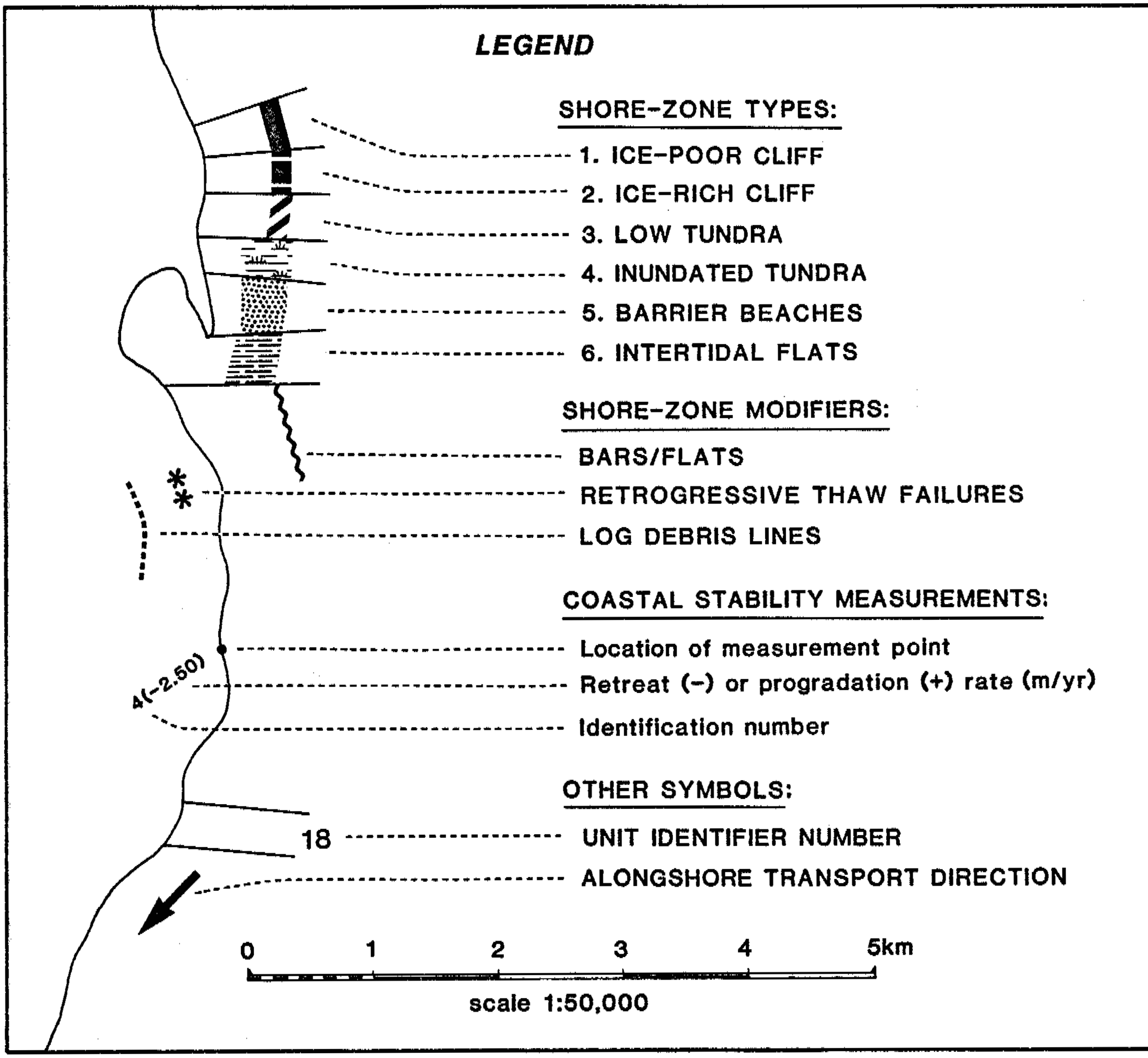
WEST
DELTA
CHANNEL



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
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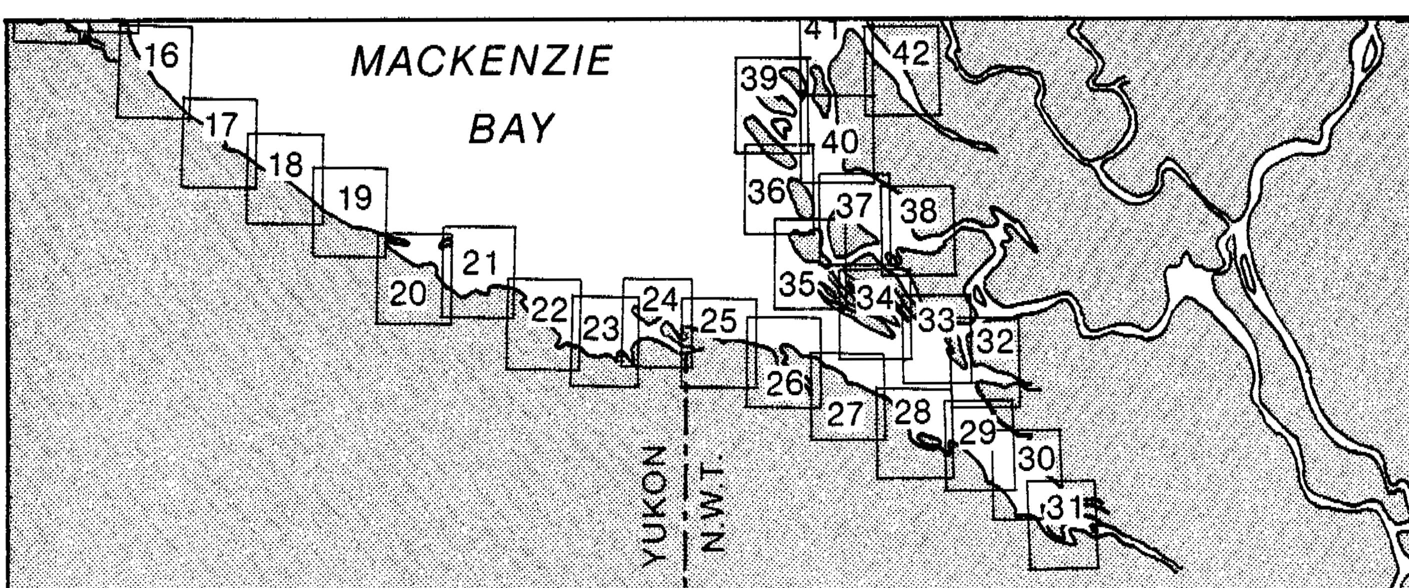
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKENZIE
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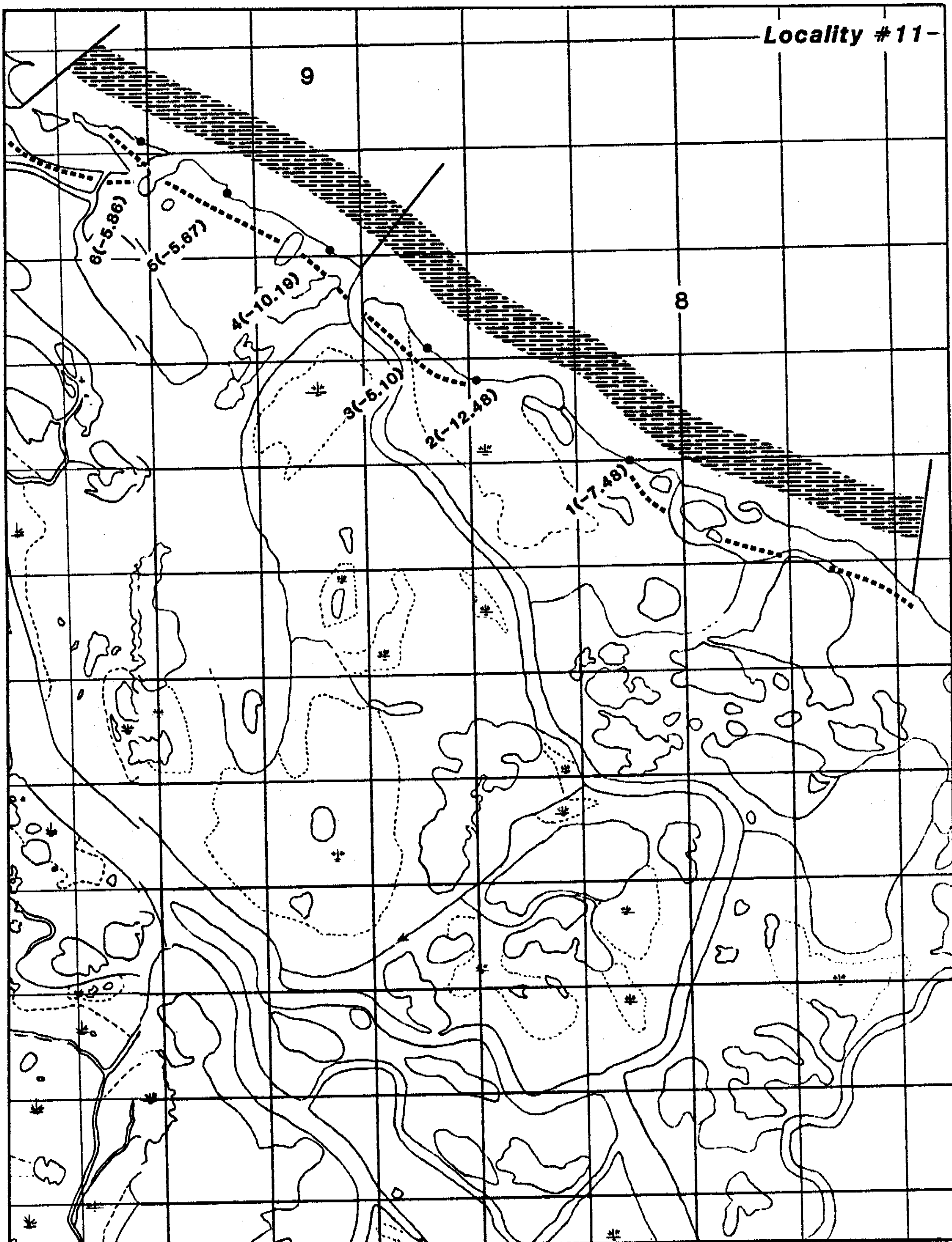
Locality #11
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4(-10.19)
3(-5.10)
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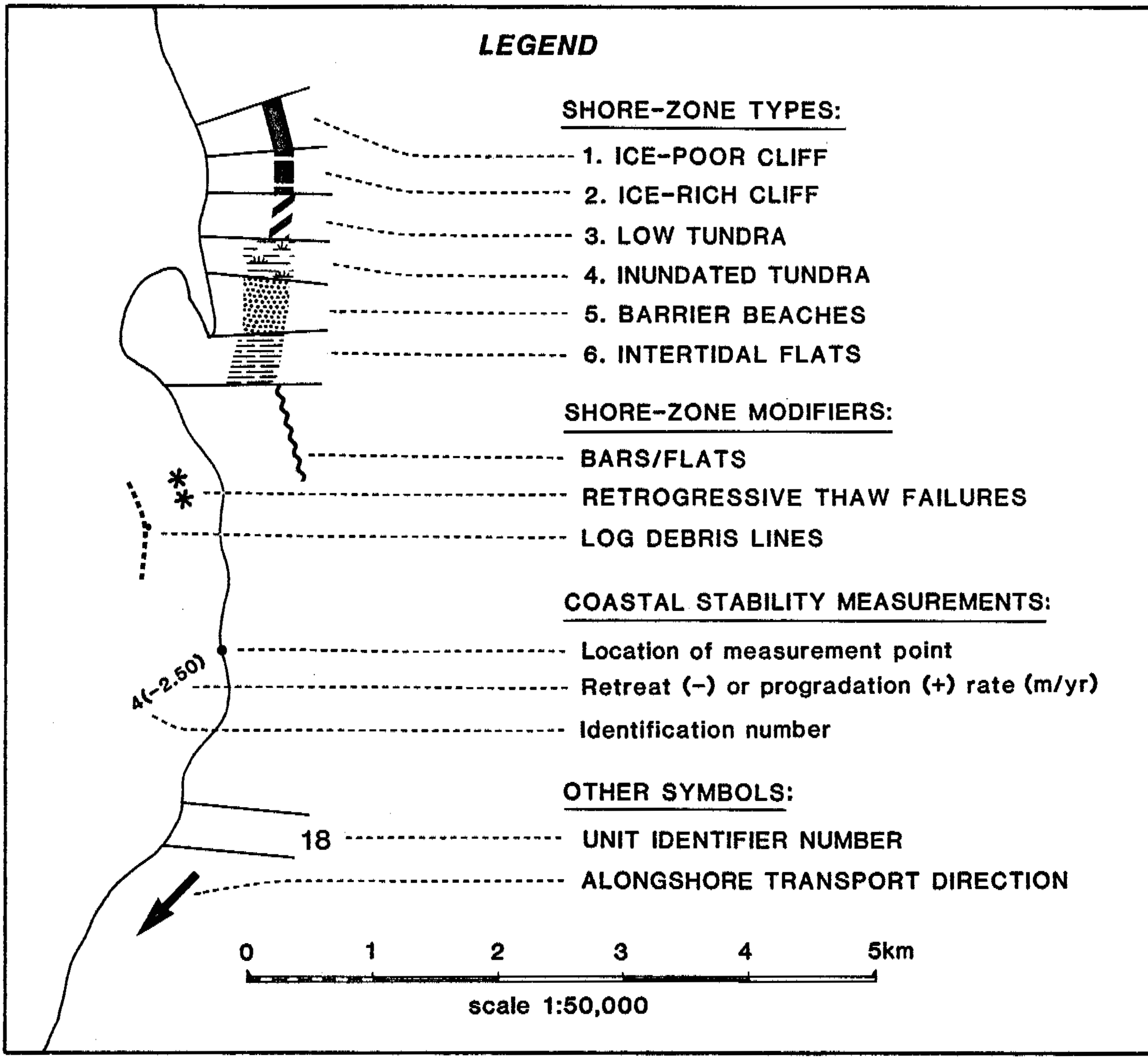

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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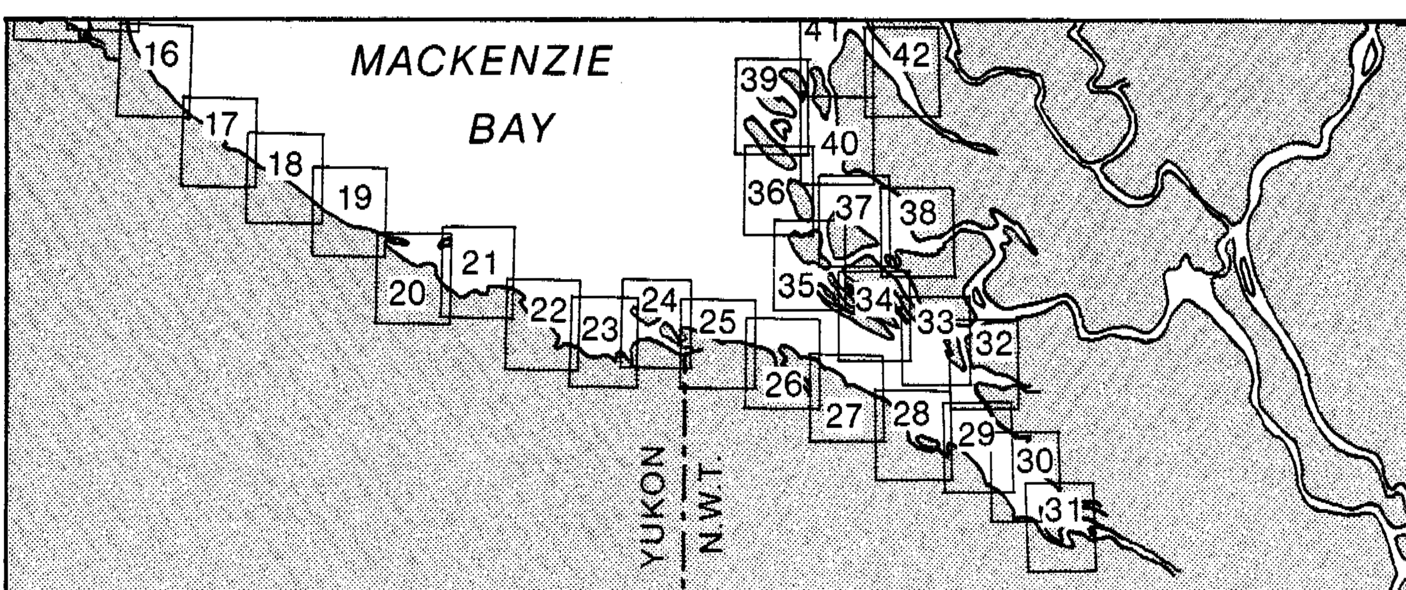
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKENZIE
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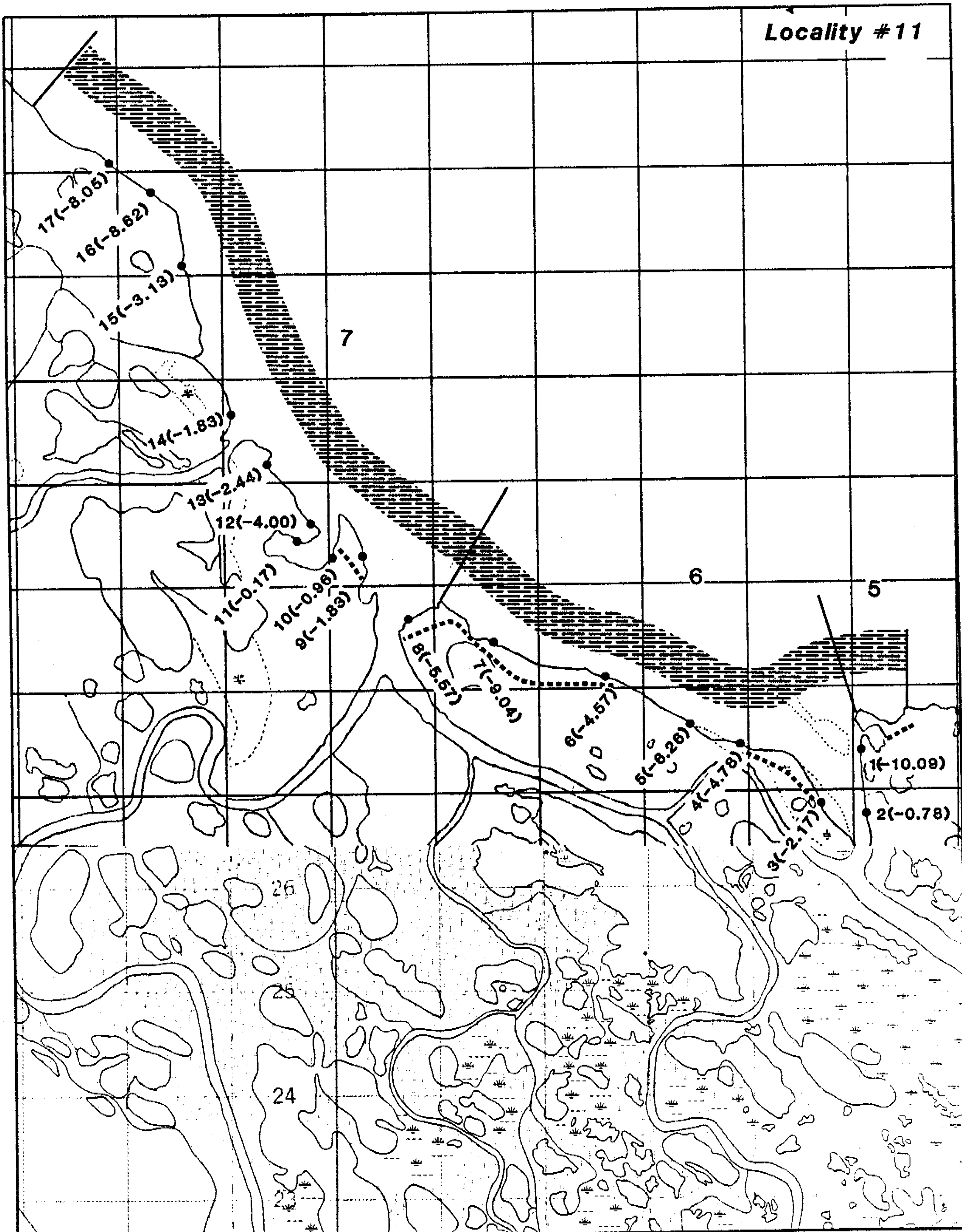
Locality #11
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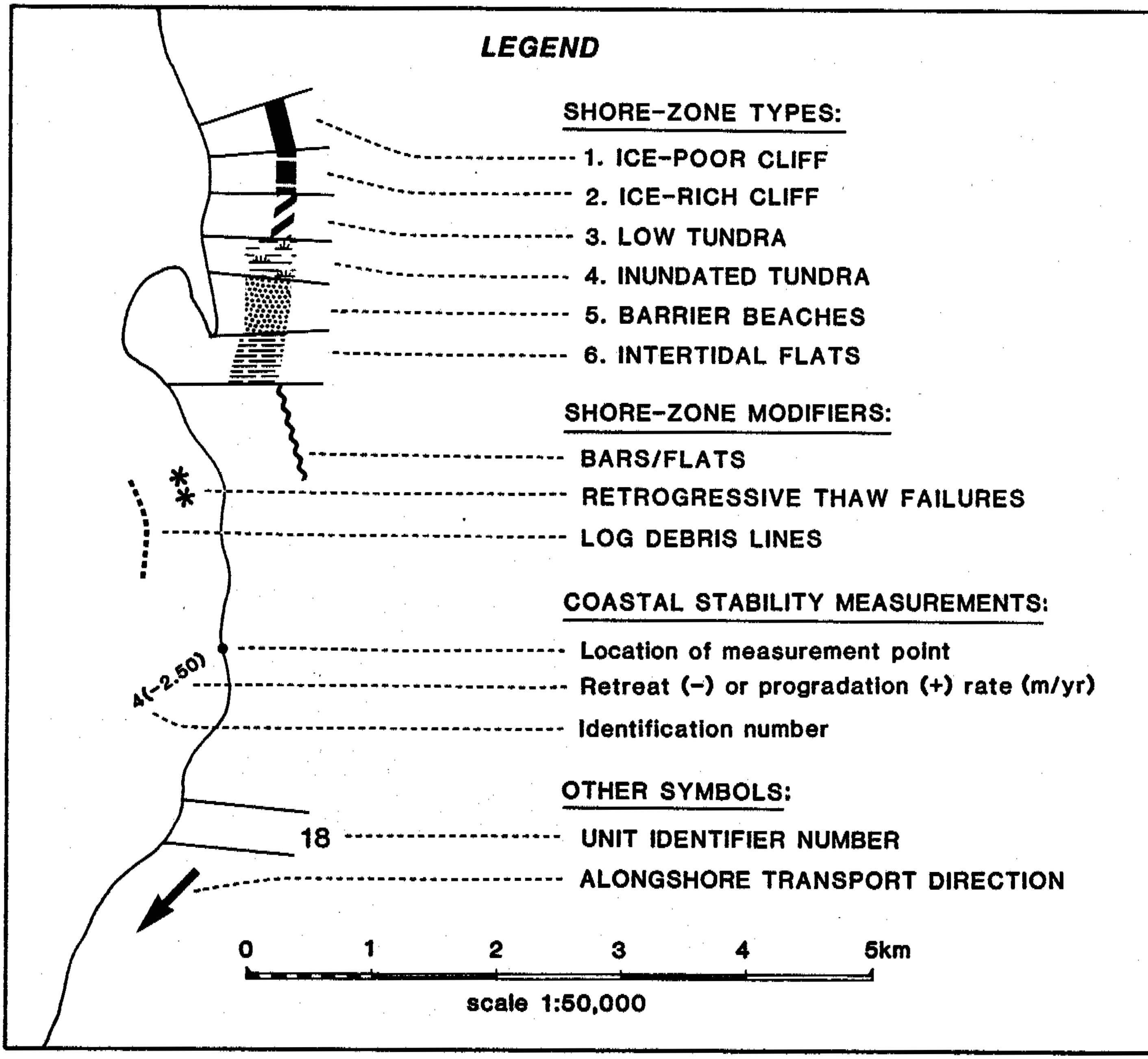

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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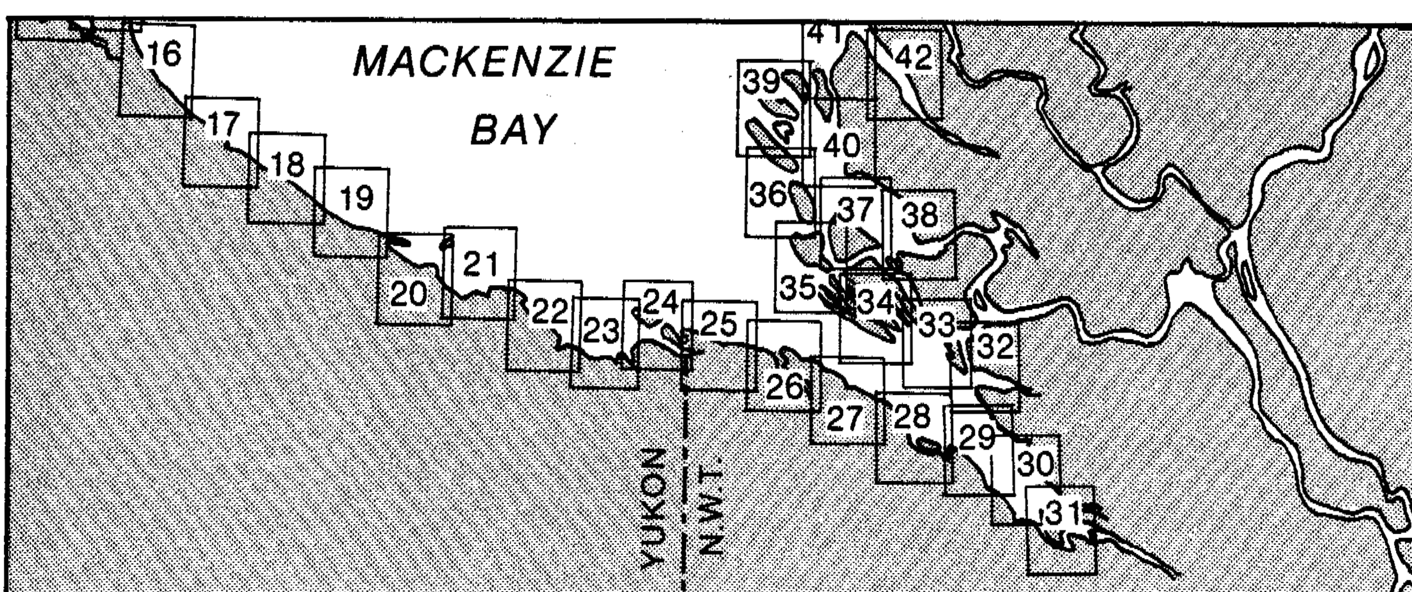
5km
scale 1:50,000



MACKENZIE
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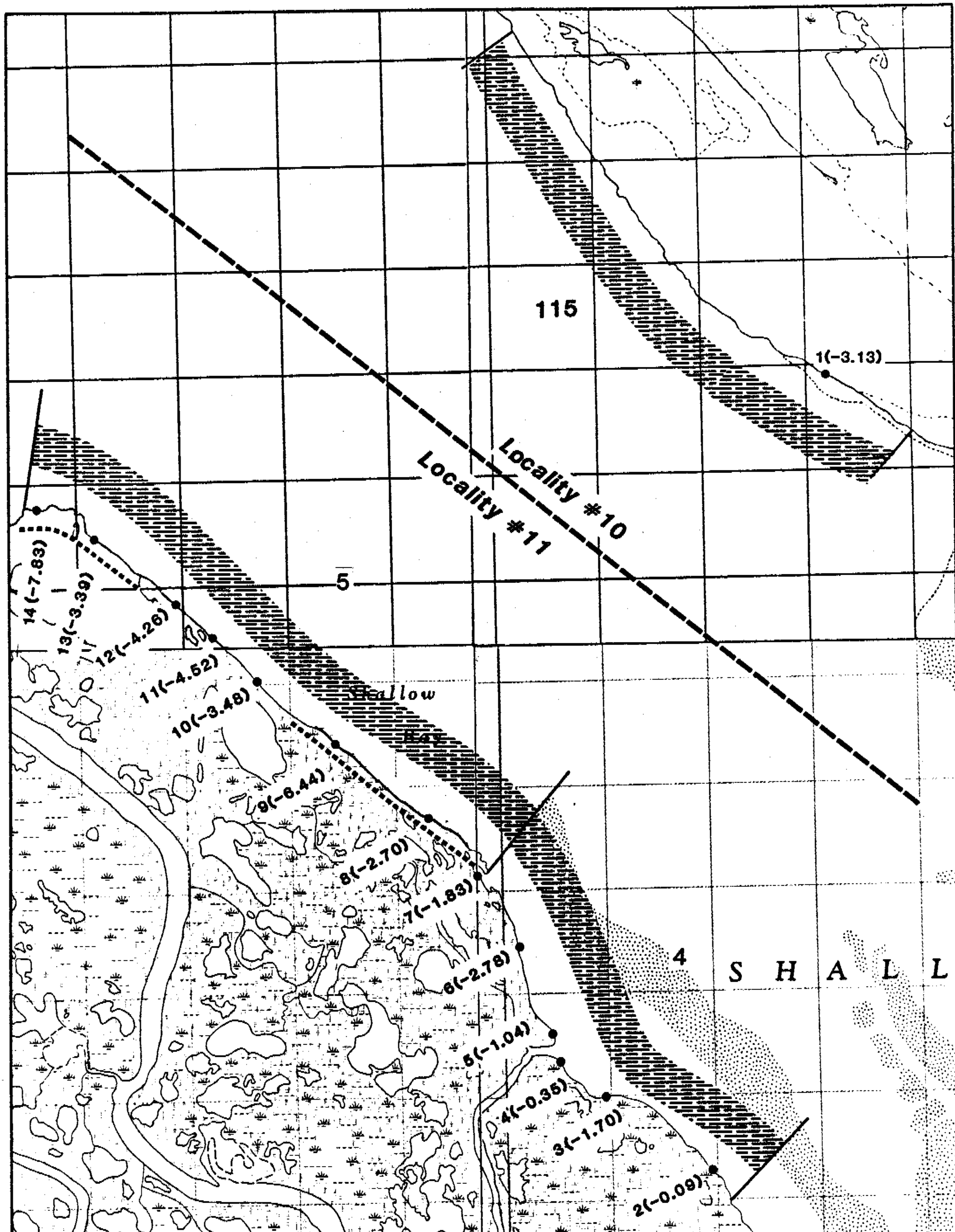

115
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Locality #10
Locality #11
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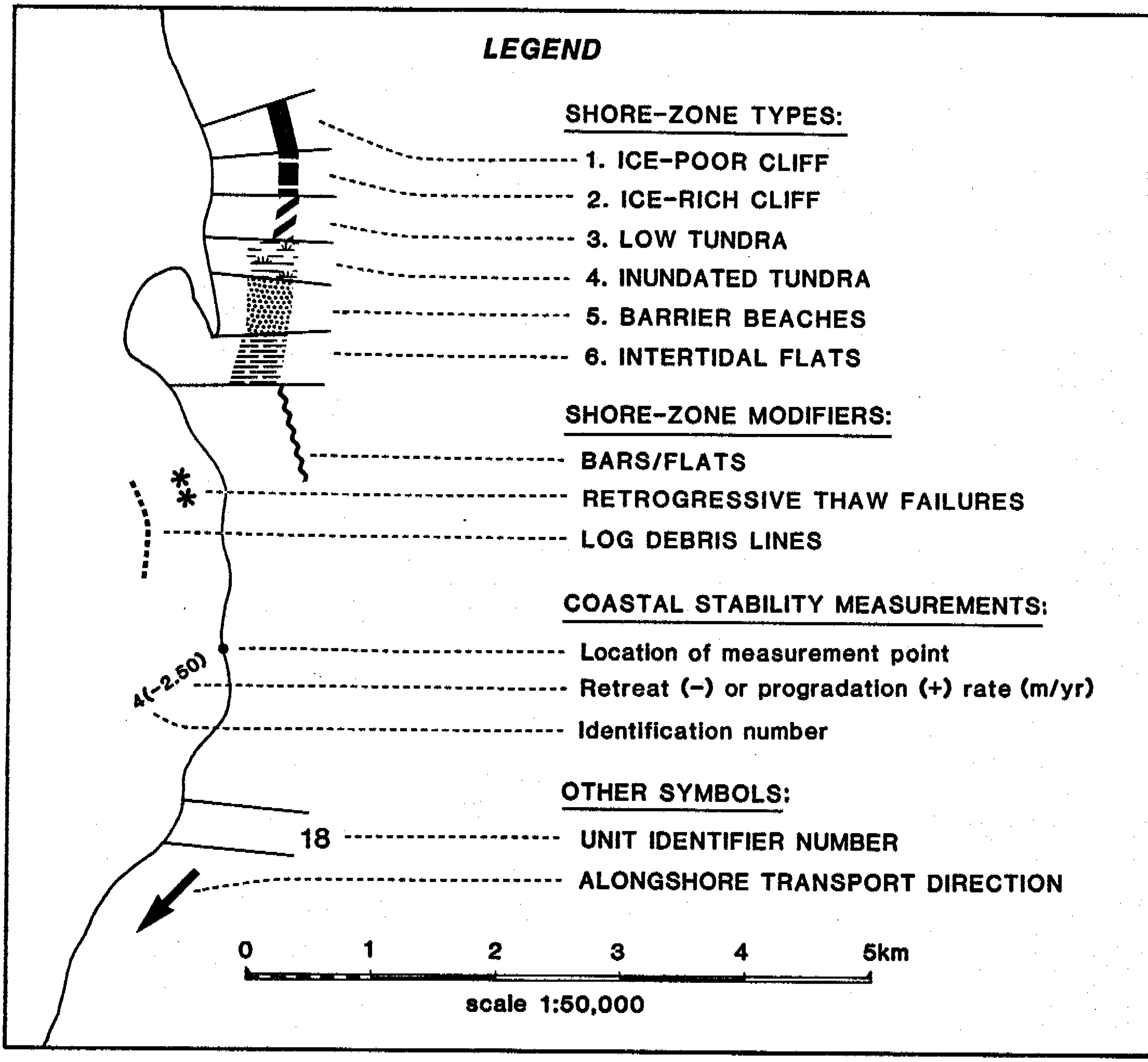
11(-4.52)
10(-3.48)
Shallow
Bay
9(-6.44)
8(-2.70)
7(-1.83)
6(-2.78)
4
S H A L L
5(-1.04)
4(-0.35)
3(-1.70)
2(-0.09)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
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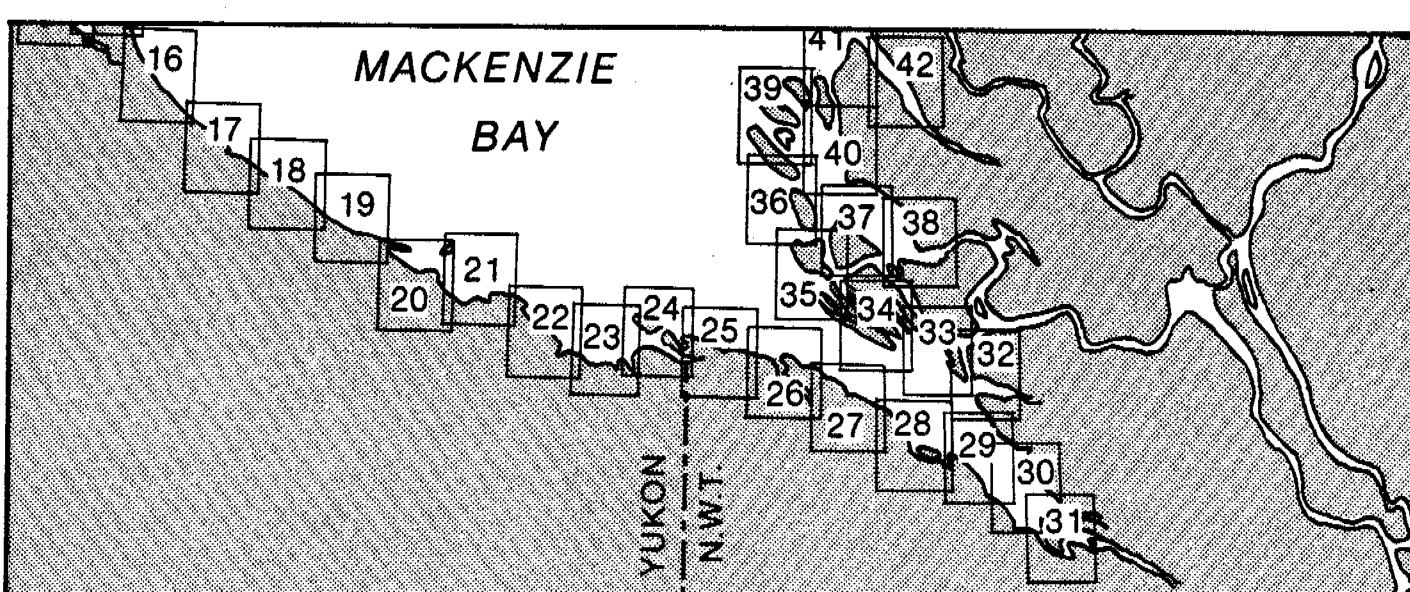
4
5km
scale 1:50,000


MACKENZIE
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YUKON
N.W.T.
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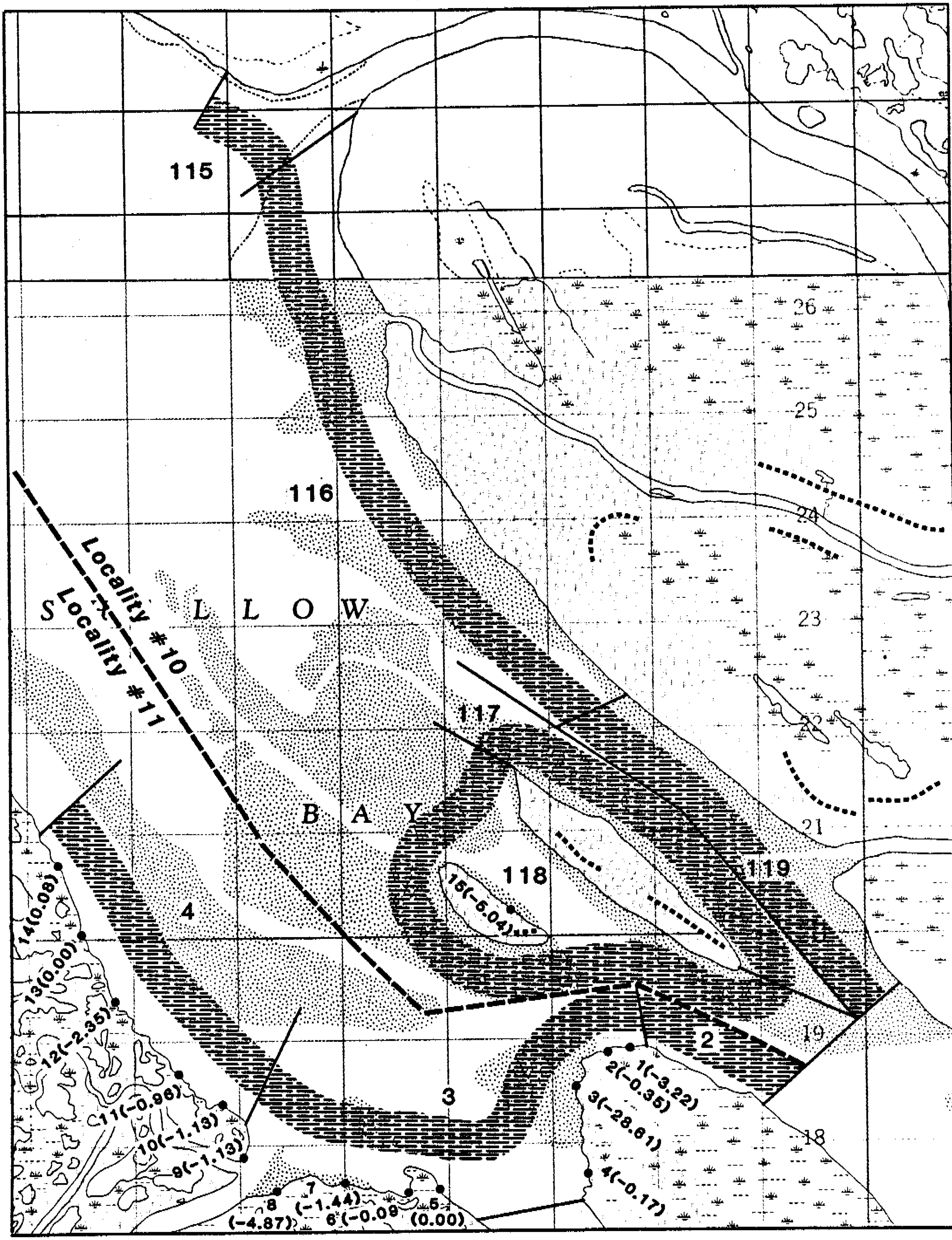
115
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119
Locality #10
Locality #11
S   L L O W
B A Y
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22
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19
18
14(0.08)
13(0.00)
12(-2.35)
11(-0.96)
10(-1.13)
9(-1.13)
8
(-4.87)
7
(-1.44)
6(-0.09)
5
(0.00)
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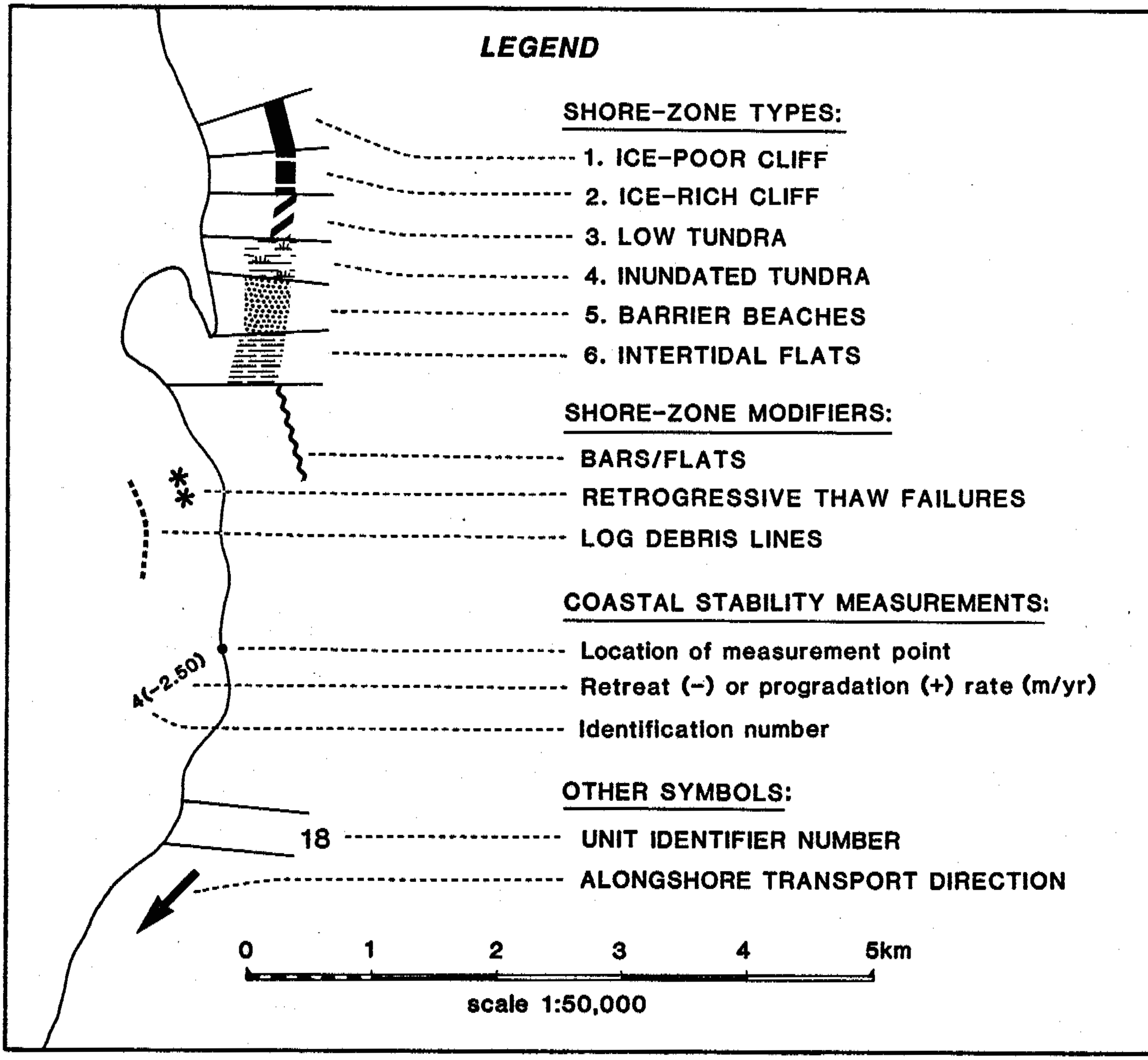
2(-0.35)
3(-28.61)
4(-0.17)
15(-5.04)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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Location of measurement point
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Identification number
4(-2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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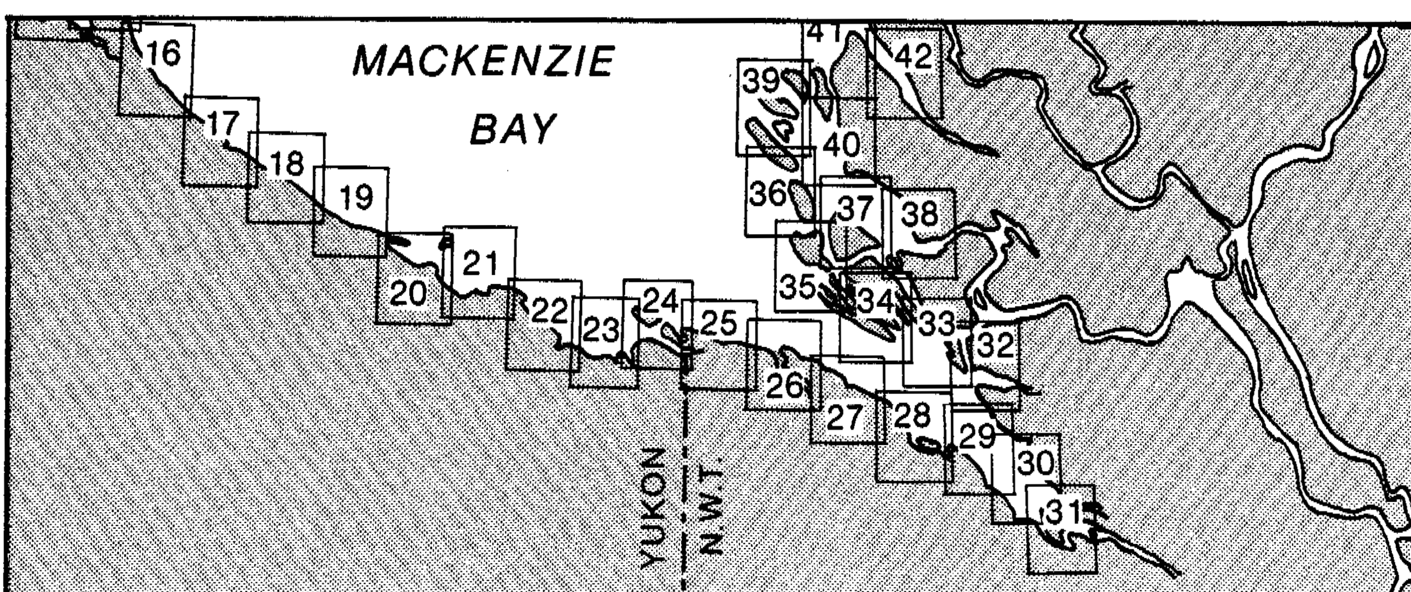
5km
scale 1:50,000



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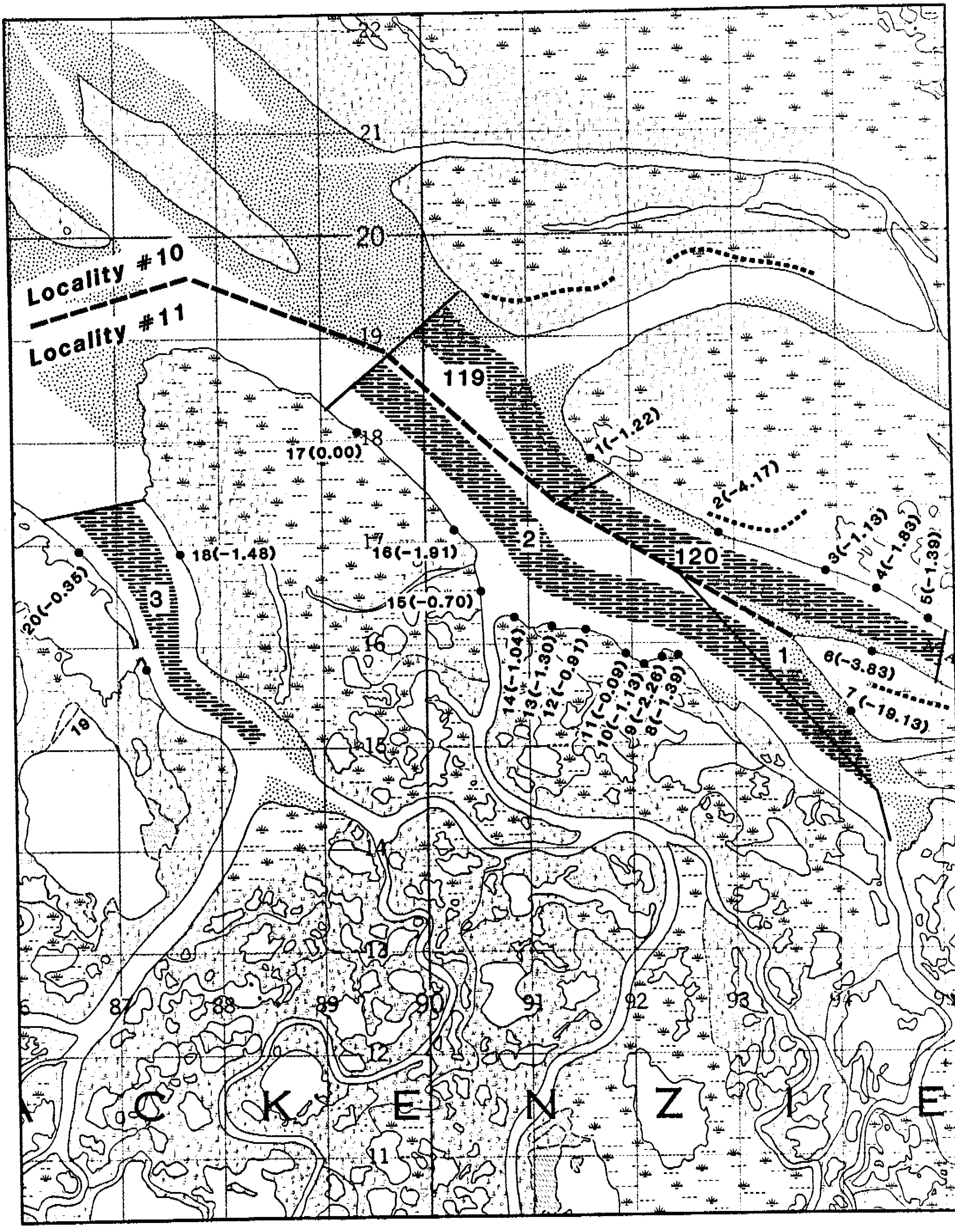
YUKON
N.W.T.


Locality #10
Locality #11
119
120
1
2
3
17(0.00)
1(-1.22)
2(-4.17)
3(-1.13)
4(-1.83)
5(-1.39)
6(-3.83)
7 (-19.13)
8(-1.39)
9(-2.26)
10(-1.13)
11(-0.09)
12(-0.91)
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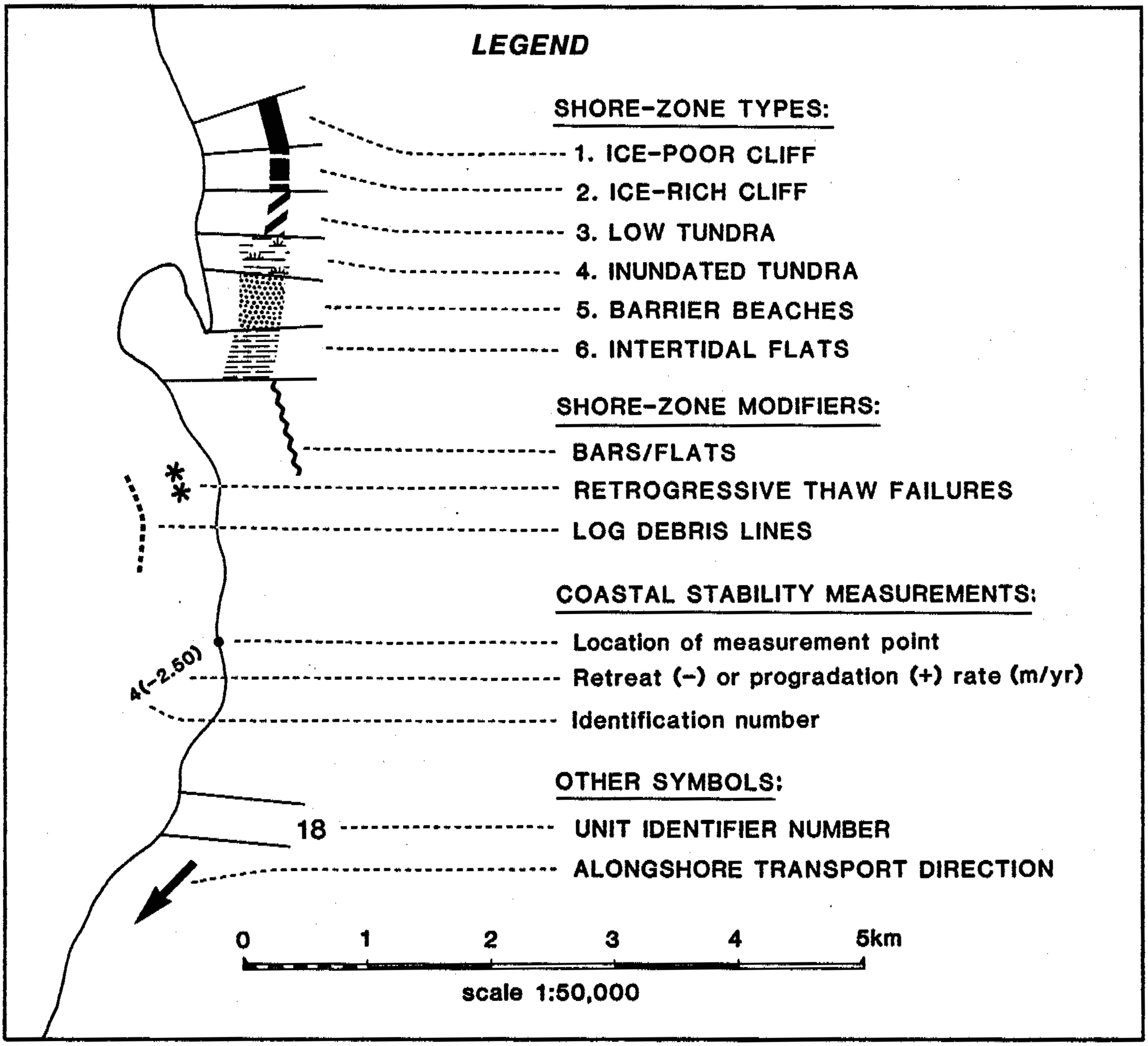
14(-1.04)
15(-0.70)
16(-1.91)
18(-1.48)
20(-0.35)
C K E N Z I E


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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5. BARRIER BEACHES
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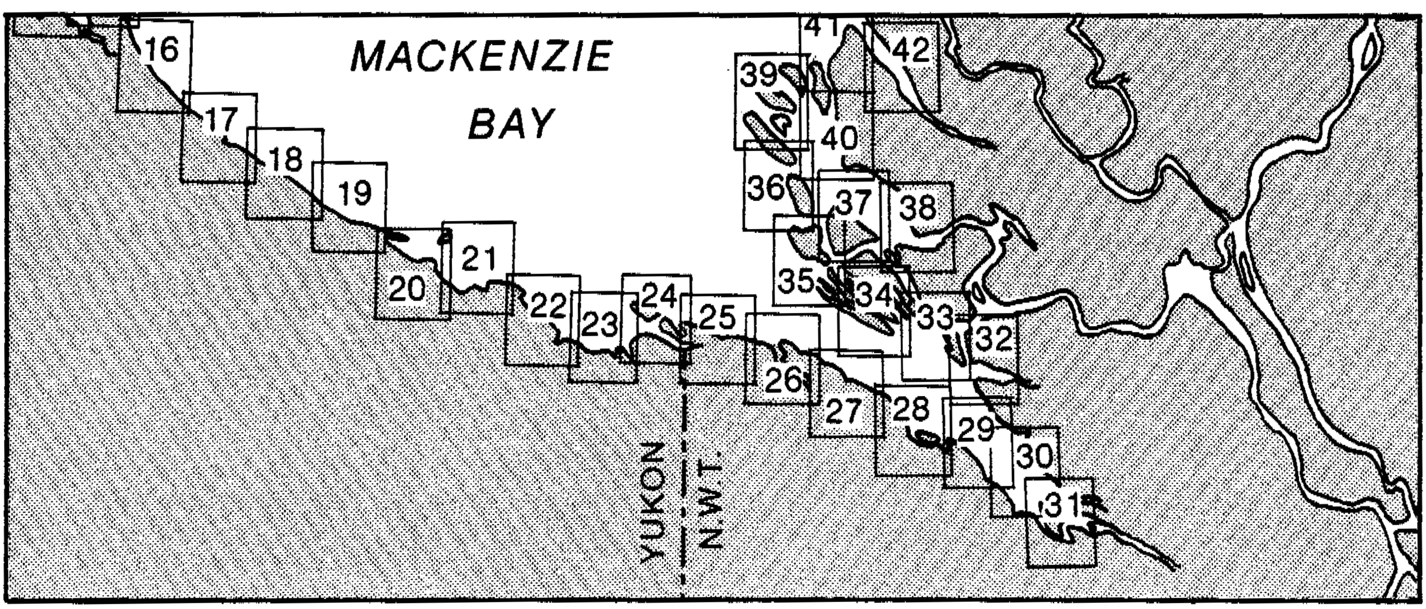
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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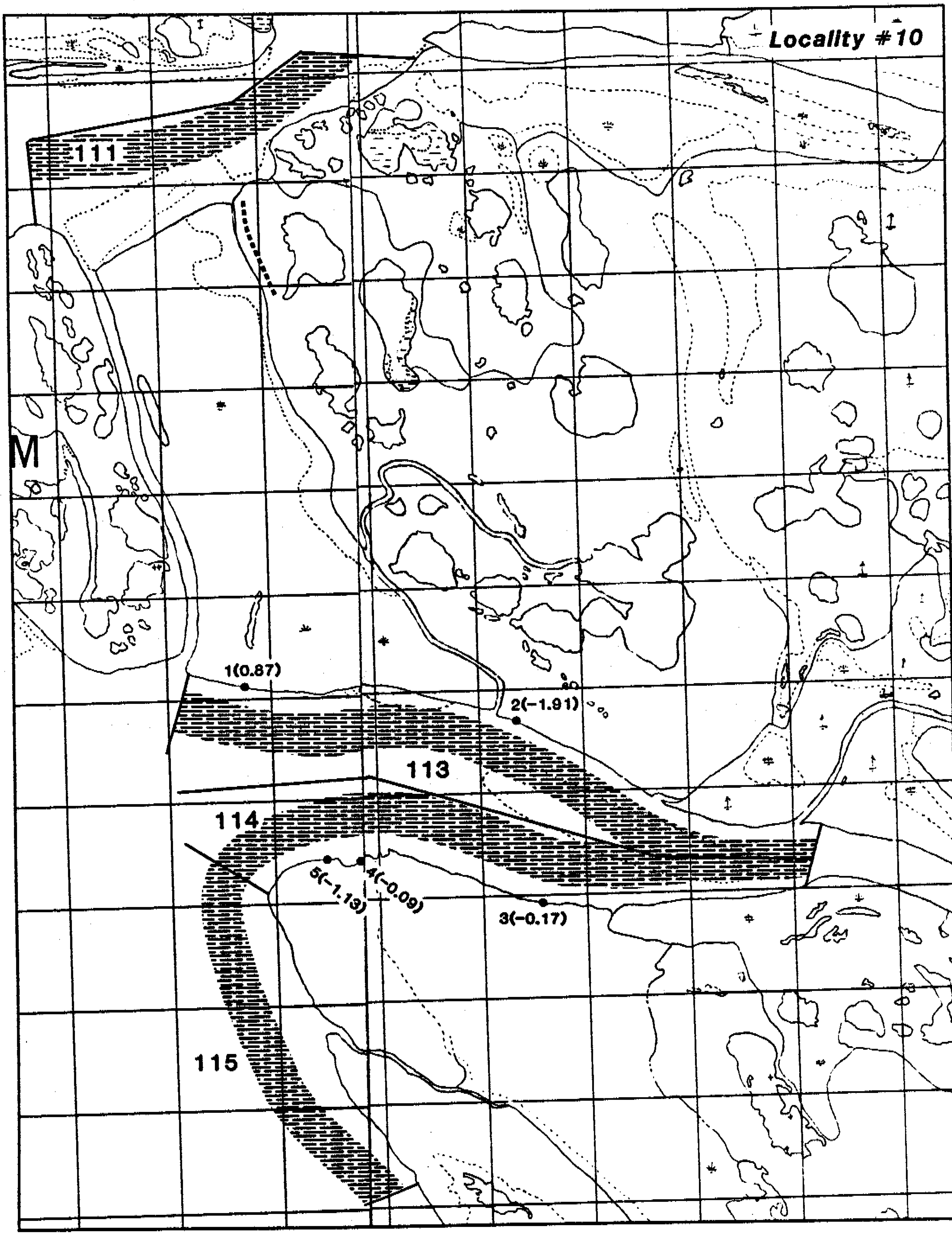
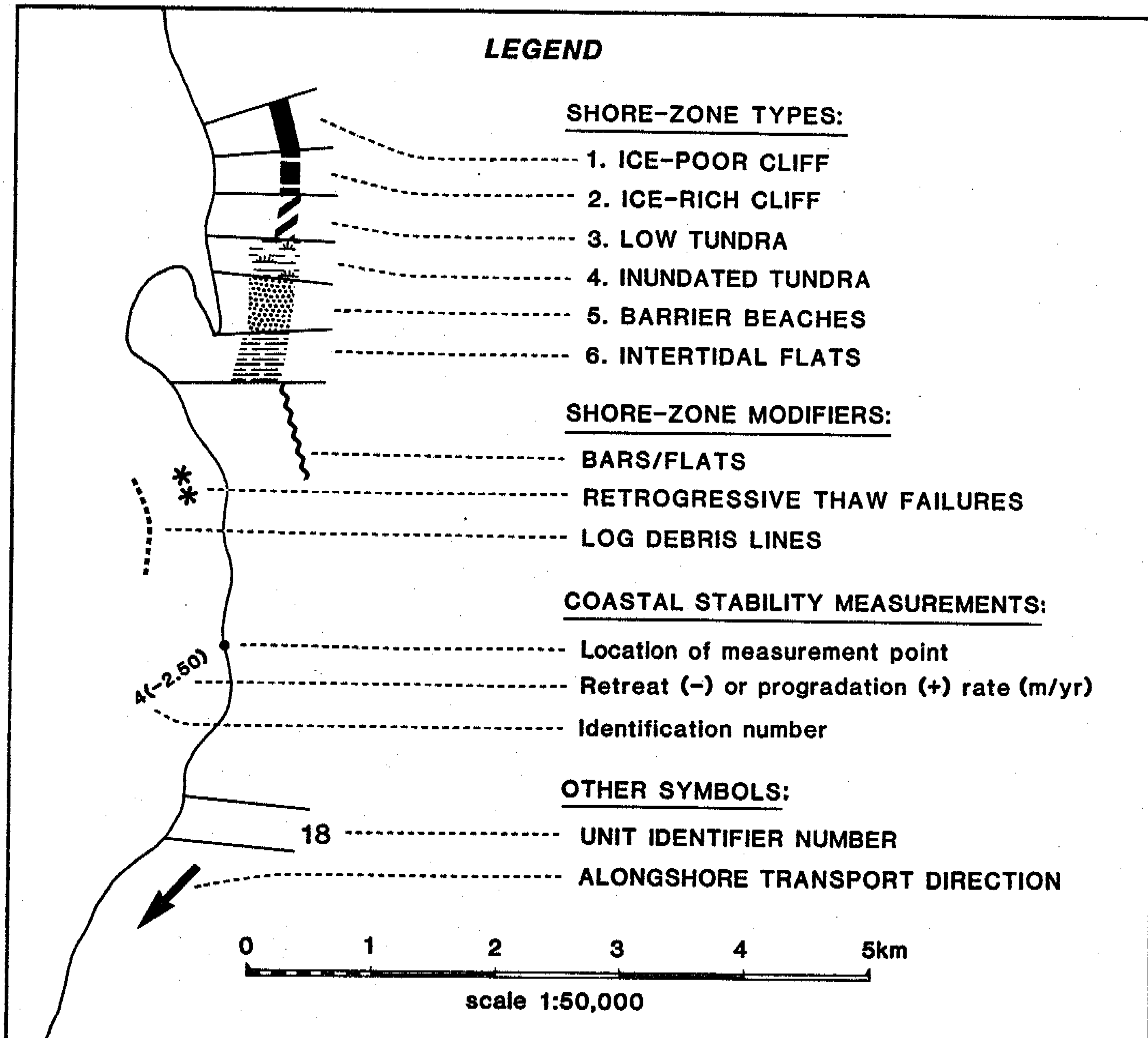
YUKON
N.W.T.



Locality #10
111
M
1(0.87)
2(−1.91)
113
114
5(−1.13)
4(−0.09)
3(−0.17)
115


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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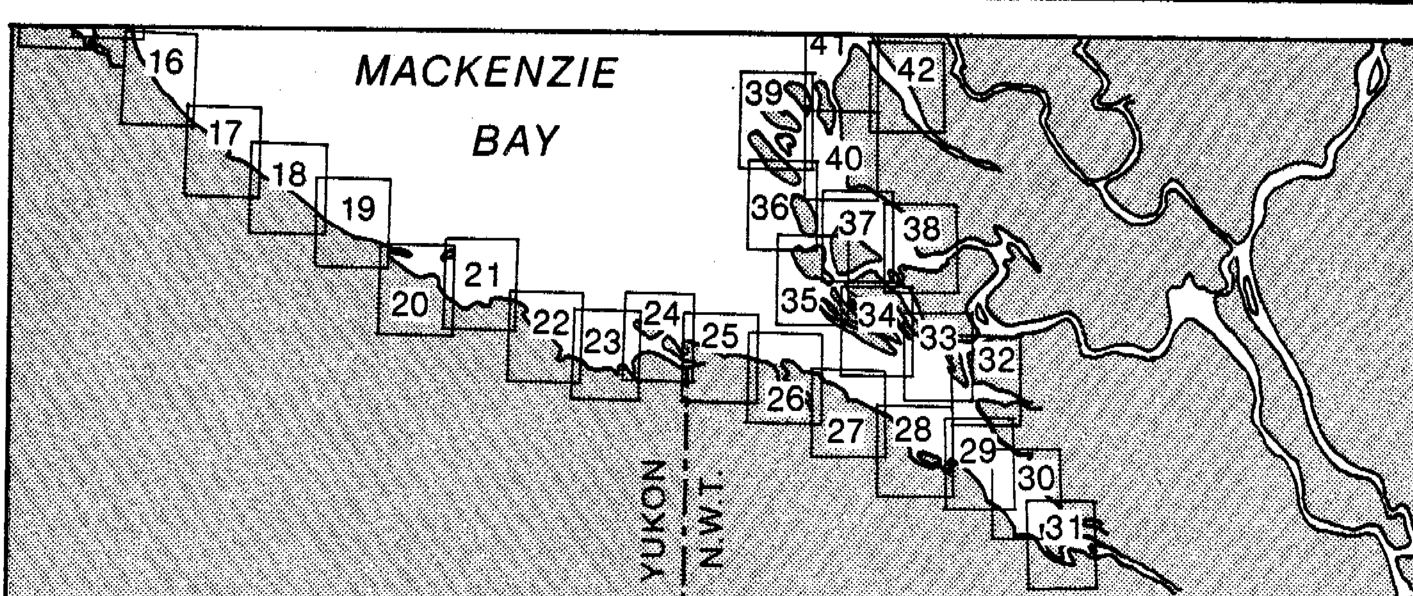
5km
scale 1:50,000


MACKENZIE
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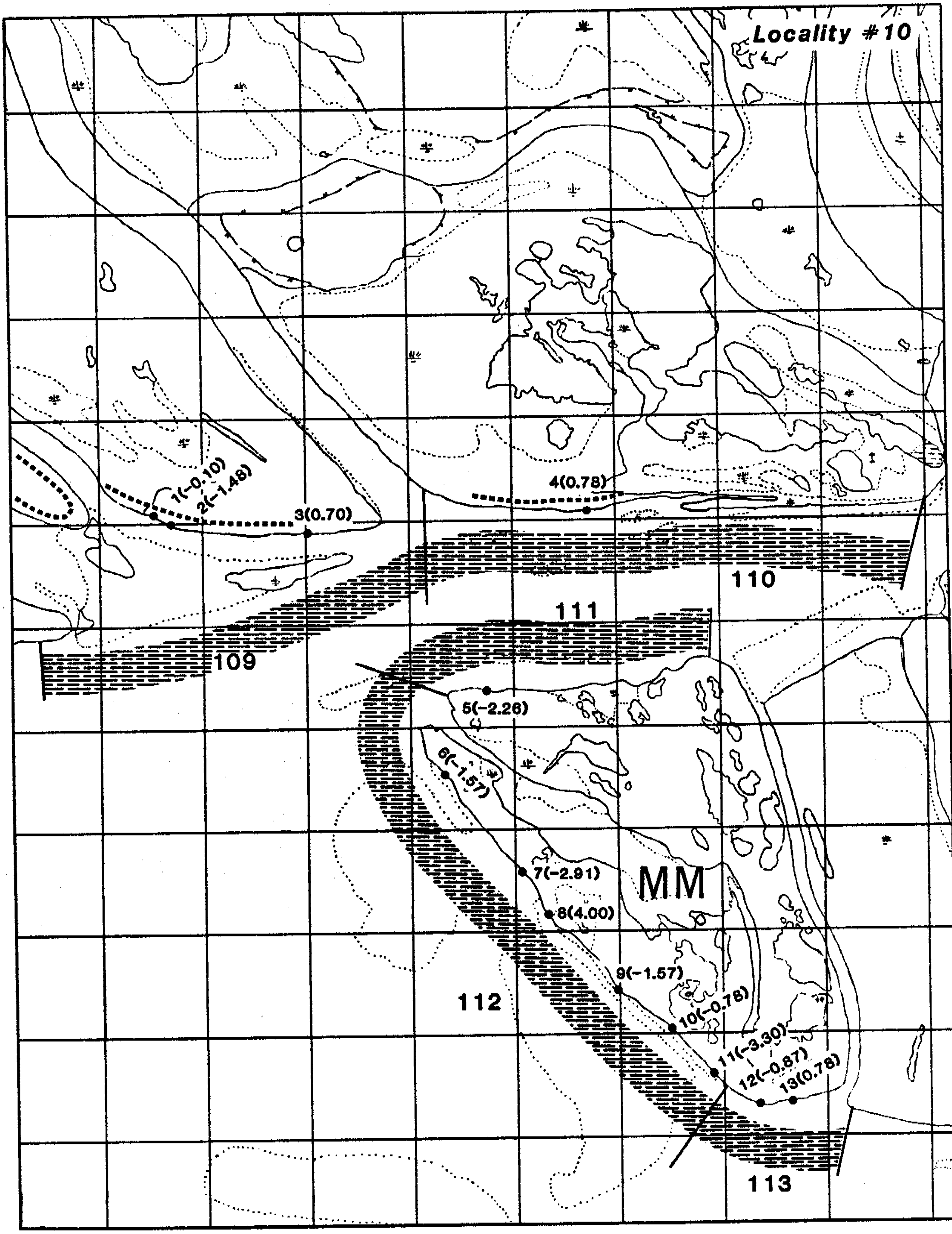
YUKON
N.W.T.


Locality #10
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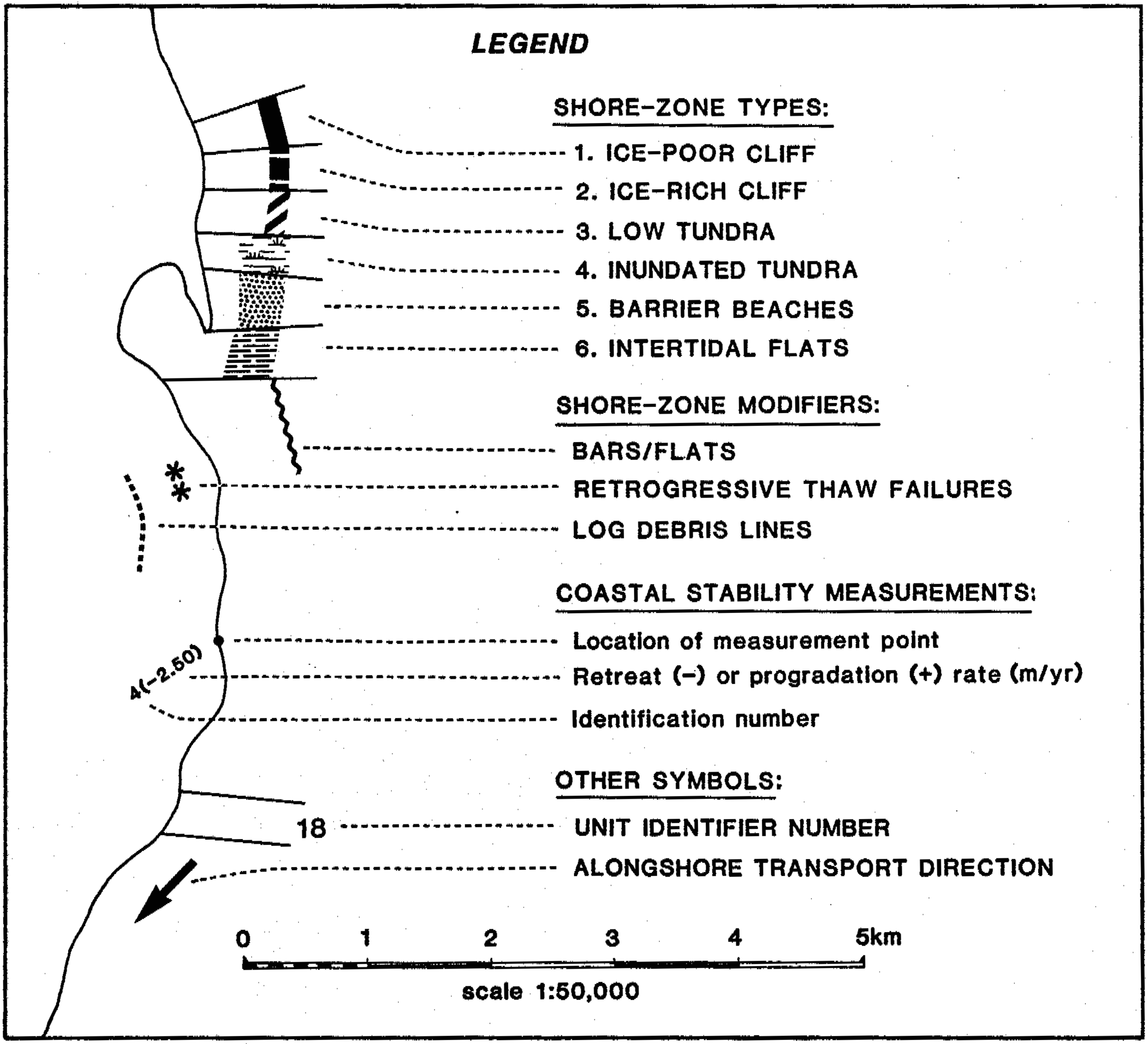
2(-1.48)
3(0.70)
4(0.78)
110
111
109
5(-2.26)
6(-1.57)
7(-2.91)
MM
8(4.00)
9(-1.57)
112
10(-0.78)
11(-3.30)
12(-0.87)
13(0.78)
113



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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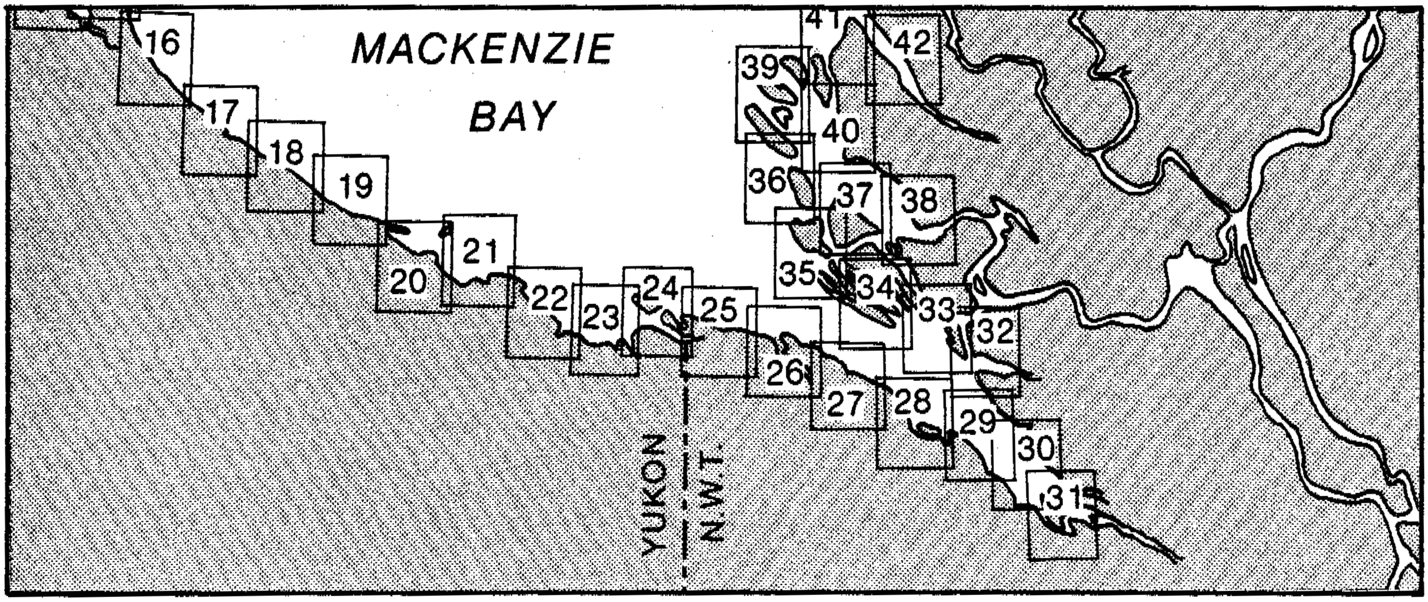
5km
scale 1:50,000



MACKENZIE BAY
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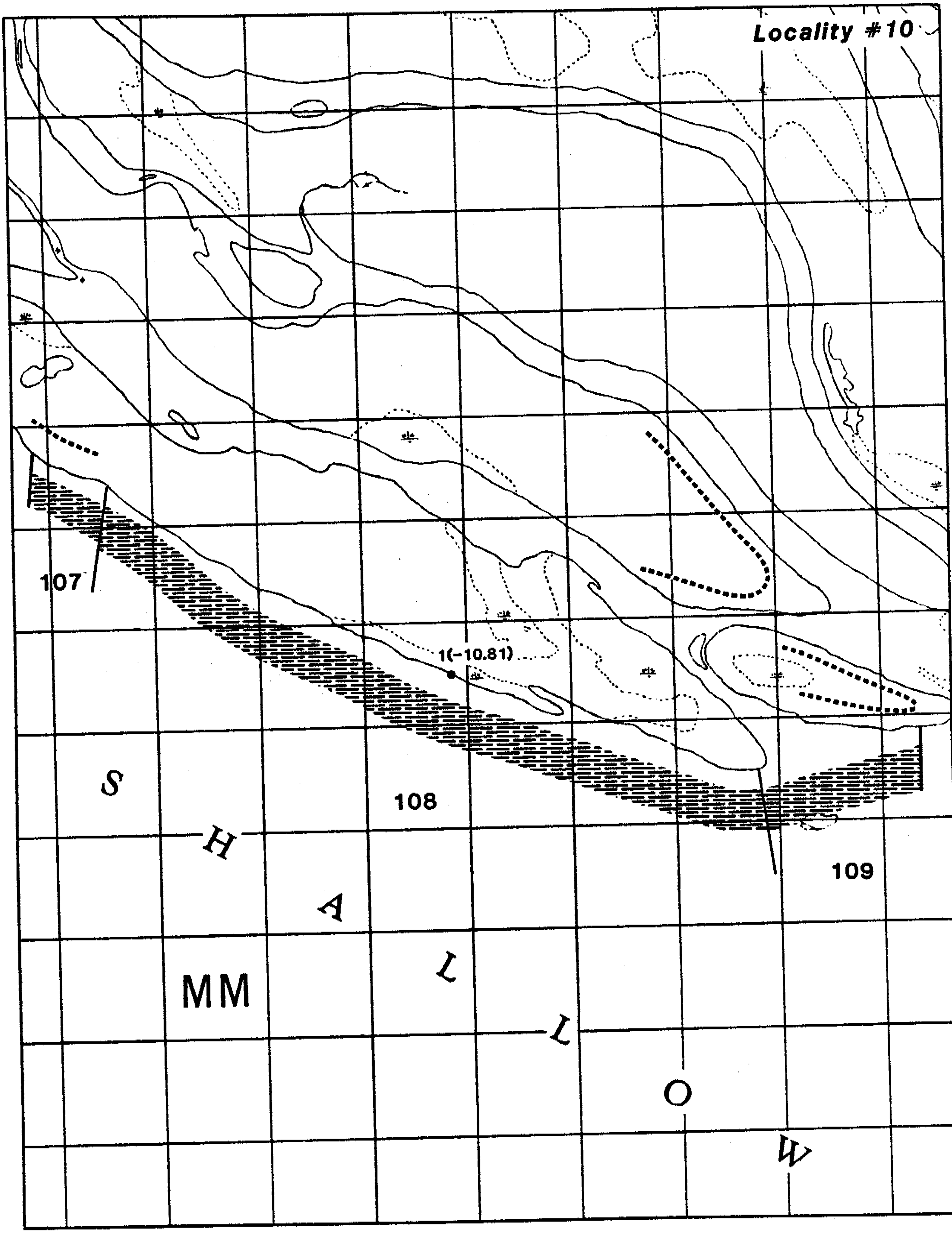
N.W.T.


Locality #10
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1(-10.81)
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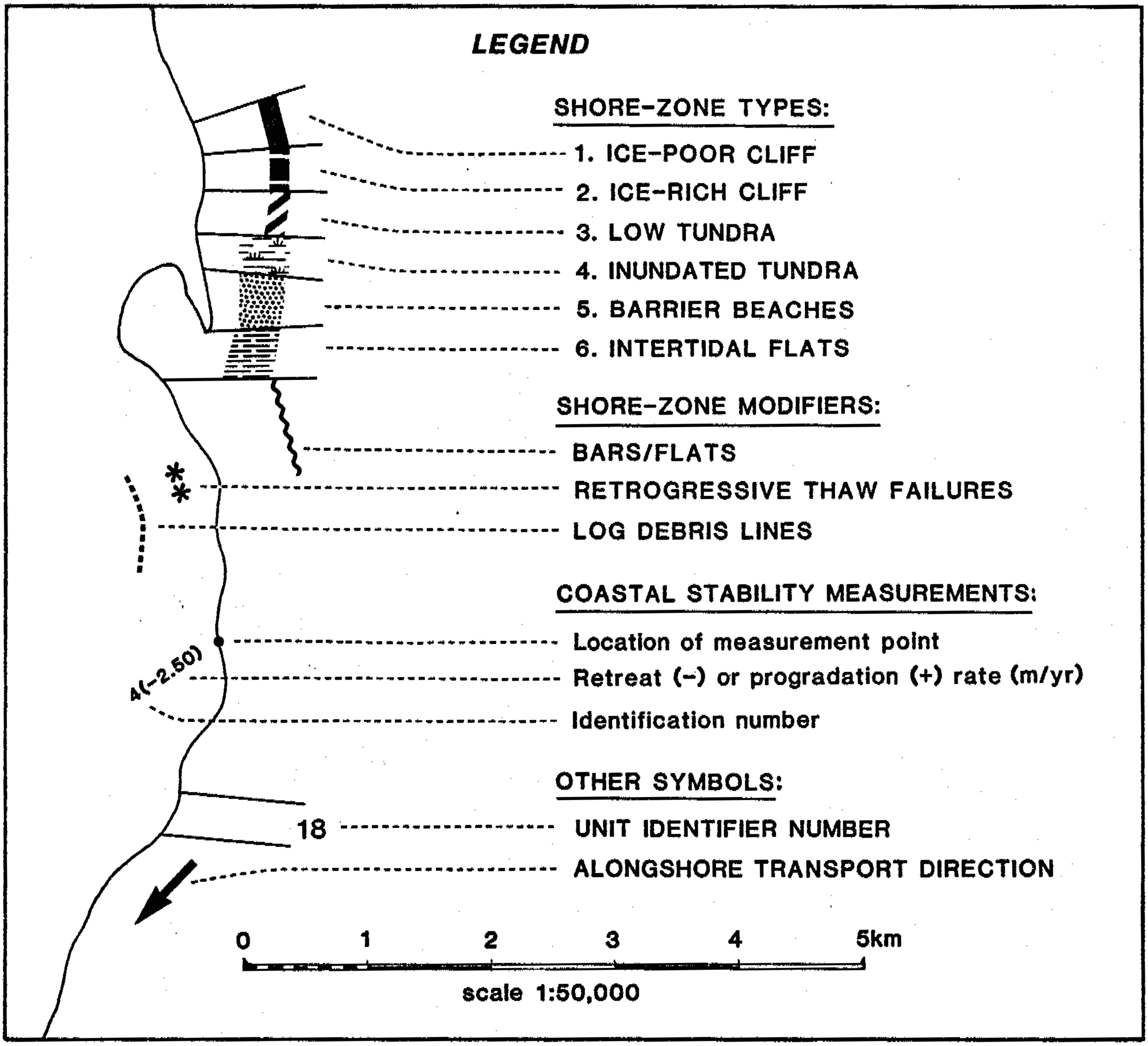
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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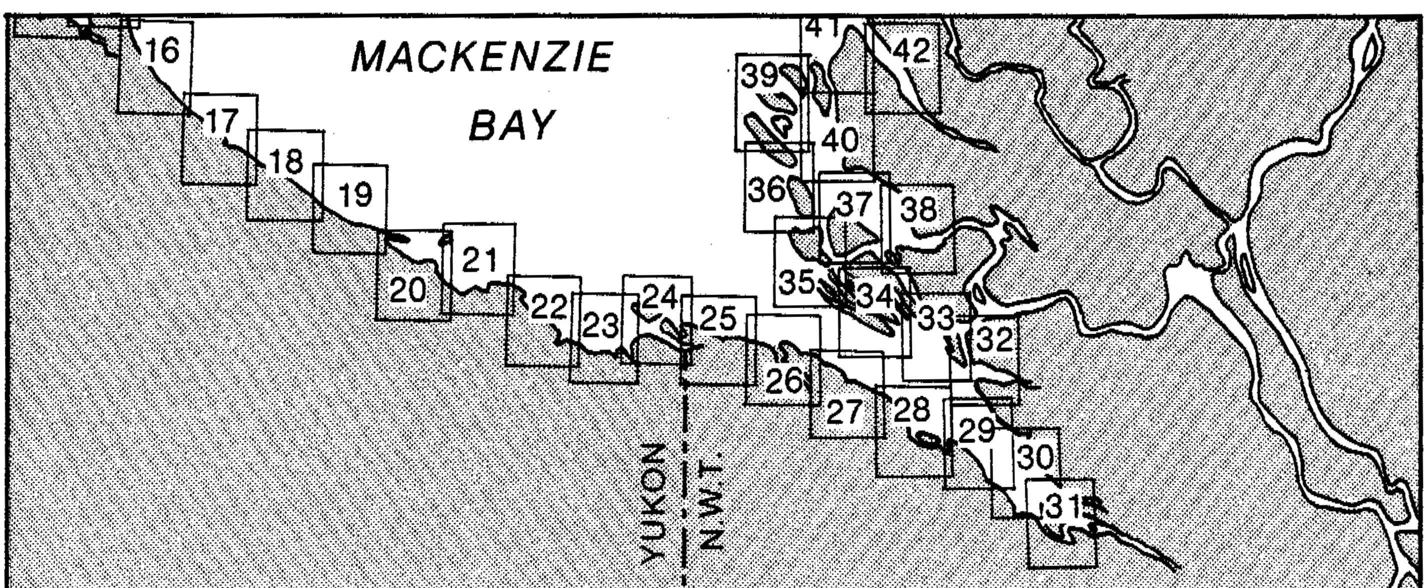
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(–2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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Locality #10
1(-6.59)
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3(-4.05)
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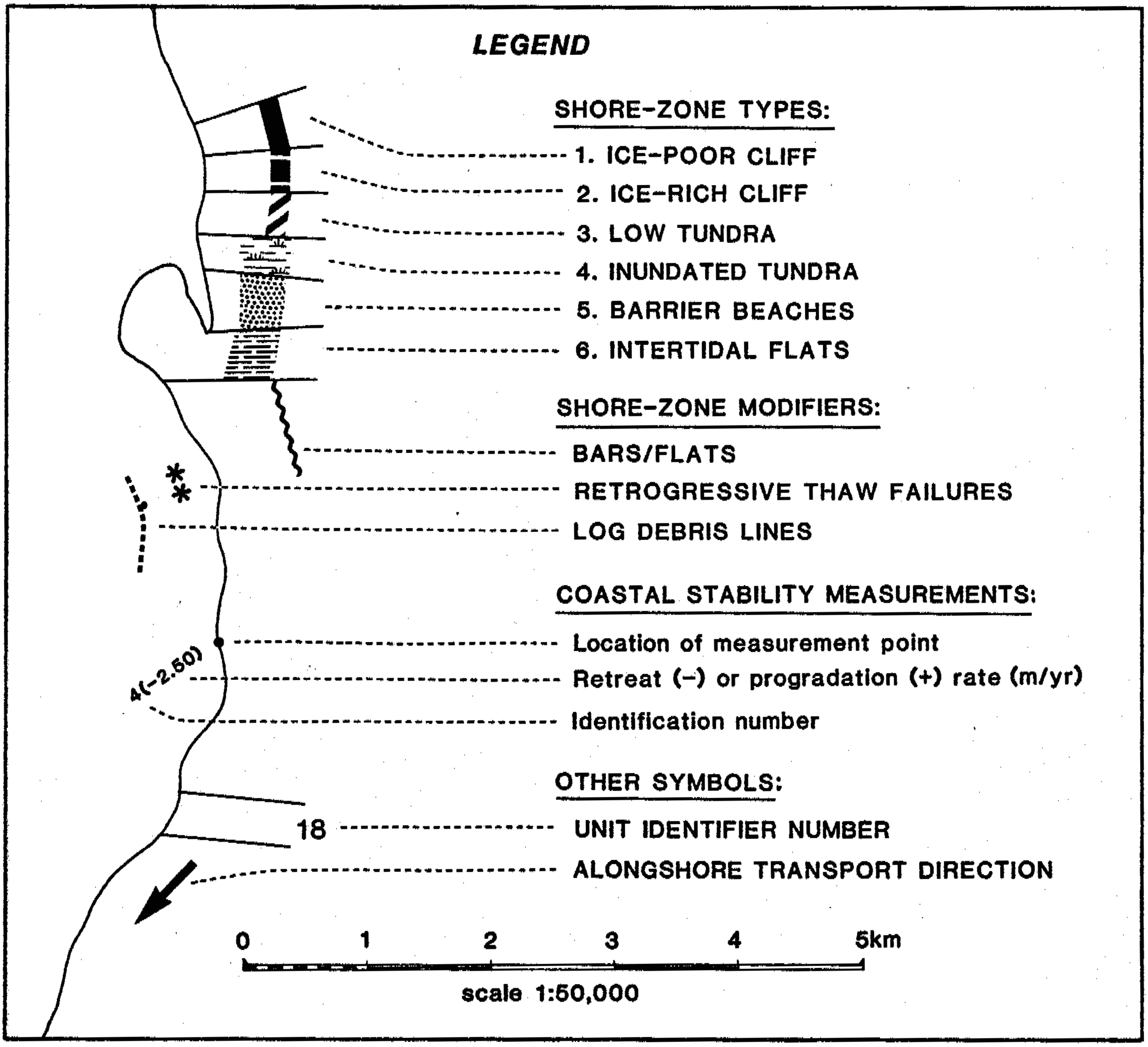
106
4(0.46)
5(-1.46)
6(1.38)
107
7(-1.14)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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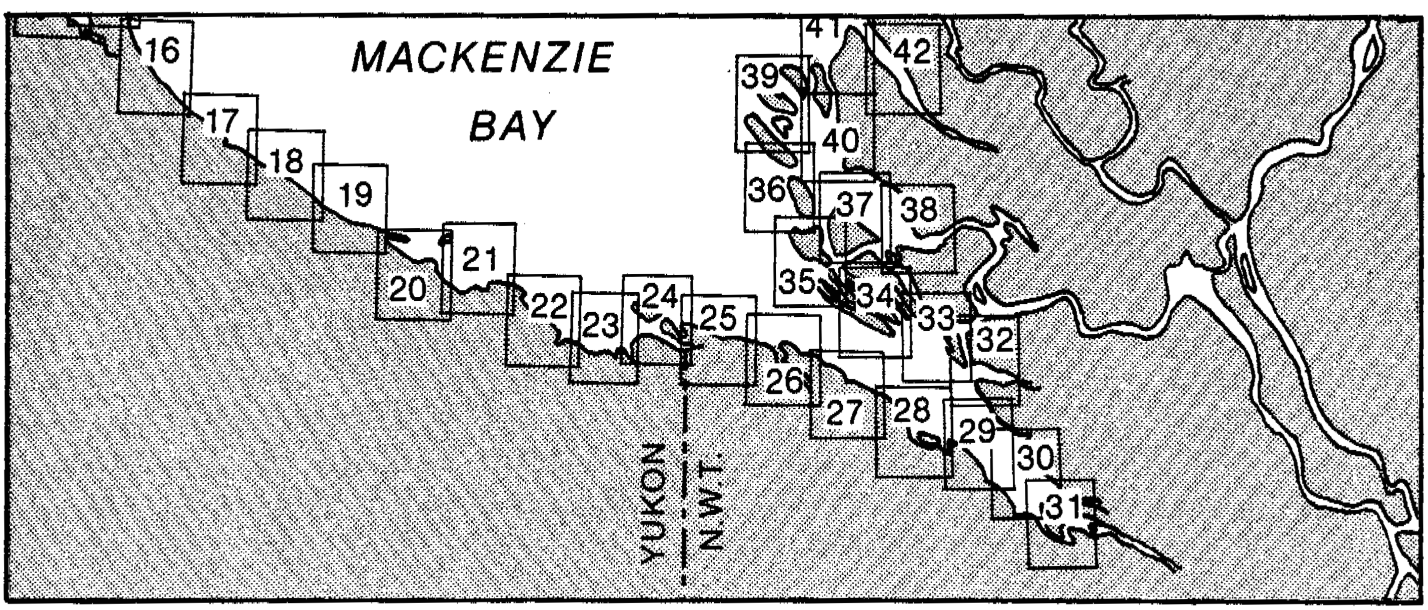
5km
scale 1:50,000


MACKENZIE
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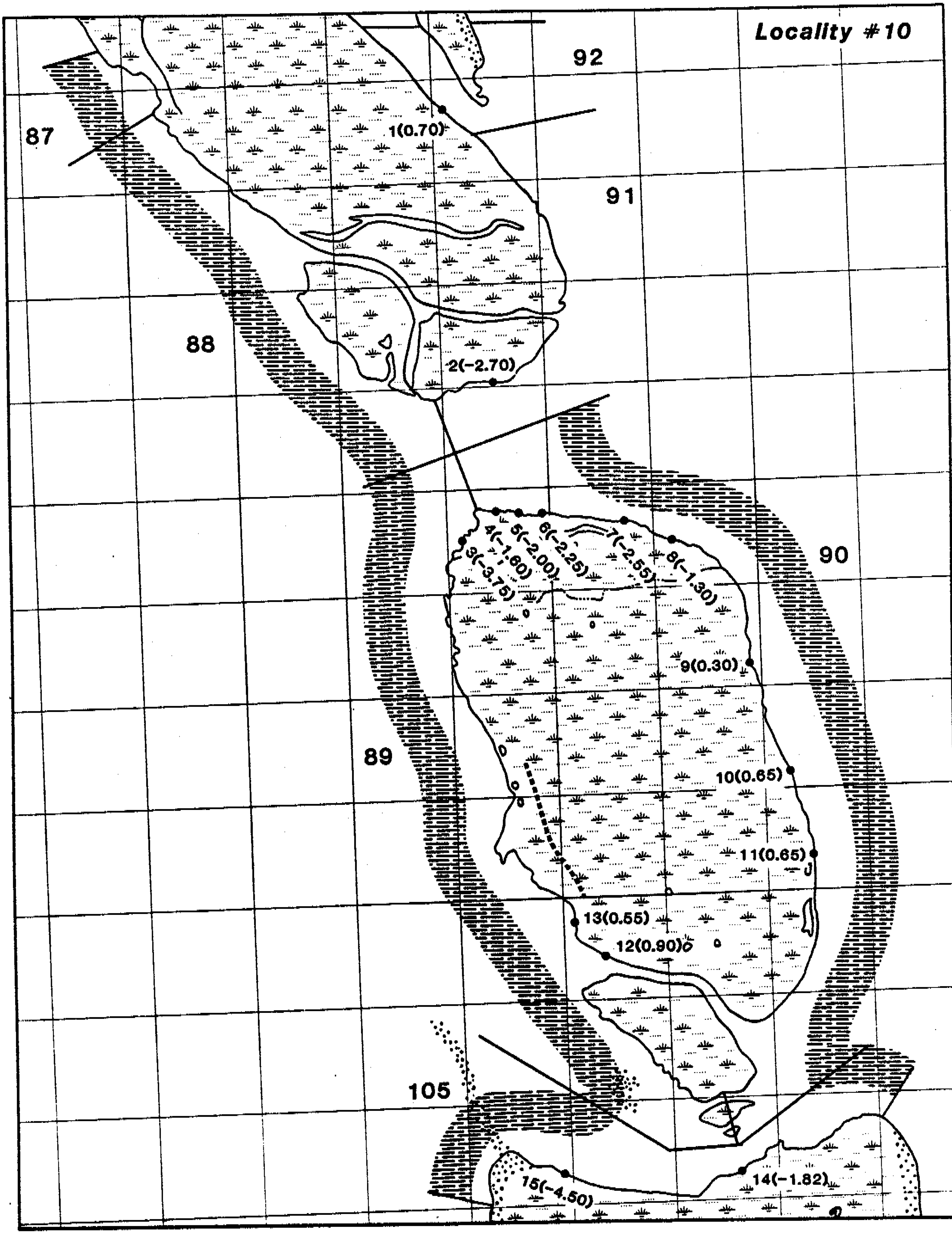
YUKON
N.W.T.


Locality #10
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88
2(-2.70)
90
4(-1.60)
5(-2.00)
6(-2.25)
7(-2.55)
8(-1.30)
3(-3.75)
9(0.30)
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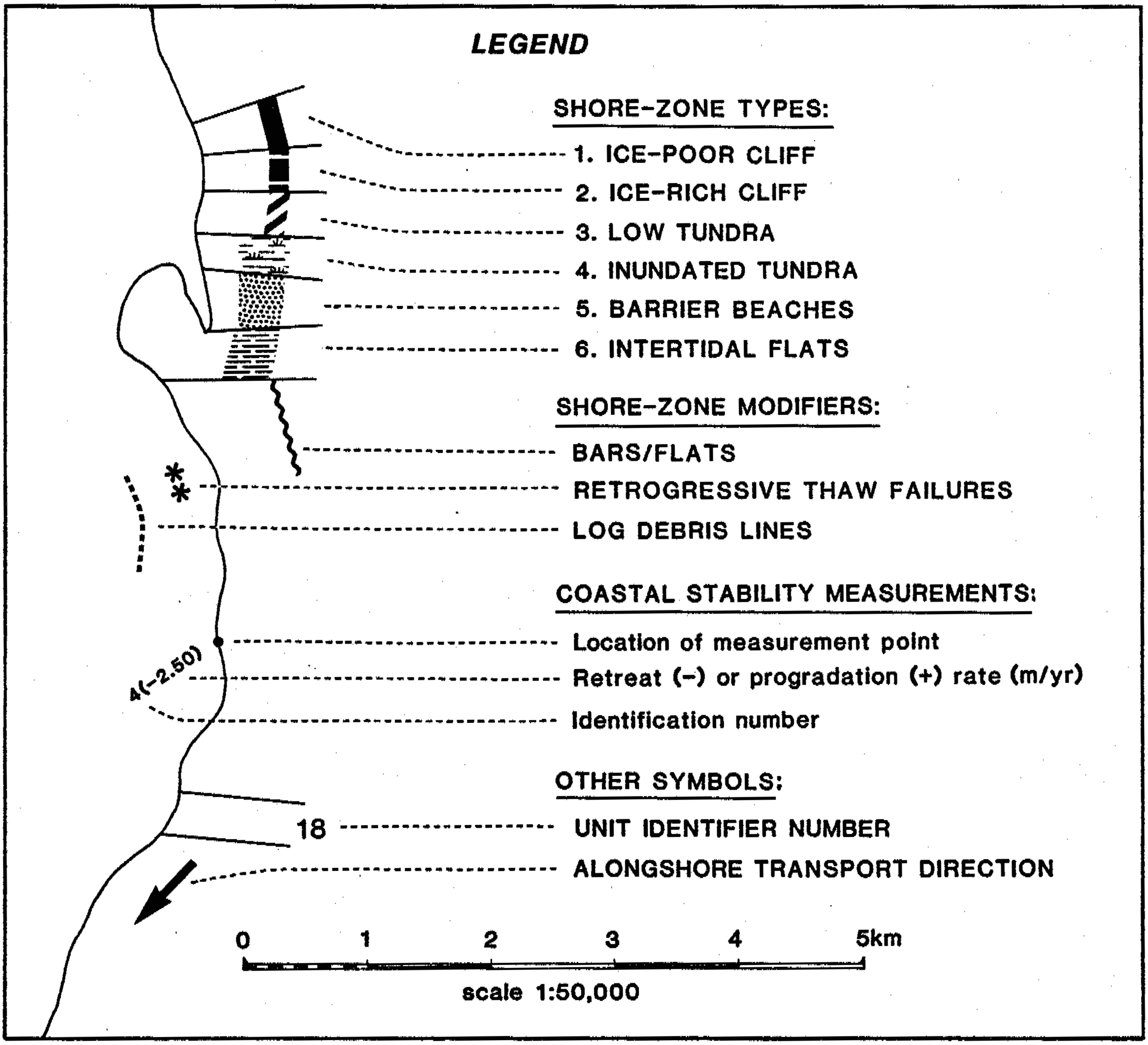
11(0.65)
13(0.55)
12(0.90)
105
14(-1.82)
15(-4.50)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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4. INUNDATED TUNDRA
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4(-2.50)
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Identification number
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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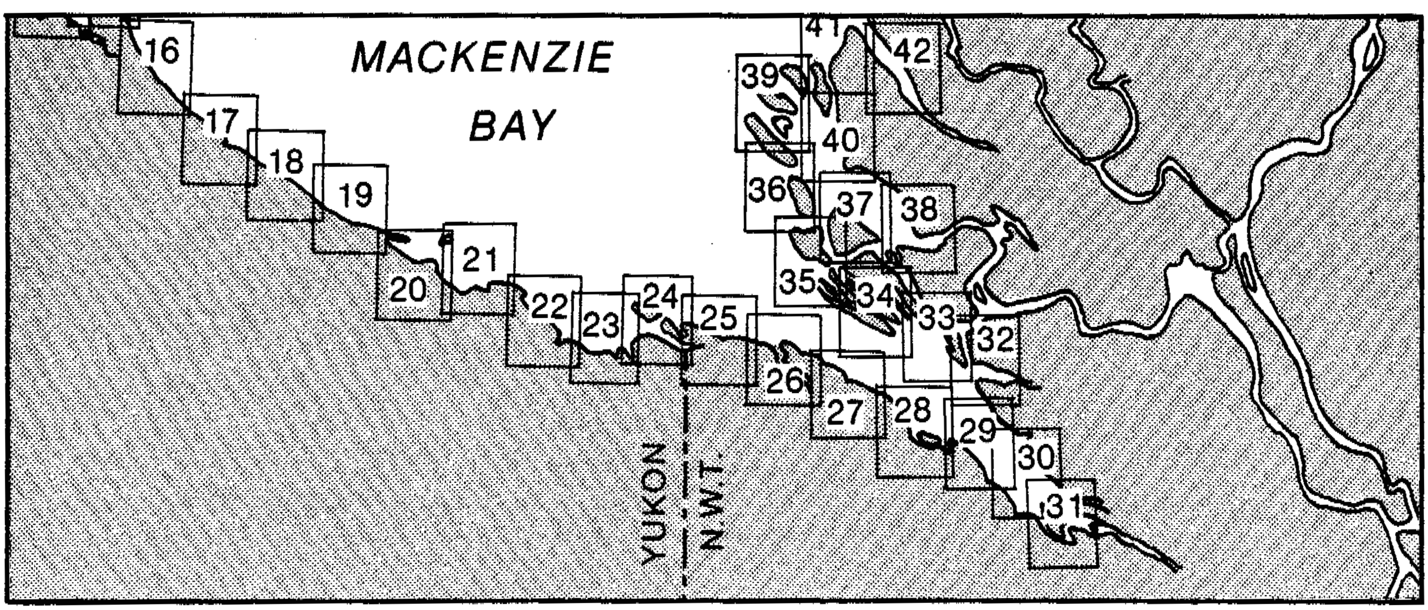
5km
scale 1:50,000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YUKON
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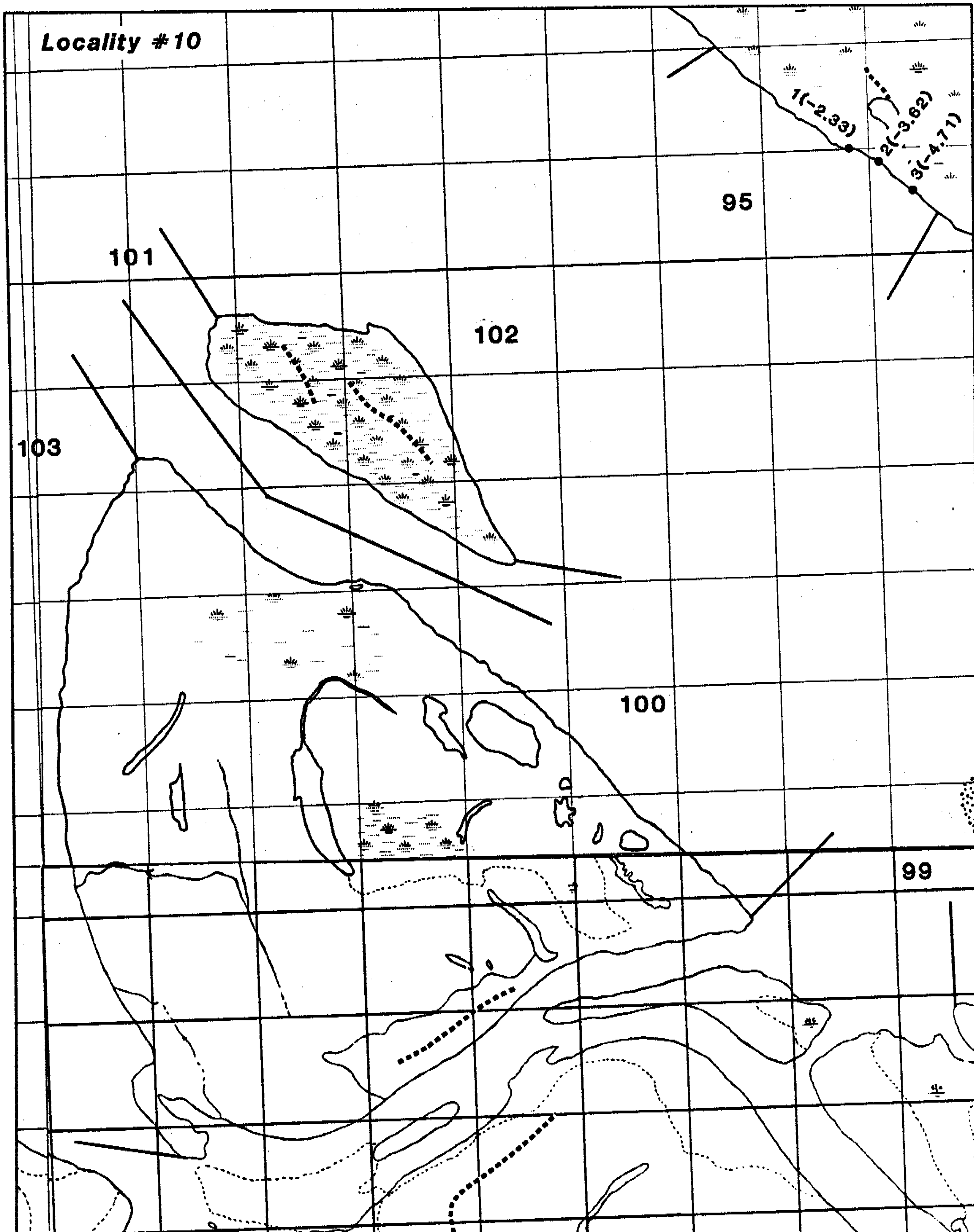
Locality #10
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3(-4.71)
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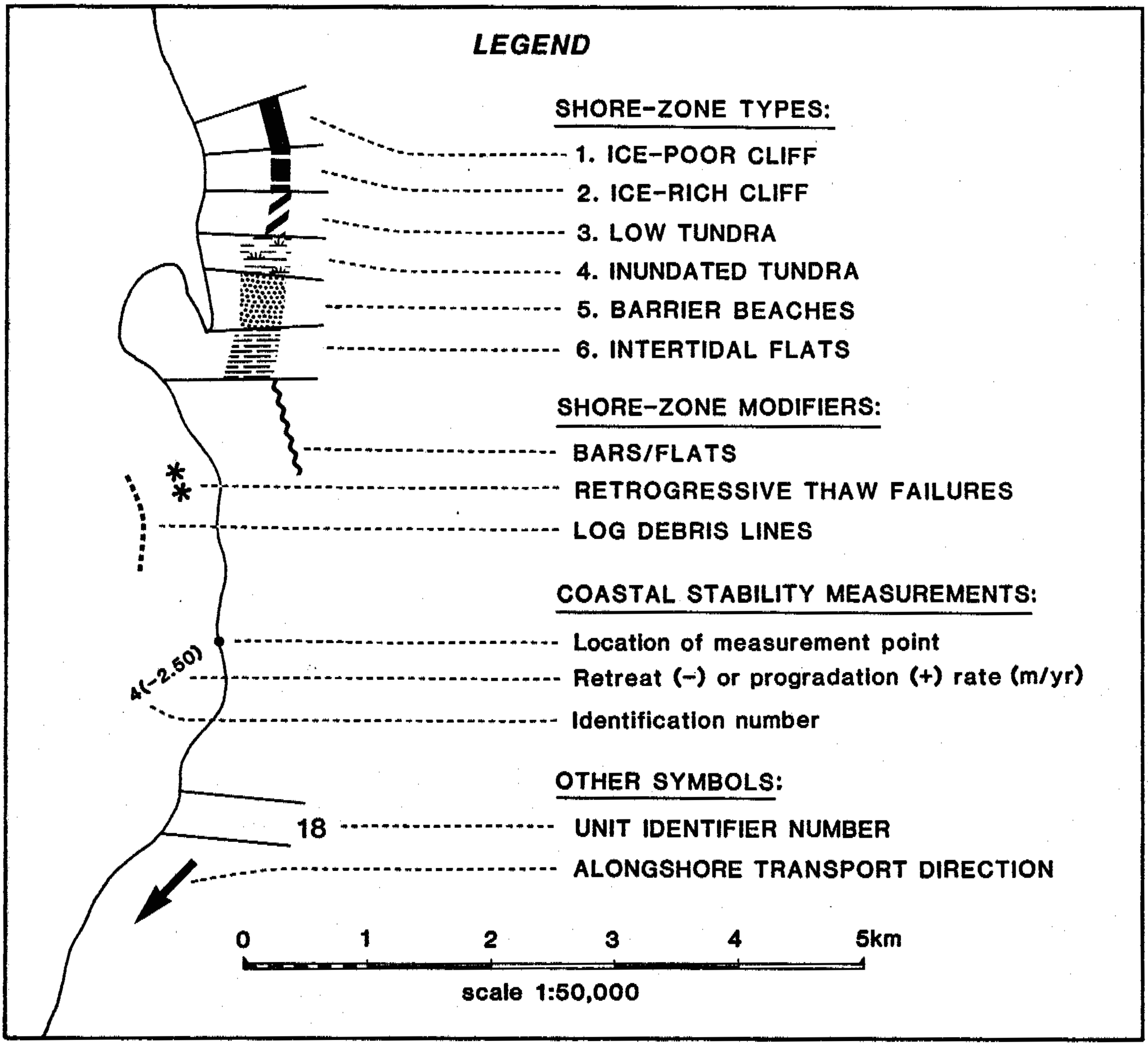
103
100
99


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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COASTAL STABILITY MEASUREMENTS:
Location of measurement point
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Identification number
4(-2.50)
OTHER SYMBOLS:
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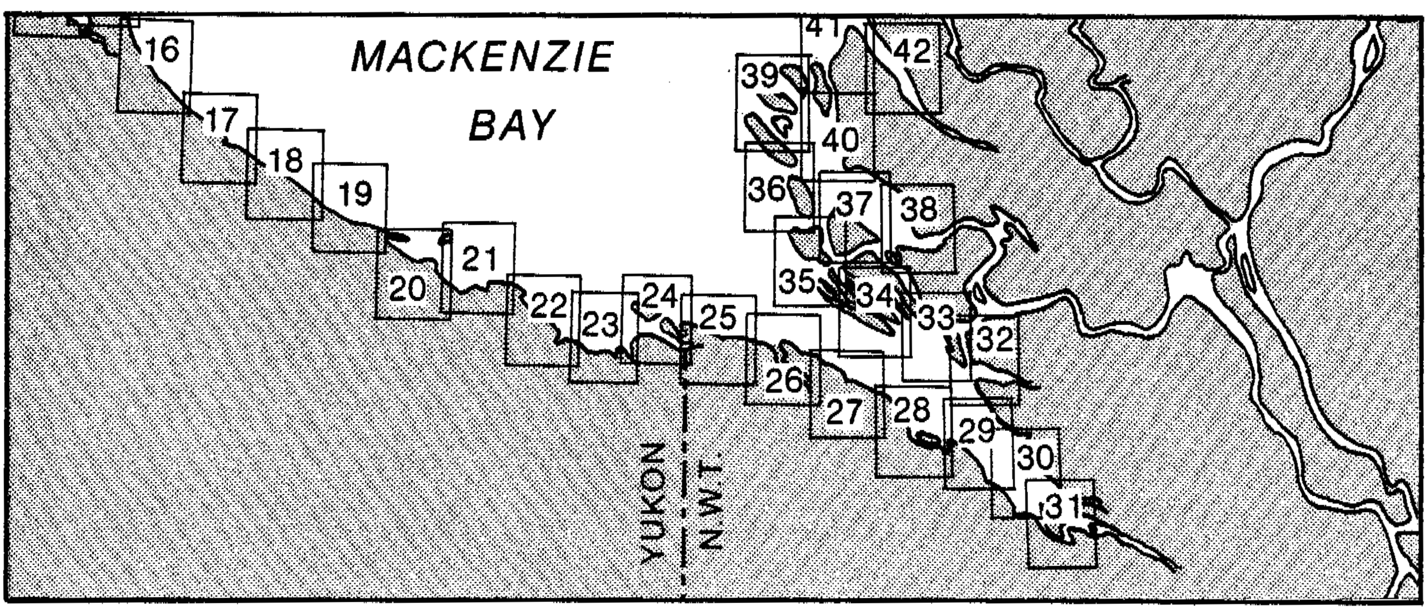
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKENZIE BAY
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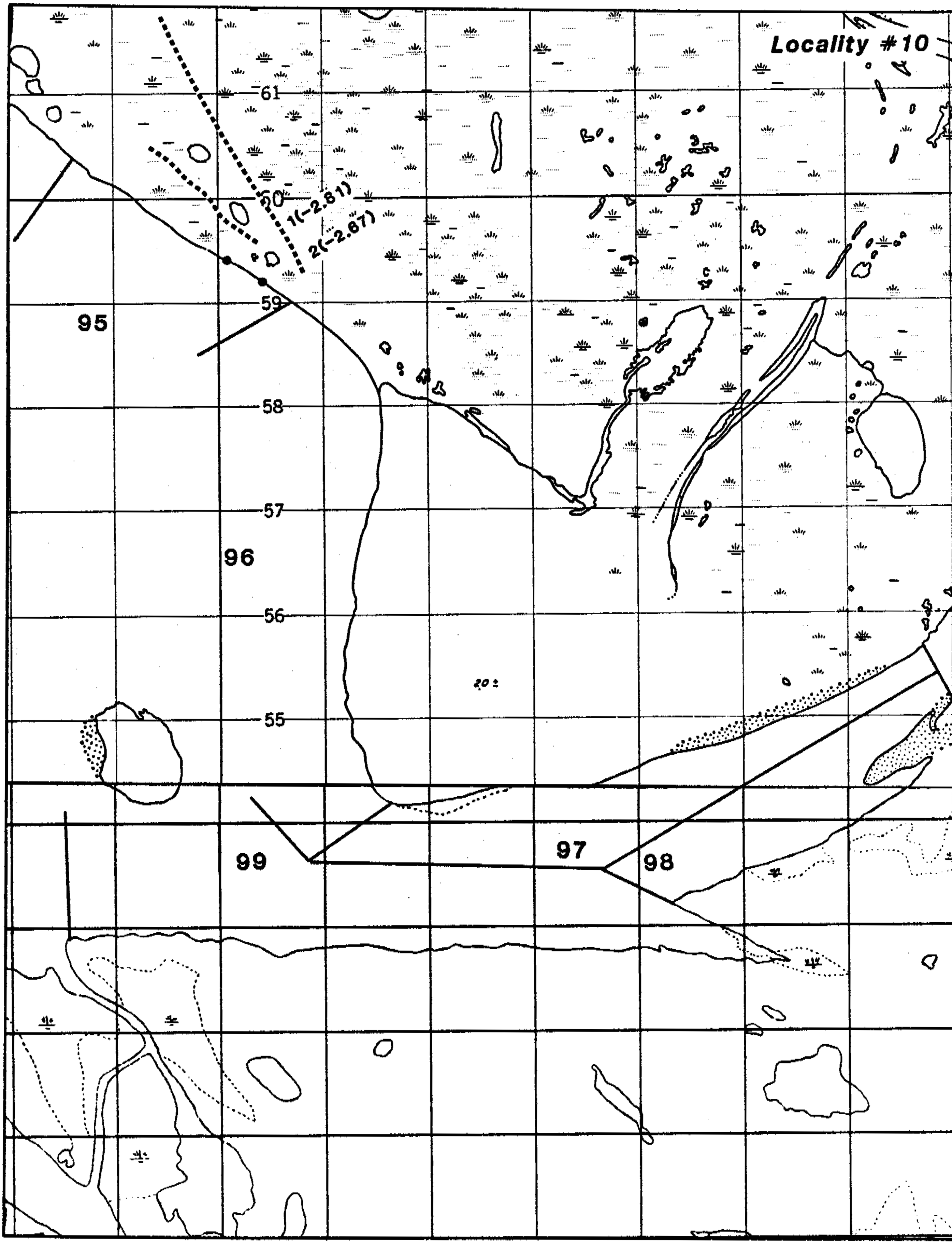
YUKON
N.W.T.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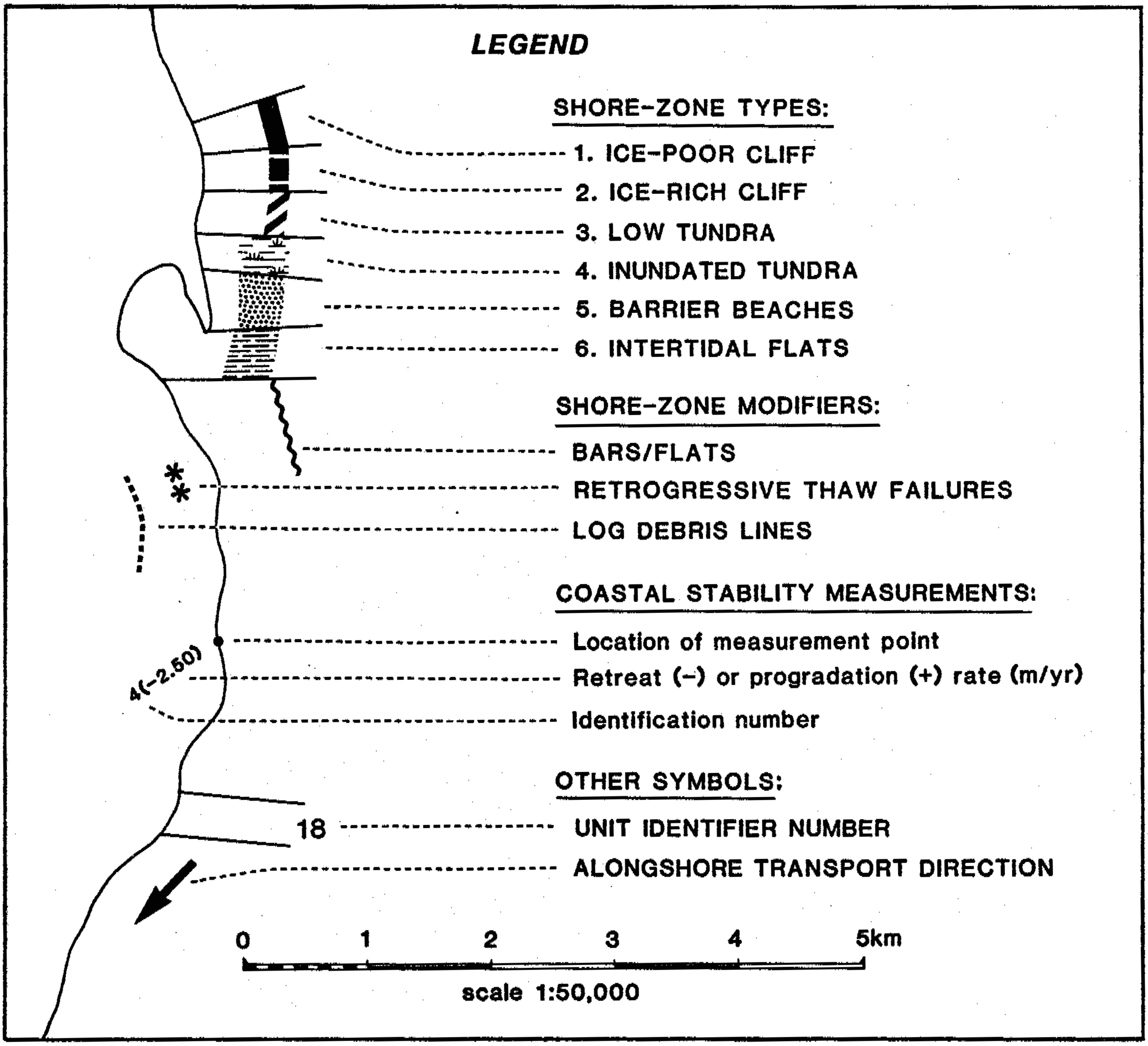

LEGEND
SHORE-ZONE TYPES:
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OTHER SYMBOLS:
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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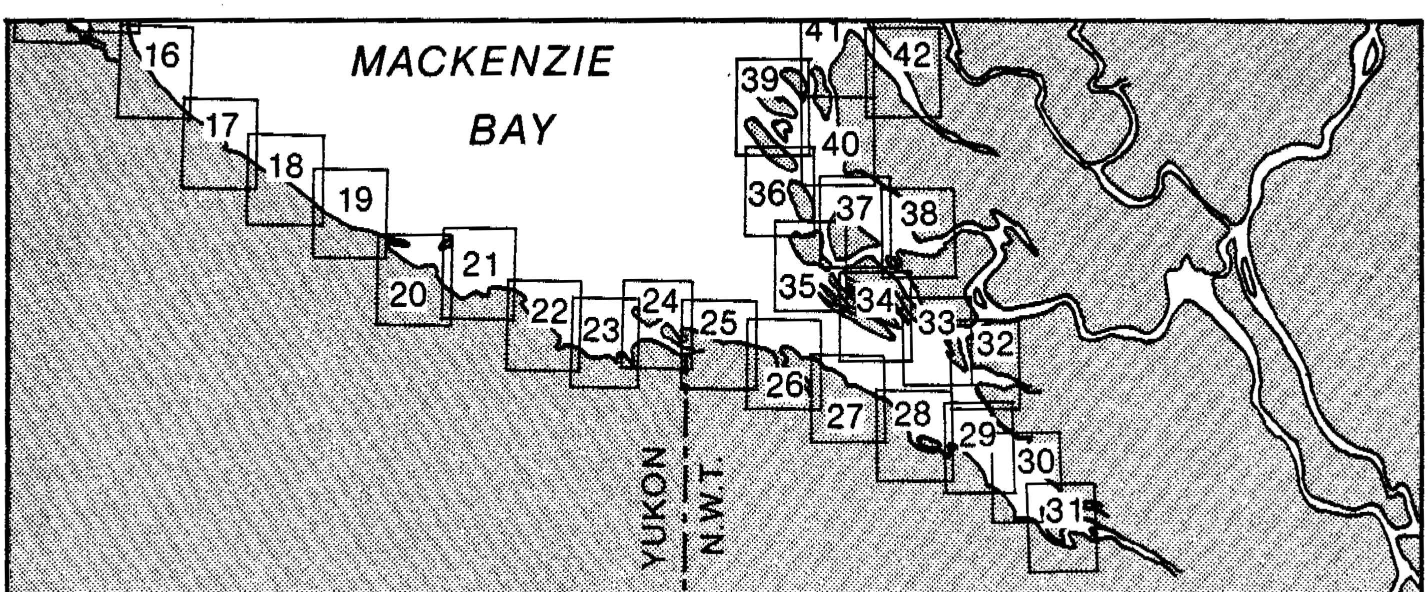
5km
scale 1:50,000



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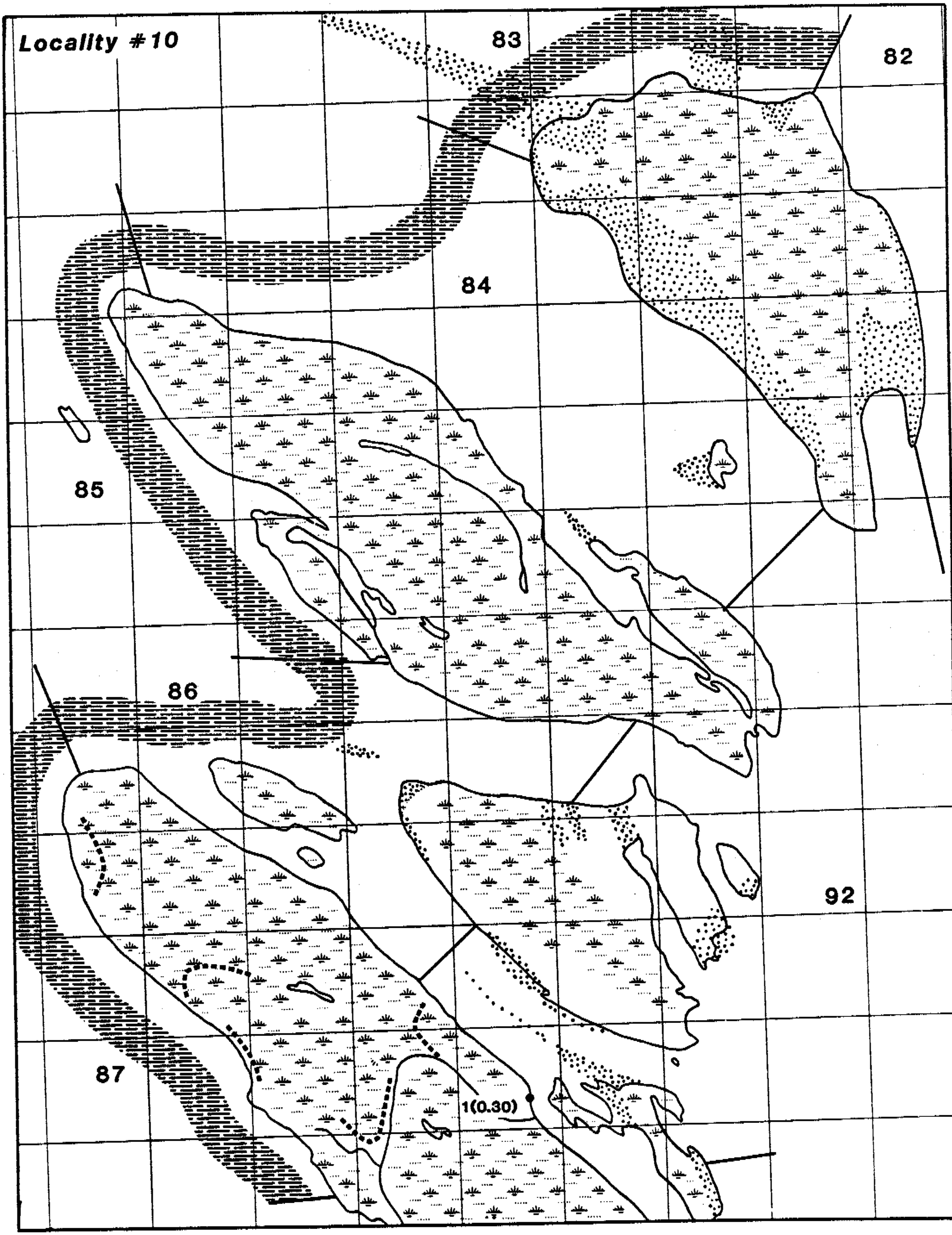
YUKON
N.W.T.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86
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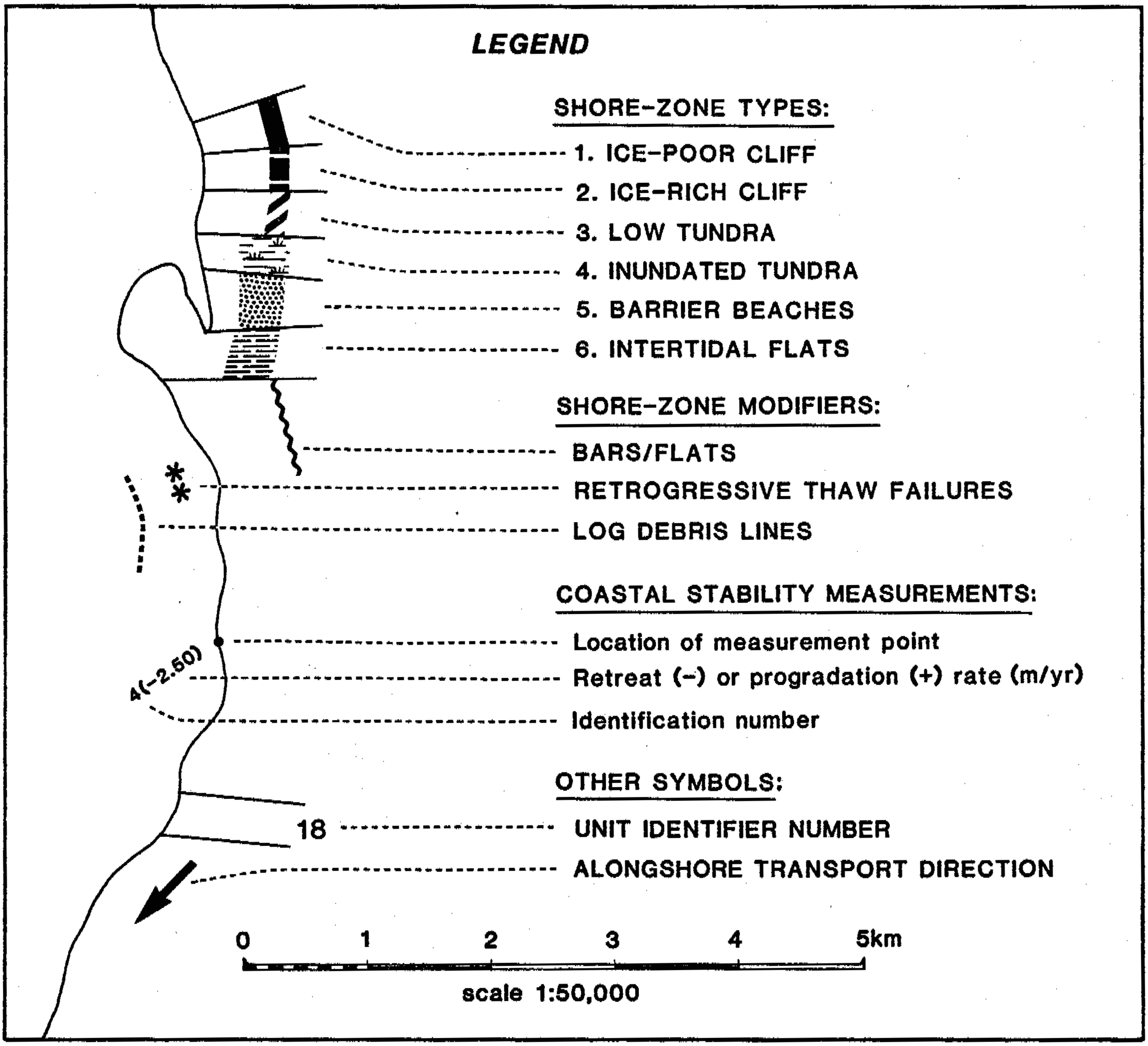
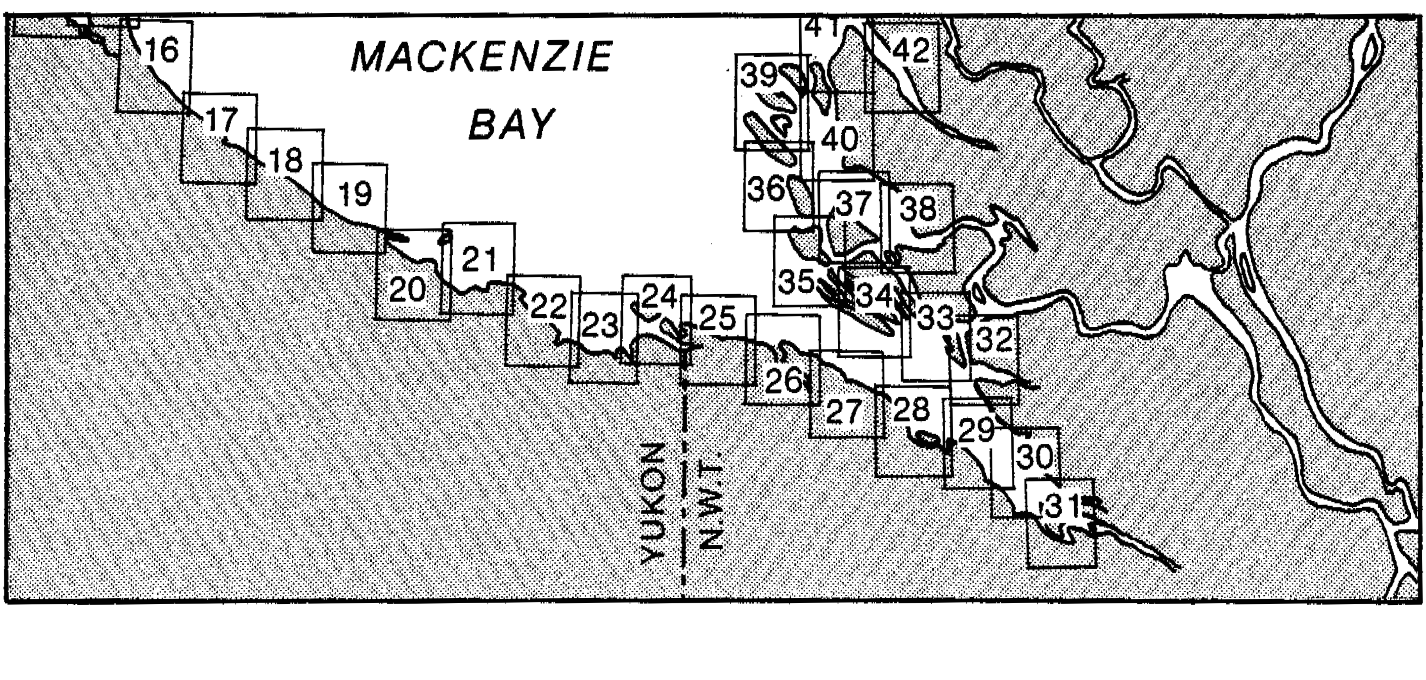
92
1(0.30)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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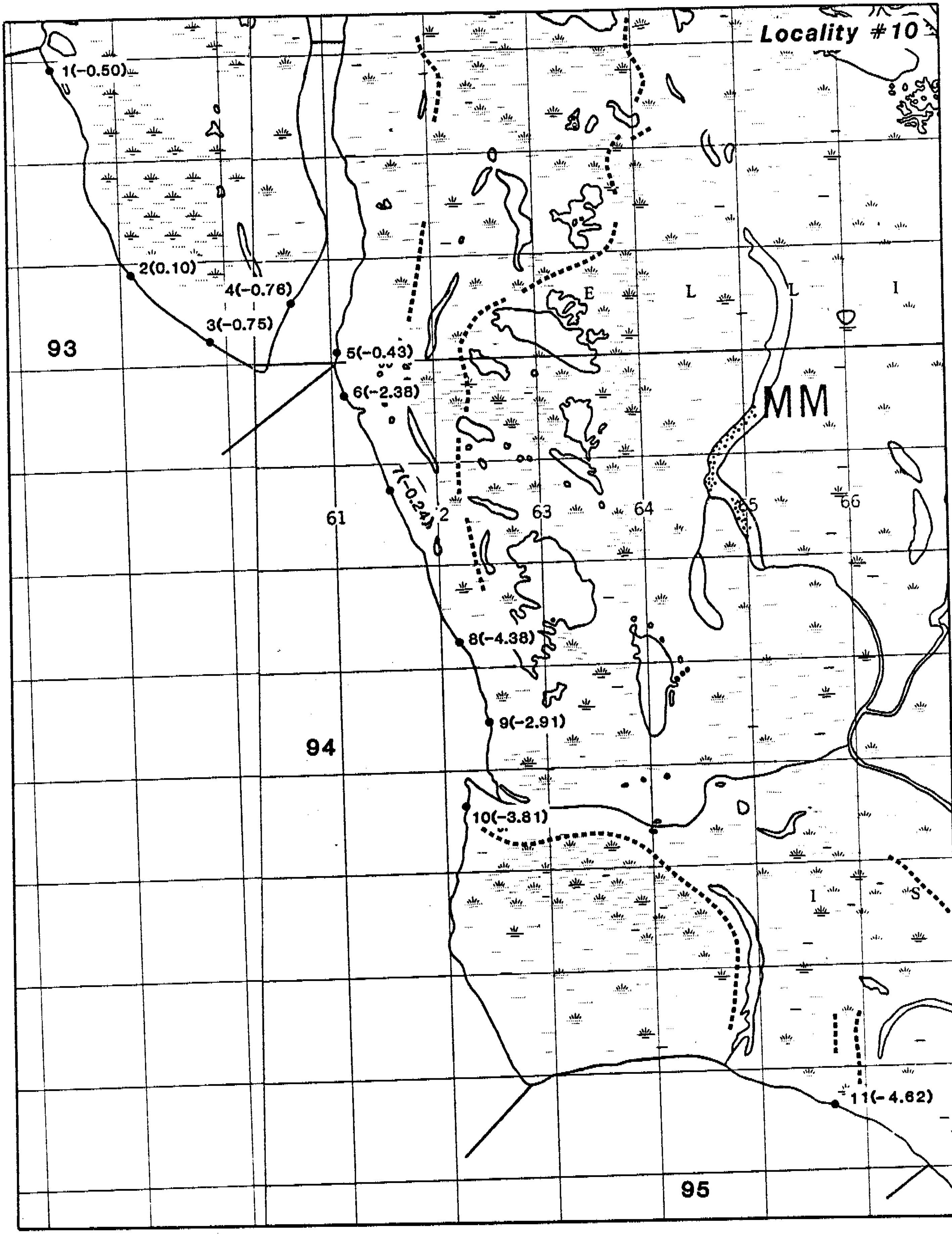
YUKON
N.W.T.



Locality #10
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3(-0.75)
4(-0.76)
5(-0.43)
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8(-4.38)
9(-2.91)
10(-3.81)
11(-4.62)
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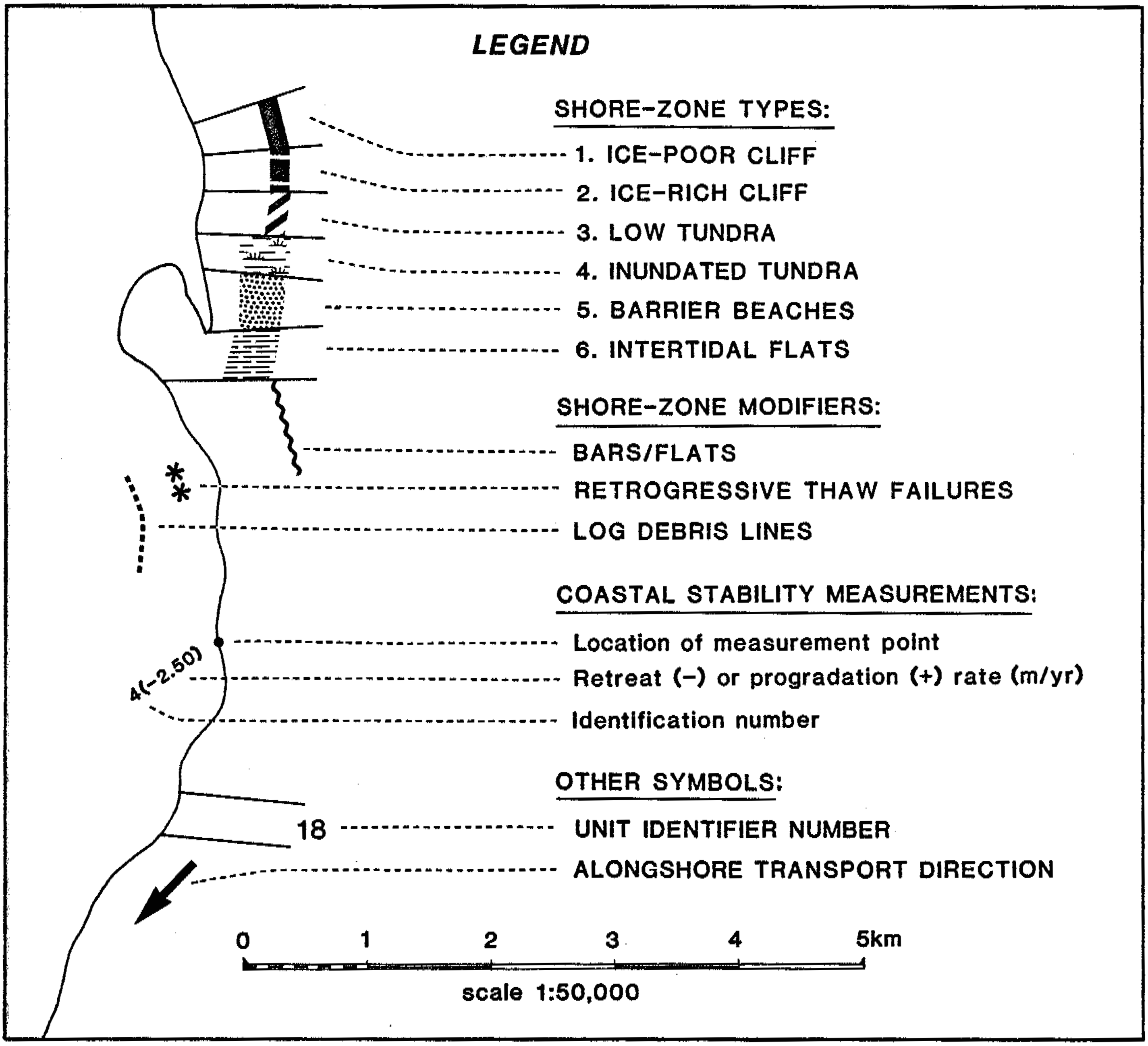
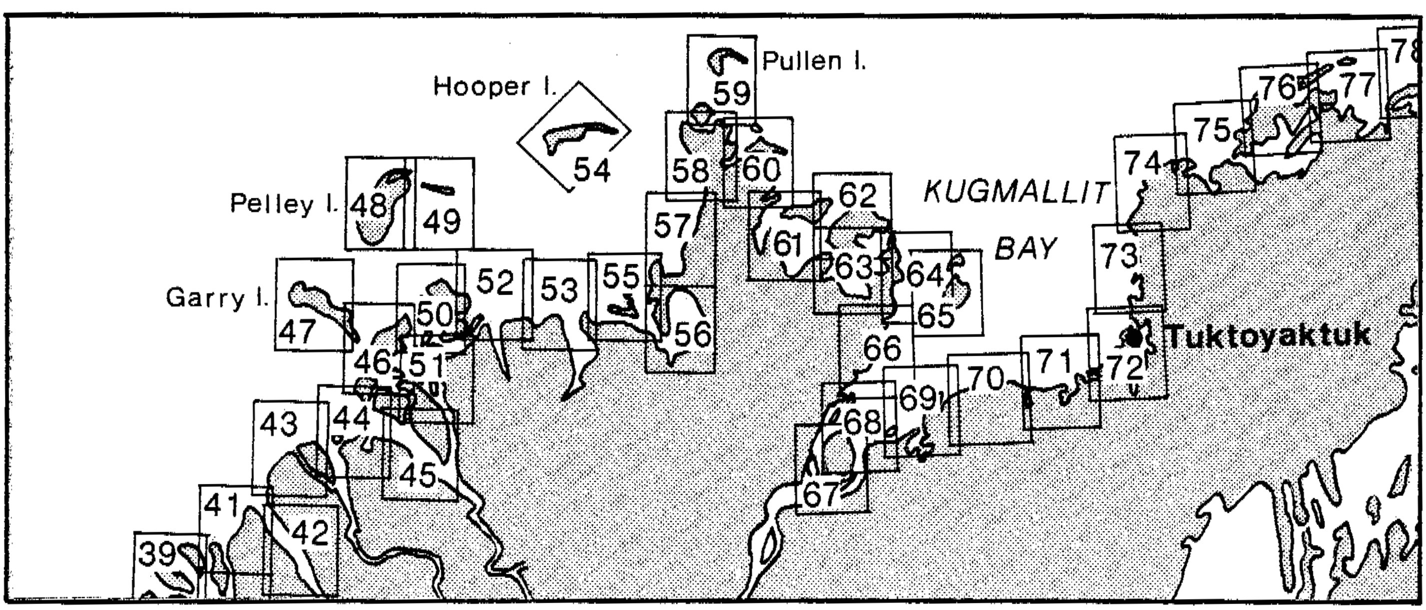

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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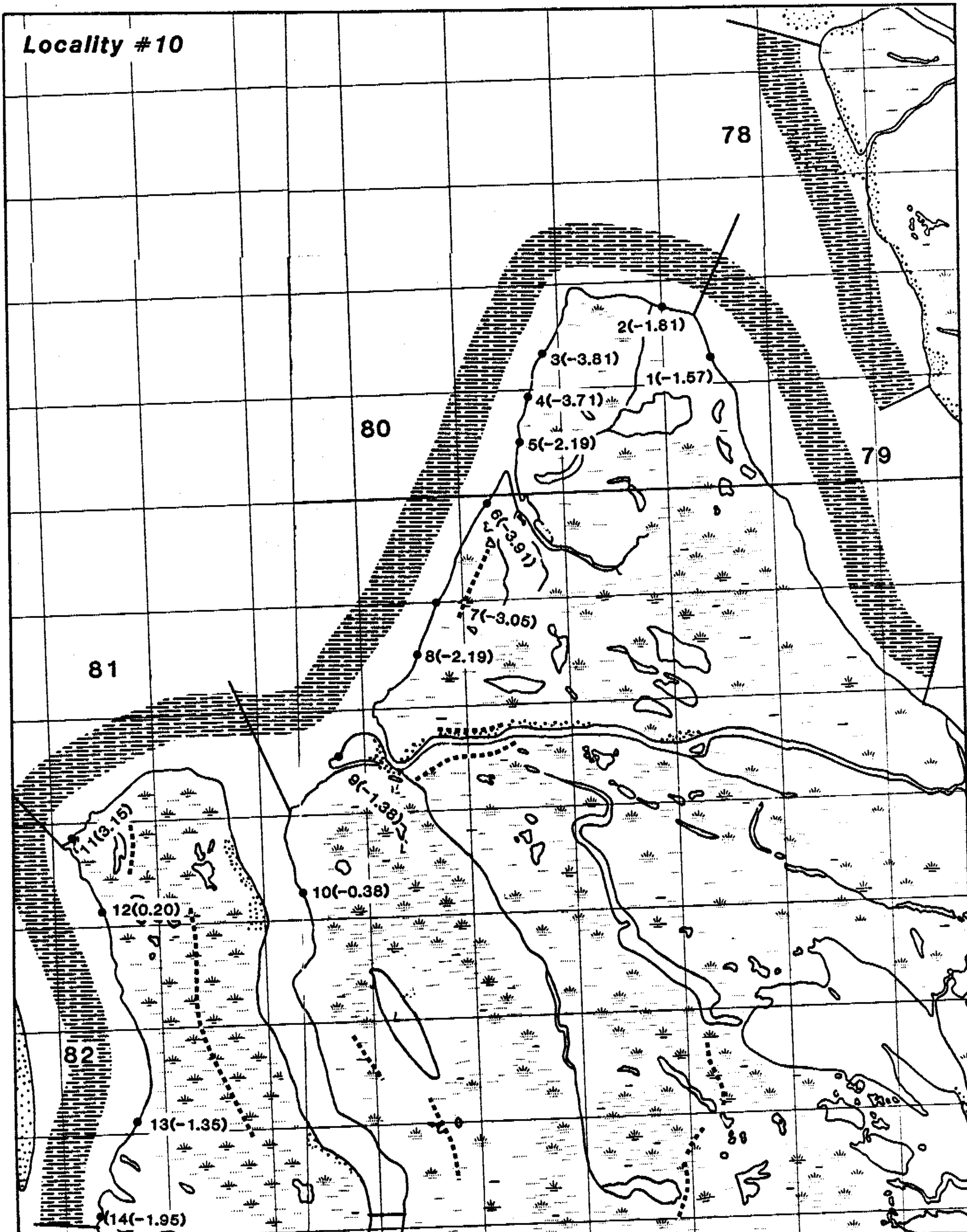
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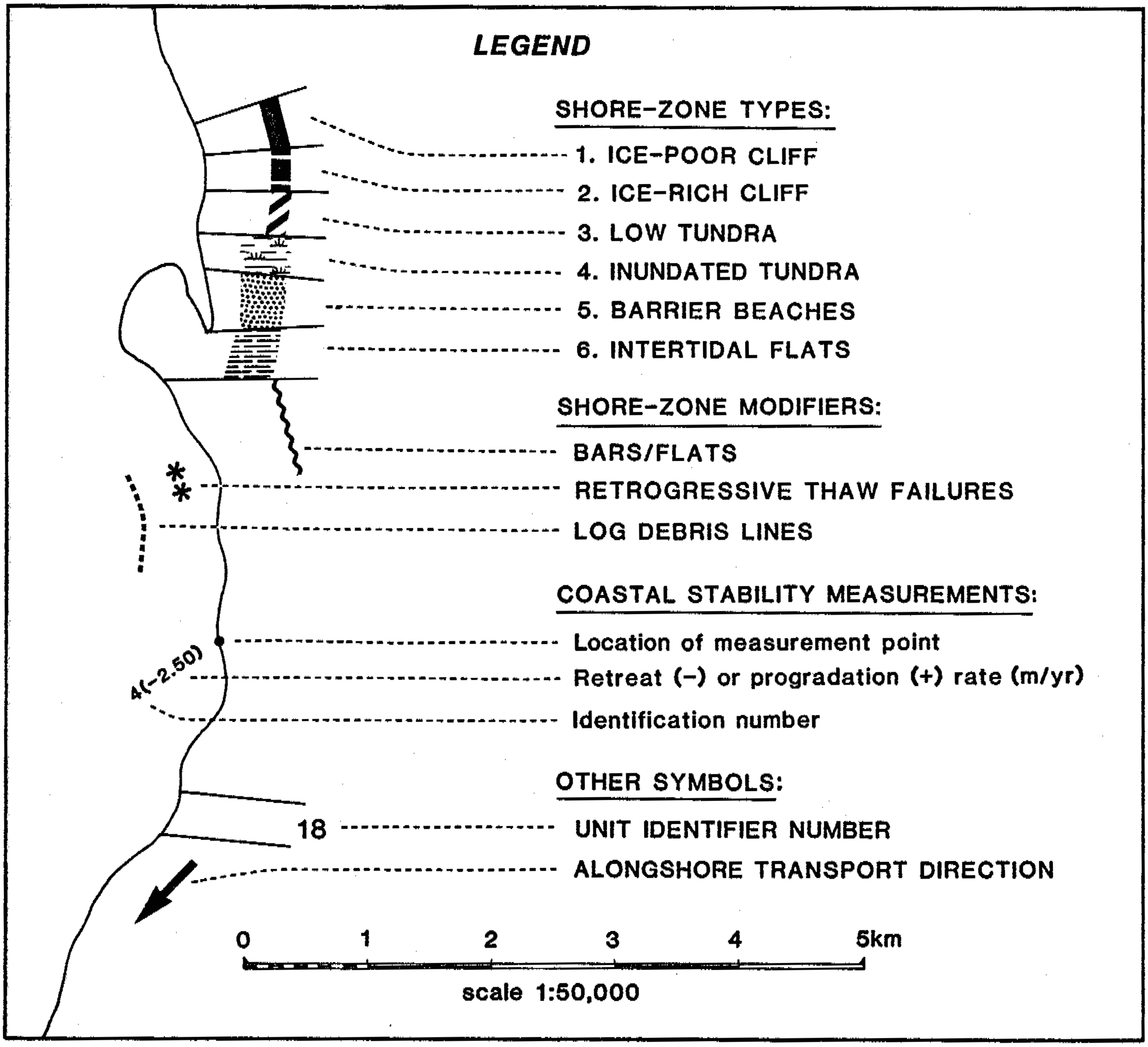
6(-3.91)
7(-3.05)
8(-2.19)
9(-1.38)
10(-0.38)
11(3.15)
12(0.20)
13(-1.35)
14(-1.95)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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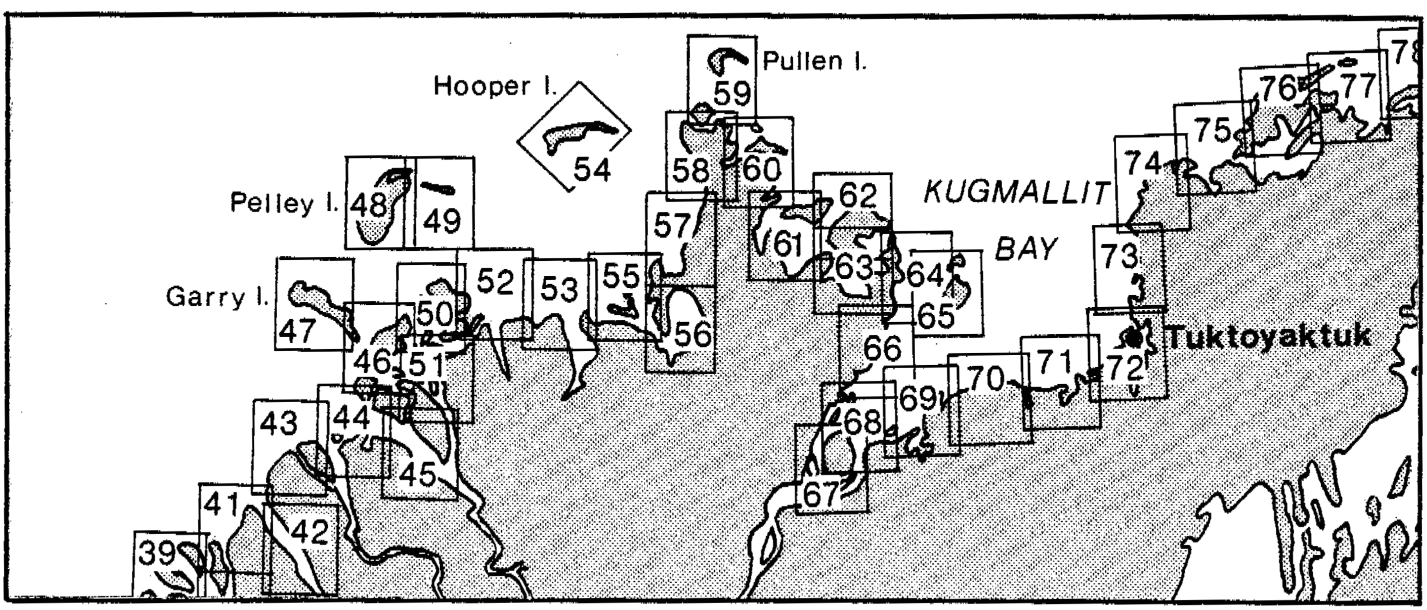
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000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Pelley I.
Garry I.
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BAY
Tuktoyaktuk
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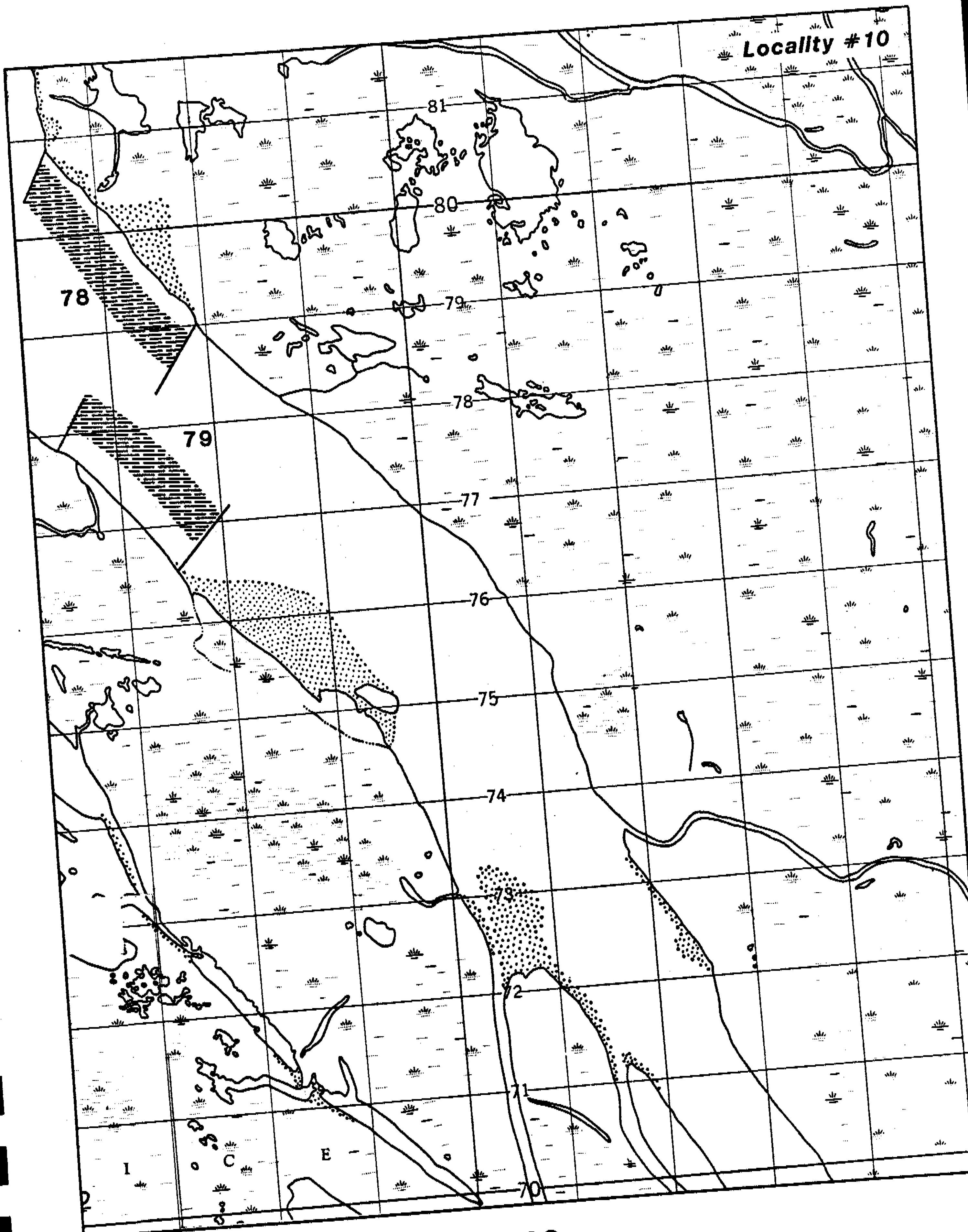
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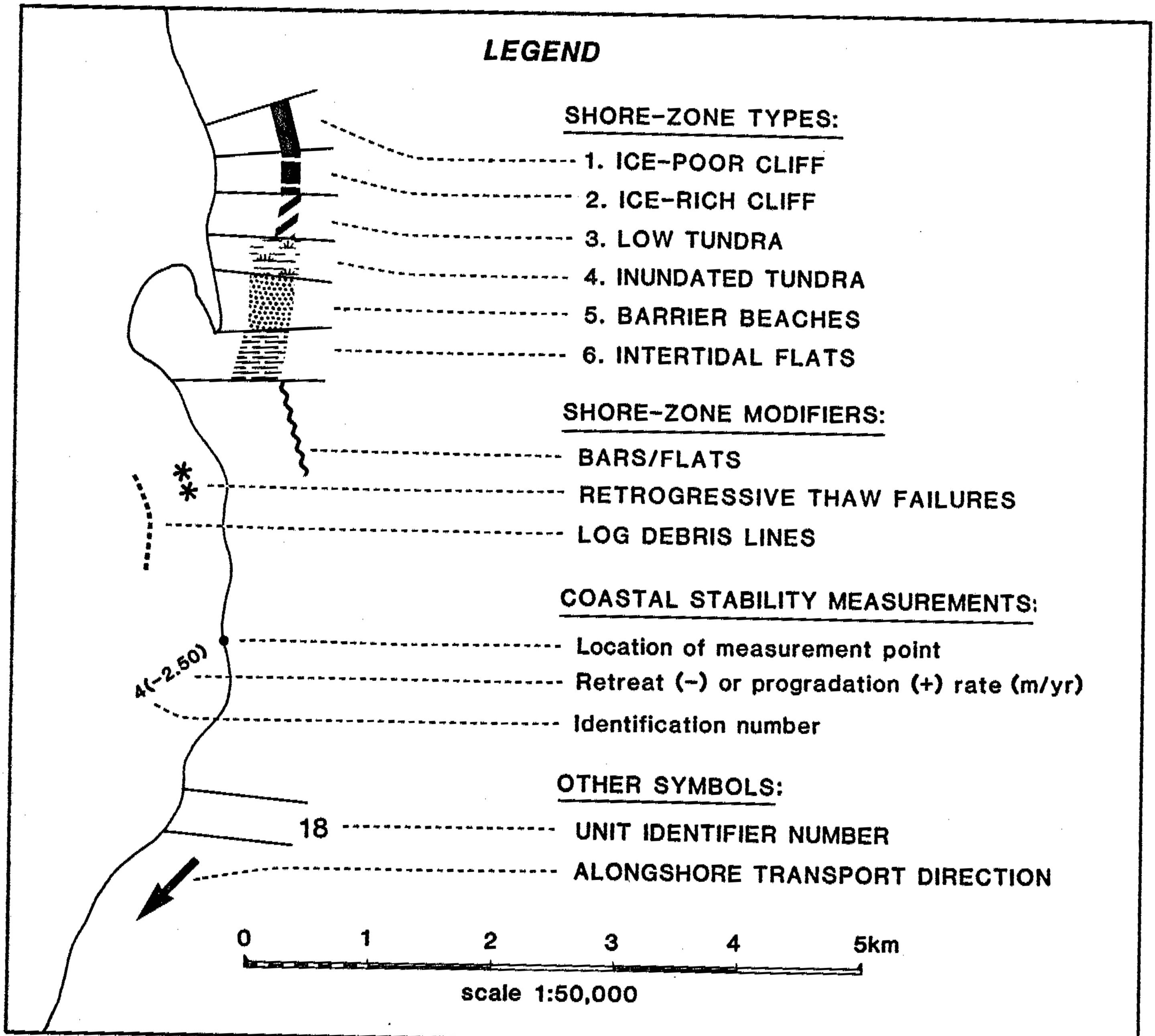
LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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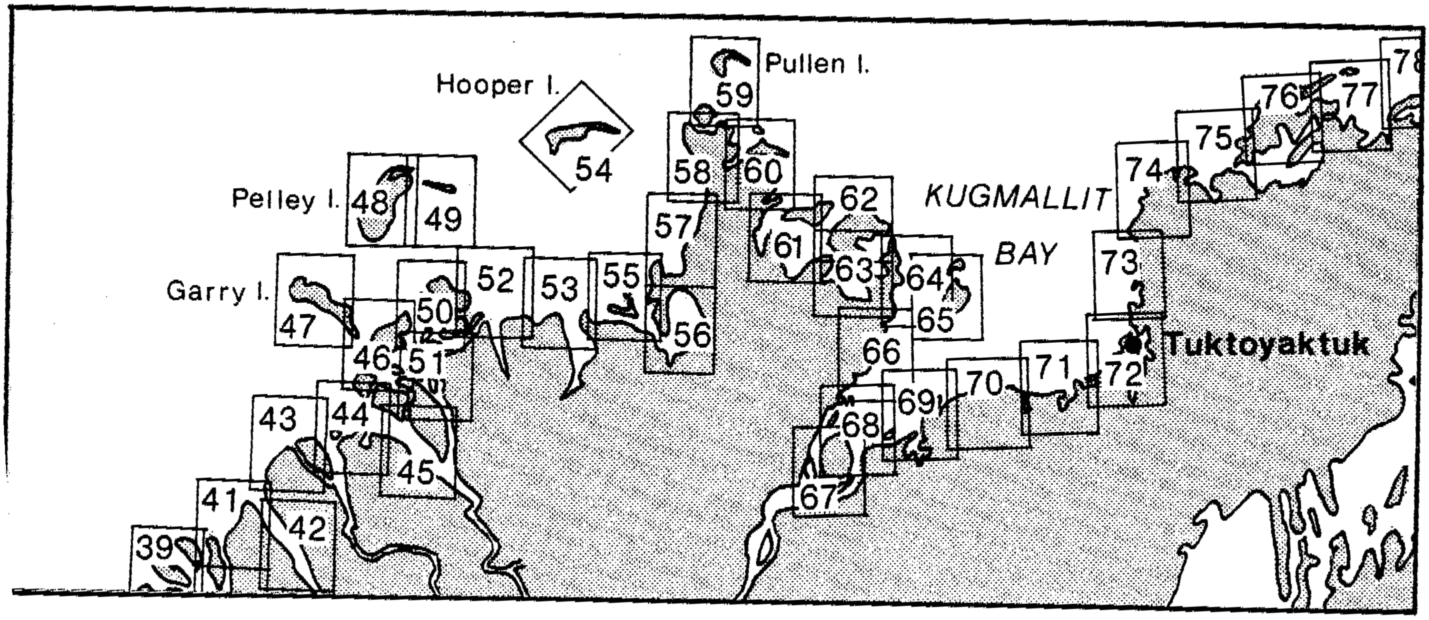
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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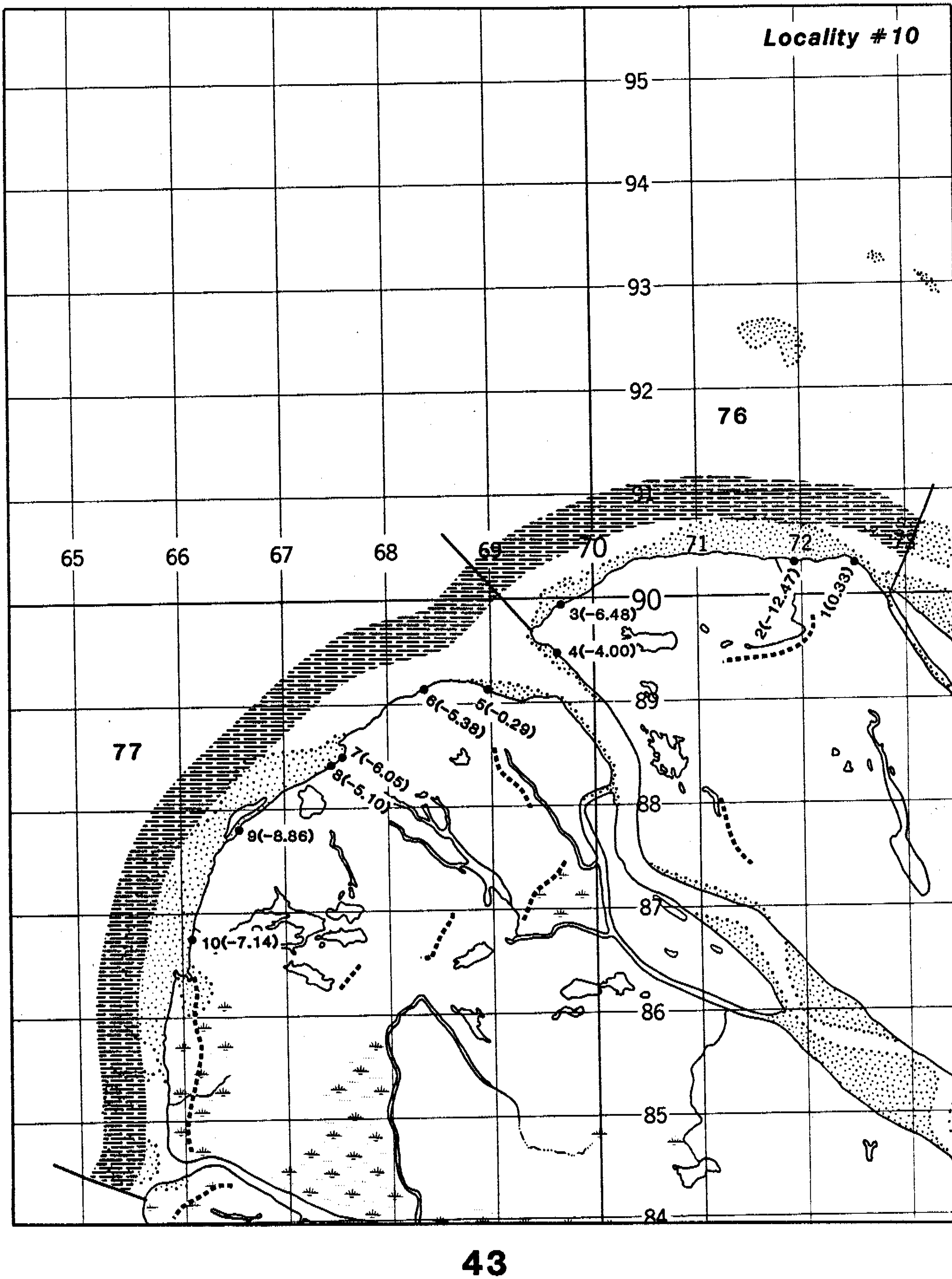
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77



Locality #10
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92
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73
90
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4(-4.00)
2(-12.47)
1(0.33)
89
6(-5.38)
5(-0.29)
77
7(-6.05)
8(-5.10)
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9(-8.86)
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10(-7.14)
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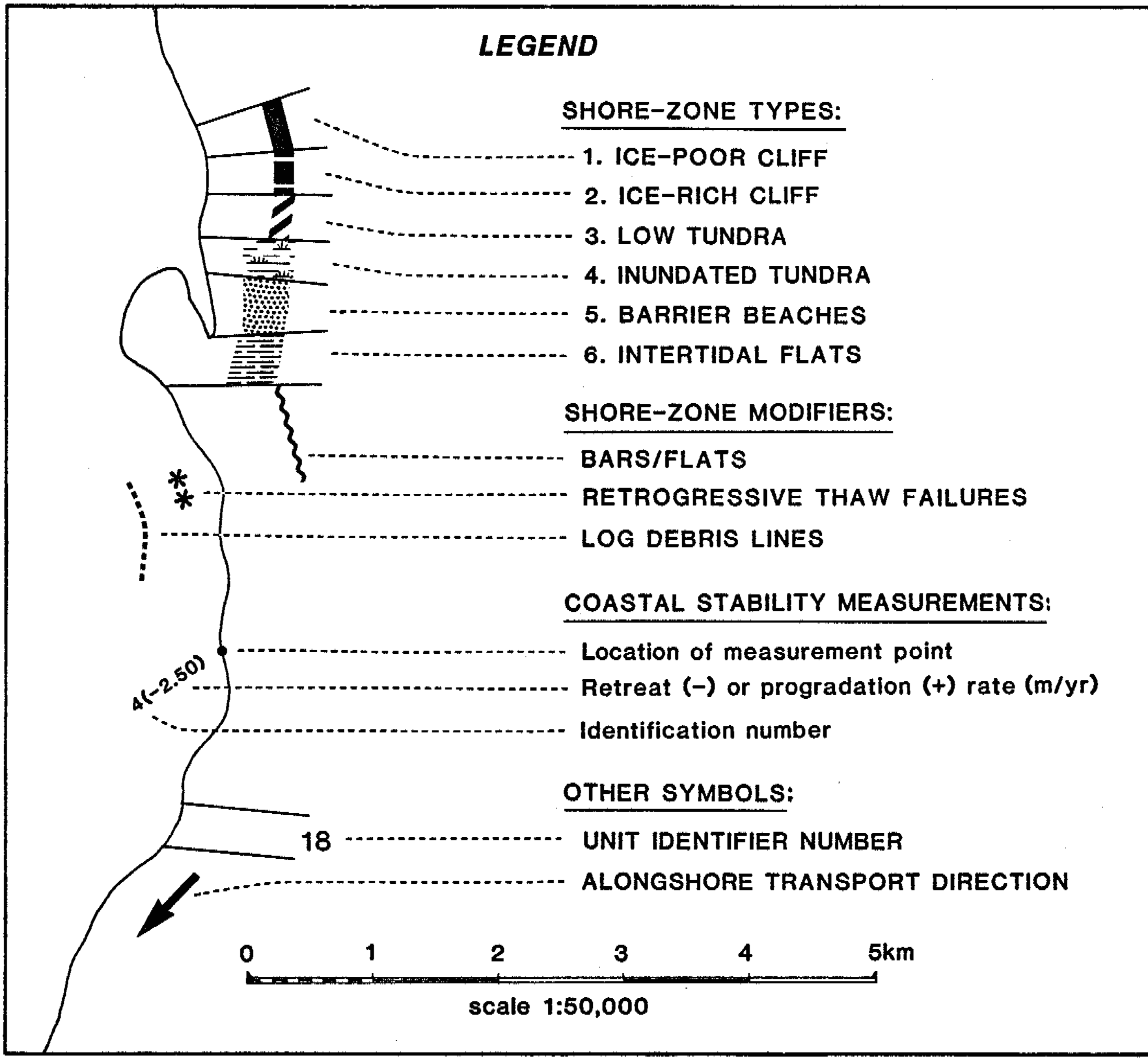
85
84


LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
3. LOW TUNDRA
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BARS/FLATS
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Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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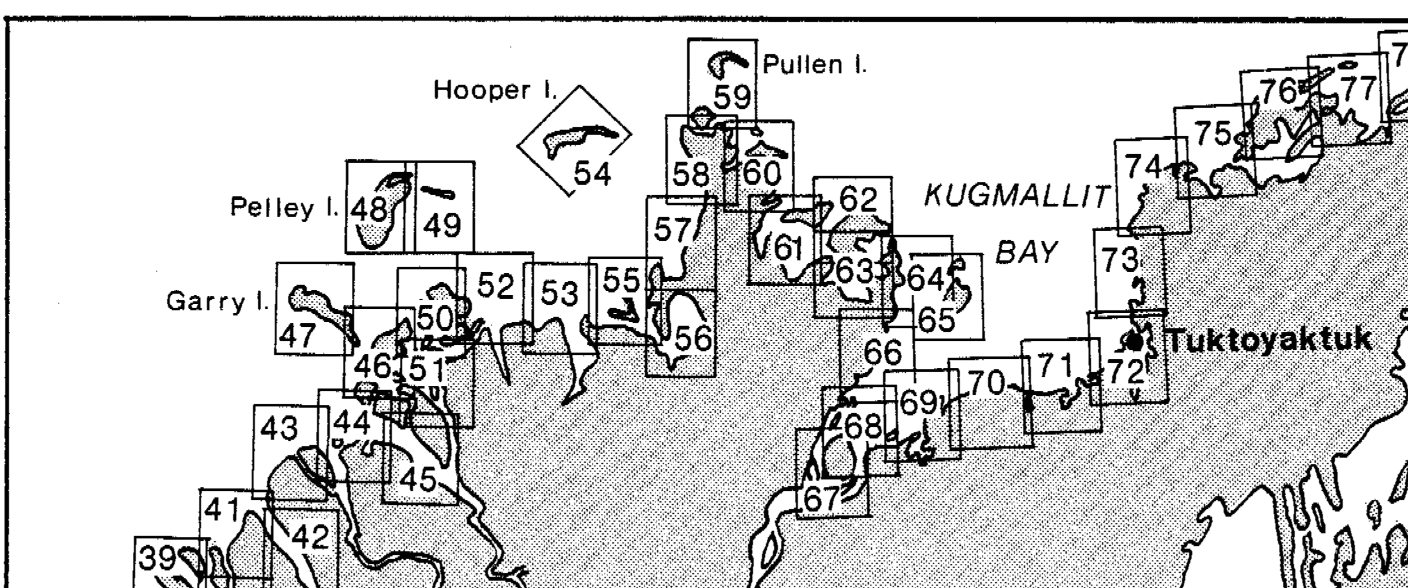
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000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BAY
Tuktoyaktuk
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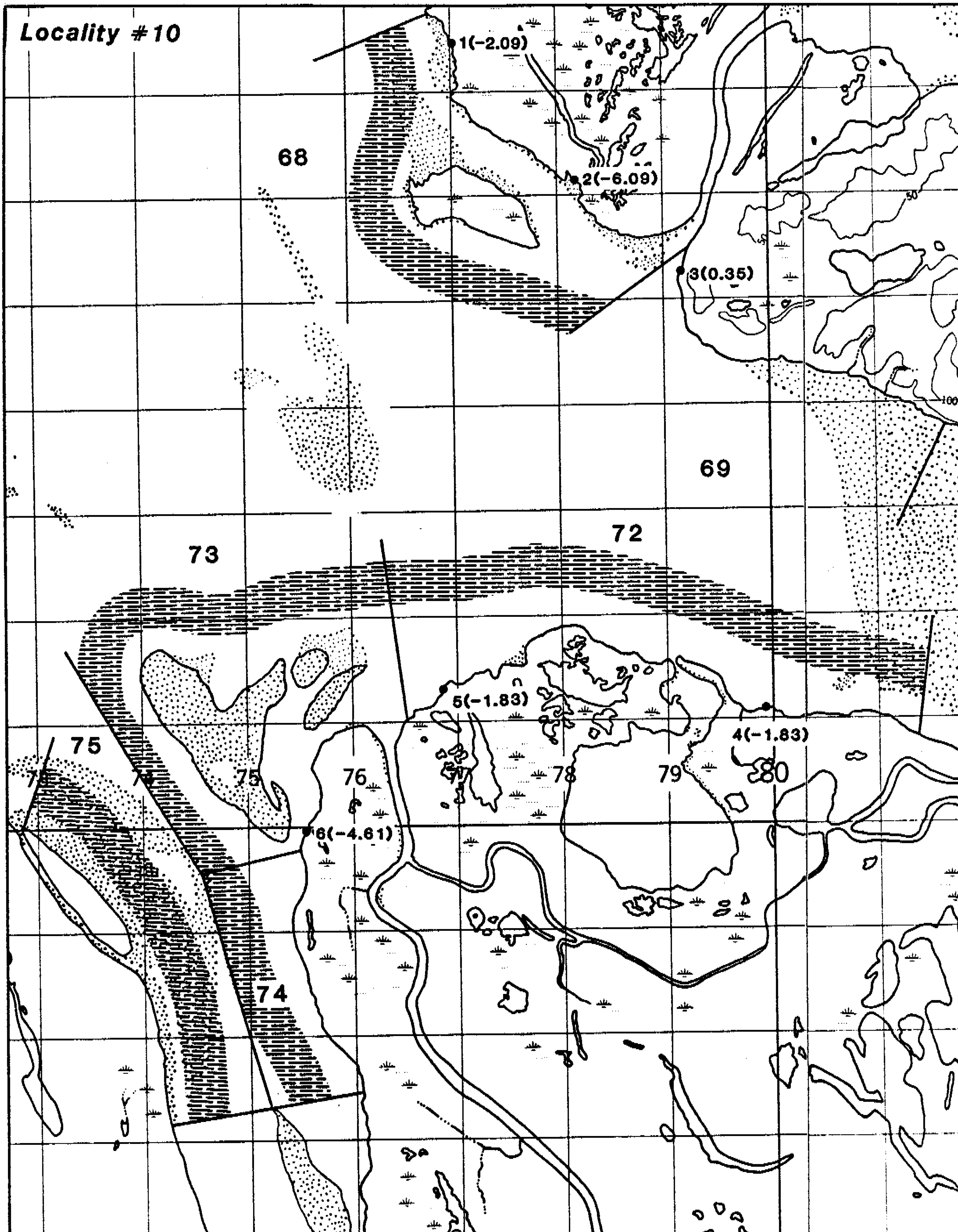

Locality #10
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3(0.35)
4(-1.83)
5(-1.83)
6(-4.61)
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72
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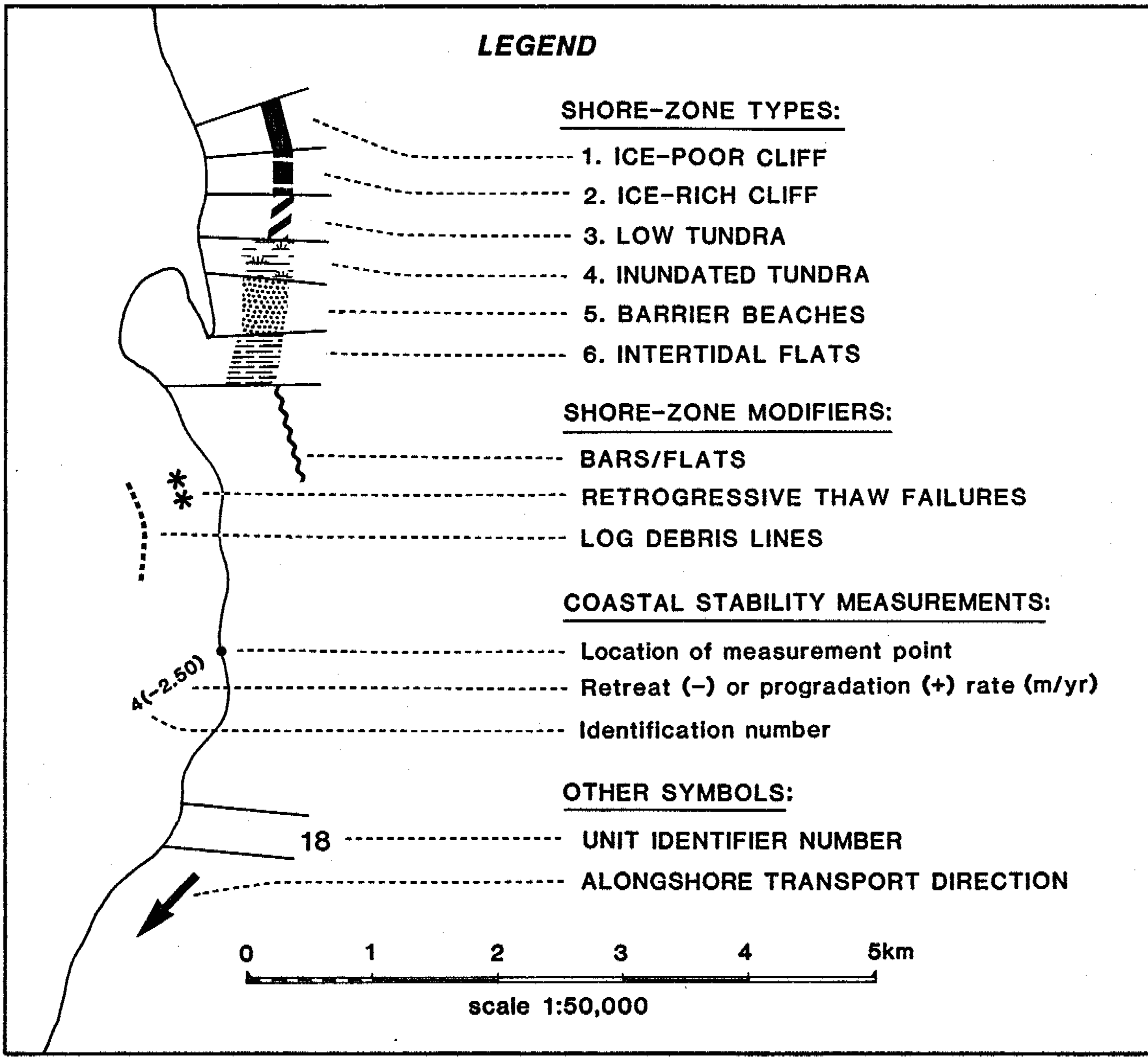
74
75
76
77
78
79
80
50
100


LEGEND
SHORE-ZONE TYPES:
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4(-2.50)
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18
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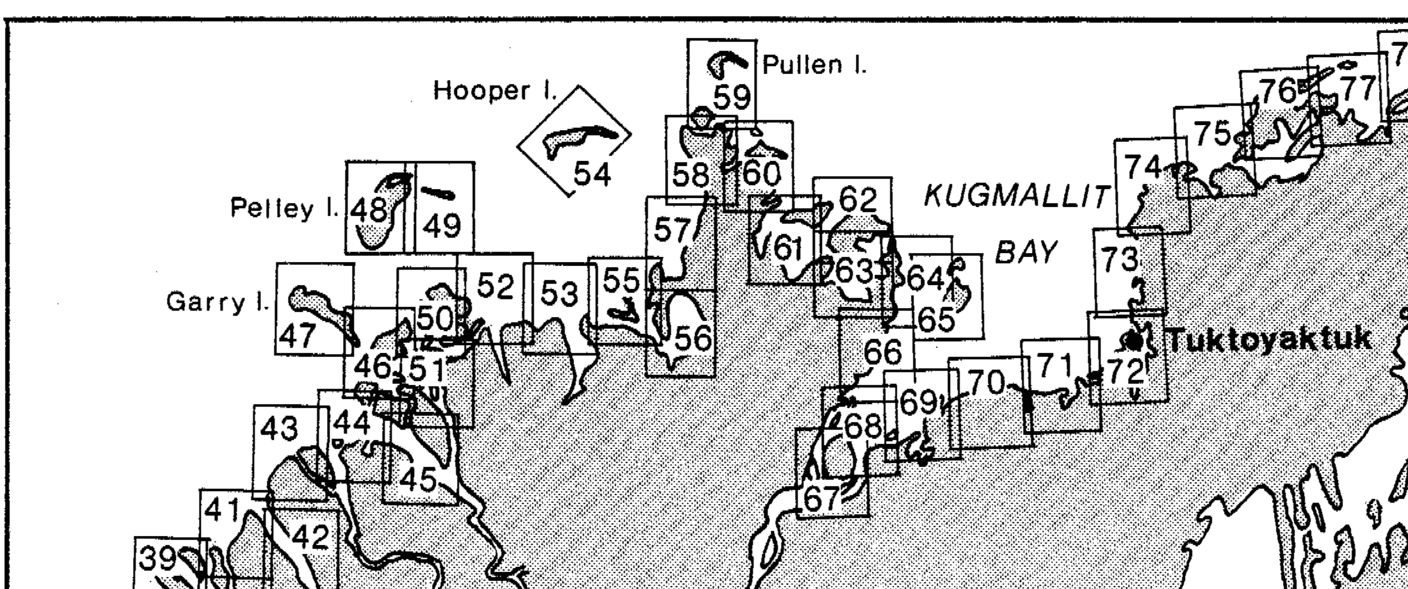
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000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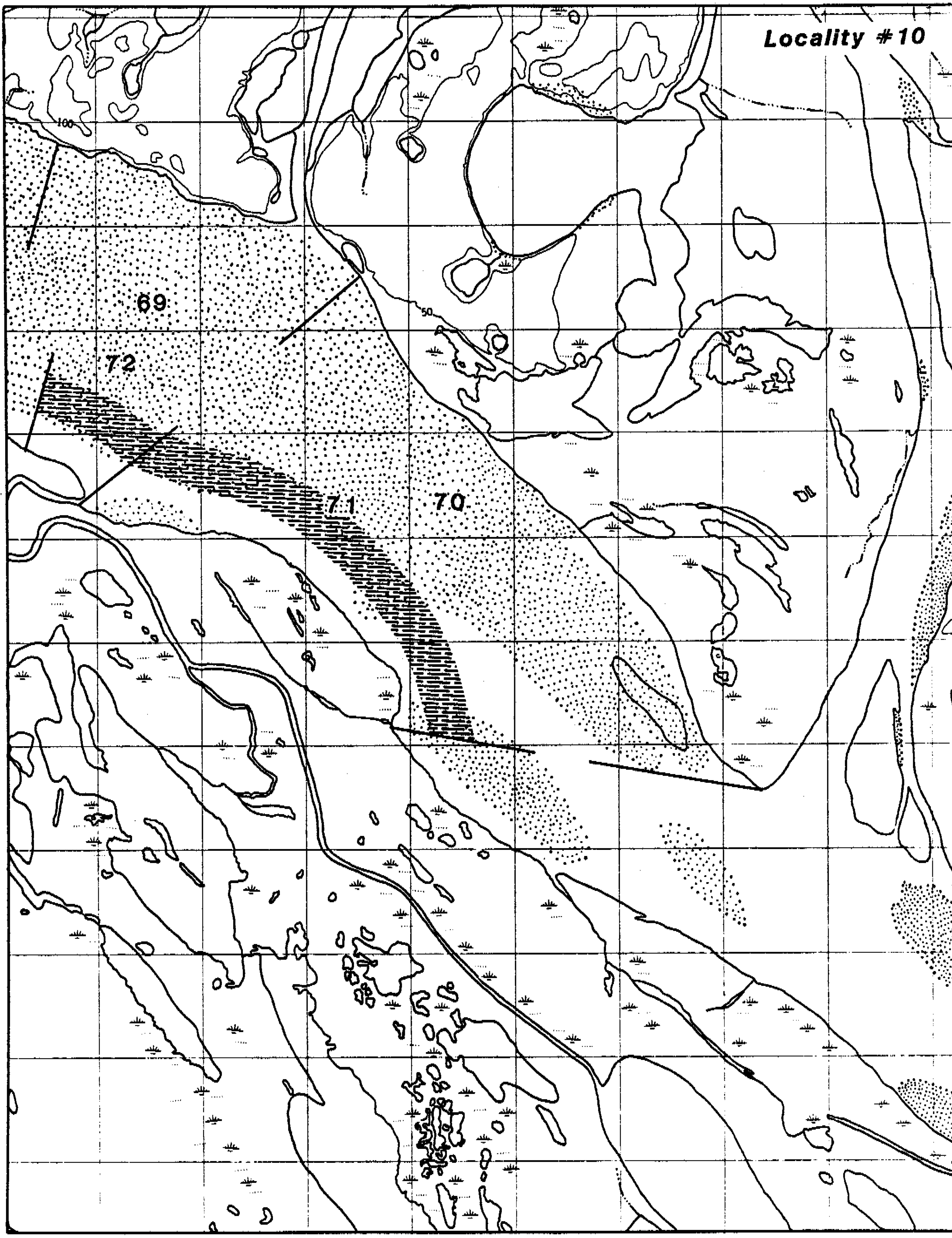
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78


Locality #10
100
69
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50
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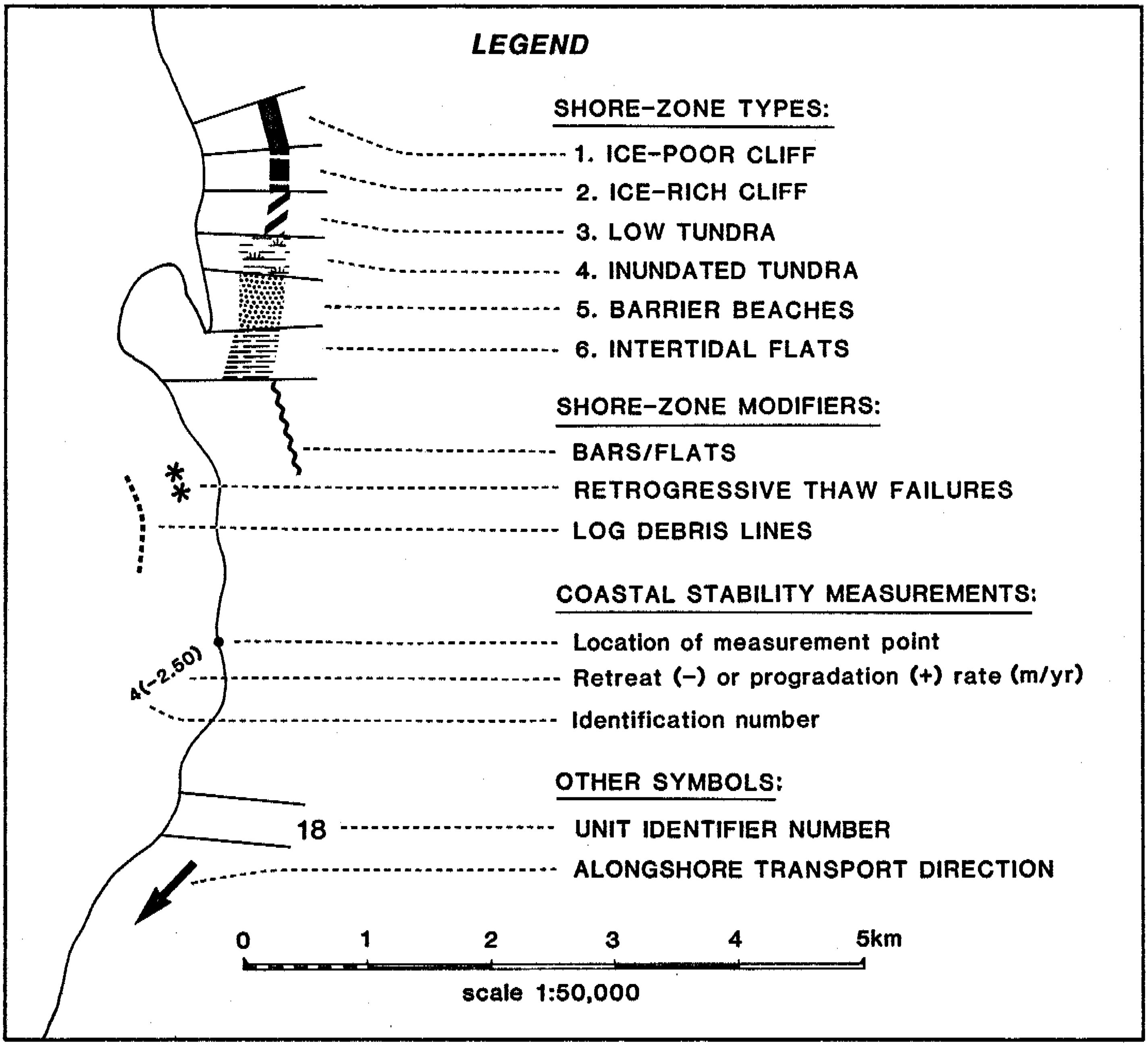
LEGEND
SHORE-ZONE TYPES:
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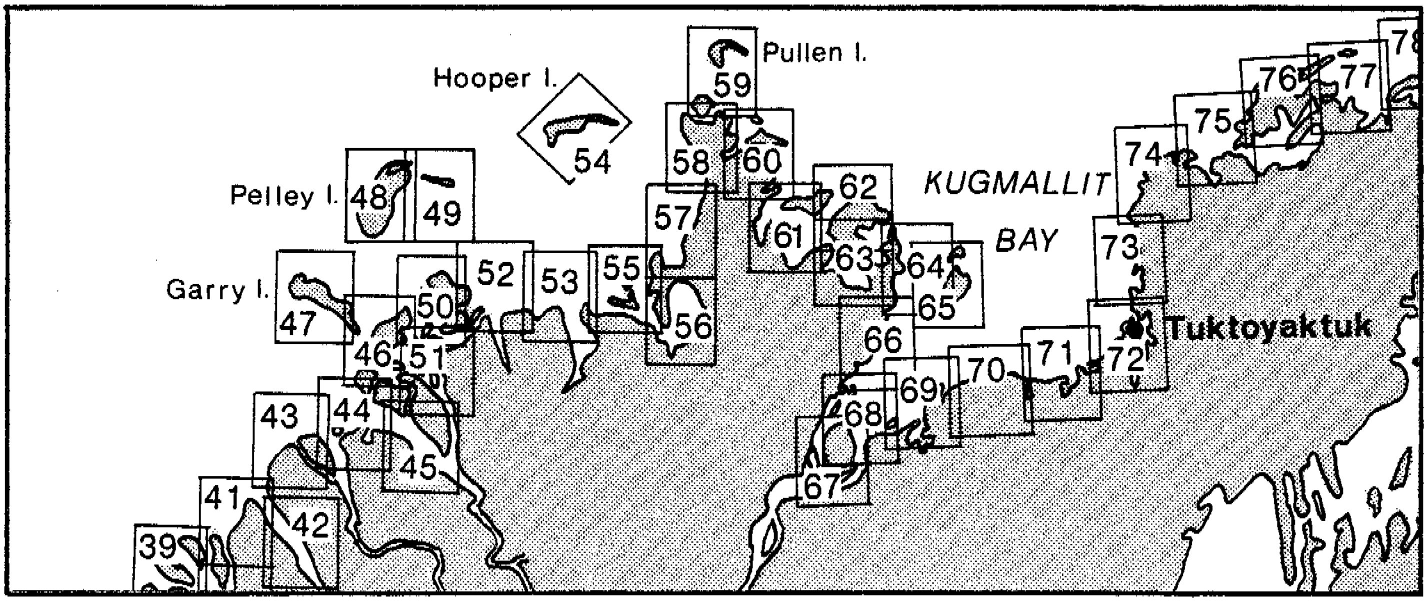
scale 1:50,000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KUGMALLIT
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Tuktoyaktuk
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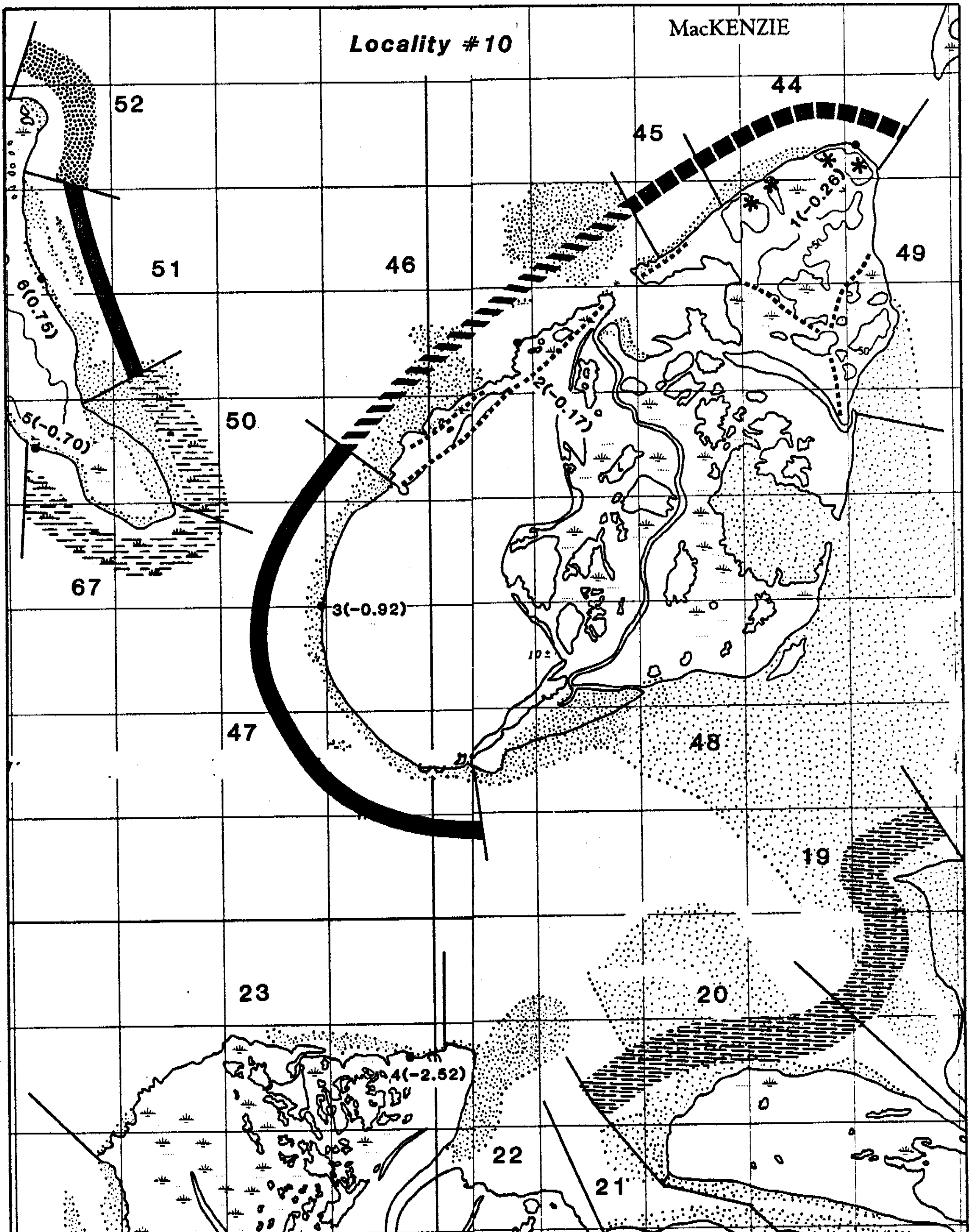
Locality #10
MacKENZIE
44
45
52
51
46
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6(0.75)
1(-0.26)
2(-0.17)
50
5(-0.70)
67
3(-0.92)
47
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19
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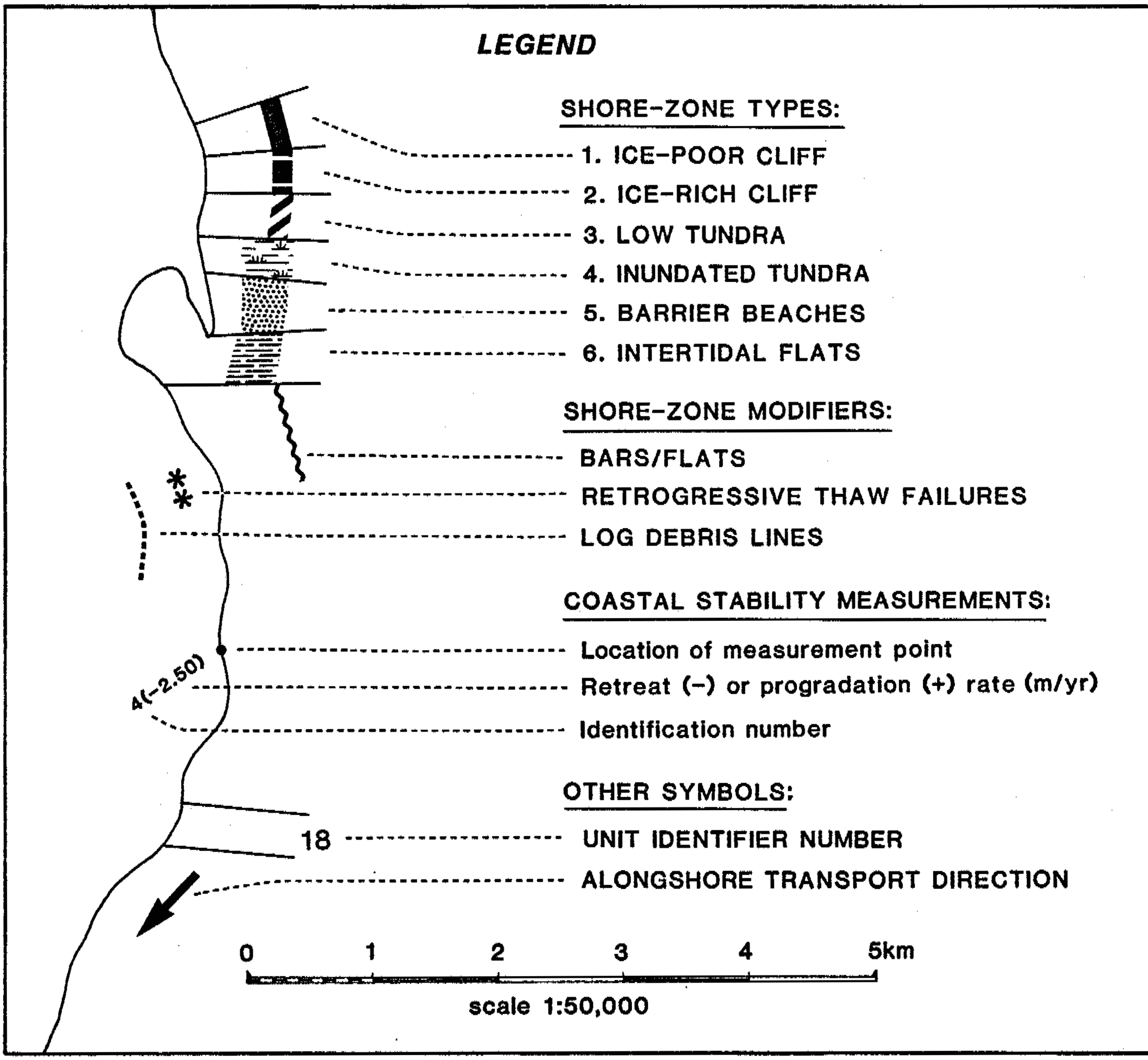
23
4(-2.52)
22
21


LEGEND
SHORE-ZONE TYPES:
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Location of measurement point
4(-2.50)
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
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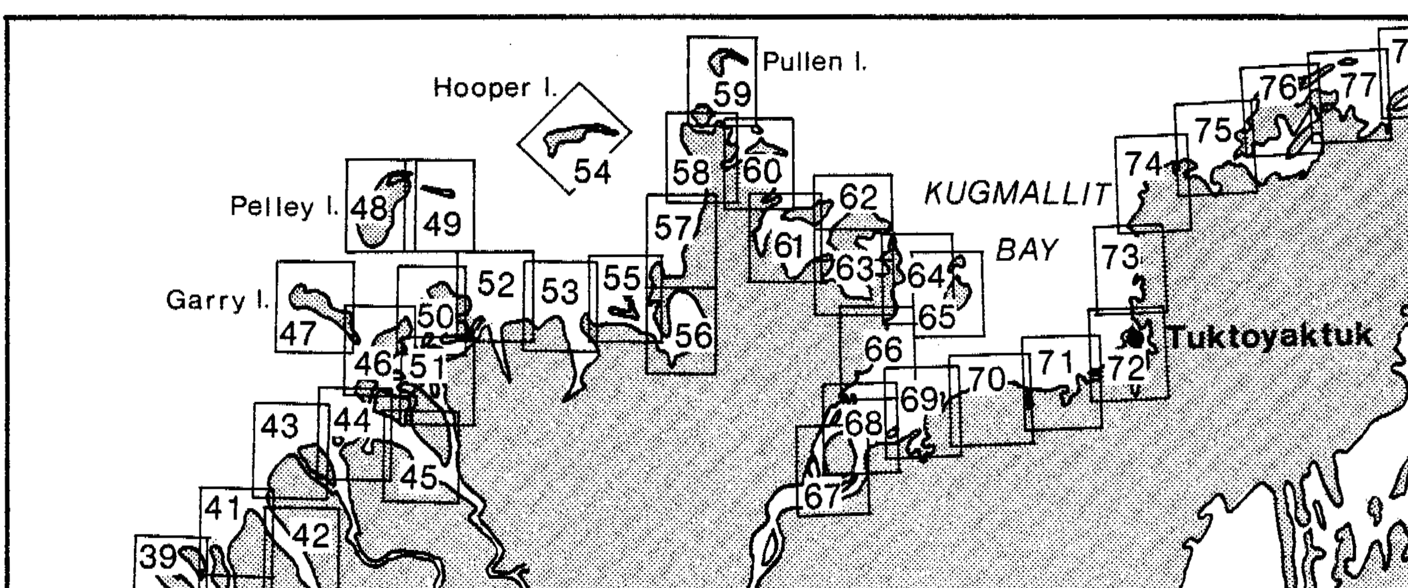
5km
scale 1:50,000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Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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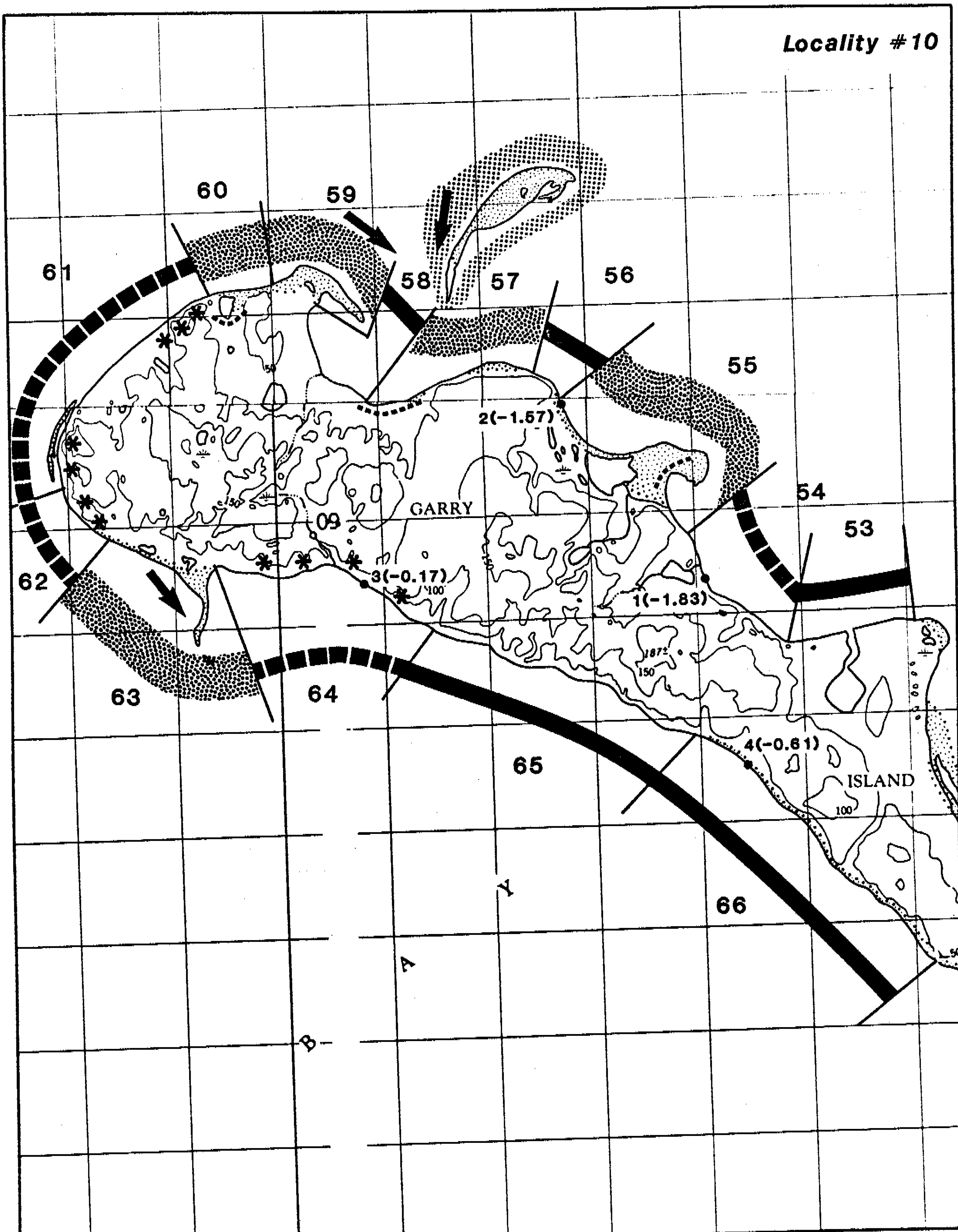

Locality #10
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2(-1.57)
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GARRY
09
3(-0.17)
1(-1.83)
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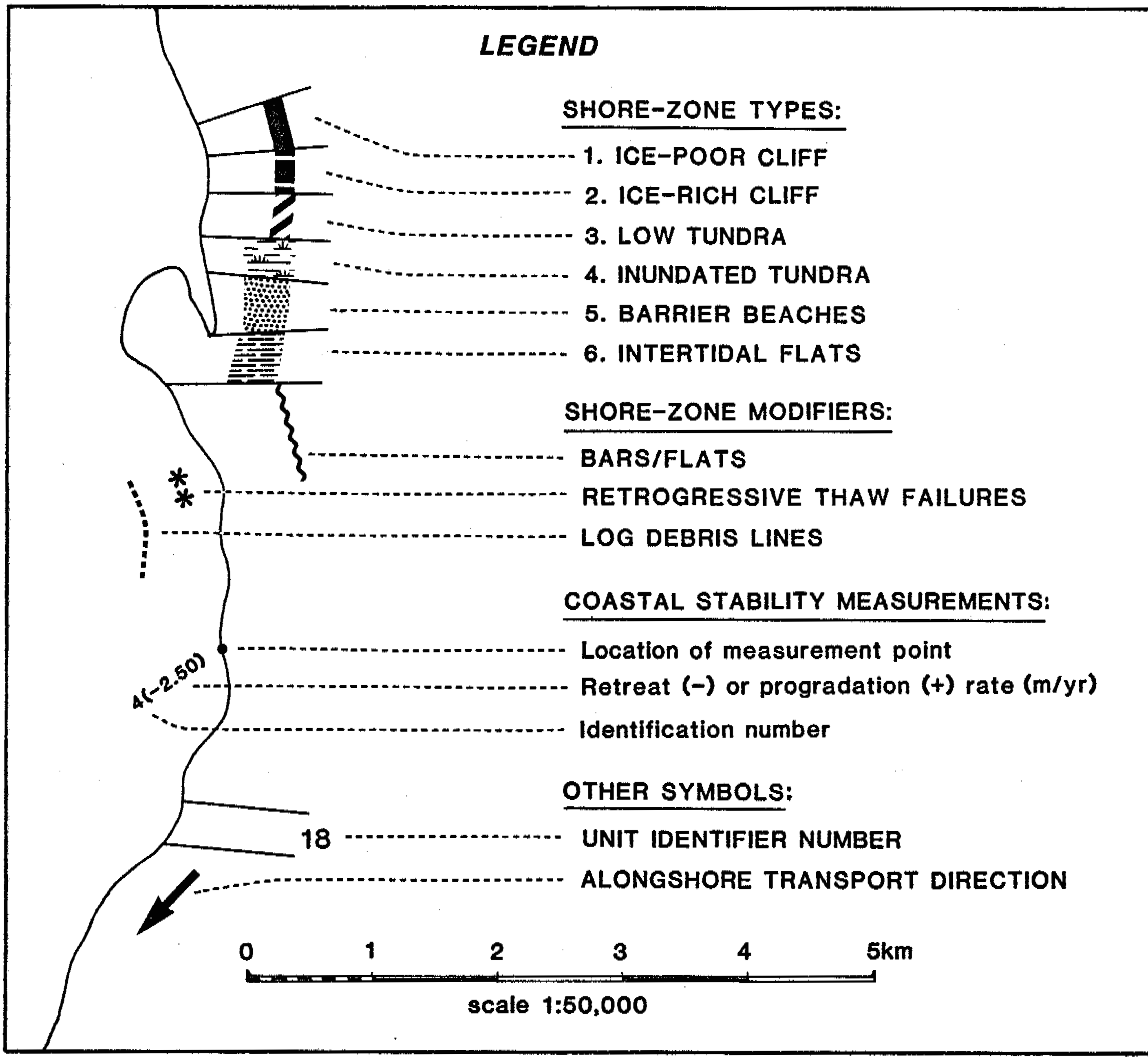
63
64
65
4(-0.61)
ISLAND
Y
66
A
B



LEGEND
SHORE-ZONE TYPES:
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4(-2.50)
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ALONGSHORE TRANSPORT DIRECTION
0
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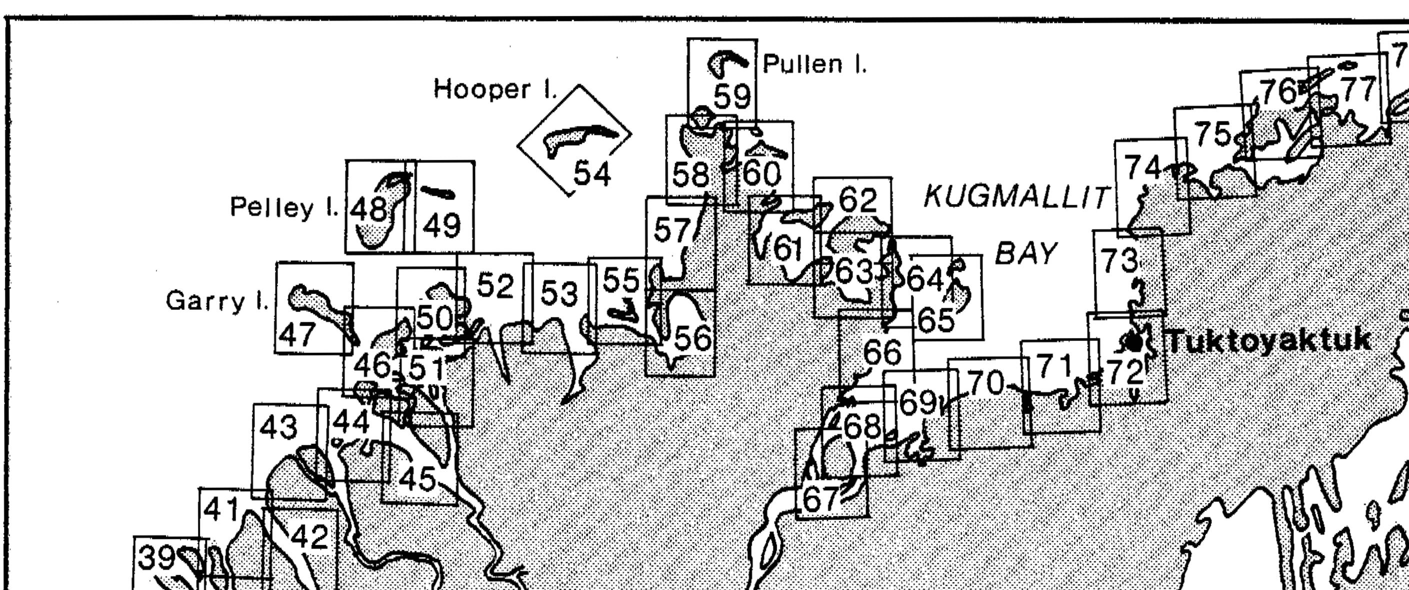
5km
scale 1:50,000



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Pelley I.
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KUGMALLIT
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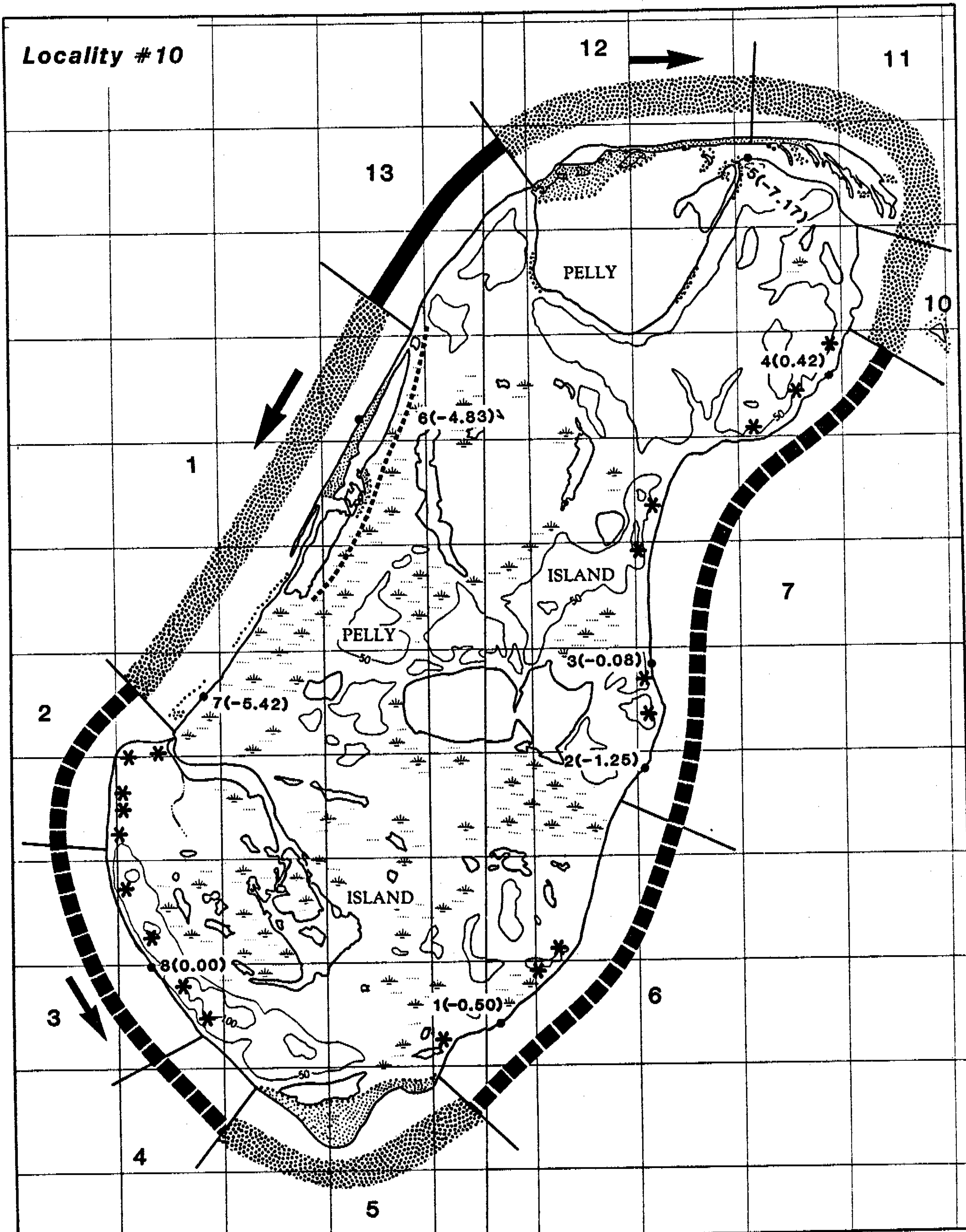

Locality #10
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11
13
PELLY
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10
4(0.42)
6(-4.83)
1
ISLAND
7
PELLY
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2
7(-5.42)
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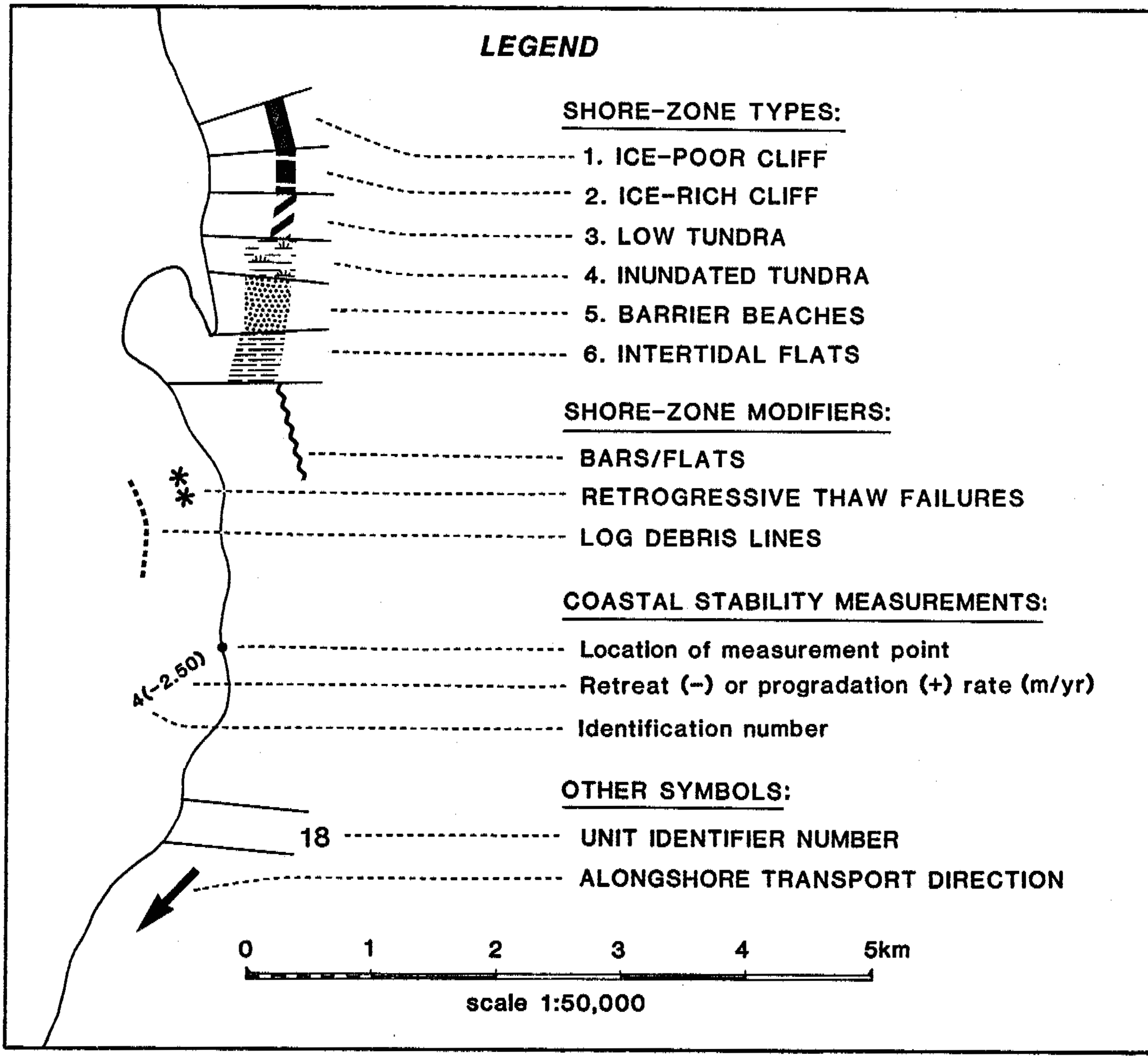
ISLAND
8(0.00)
1(-0.50)
6
3
4
5



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SHORE-ZONE TYPES:
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ALONGSHORE TRANSPORT DIRECTION
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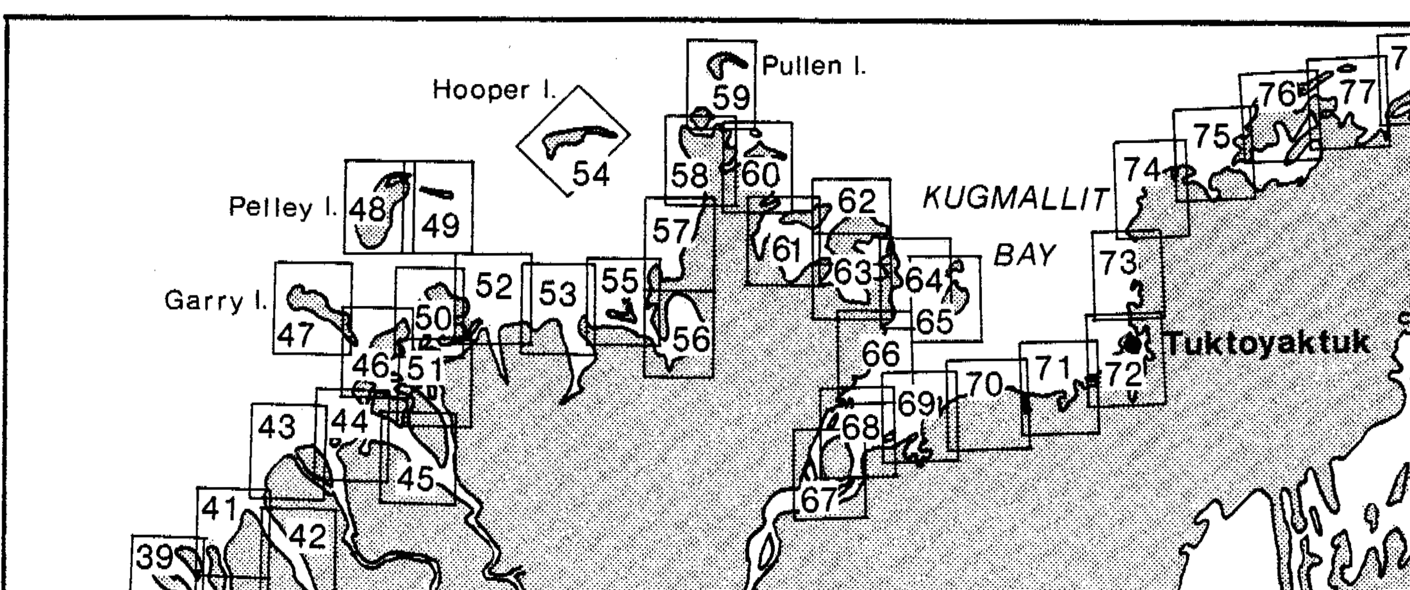
3
4
5km
scale 1:50,000



Pullen I.
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Pelley I.
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KUGMALLIT
BAY
Tuktoyaktuk
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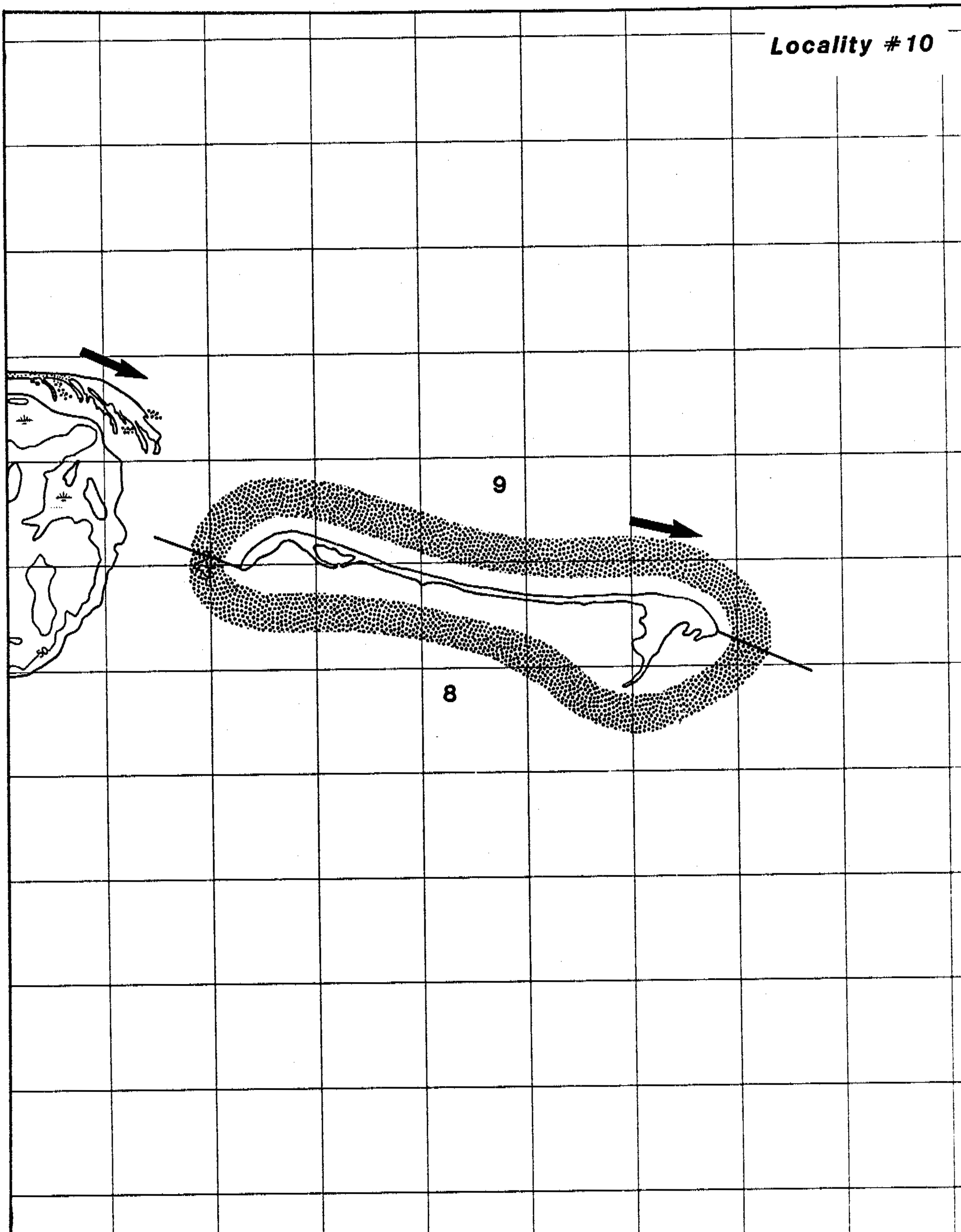
Locality #10
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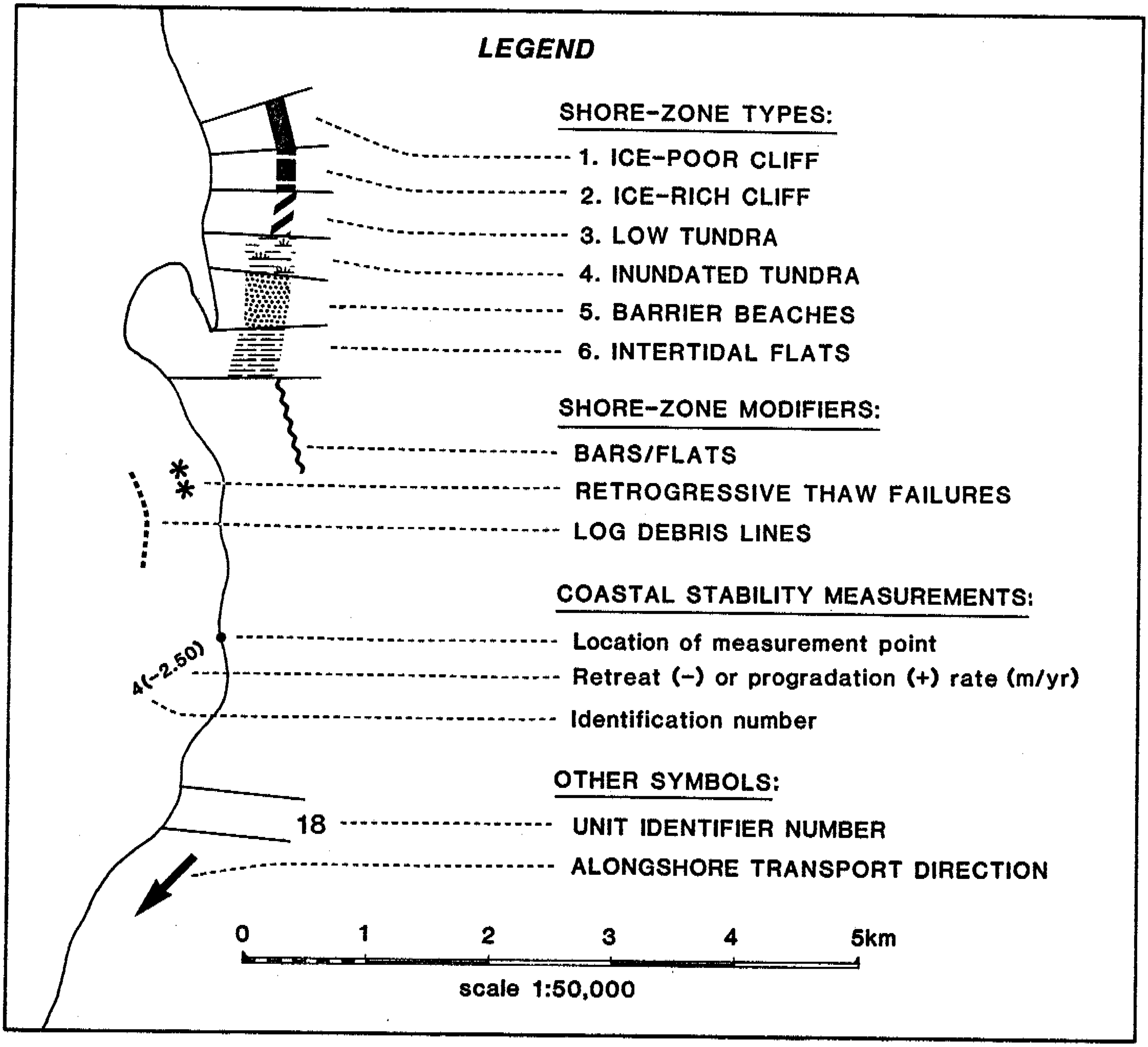

LEGEND
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0
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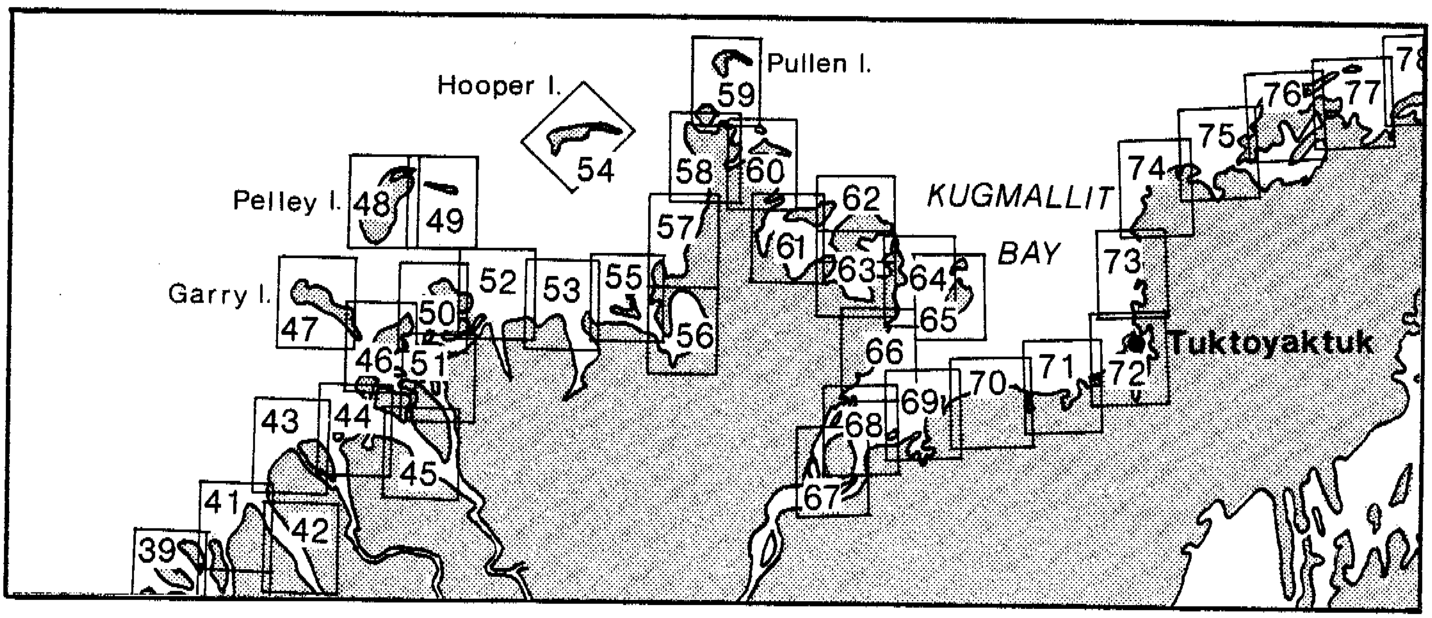
5km
scale 1:50,000



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KUGMALLIT
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Tuktoyaktuk
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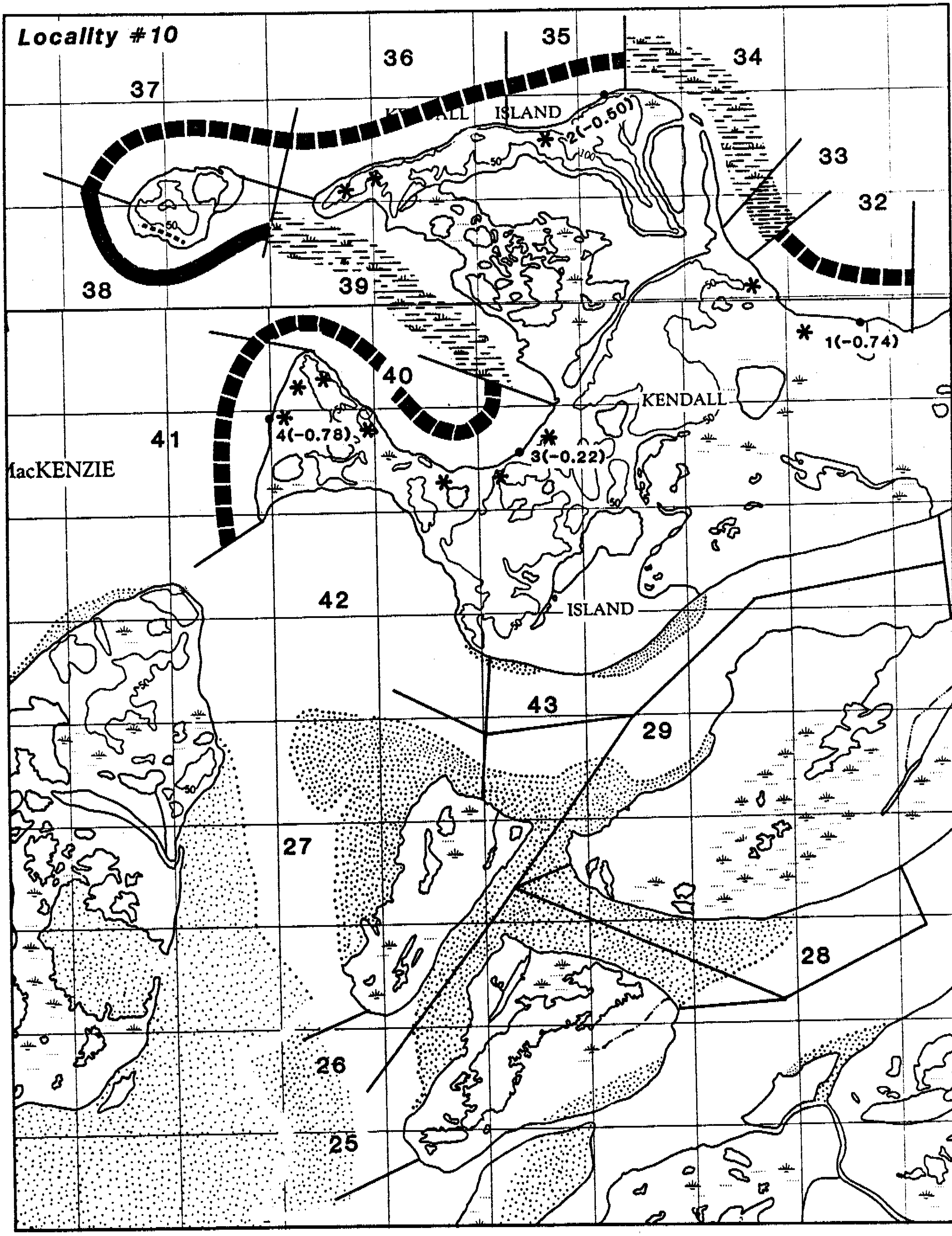
Locality #10
KENDALL ISLAND
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1(-0.74)
KENDALL
4(-0.78)
3(-0.22)
MacKENZIE
ISLAND
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34
35
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39
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41
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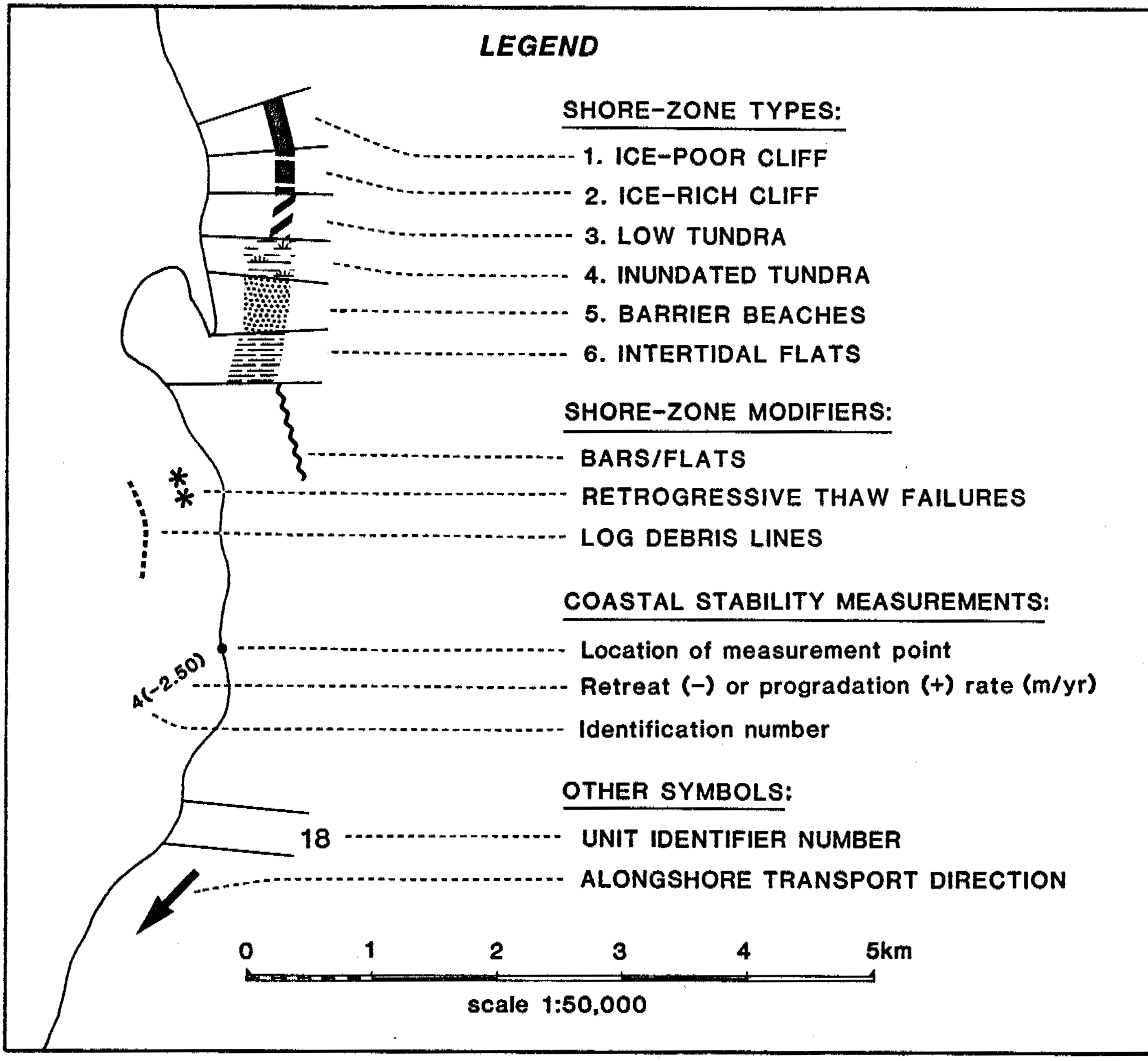
43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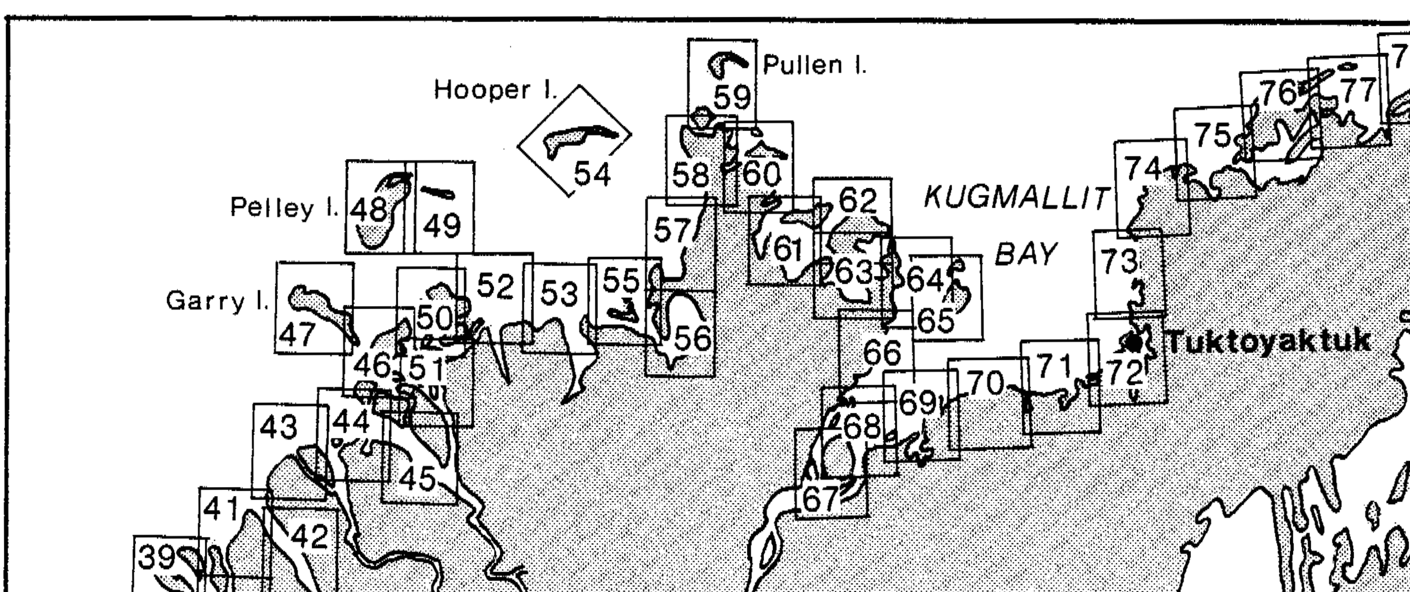
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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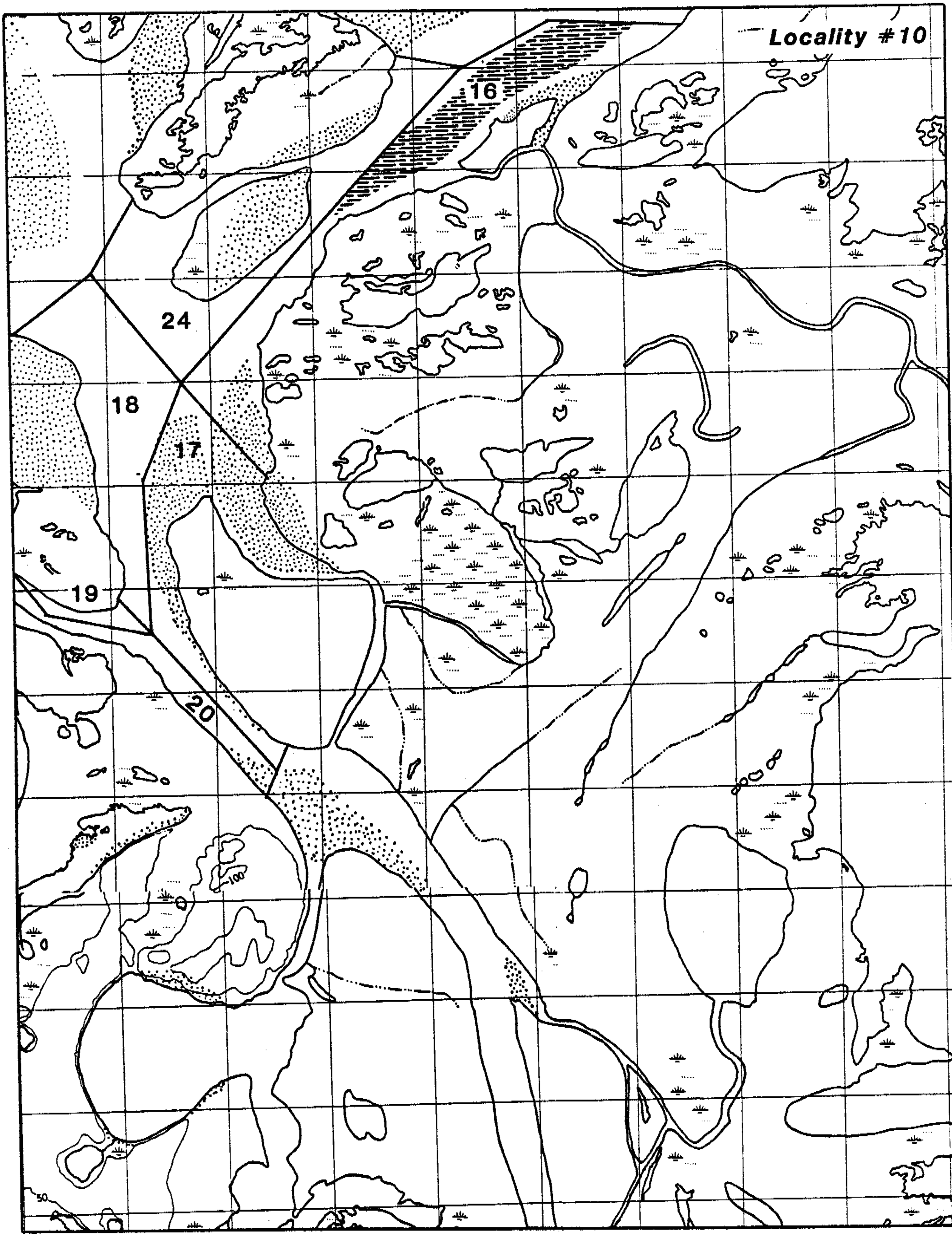
Locality #10
16
24
18
17
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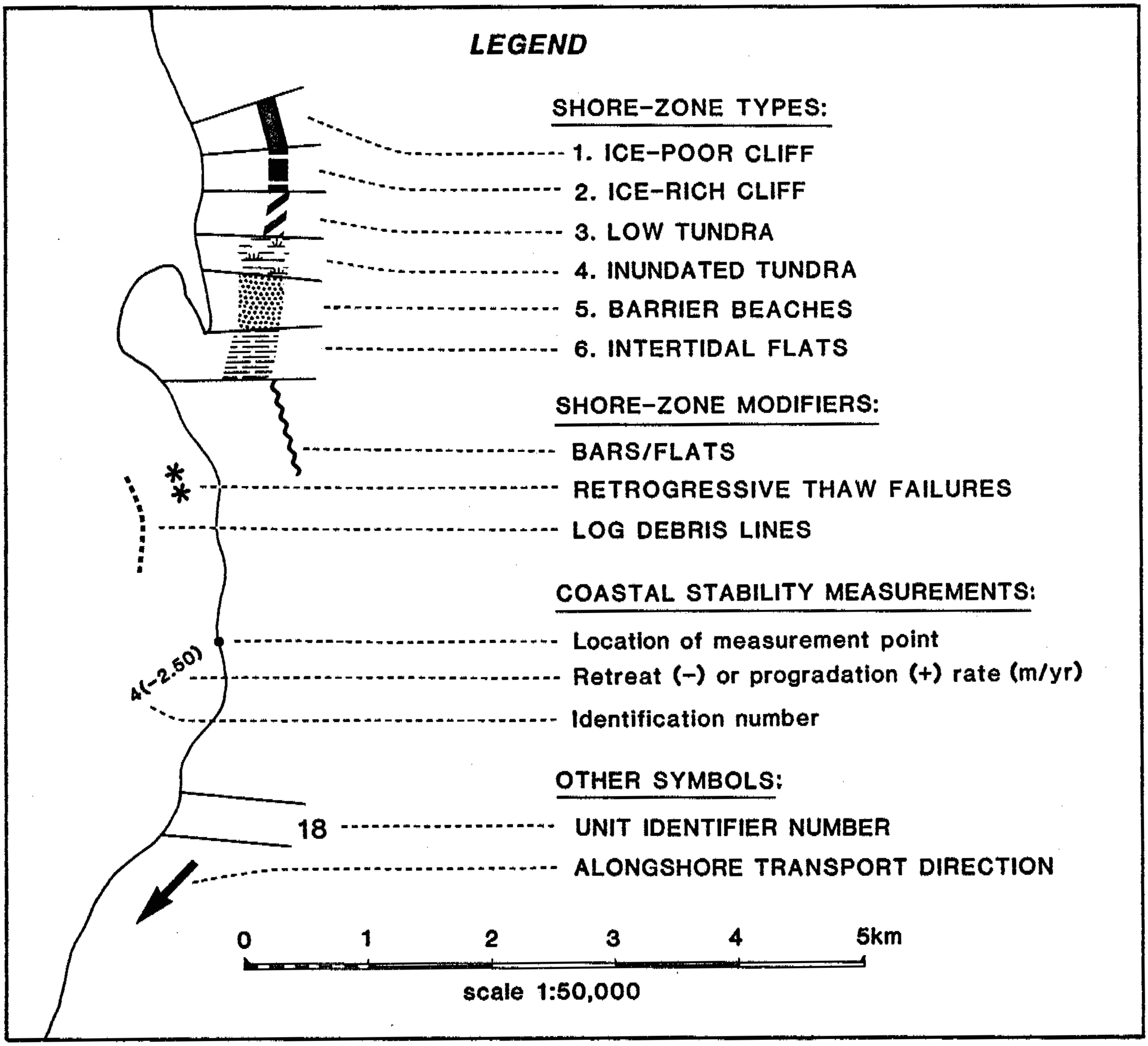
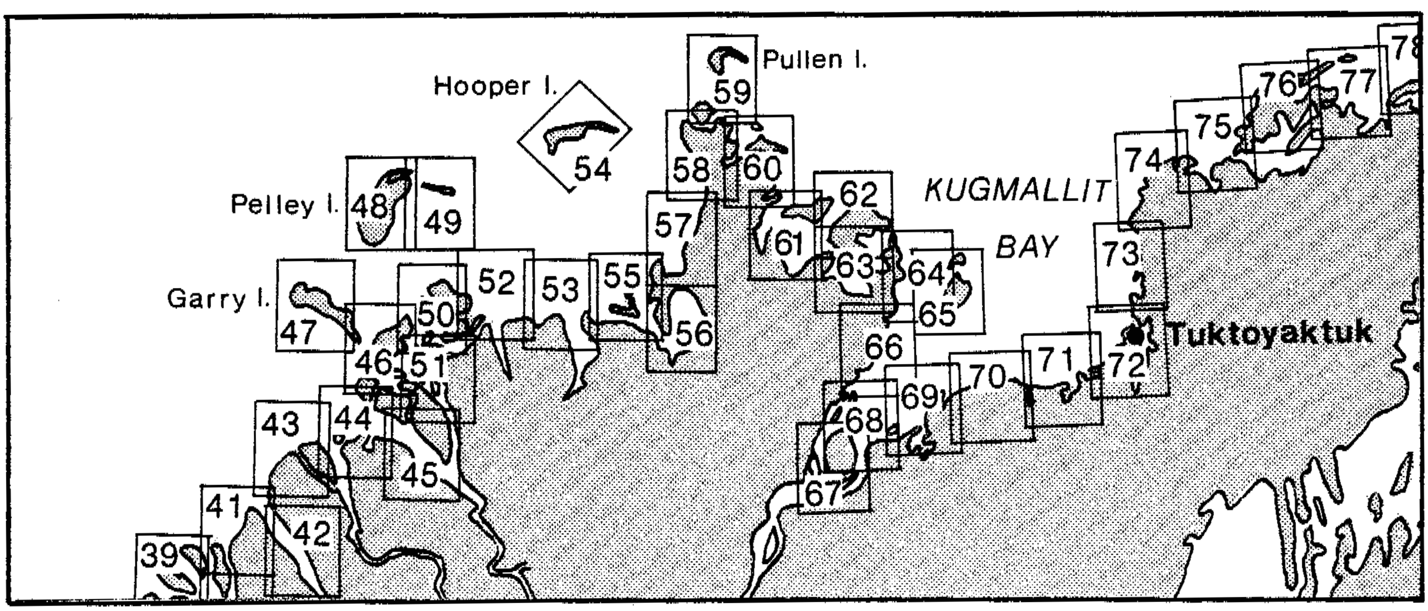
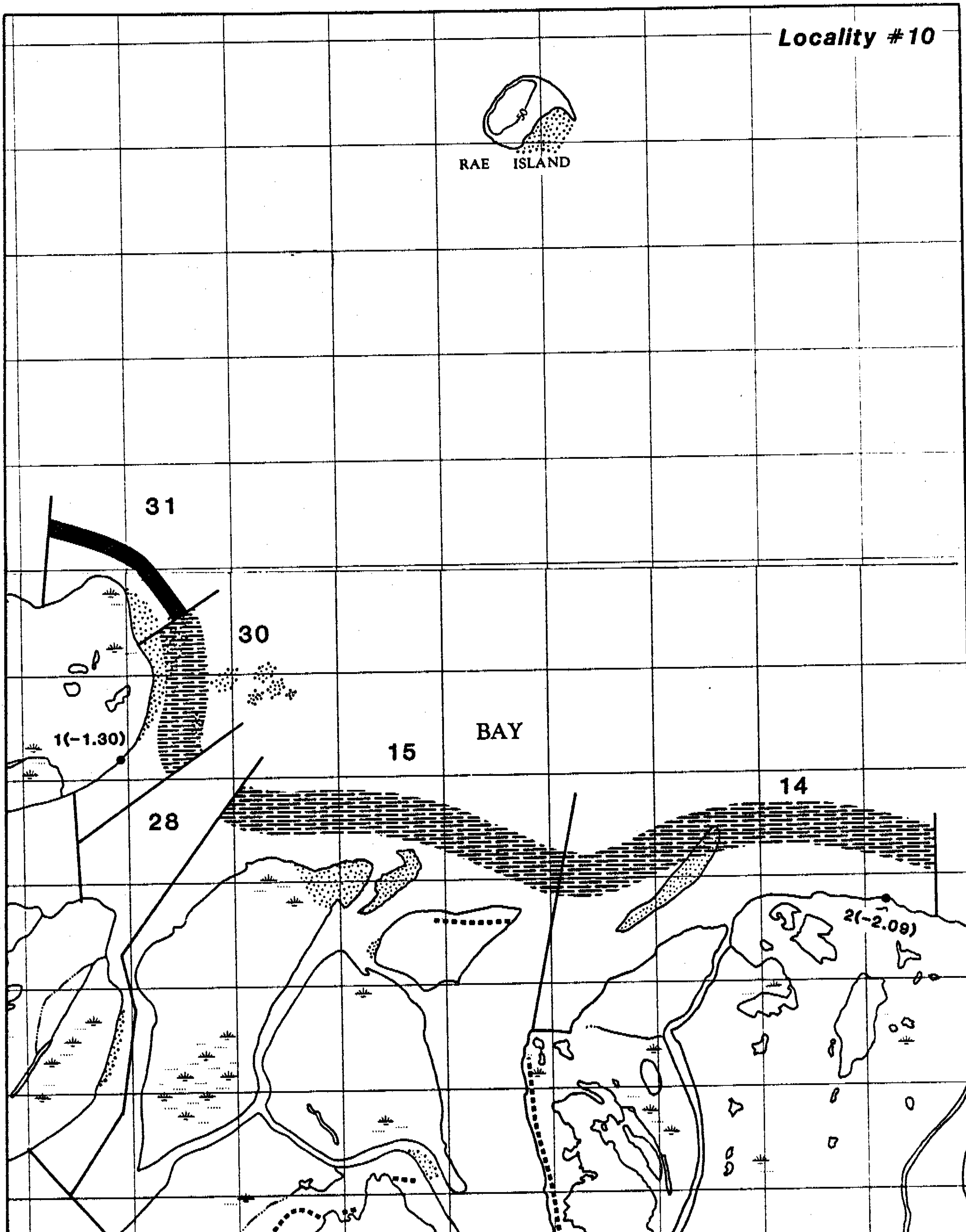
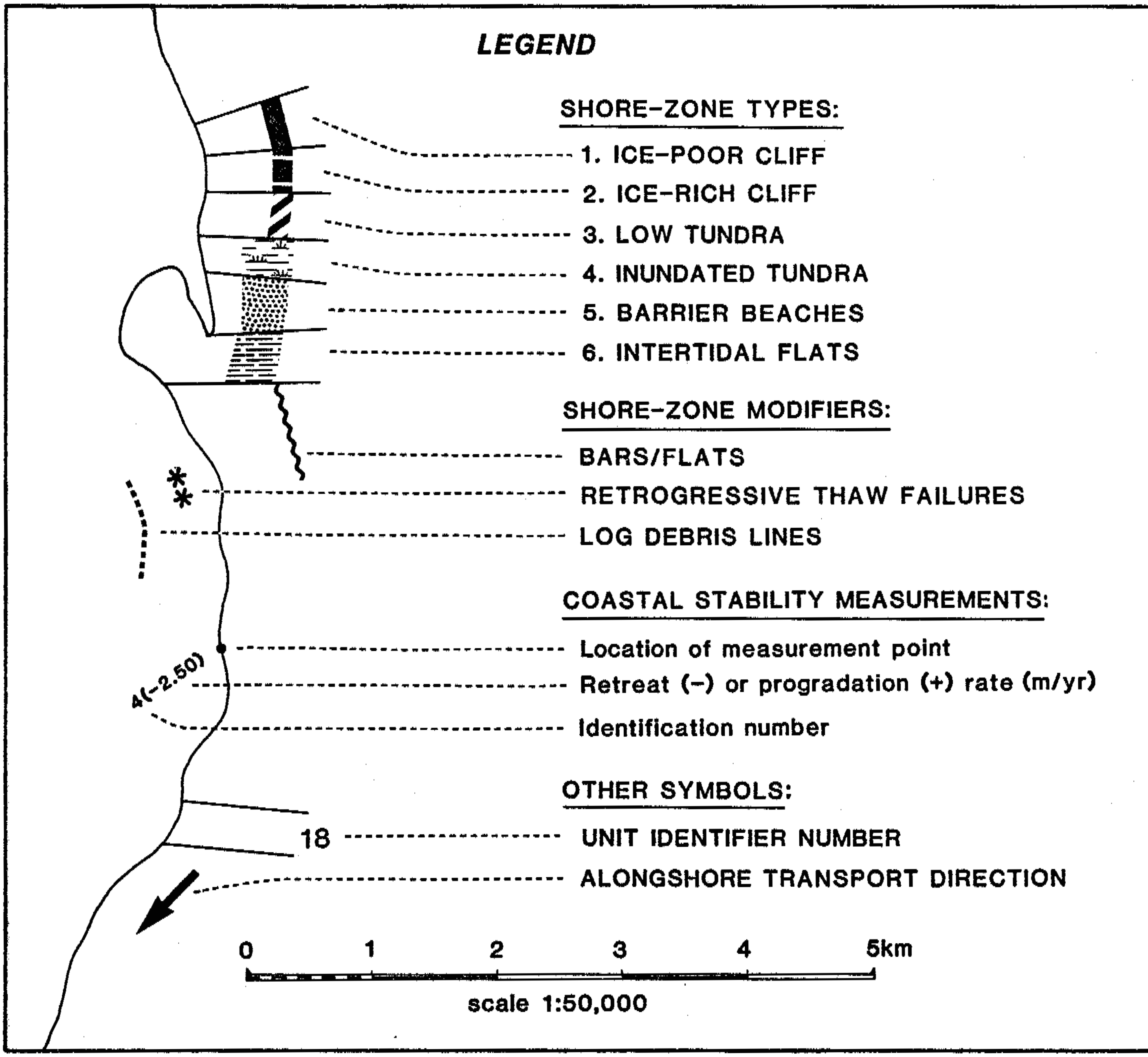
100
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78


Locality #10
RAE ISLAND
31
30
1(-1.30)
BAY
15
28
14
2(-2.09)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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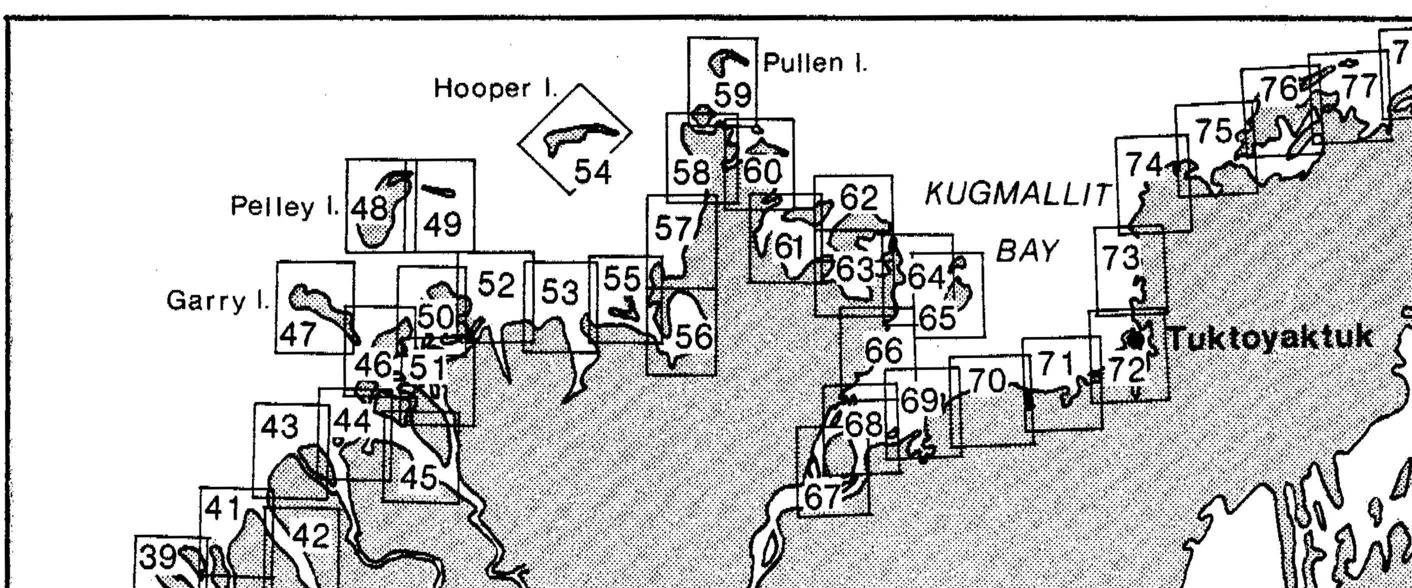
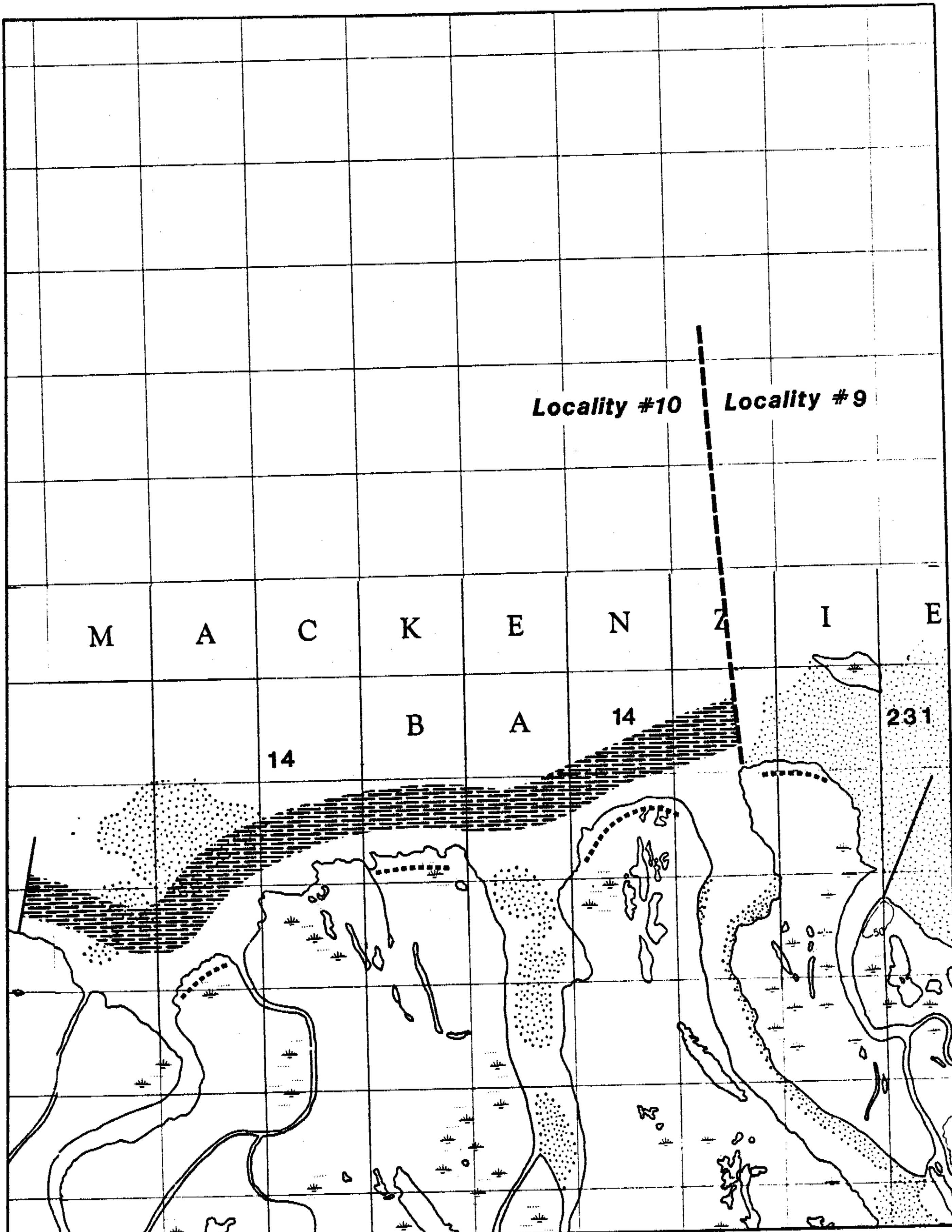
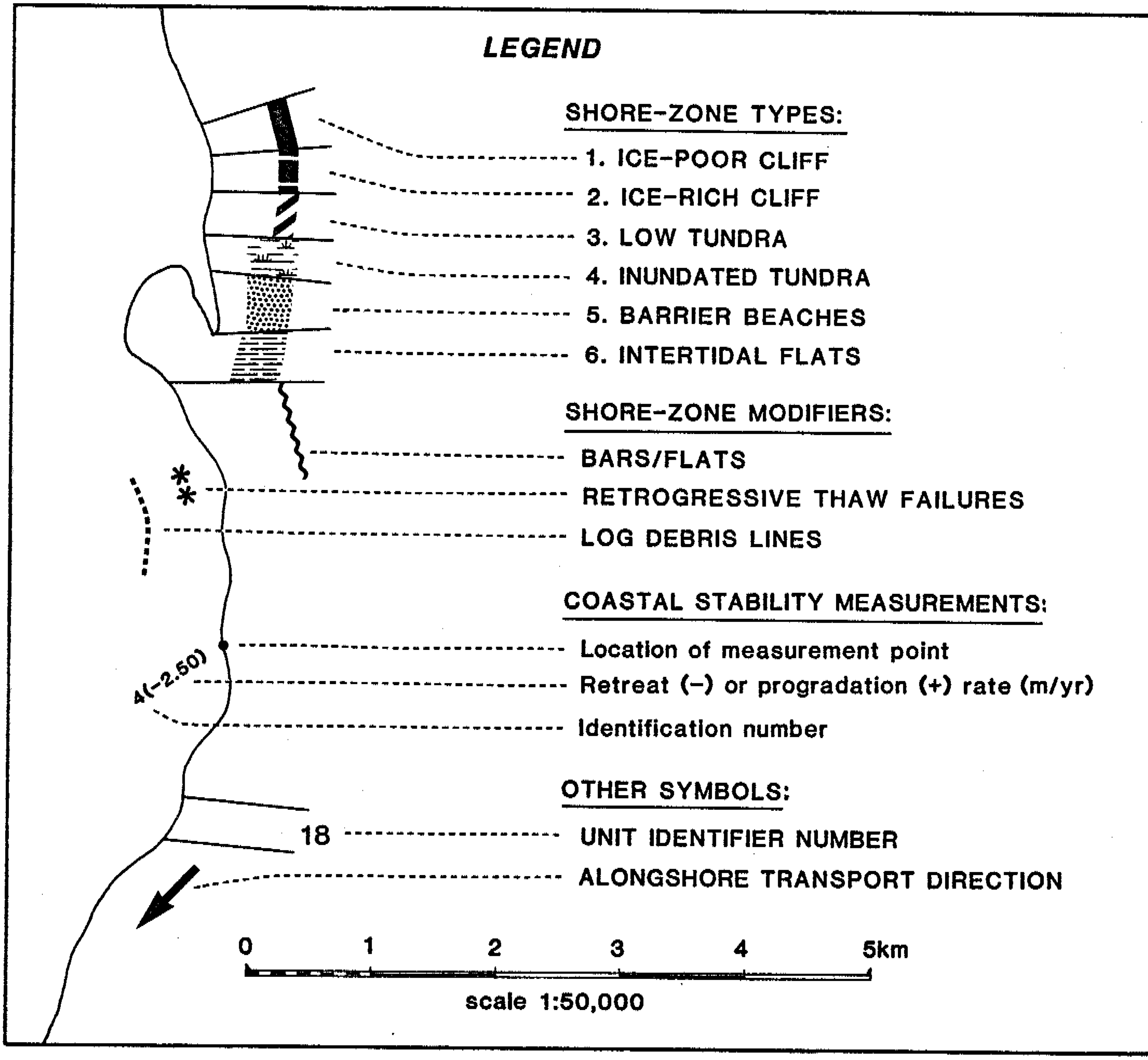
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #10
Locality #9
M A C K E N Z I E
B A
14
14
231
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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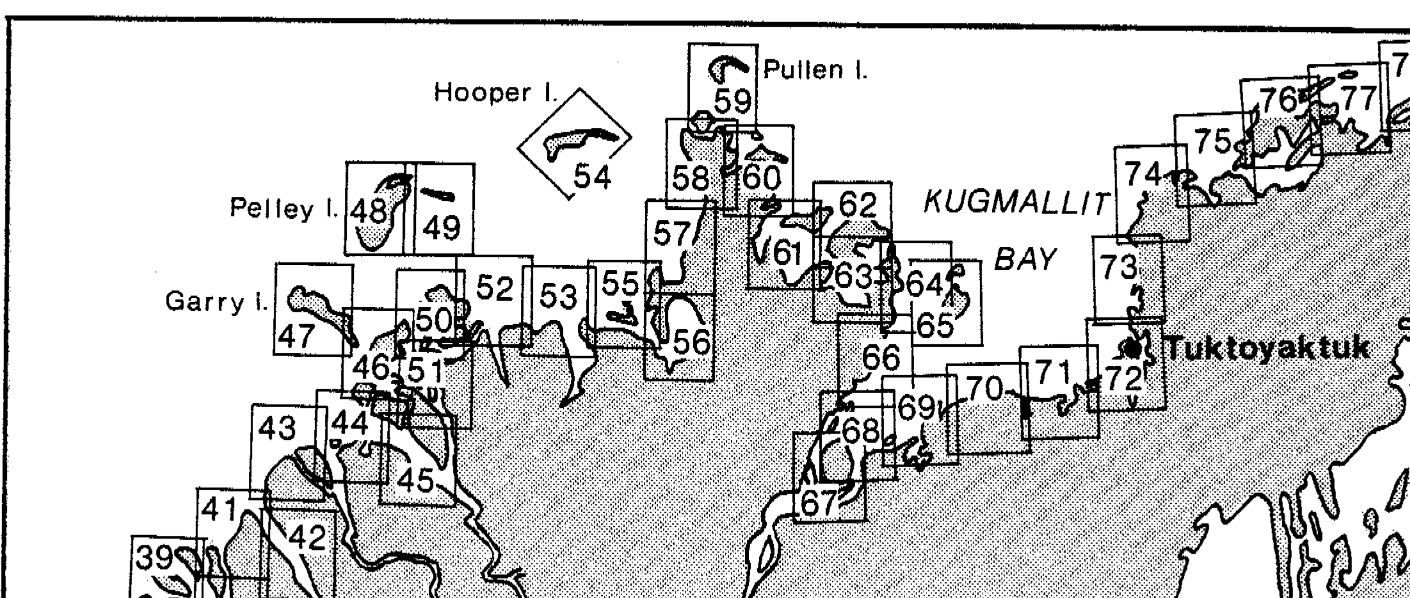
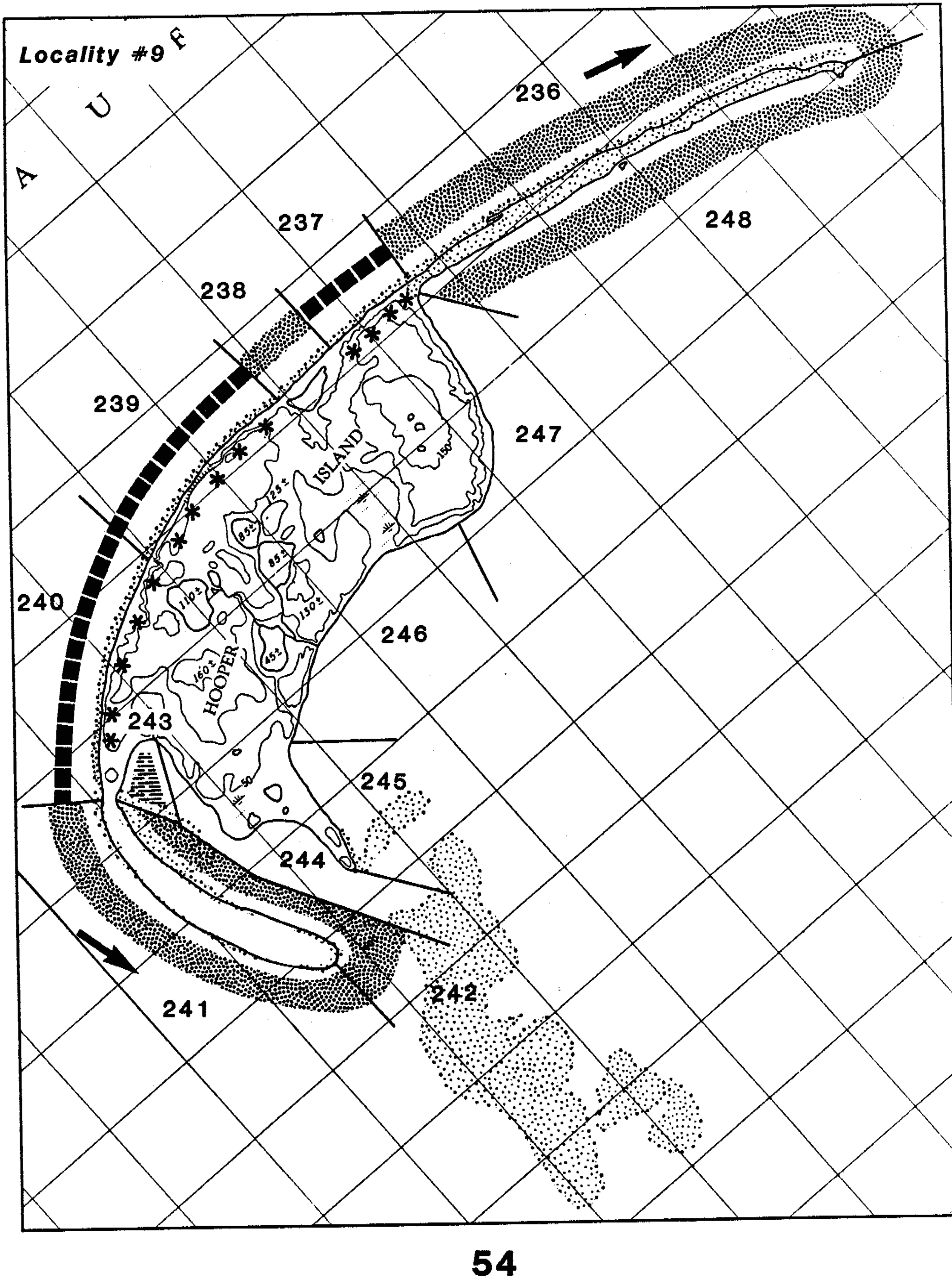
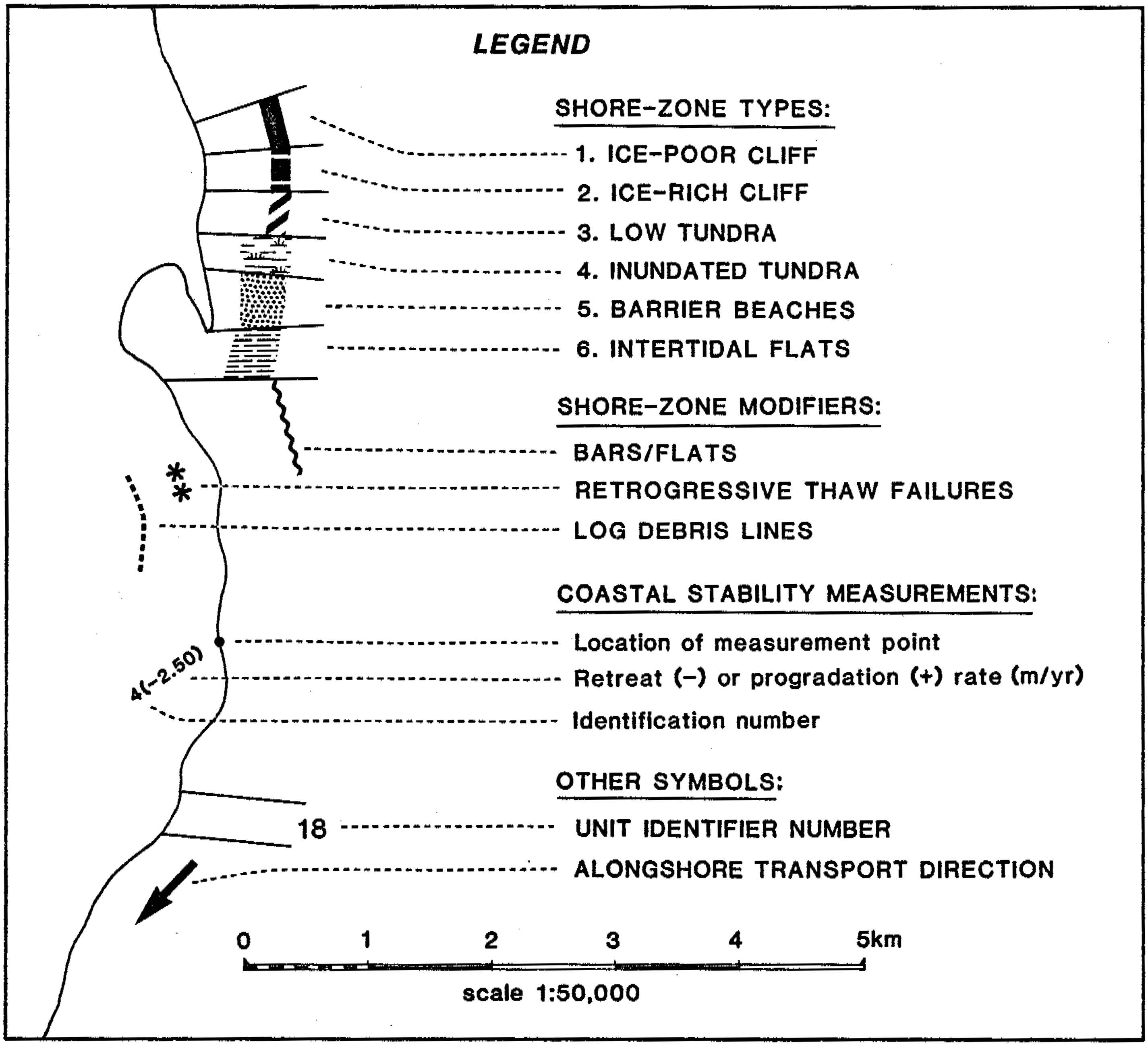
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #9
A
U
F
236
237
238
239
240
241
242
243
244
245
246
247
248
ISLAND
HOOPER
125±
85±
85±
110±
130±
45±
160±
150
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
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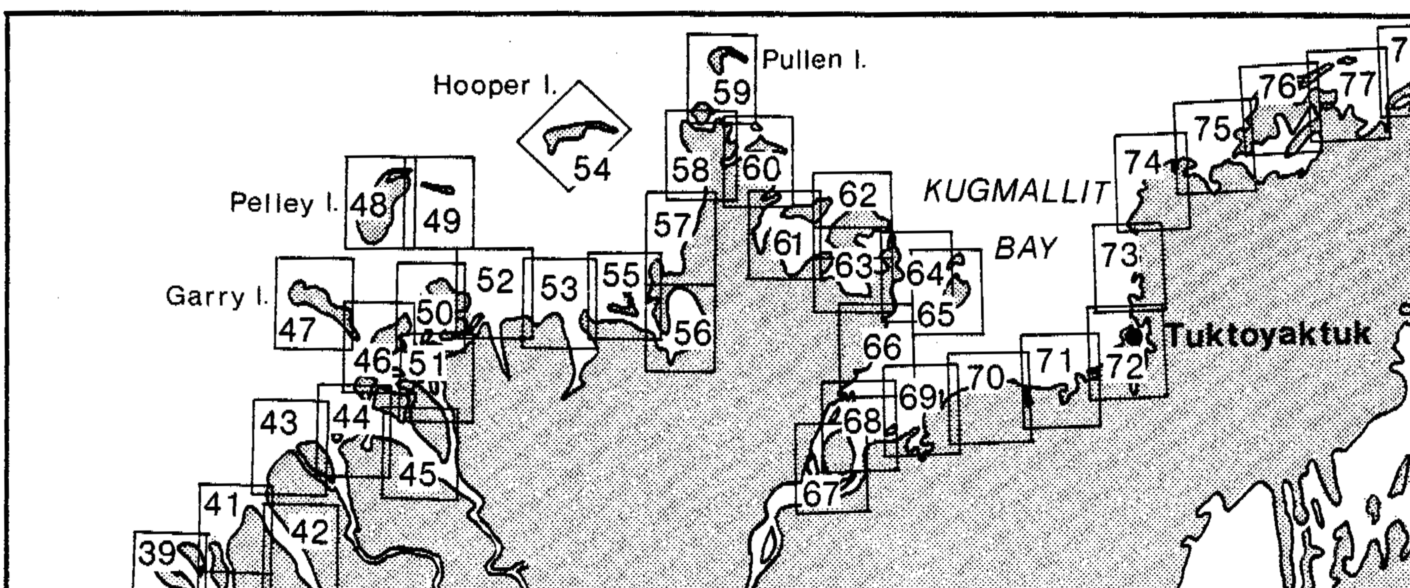
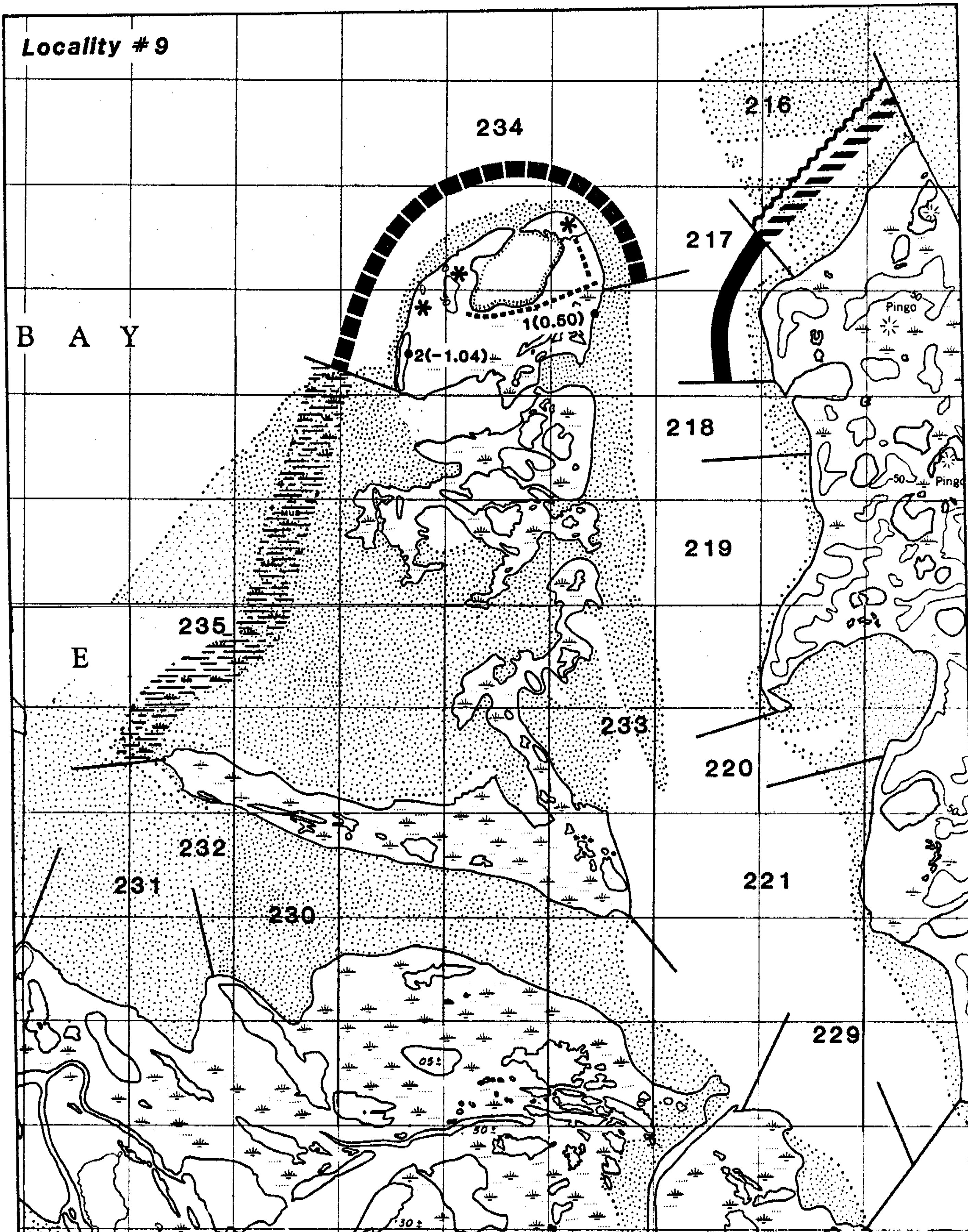
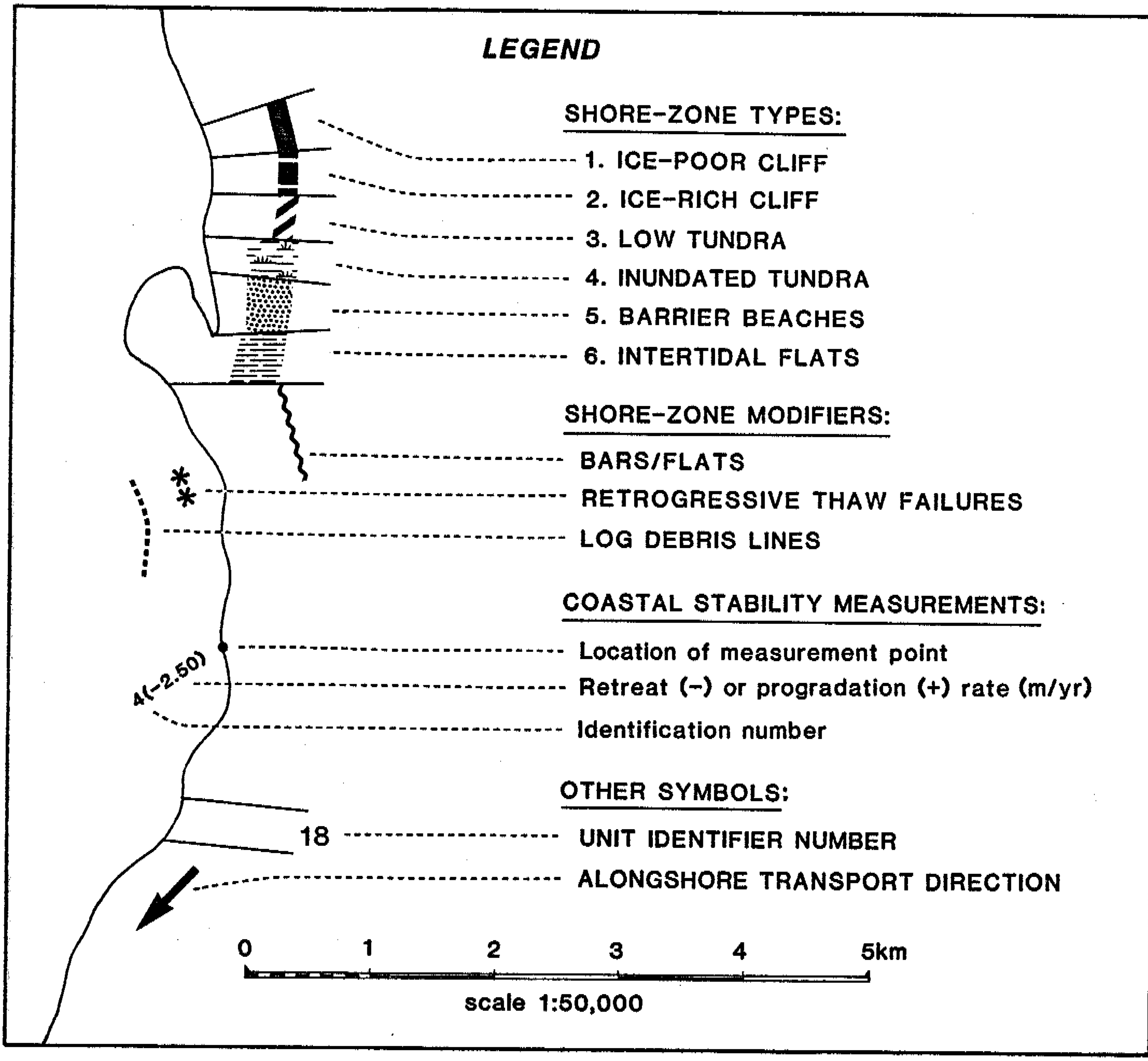
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78


Locality # 9
234
216
217
218
219
220
221
229
233
235
232
231
230
B A Y
E
1(0.50)
2(-1.04)
Pingo
Pingo
MUD


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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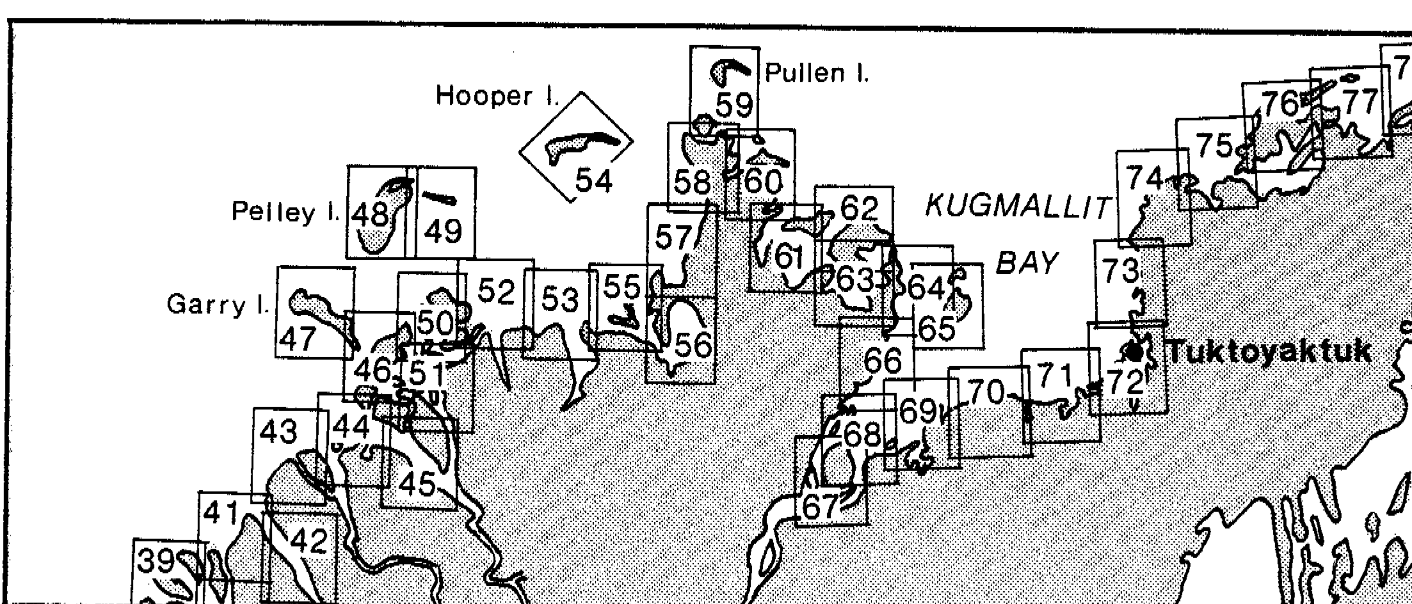
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Hooper I.
Pullen I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39
41
42
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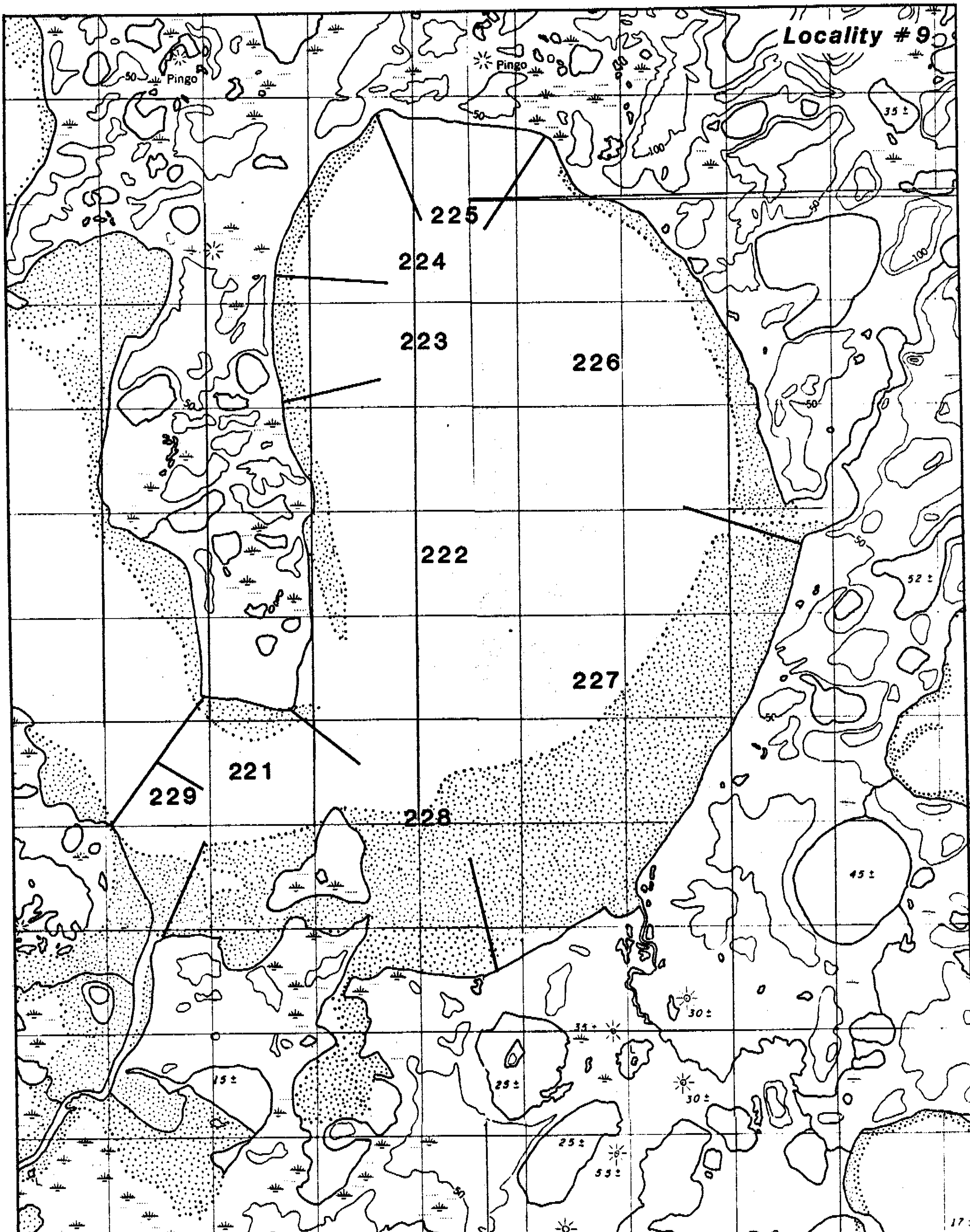
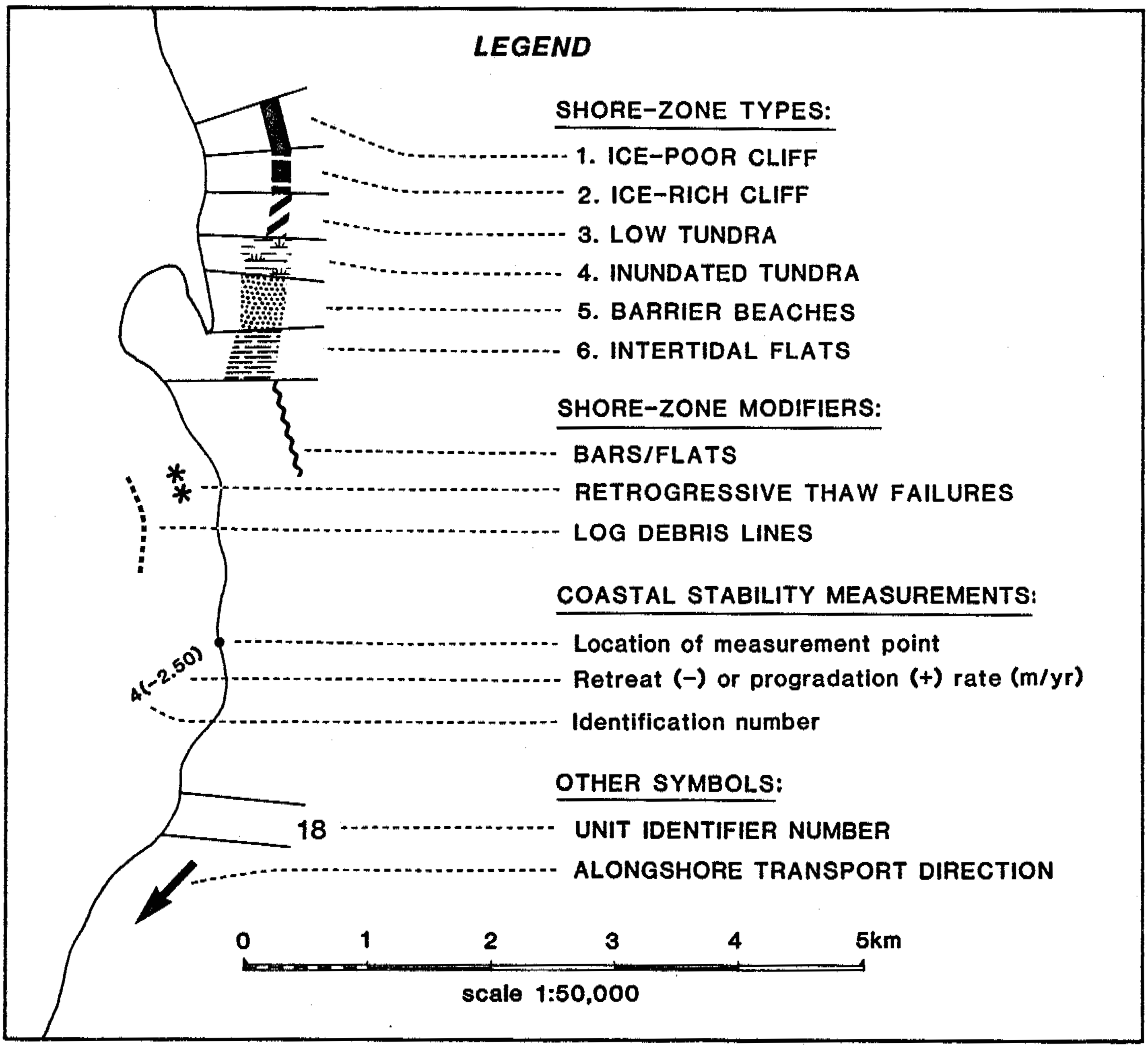

Locality # 9
Pingo
Pingo
50
100
225
224
223
226
222
227
221
229
228
35 ±
52 ±
45 ±
30 ±
25 ±
15 ±
55 ±
17 ±


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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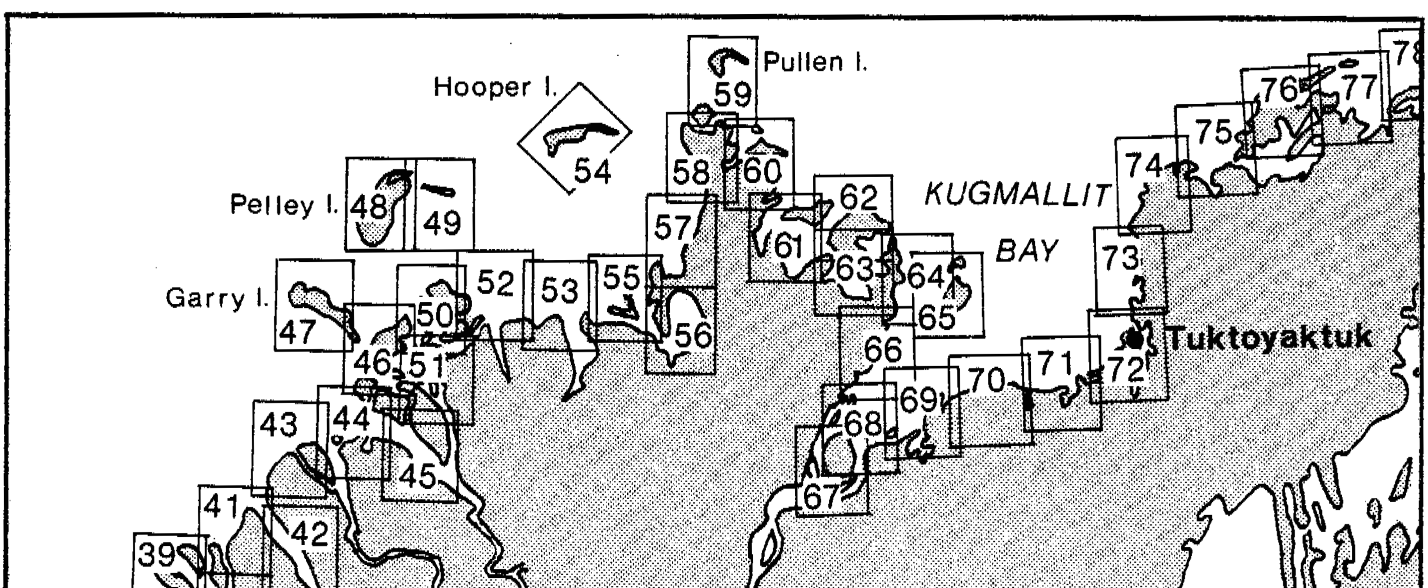
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39
41
42
43
44
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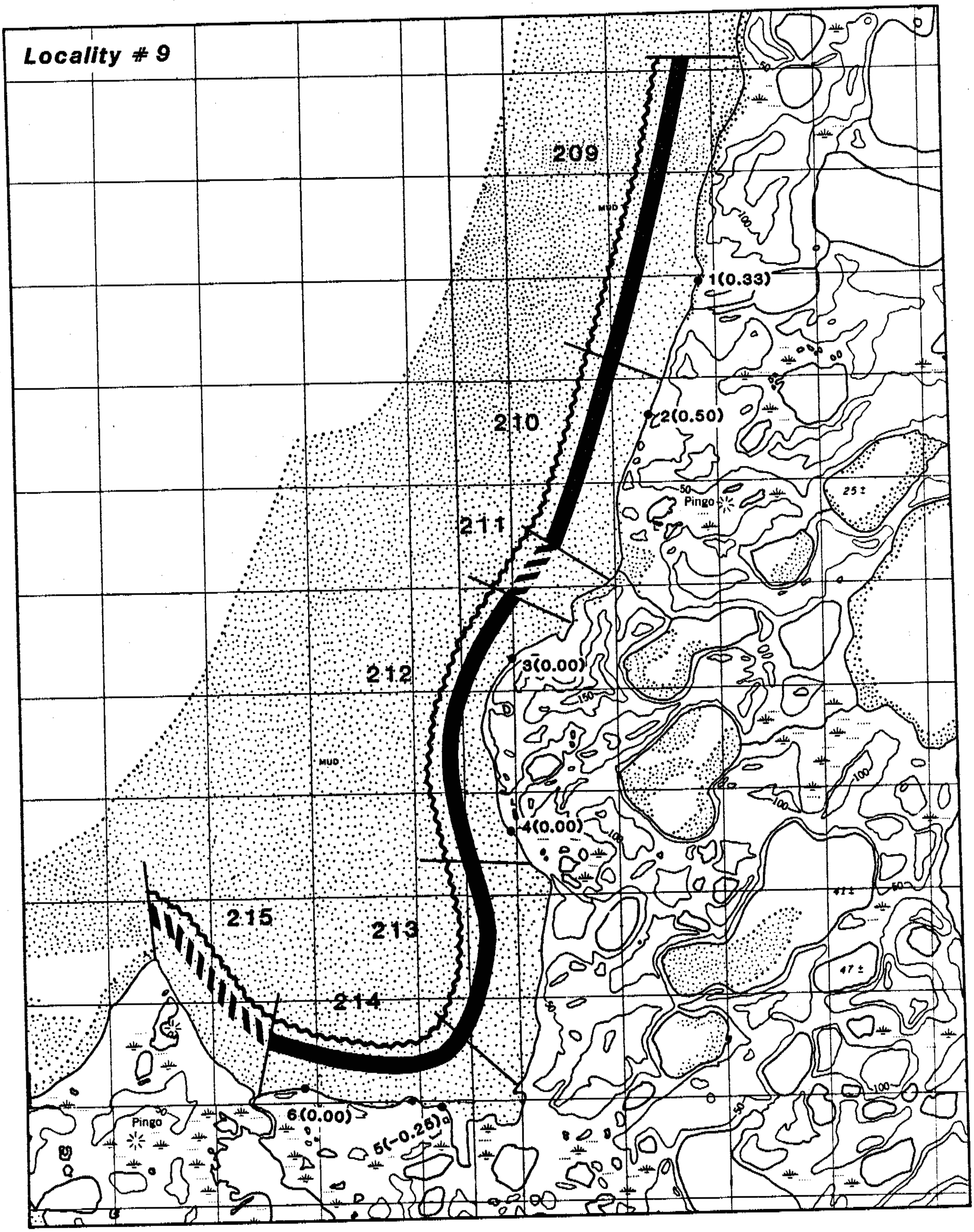
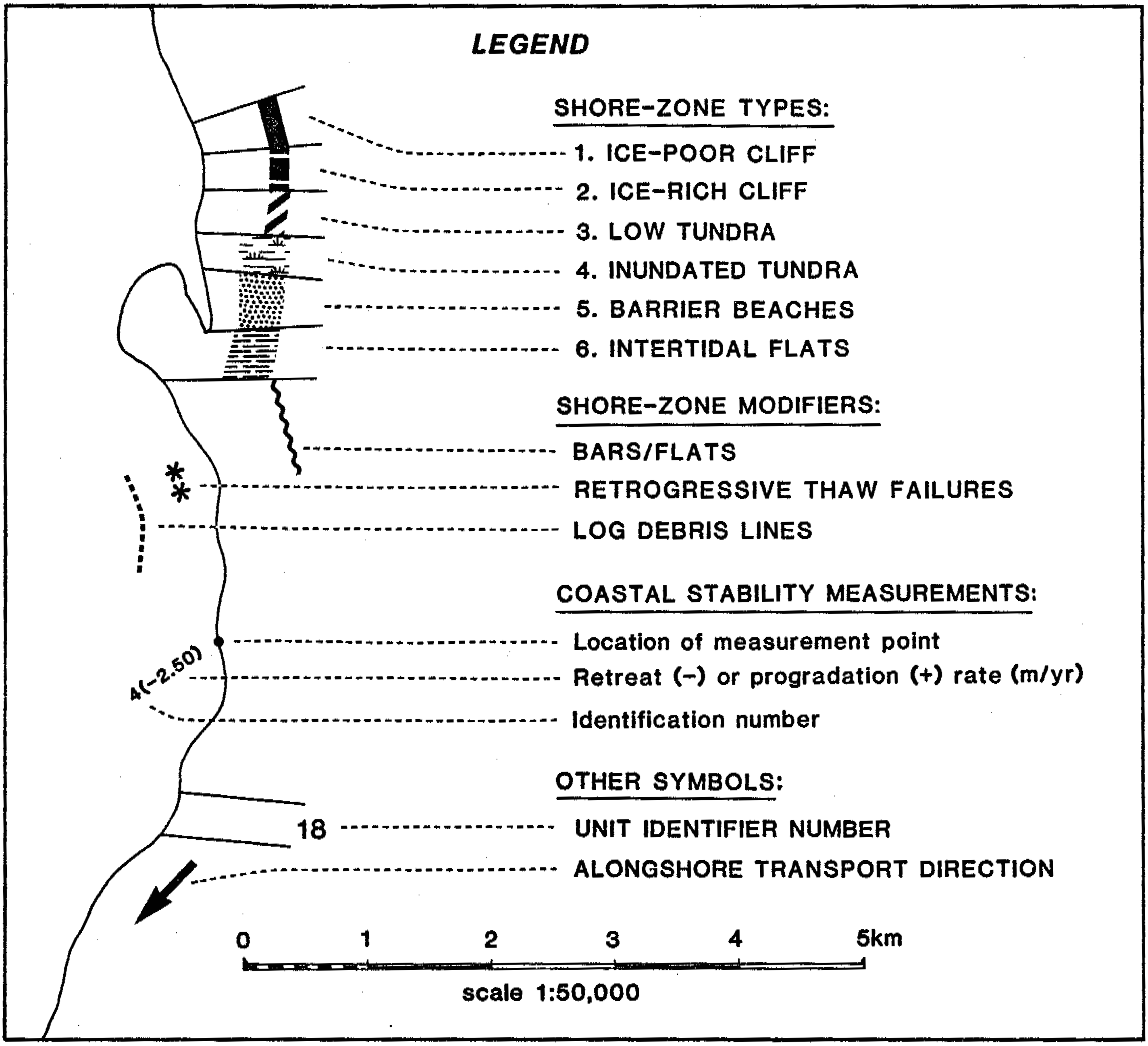


Locality # 9
209
MUD
1(0.33)
210
2(0.50)
Pingo
25 ±
211
212
3(0.00)
150
MUD
100
4(0.00)
100
215
213
47 ±
50
47 ±
214
100
6(0.00)
5(-0.25)
Pingo
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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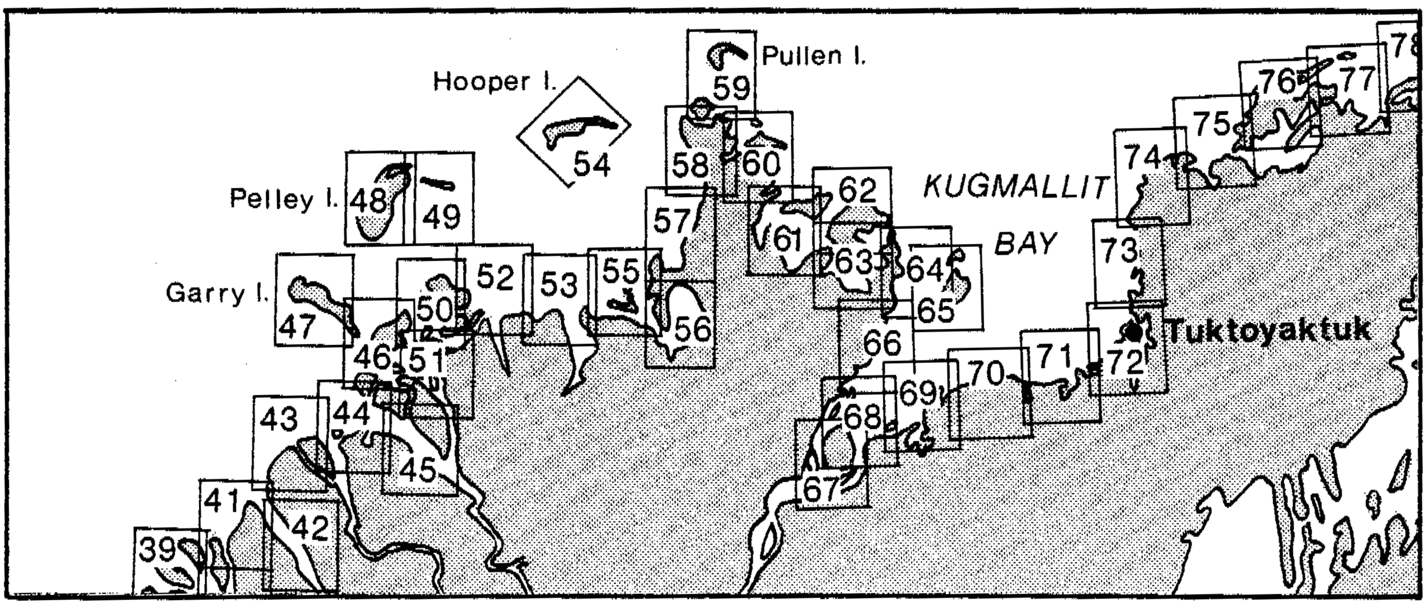
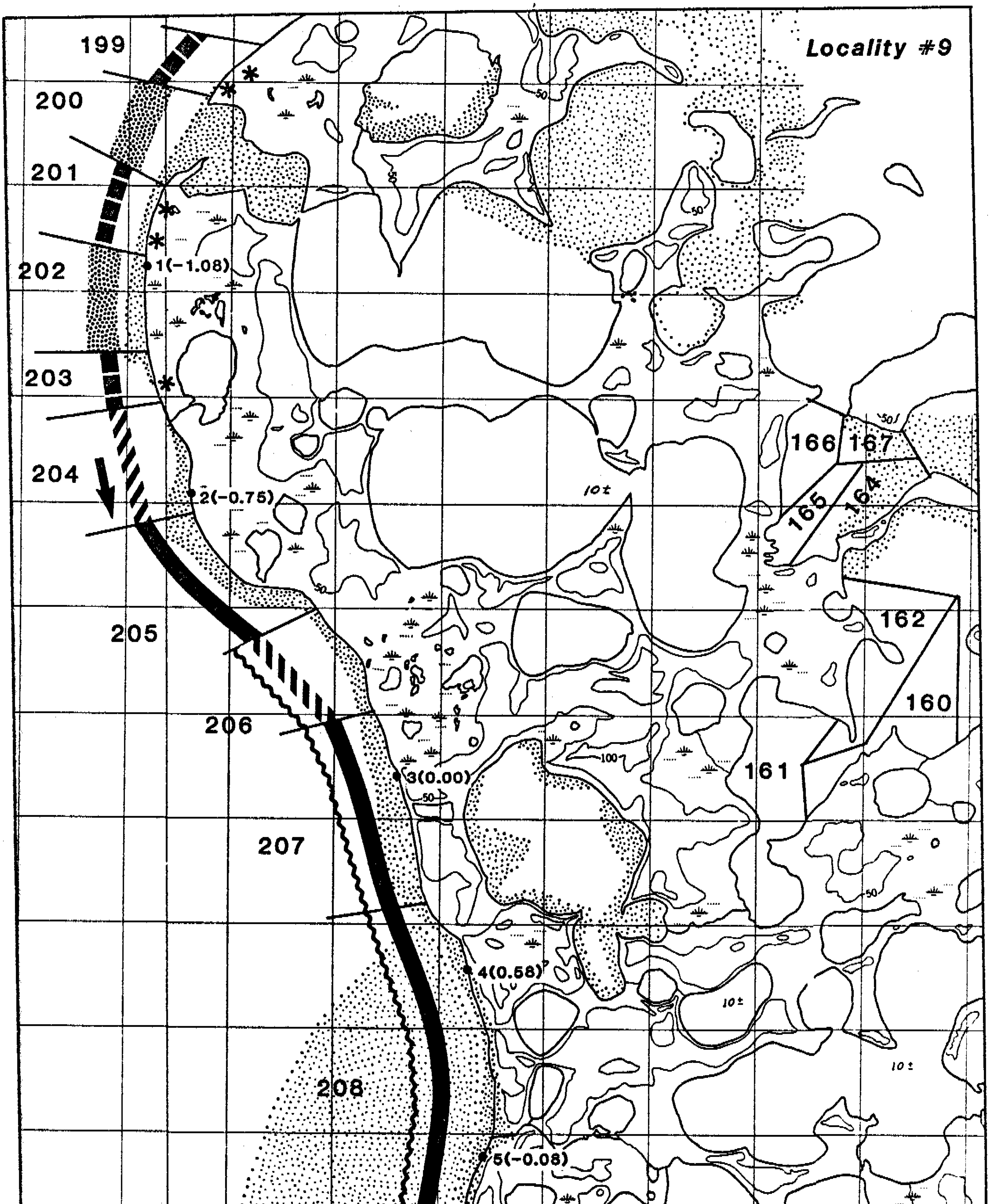
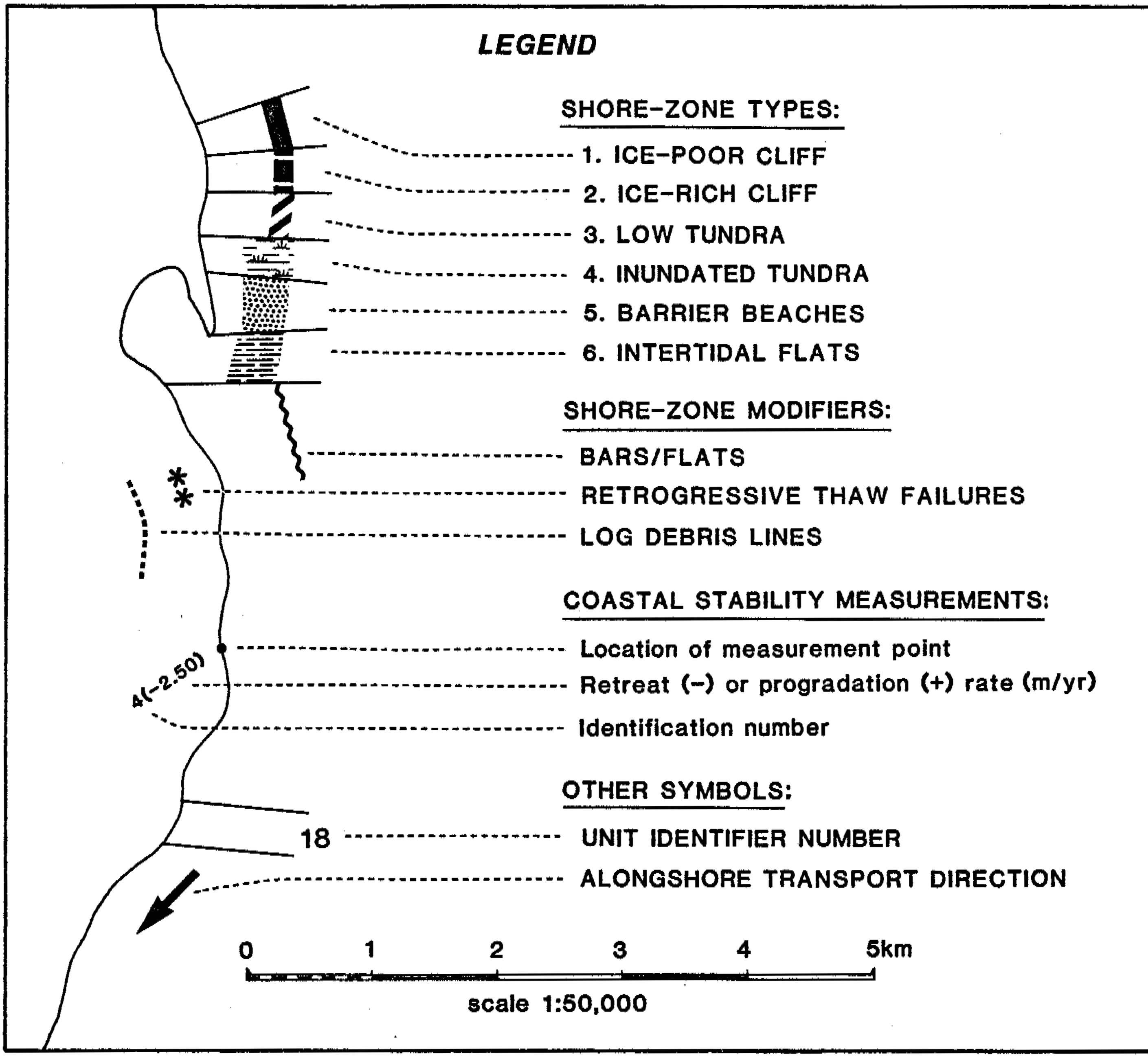
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #9
199
200
201
202
203
204
205
206
207
208
1(-1.08)
2(-0.75)
3(0.00)
4(0.58)
5(-0.08)
166
167
165
164
162
160
161
10±
50
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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4(-2.50)
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18
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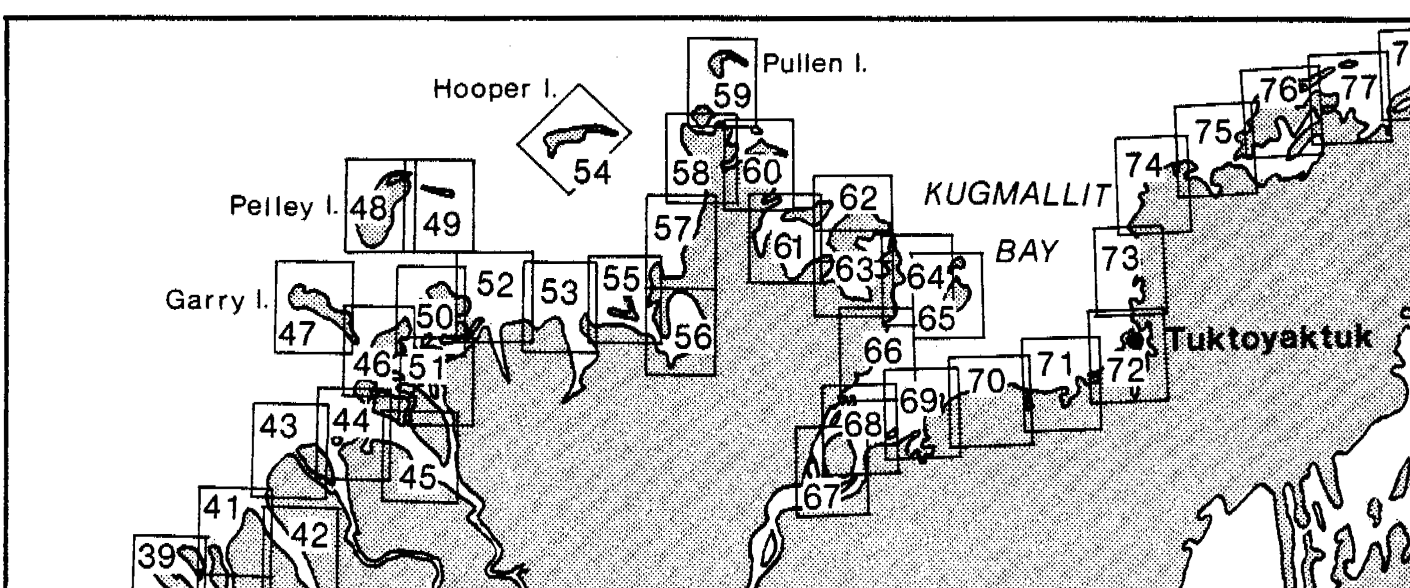
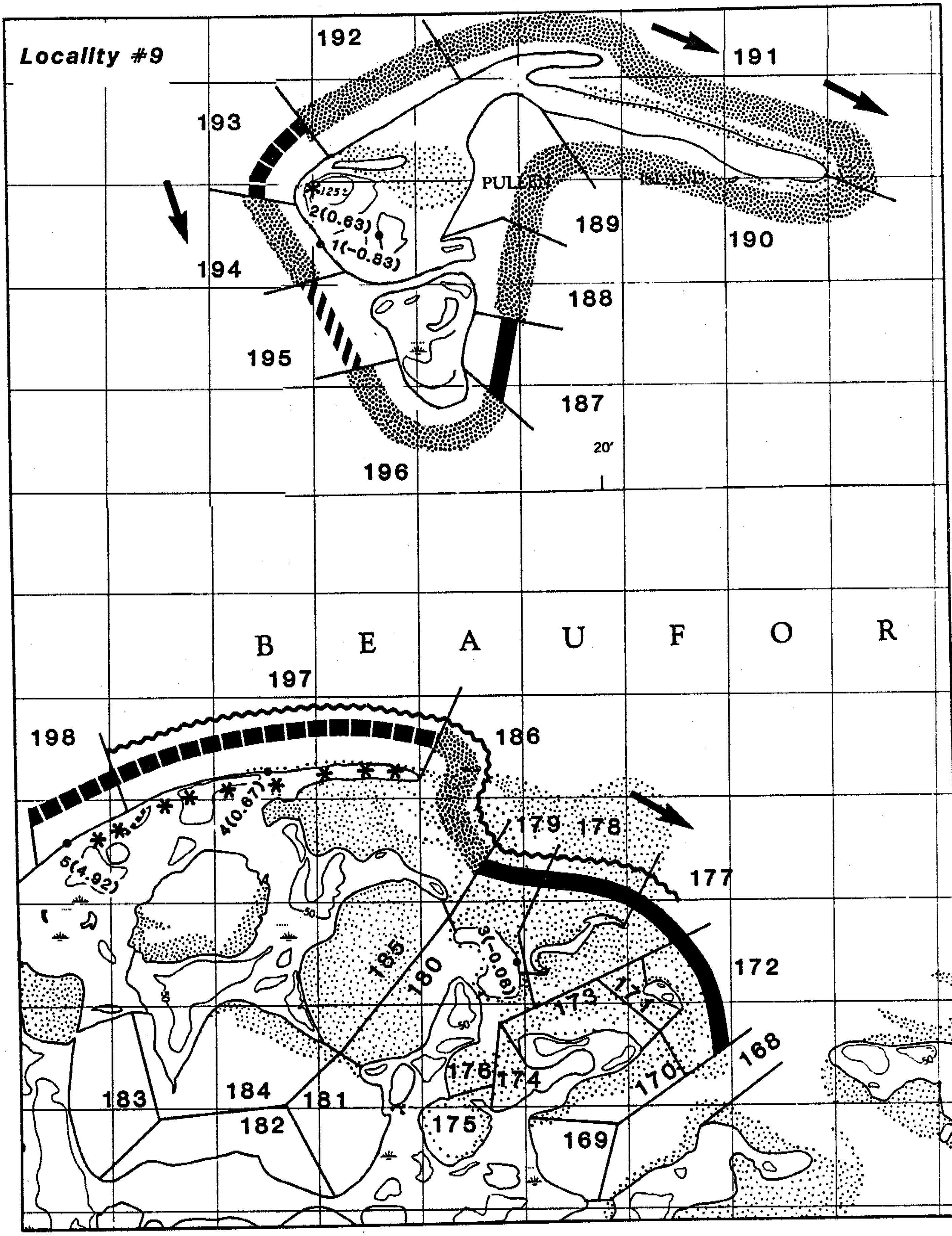
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #9
192
191
193
PULLEN
ISLAND
2(0.63)
1(-0.83)
189
190
194
188
195
187
20'
196
B E A U F O R
197
198
186
4(0.67)
179
178
5(4.92)
177
185
180
3(-0.08)
172
173
171
168
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174
170
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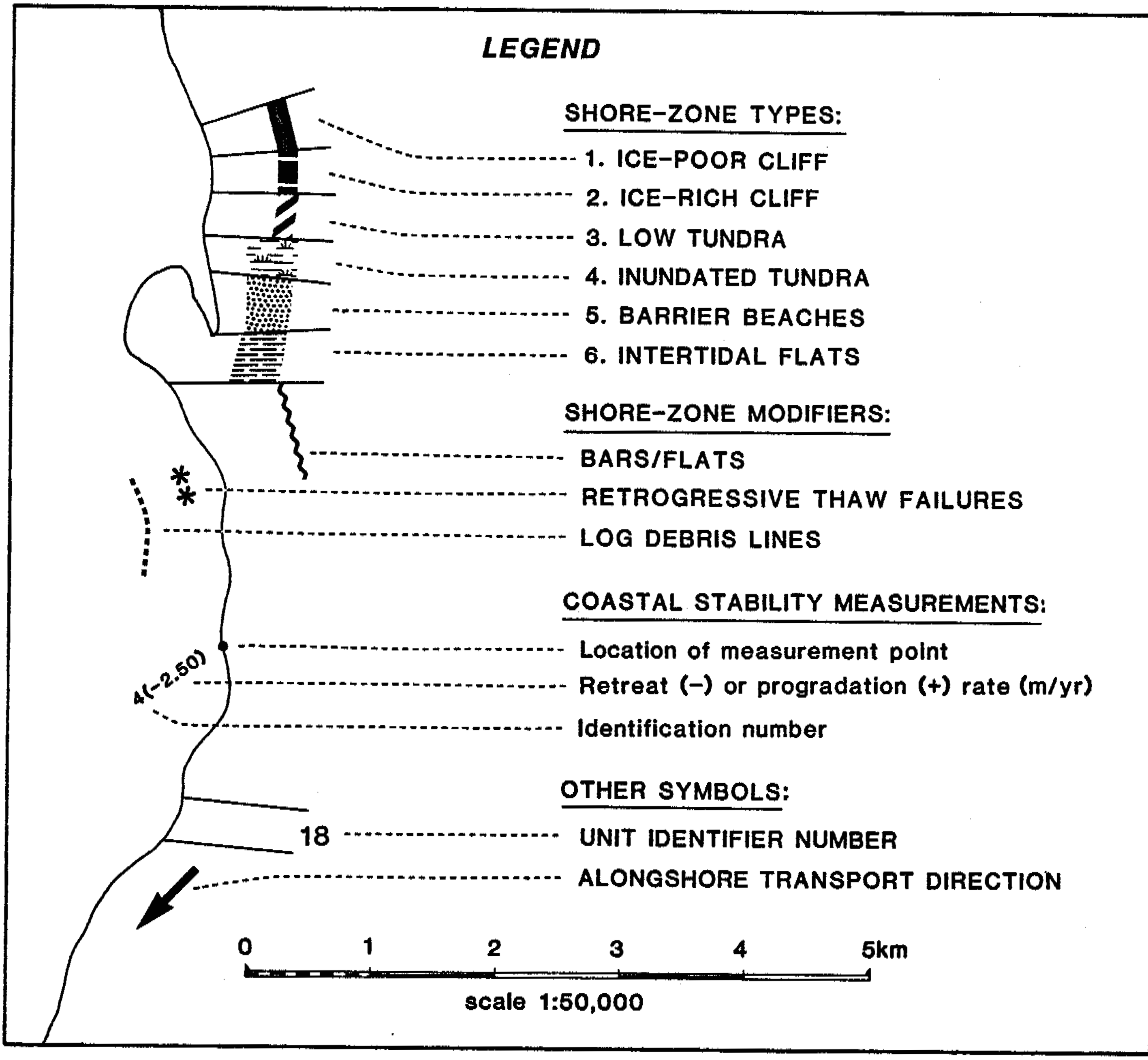
184
181
182
175
169


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
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4(-2.50)
OTHER SYMBOLS:
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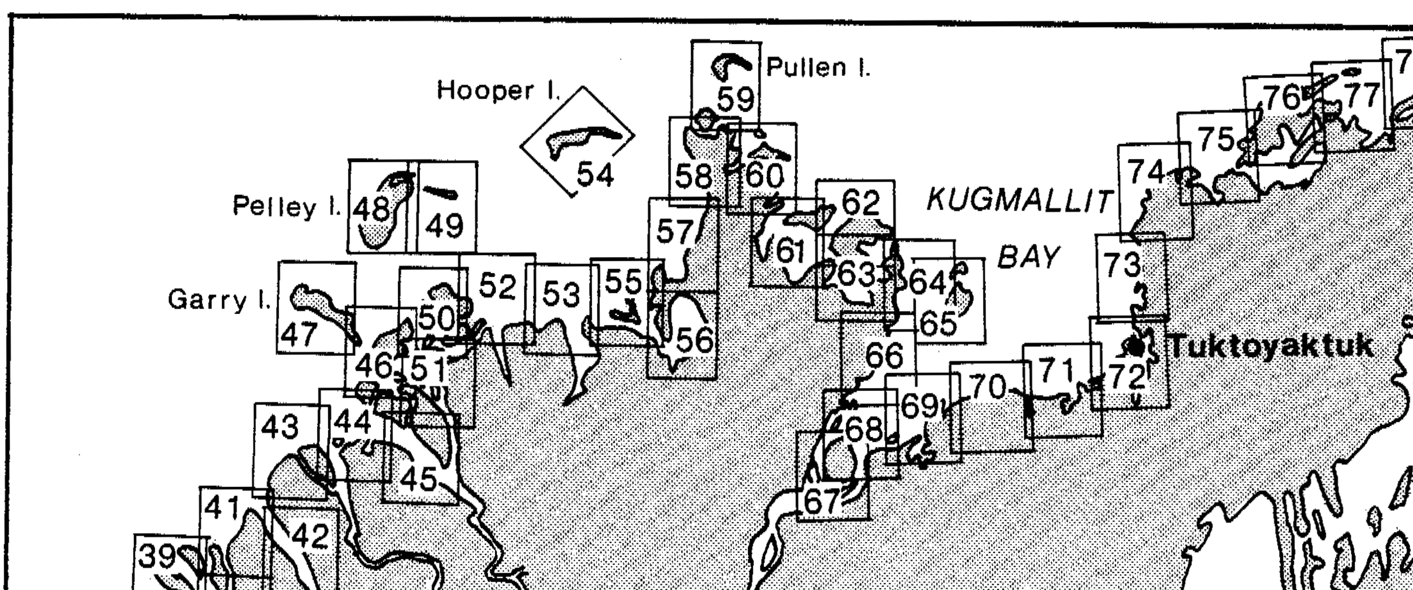
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39
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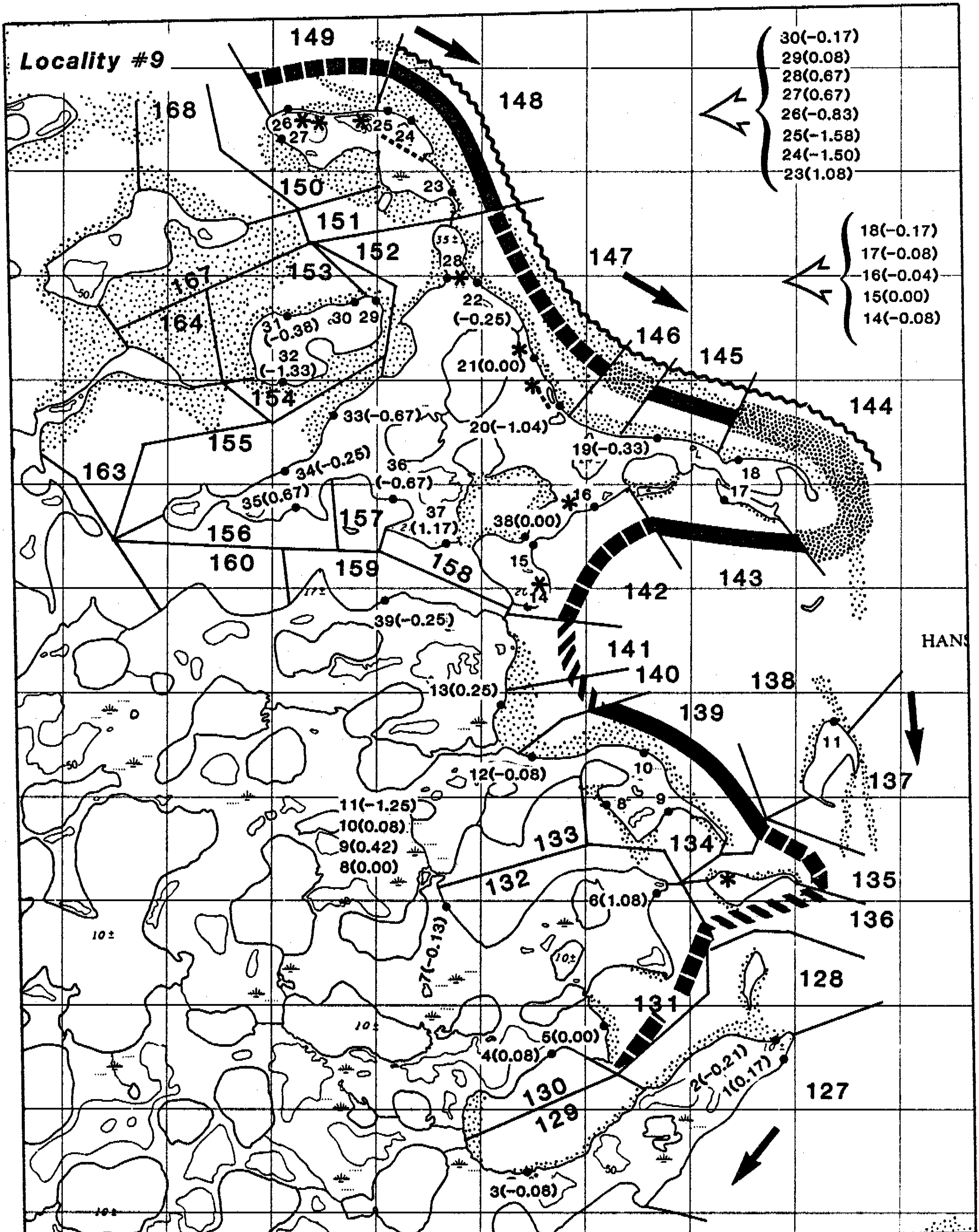
Locality #9
30(-0.17)
29(0.08)
28(0.67)
27(0.67)
26(-0.83)
25(-1.58)
24(-1.50)
23(1.08)
18(-0.17)
17(-0.08)
16(-0.04)
15(0.00)
14(-0.08)
22 (-0.25)
21(0.00)
20(-1.04)
19(-0.33)
31 (-0.38)
32 (-1.33)
33(-0.67)
34(-0.25)
35(0.67)
36 (-0.67)
37 (1.17)
38(0.00)
39(-0.25)
13(0.25)
12(-0.08)
11(-1.25)
10(0.08)
9(0.42)
8(0.00)
7(-0.13)
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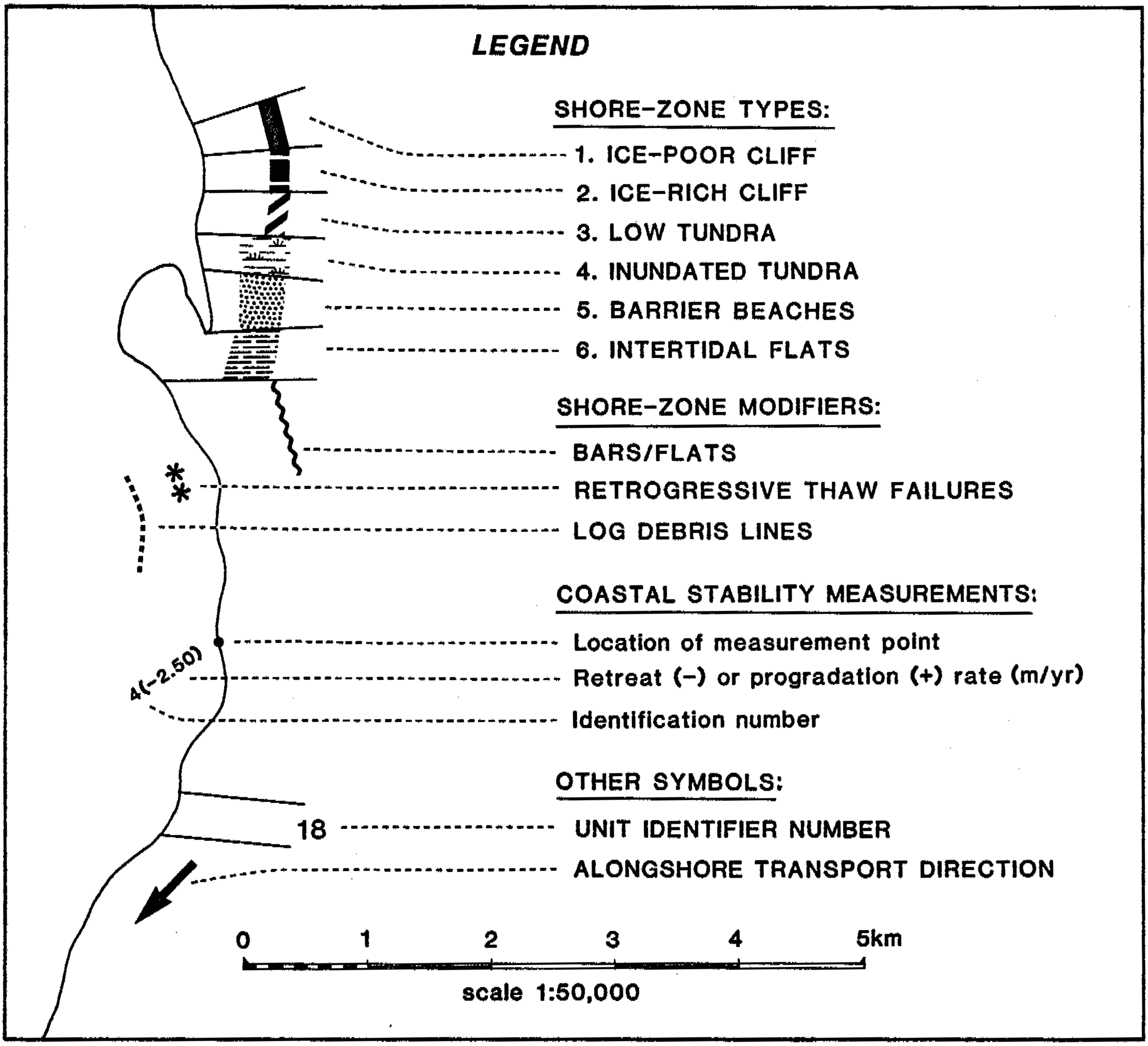
5(0.00)
4(0.08)
3(-0.08)
2(-0.21)
1(0.17)
HANS


LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
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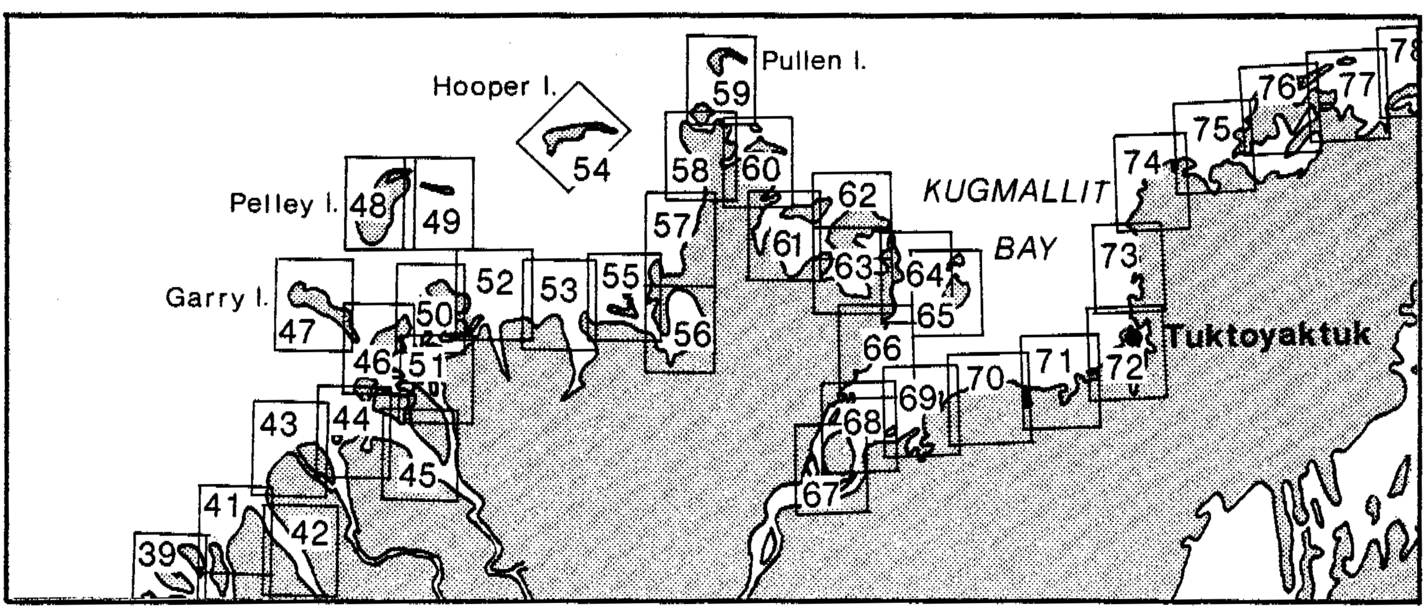
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39
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42
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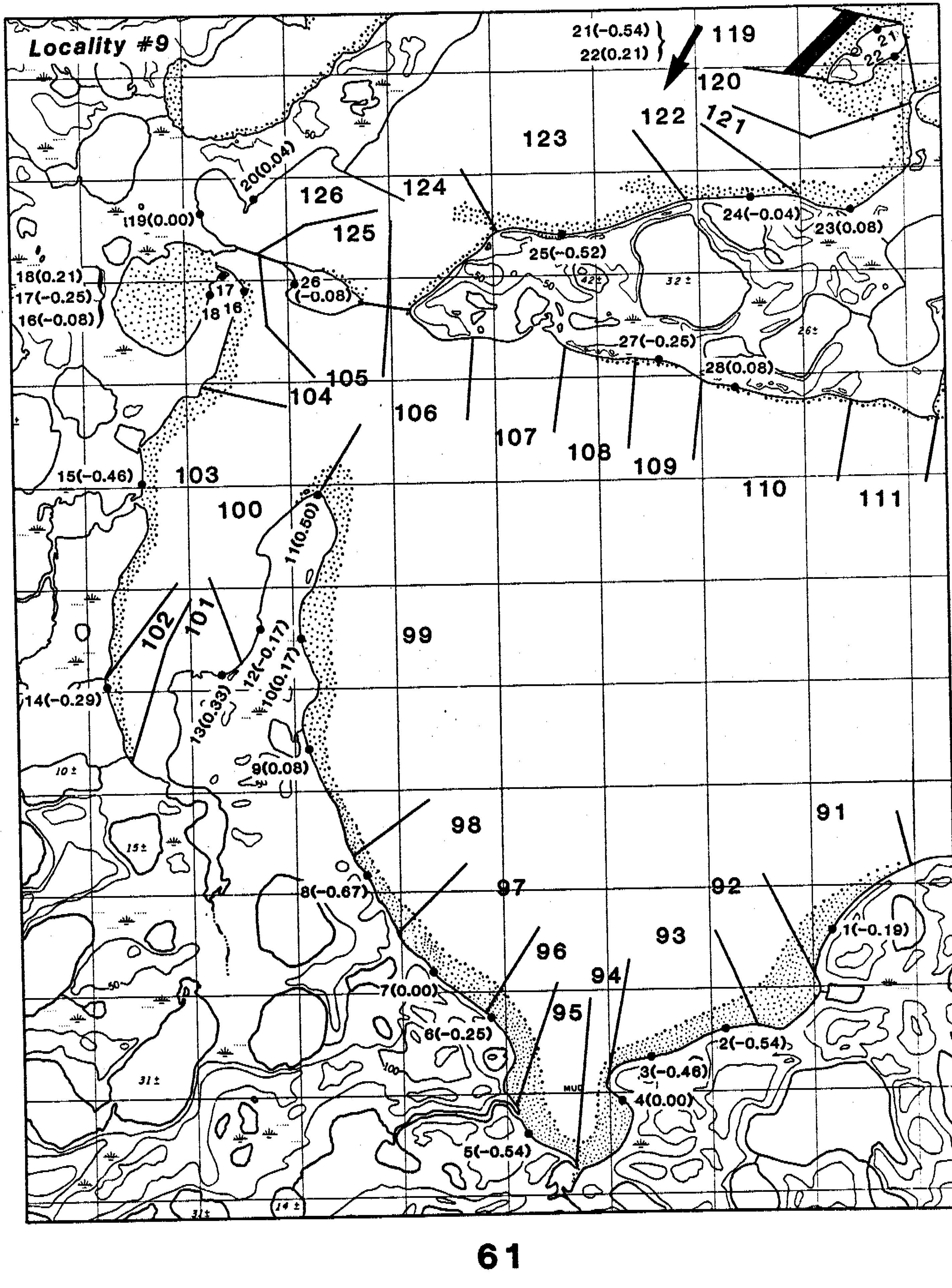
Locality #9
21(-0.54)
22(0.21)
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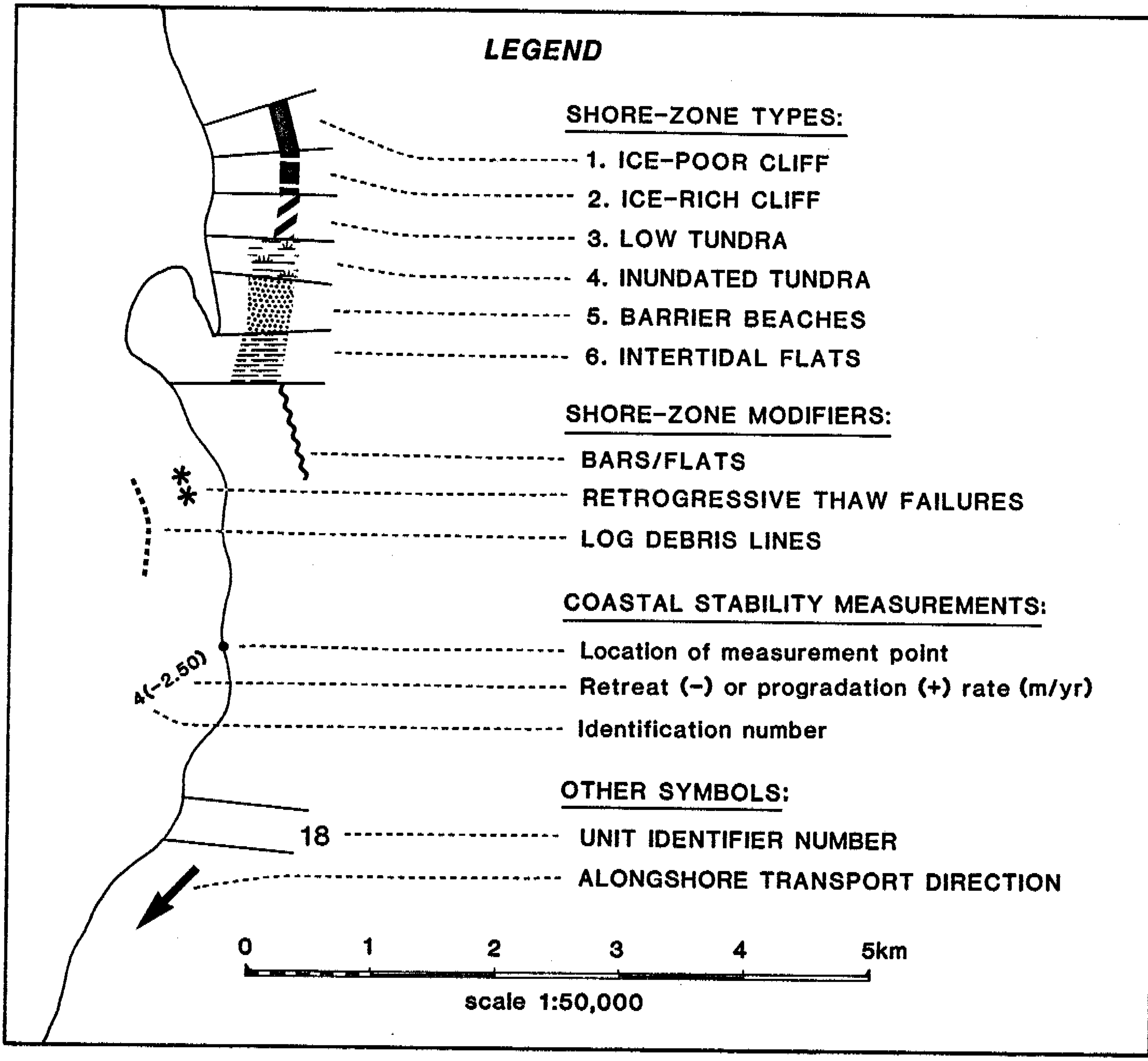
120
122
121
123
126
124
125
20(0.04)
19(0.00)
18(0.21)
17(-0.25)
16(-0.08)
26
(-0.08)
25(-0.52)
24(-0.04)
23(0.08)
27(-0.25)
28(0.08)
104
105
106
107
108
109
110
111
103
15(-0.46)
100
11(0.50)
102
101
99
12(-0.17)
10(0.17)
13(0.33)
14(-0.29)
9(0.08)
98
91
97
92
8(-0.67)
93
1(-0.19)
96
94
7(0.00)
95
6(-0.25)
2(-0.54)
3(-0.46)
4(0.00)
MUD
5(-0.54)


LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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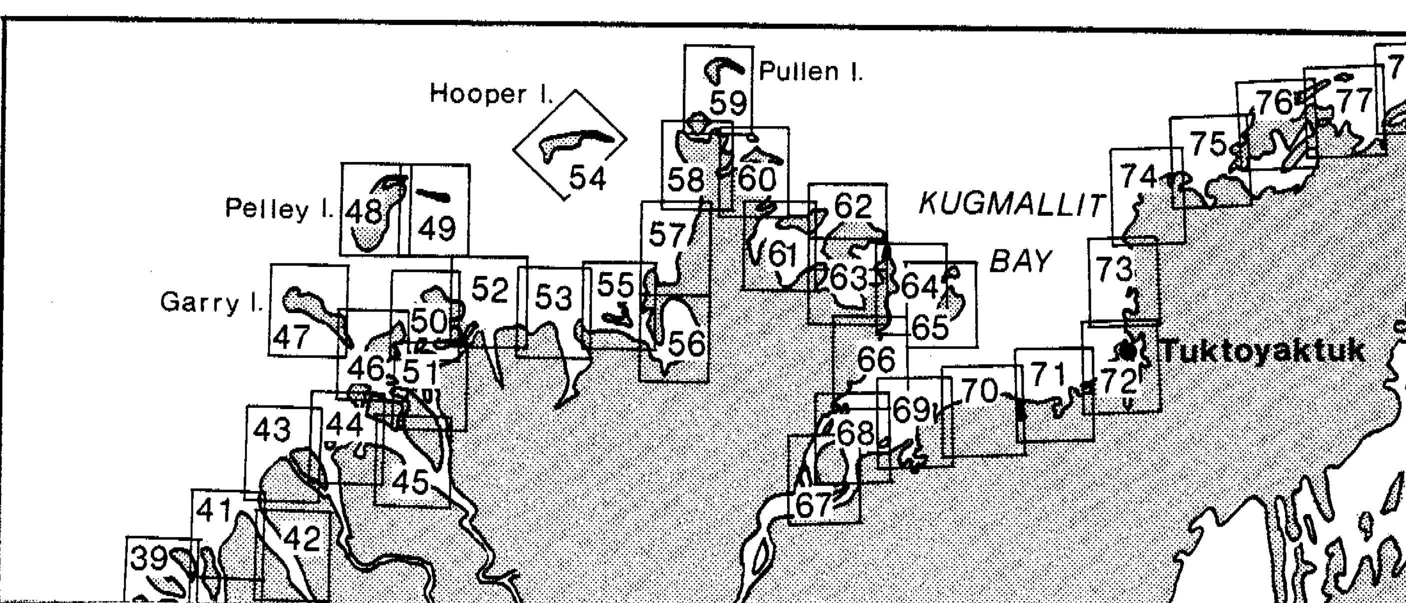
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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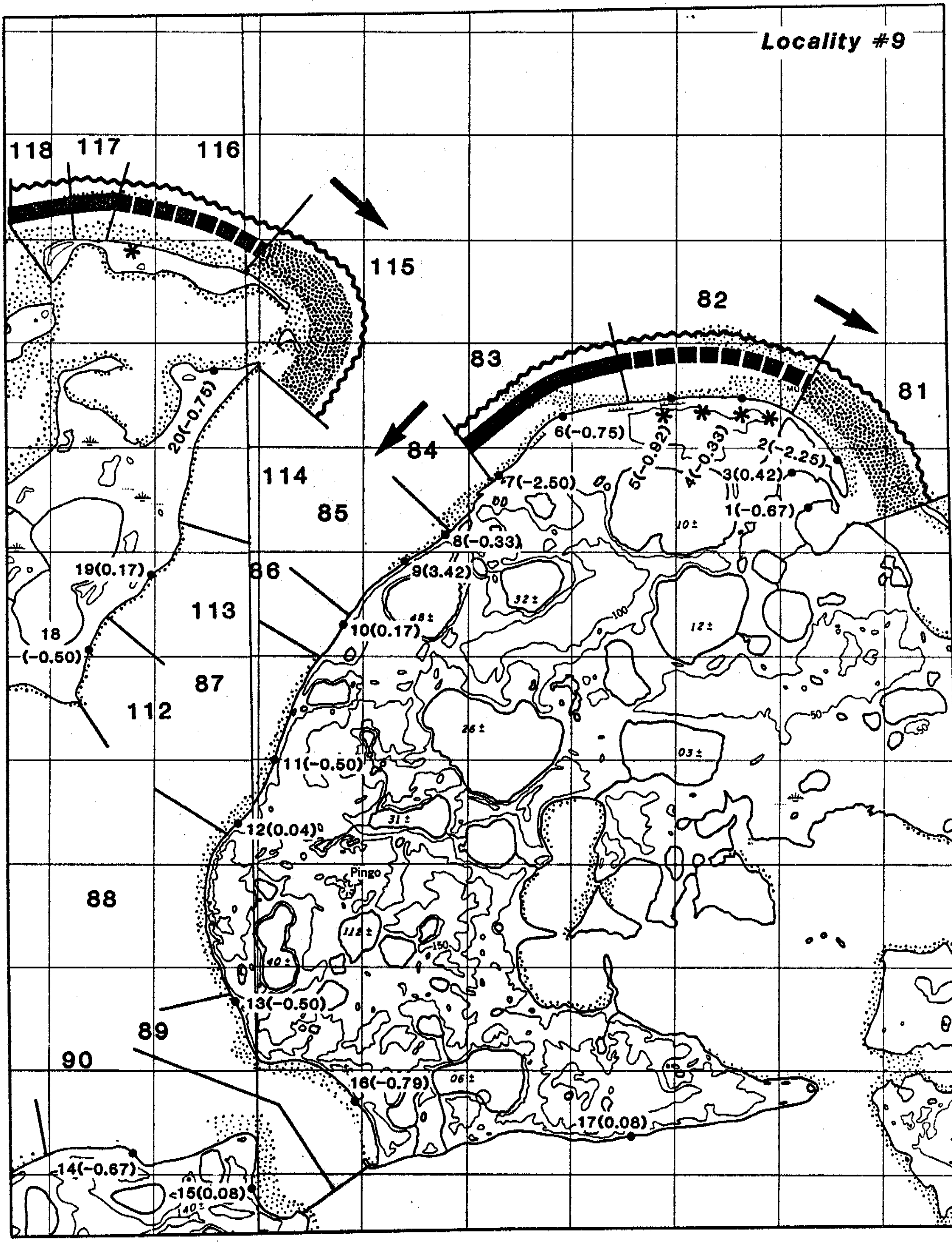
Locality #9
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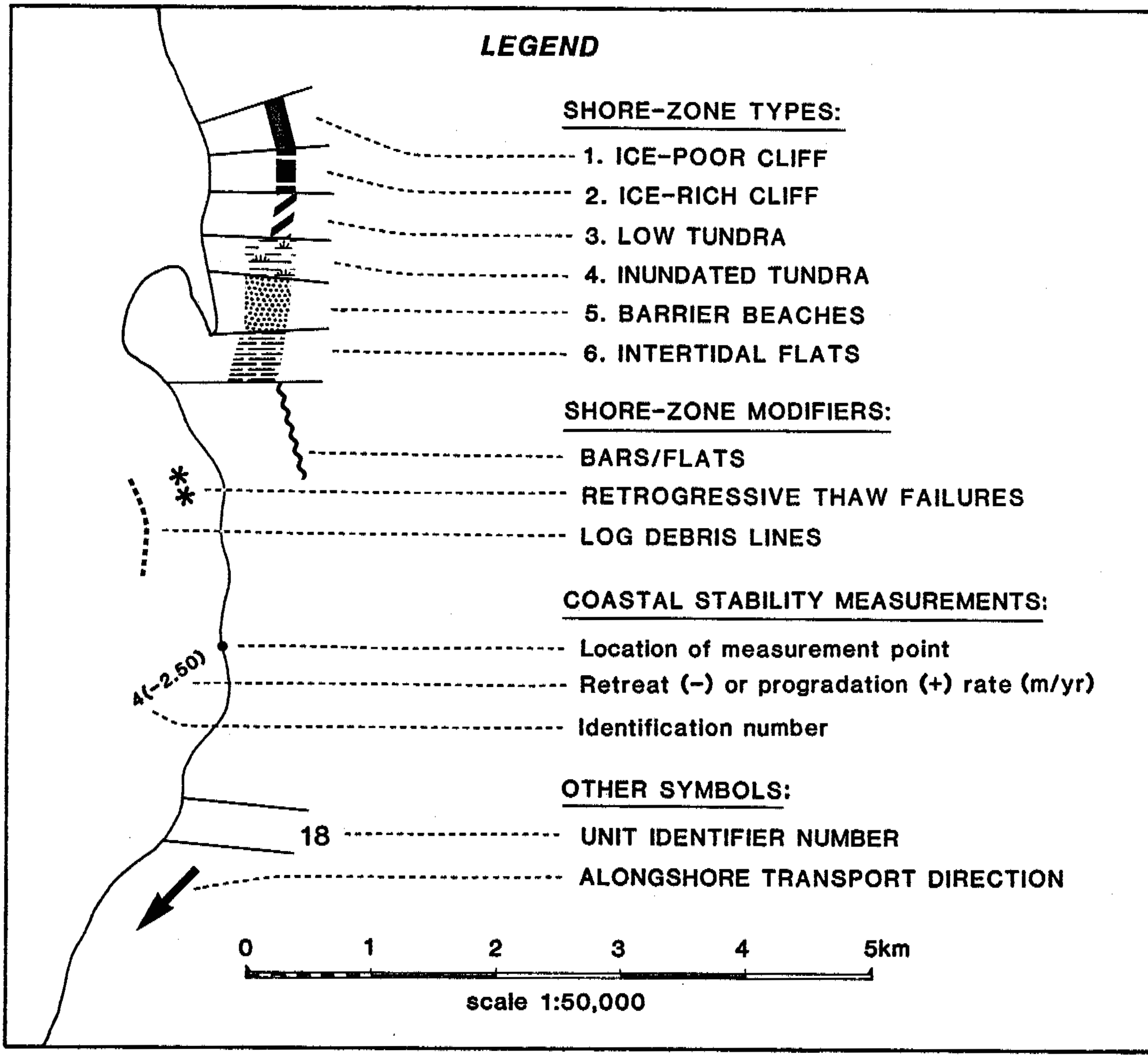
19(0.17)
18
(-0.50)
6(-0.75)
5(-0.92)
4(-0.33)
2(-2.25)
3(0.42)
1(-0.67)
7(-2.50)
8(-0.33)
9(3.42)
10(0.17)
11(-0.50)
12(0.04)
13(-0.50)
14(-0.67)
15(0.08)
16(-0.79)
17(0.08)
Pingo


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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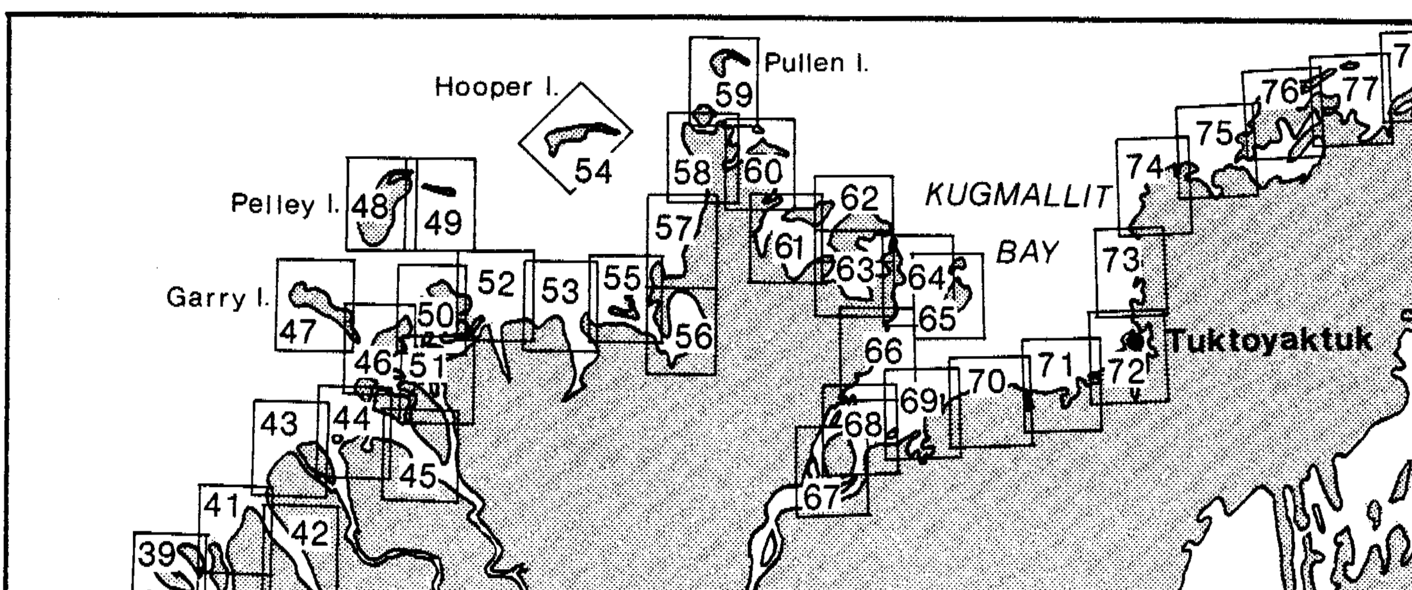
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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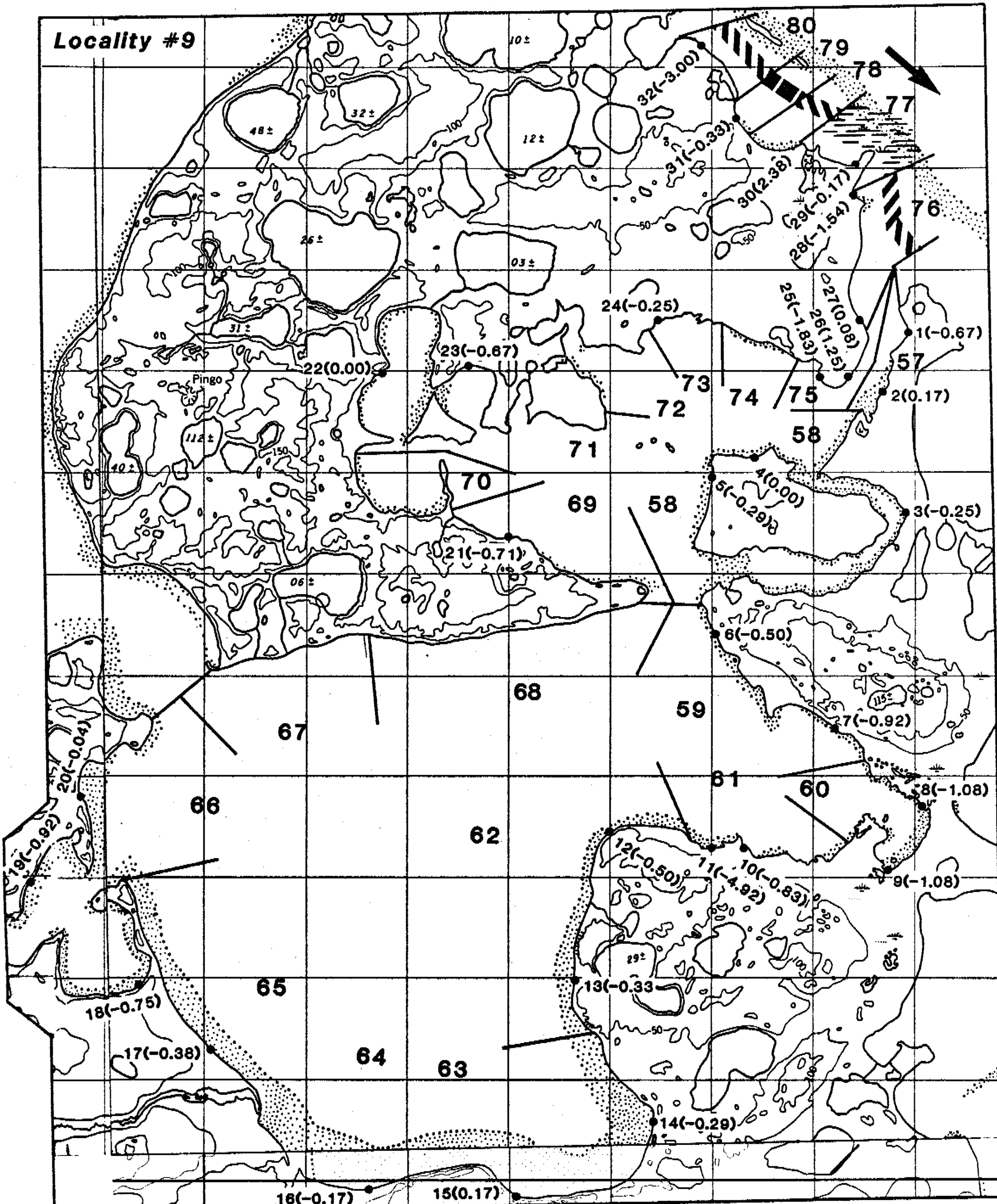

Locality #9
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Pingo
1(-0.67)
2(0.17)
3(-0.25)
4(0.00)
5(-0.29)
6(-0.50)
7(-0.92)
8(-1.08)
9(-1.08)
10(-0.83)
11(-4.92)
12(-0.50)
13(-0.33)
14(-0.29)
15(0.17)
16(-0.17)
17(-0.38)
18(-0.75)
19(-0.92)
20(-0.04)
21(-0.71)
22(0.00)
23(-0.67)
24(-0.25)
25(-1.83)
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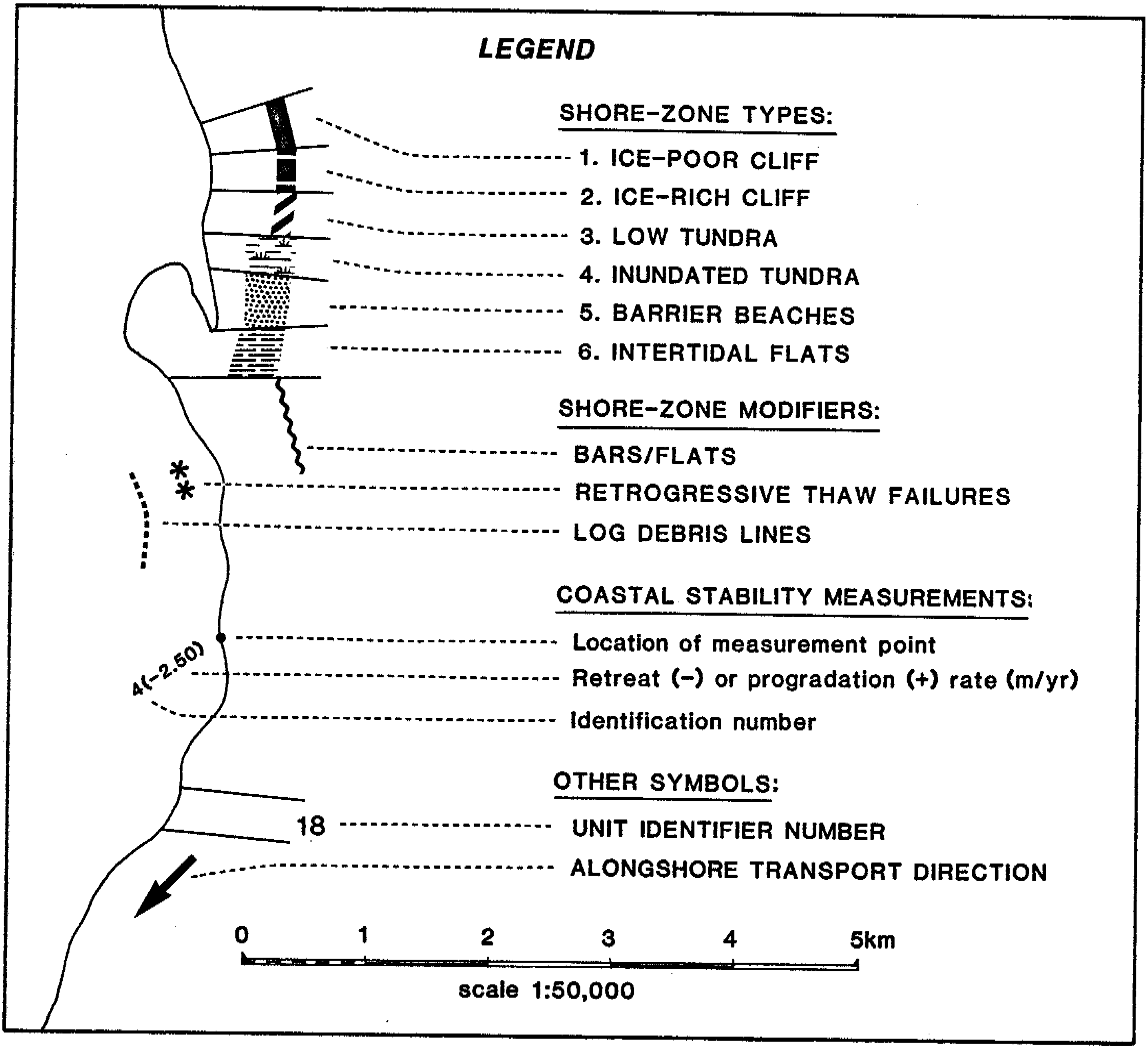
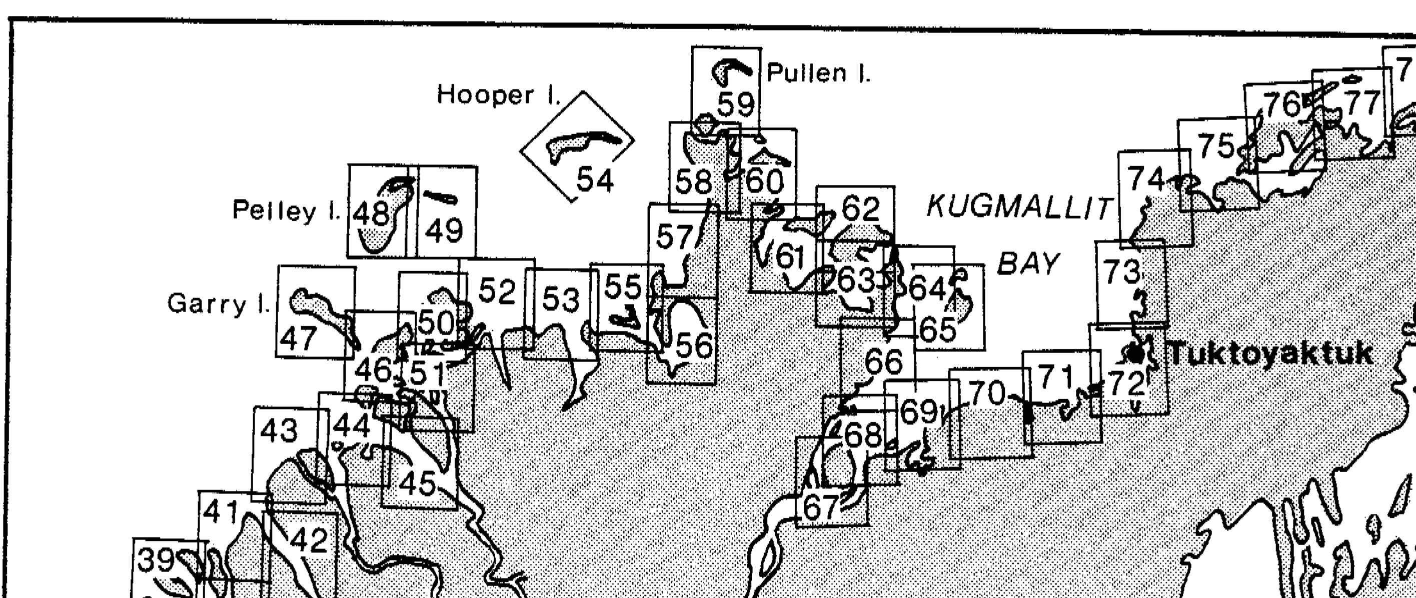
27(0.08)
28(-1.54)
29(-0.17)
30(2.38)
31(-0.33)
32(-3.00)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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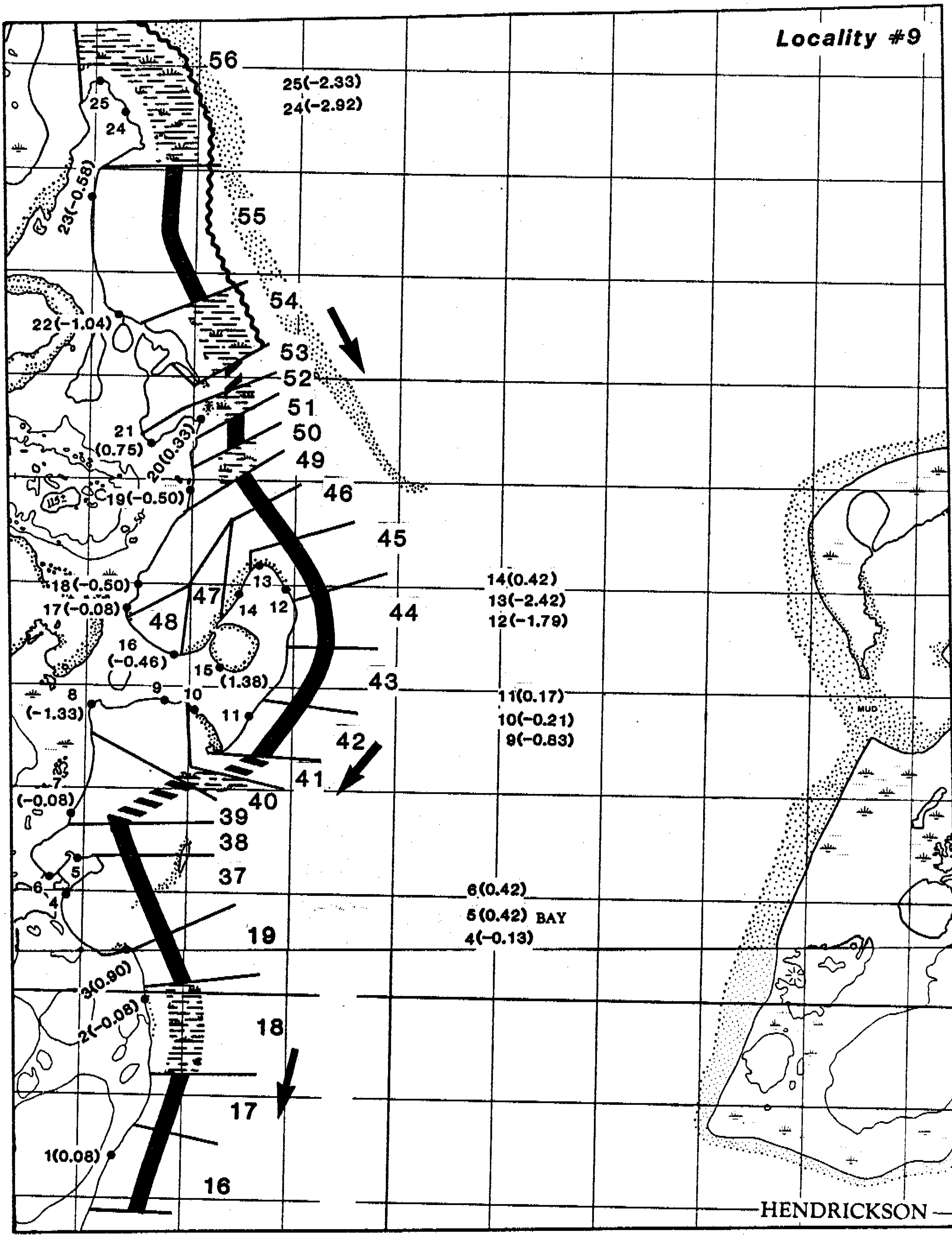

Locality #9
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25(-2.33)
24(-2.92)
25
24
23(-0.58)
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22(-1.04)
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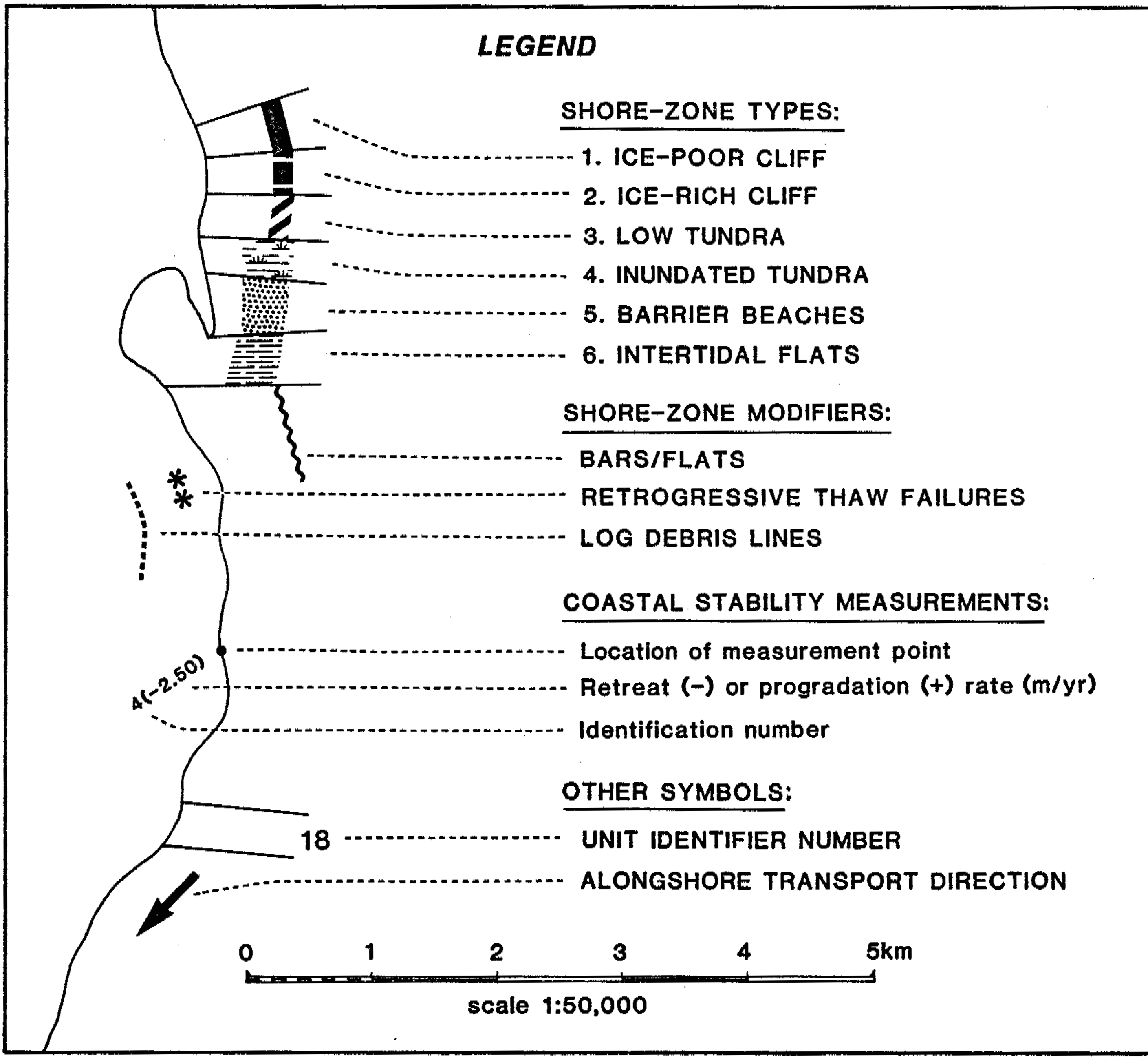
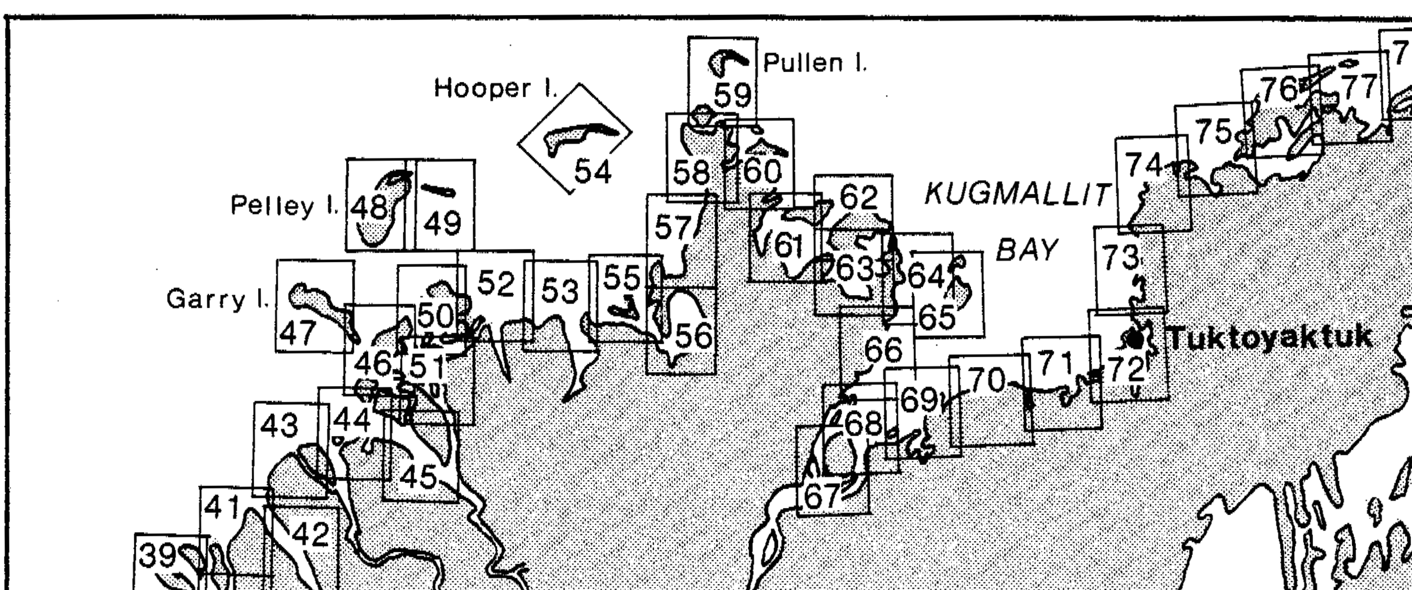
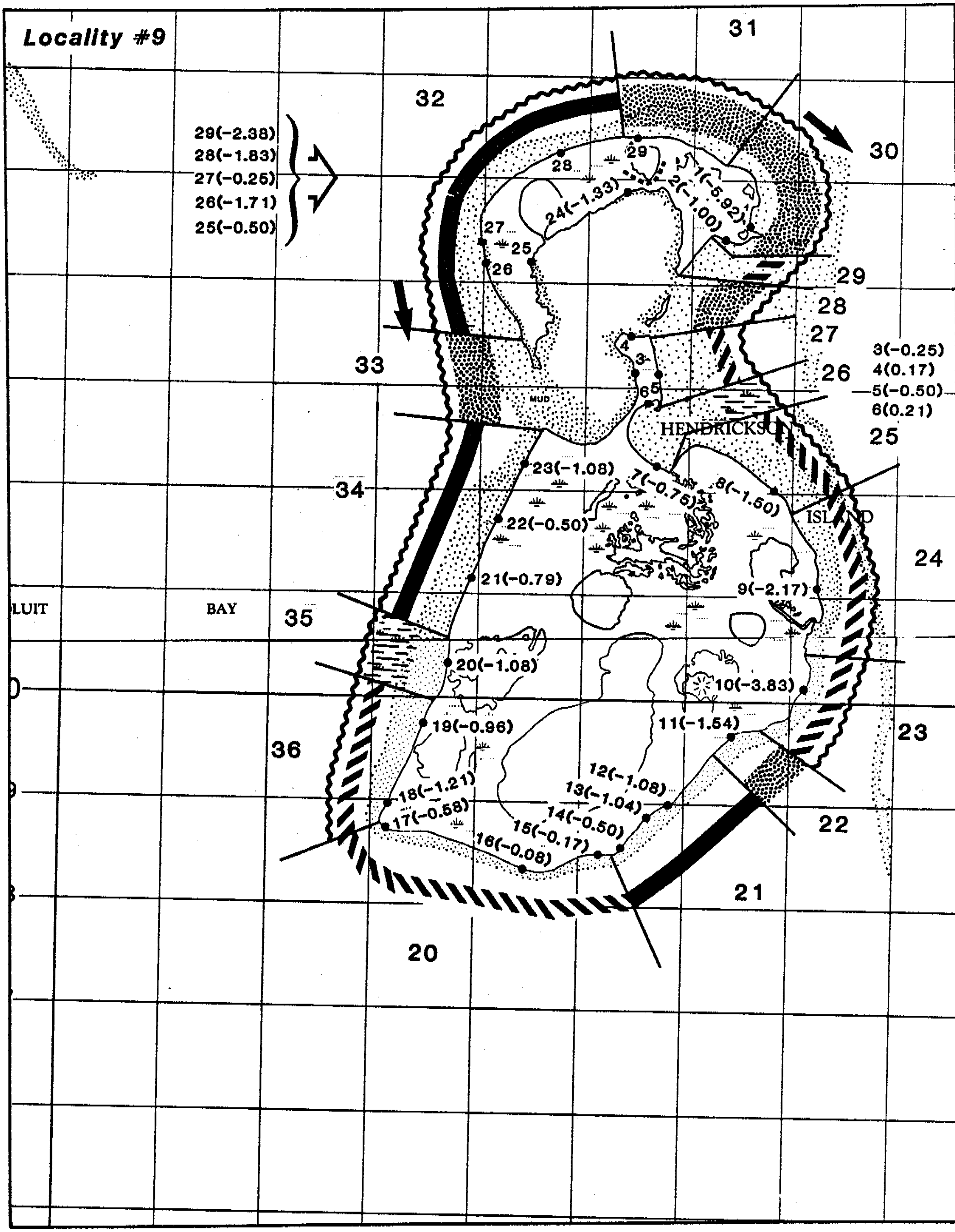
51
50
49
21
(0.75)
20(0.33)
19(-0.50)
46
45
18(-0.50)
17(-0.08)
47
48
13
14
12
44
14(0.42)
13(-2.42)
12(-1.79)
16
(-0.46)
15
(1.38)
43
8
(-1.33)
9
10
11
11(0.17)
10(-0.21)
9(-0.83)
42
41
7
(-0.08)
40
39
38
37
5
6
4
6(0.42)
5(0.42) BAY
4(-0.13)
19
3(0.90)
2(-0.08)
18
17
1(0.08)
16
MUD
HENDRICKSON


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77



Locality #9
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29(-2.38)
28(-1.83)
27(-0.25)
26(-1.71)
25(-0.50)
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24(-1.33)
1(-5.92)
2(-1.00)
27
25
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33
4
3
3(-0.25)
4(0.17)
5(-0.50)
6(0.21)
26
MUD
6
5
HENDRICKSON
25
34
23(-1.08)
7(-0.75)
8(-1.50)
ISLAND
22(-0.50)
24
21(-0.79)
9(-2.17)
LUIT
BAY
35
20(-1.08)
10(-3.83)
19(-0.96)
11(-1.54)
23
36
12(-1.08)
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16(-0.08)
21
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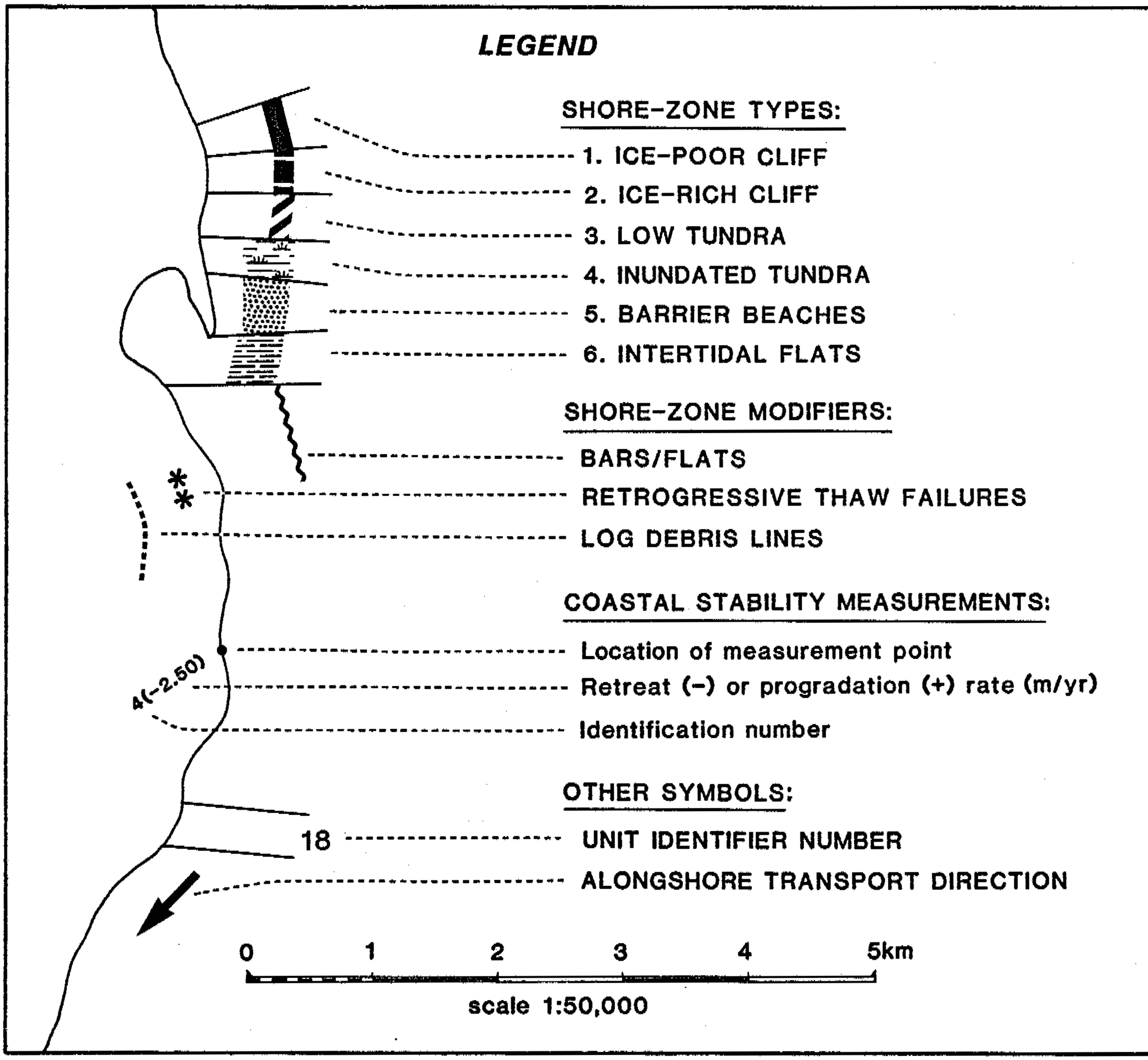
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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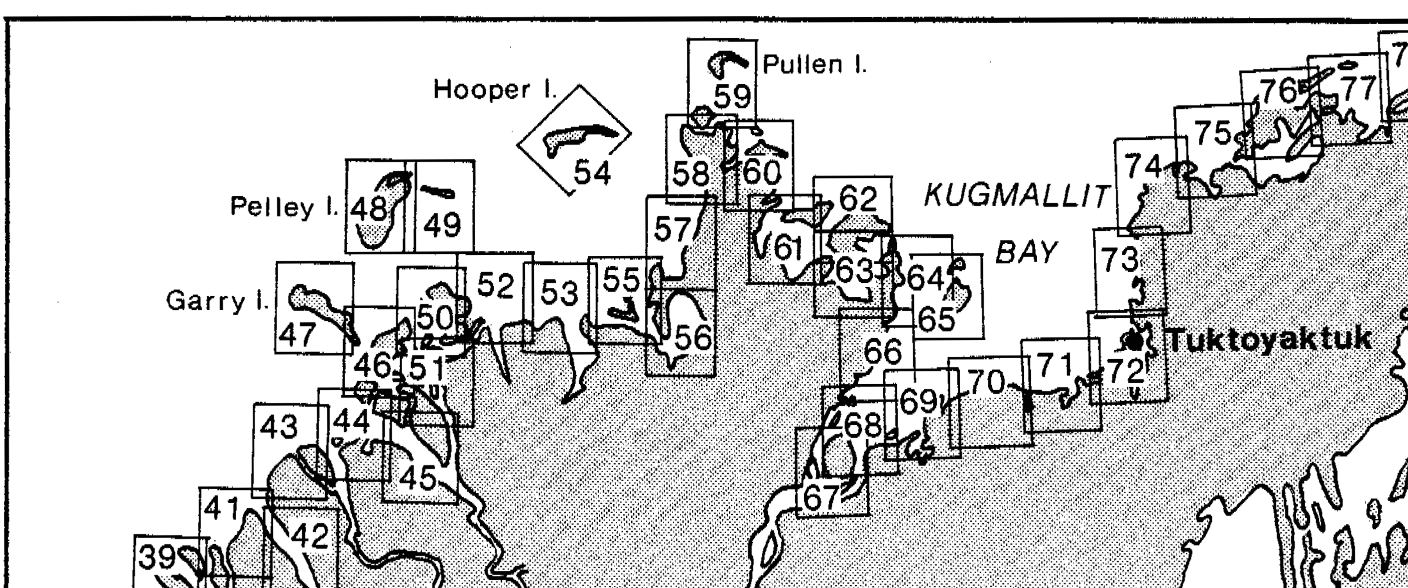
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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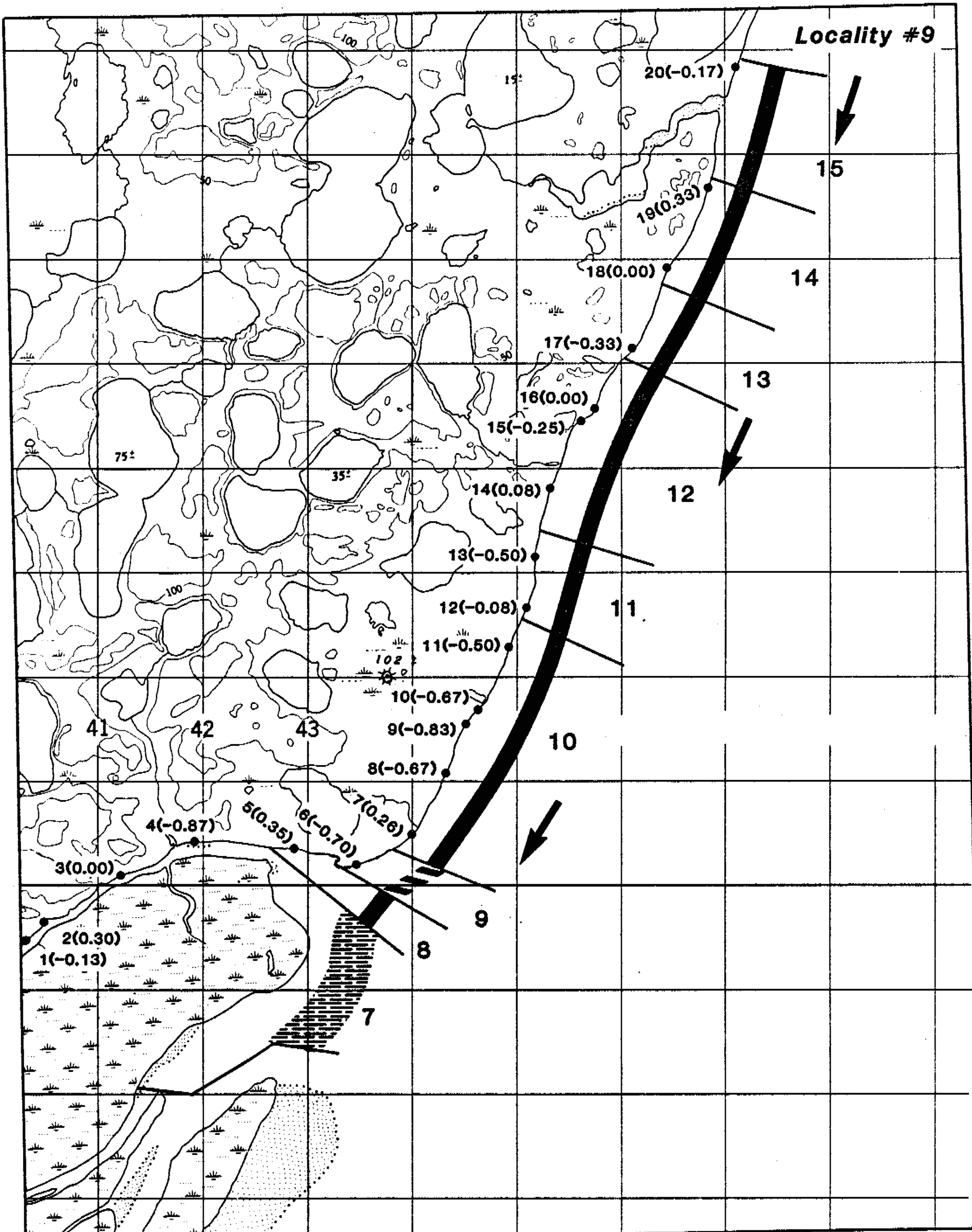
Locality #9
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12(−0.08)
11(−0.50)
10(−0.67)
9(−0.83)
8(−0.67)
7(0.26)
6(−0.70)
5(0.35)
4(−0.87)
3(0.00)
2(0.30)
1(−0.13)
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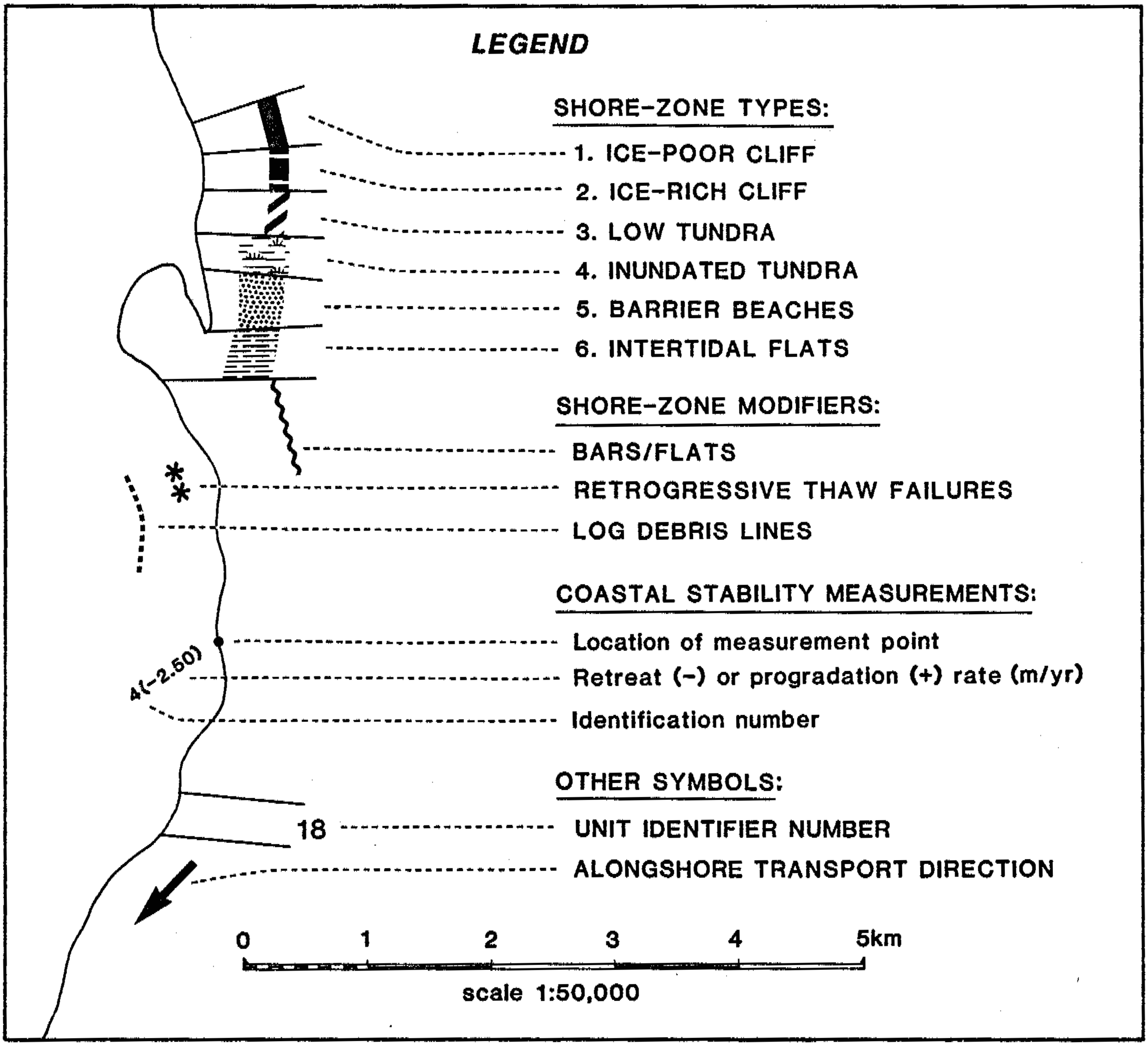
43
100
50
75±
35±
15±
102



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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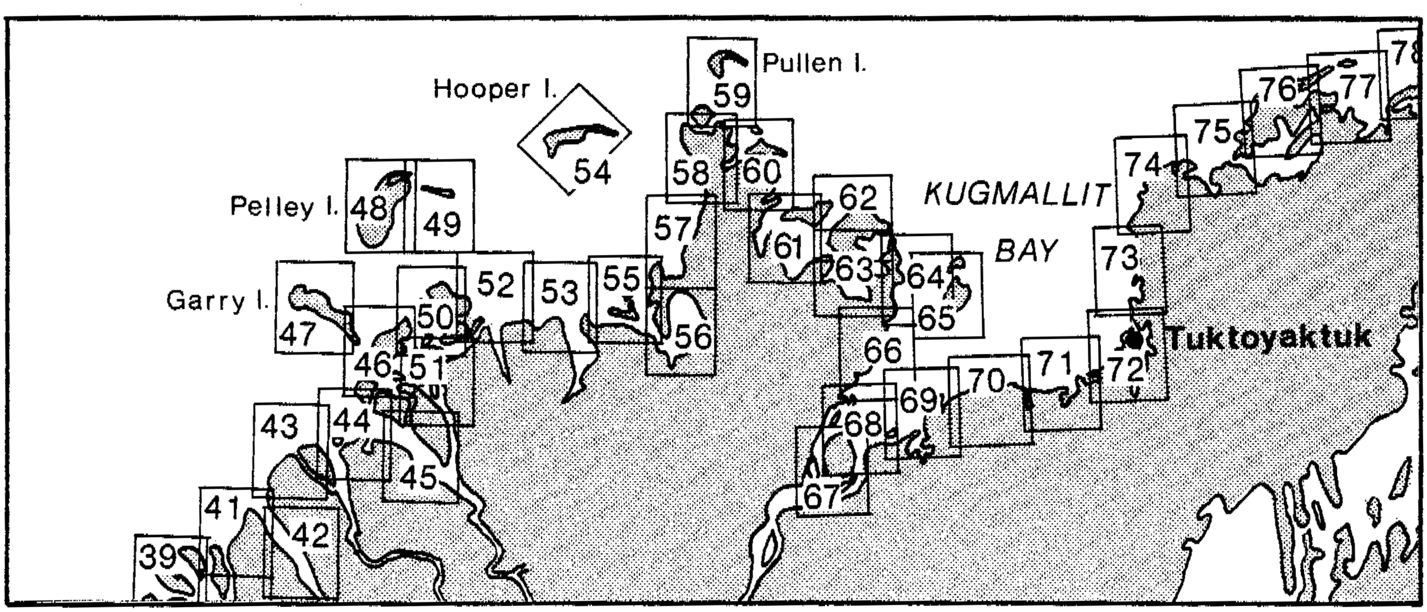
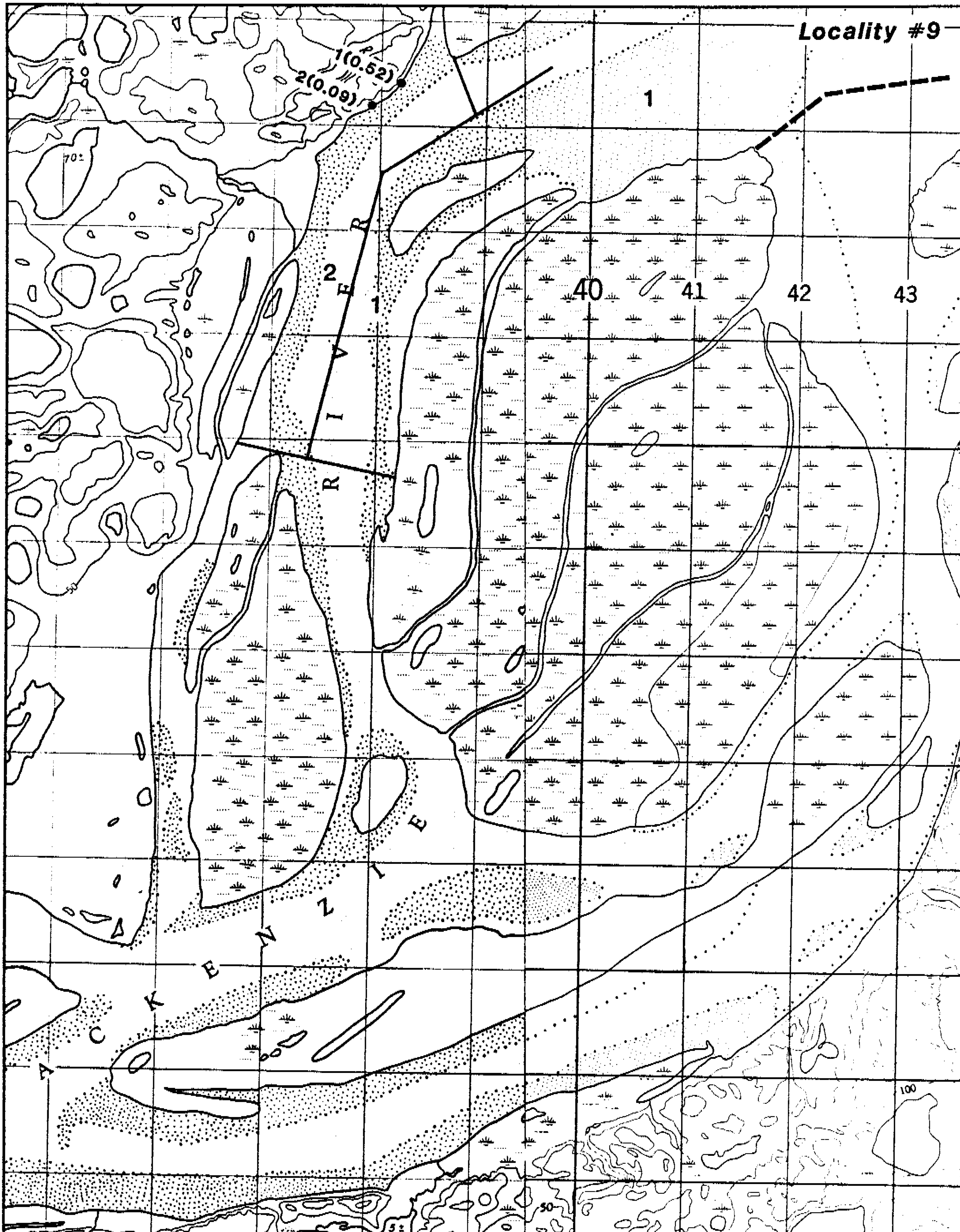
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78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MACKENZIE RIVER
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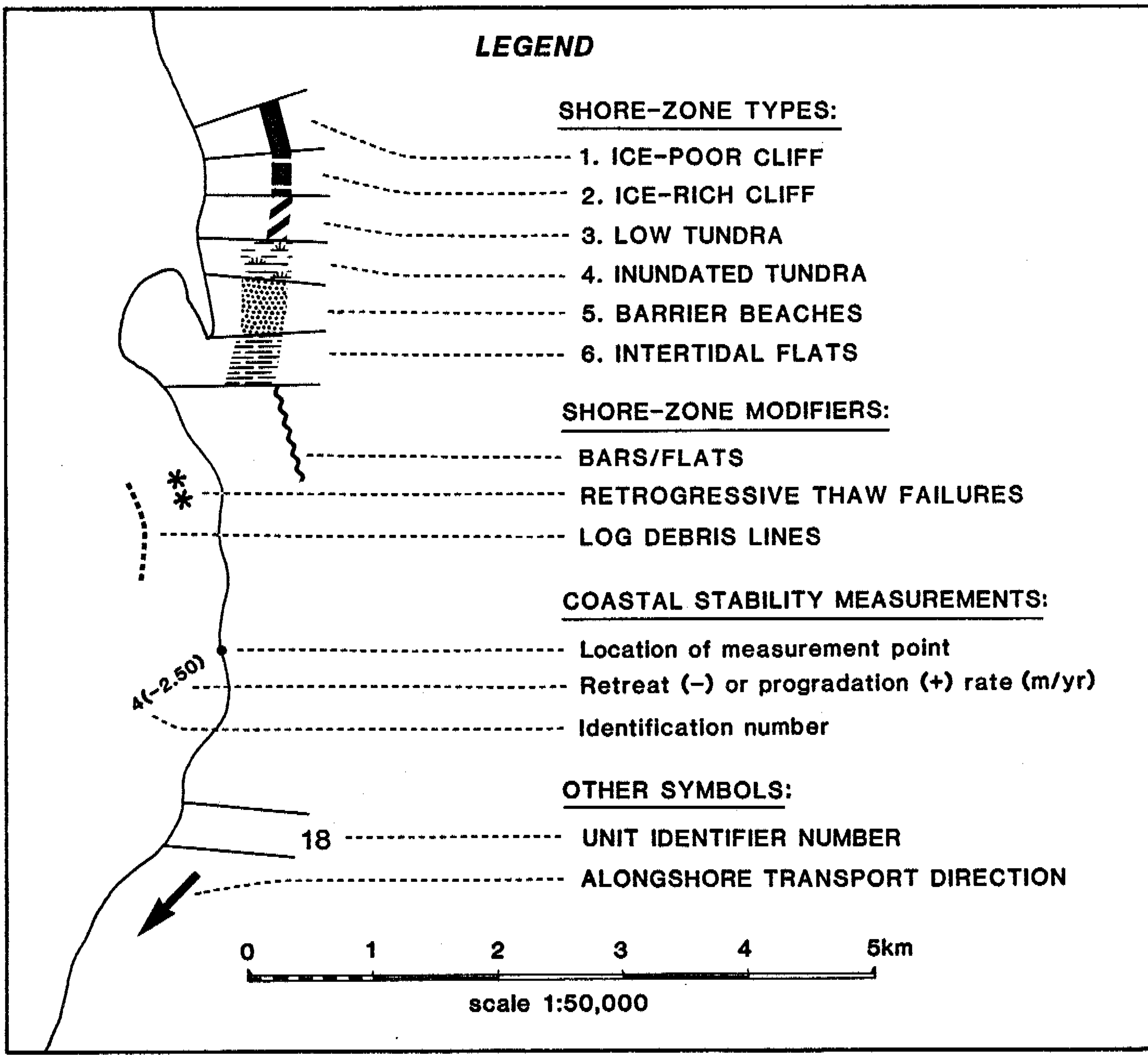
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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LOG DEBRIS LINES
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Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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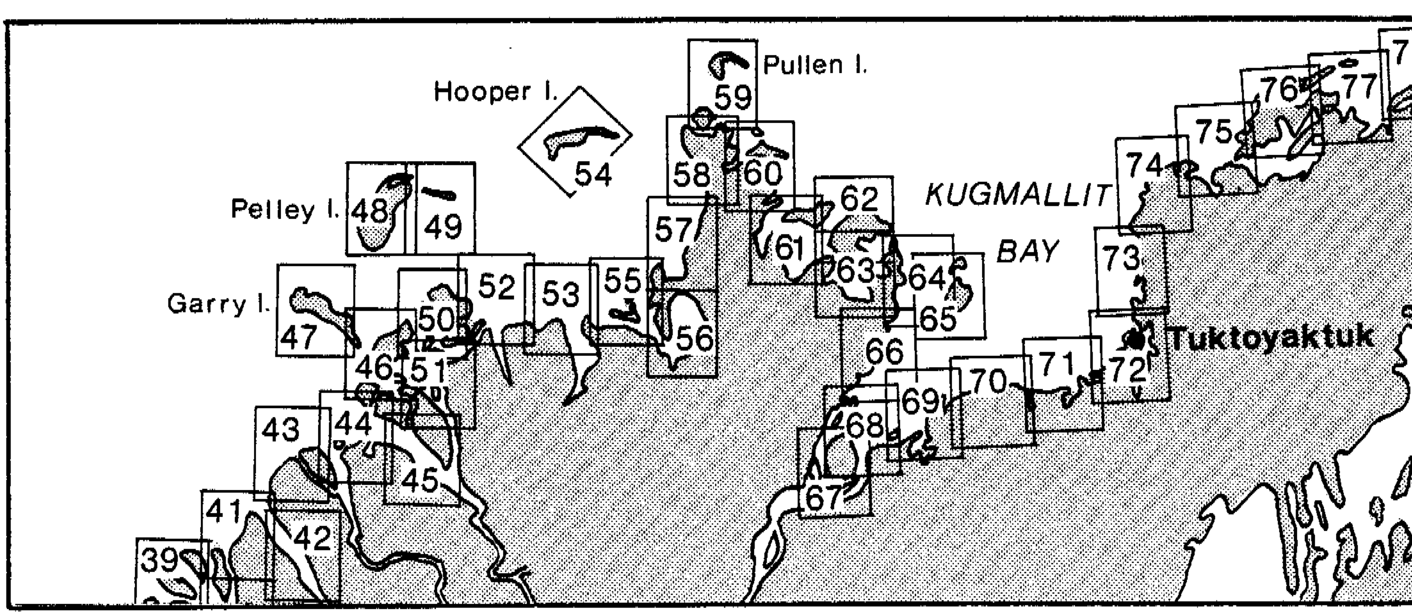
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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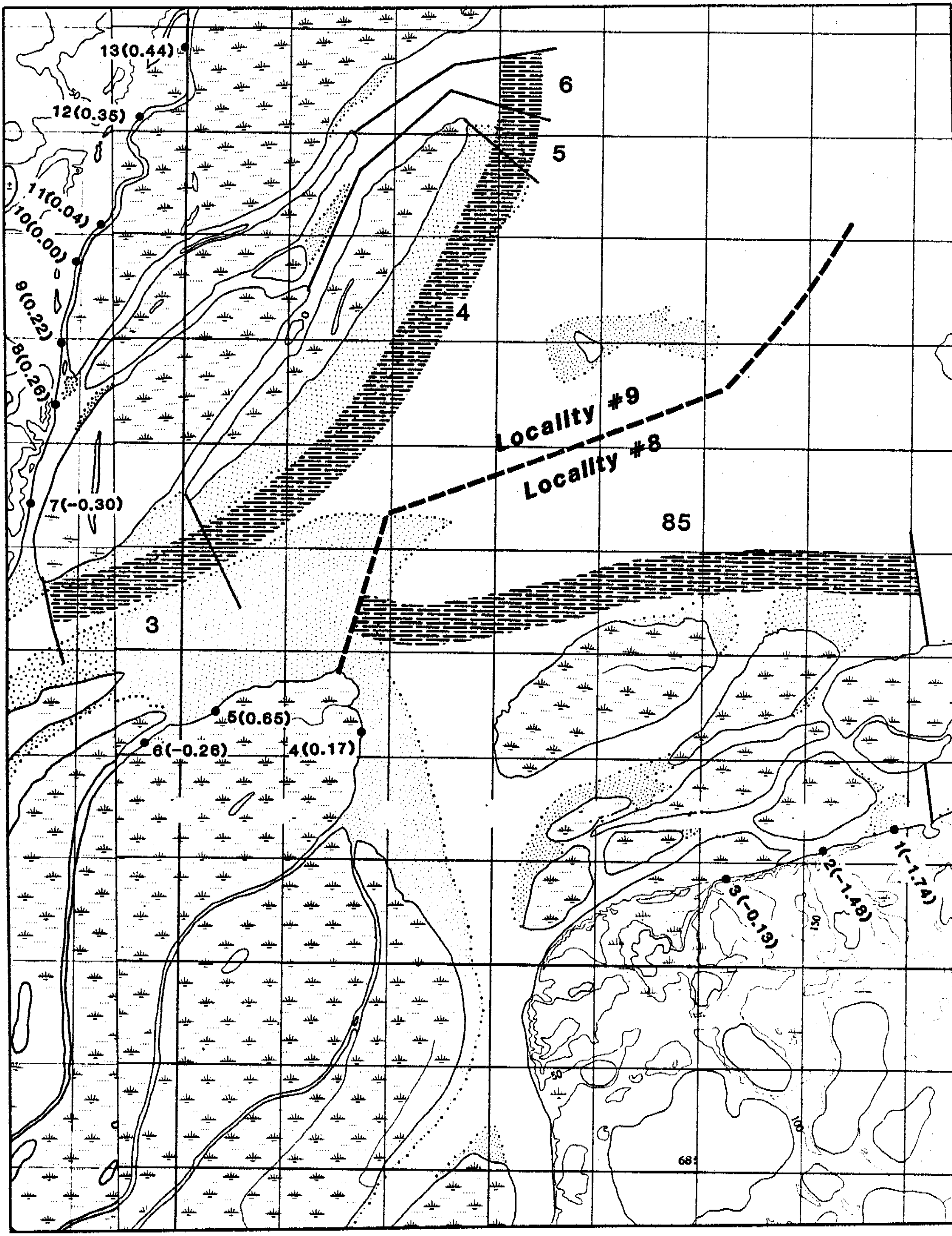
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10(0.00)
9(0.22)
8(0.26)
7(-0.30)
6
5
4
3
Locality #9
Locality #8
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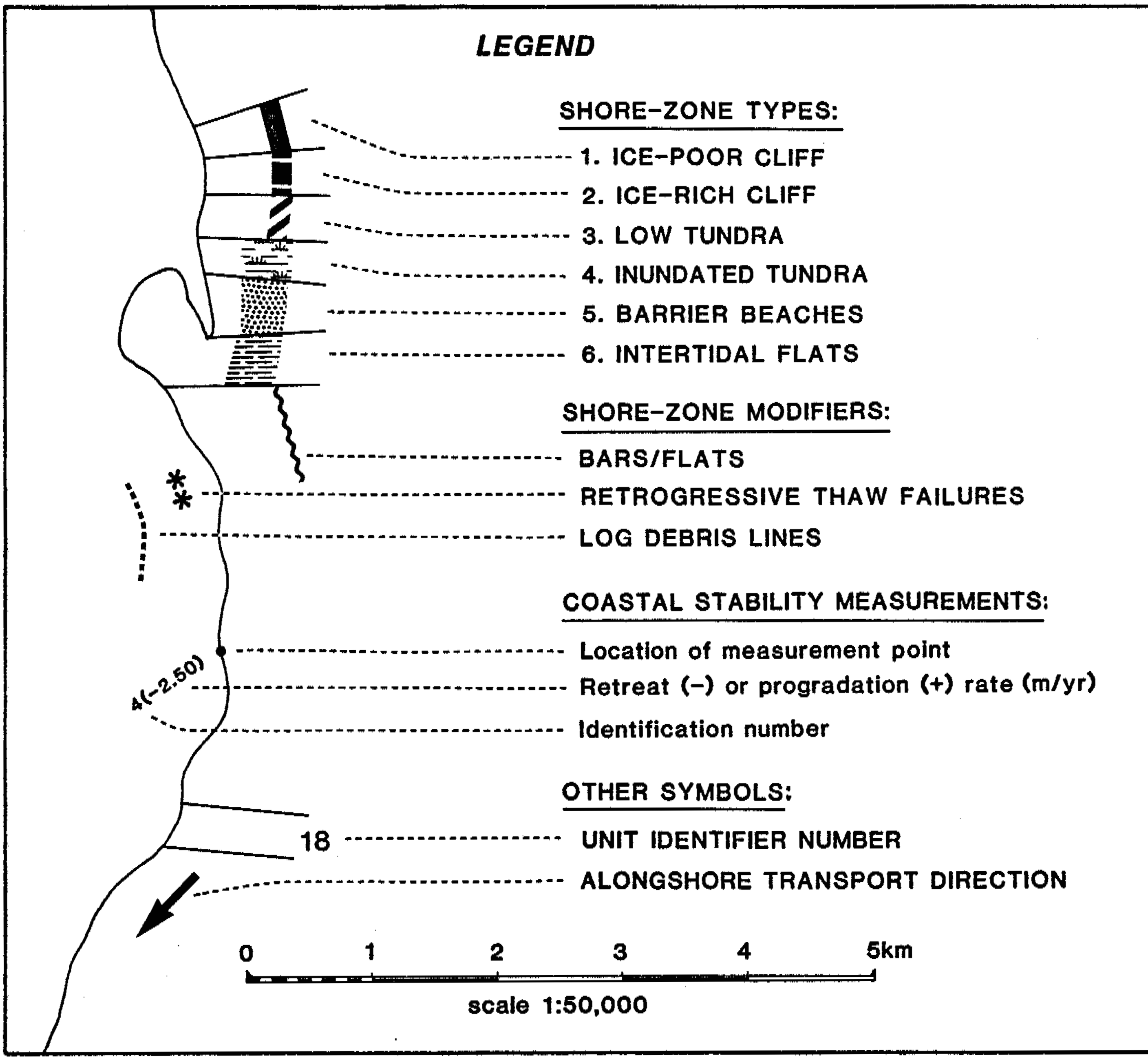
5(0.65)
6(-0.26)
4(0.17)
3(-0.13)
2(-1.48)
1(-1.74)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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4(-2.50)
Location of measurement point
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UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
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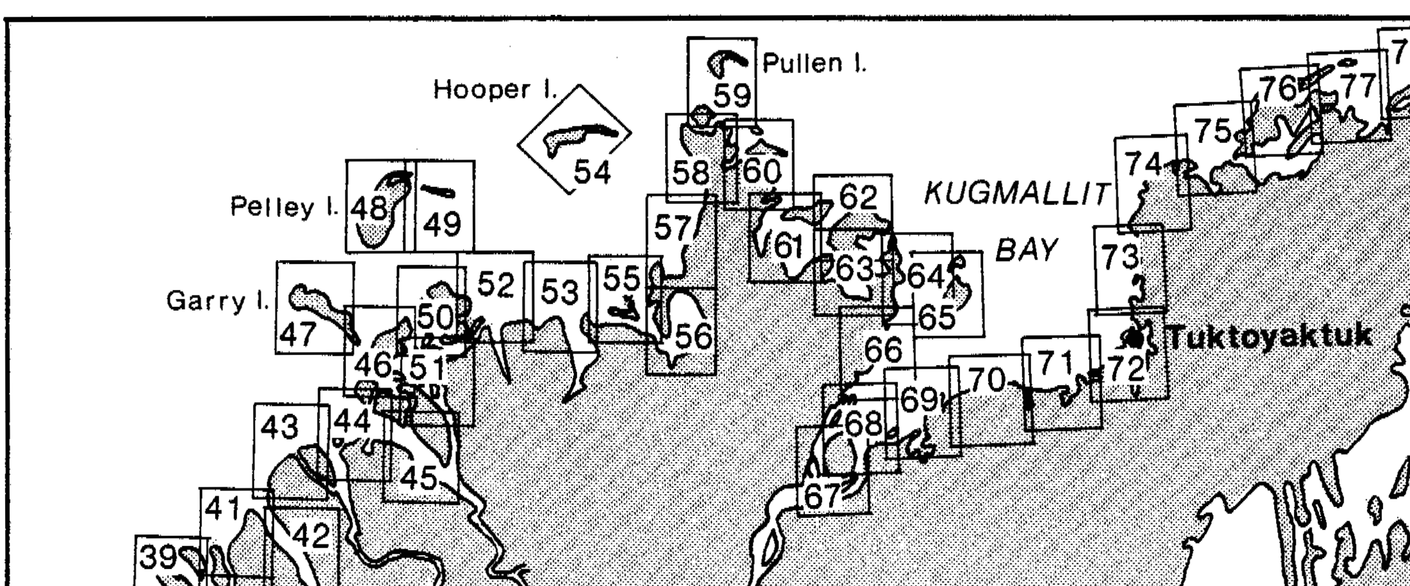
5km
scale 1:50,000



Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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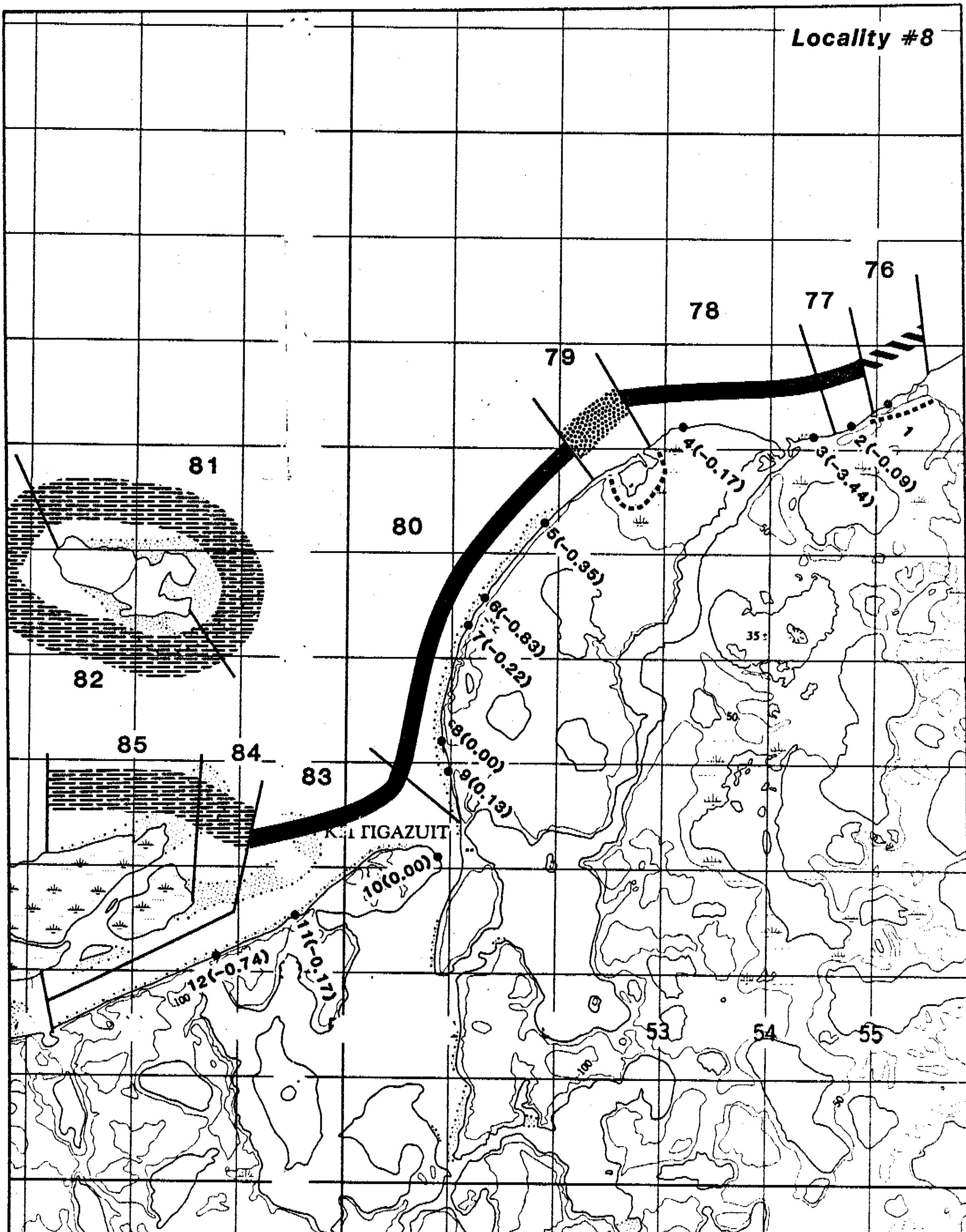
Locality #8
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3(-3.44)
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6(-0.83)
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10(0.00)
11(-0.17)
12(-0.74)
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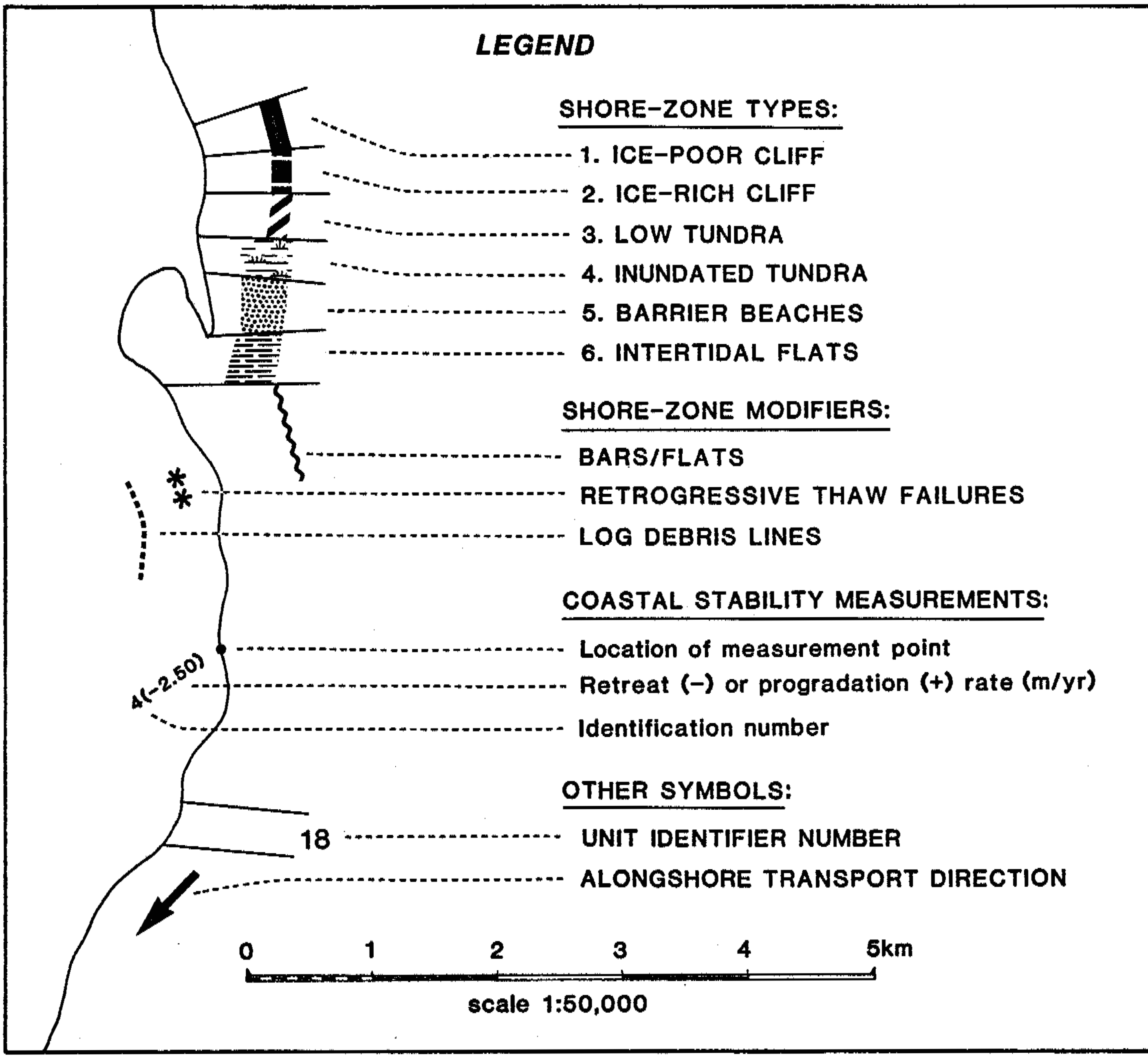
54
55


LEGEND
SHORE-ZONE TYPES:
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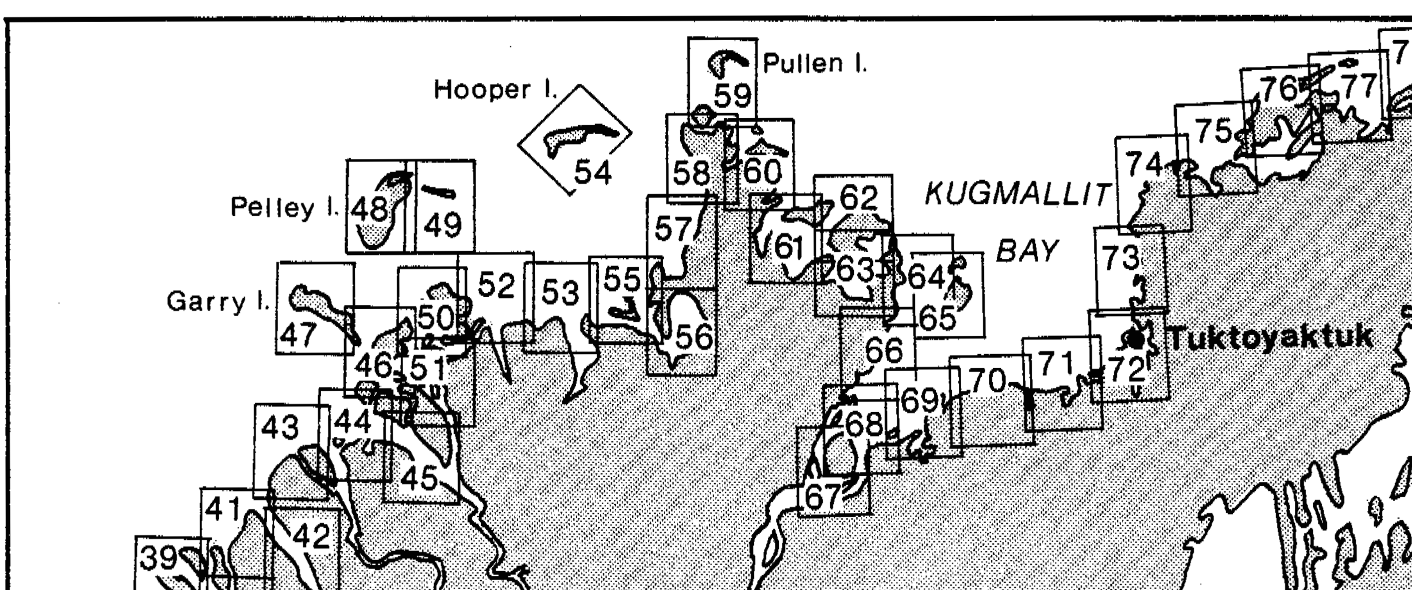
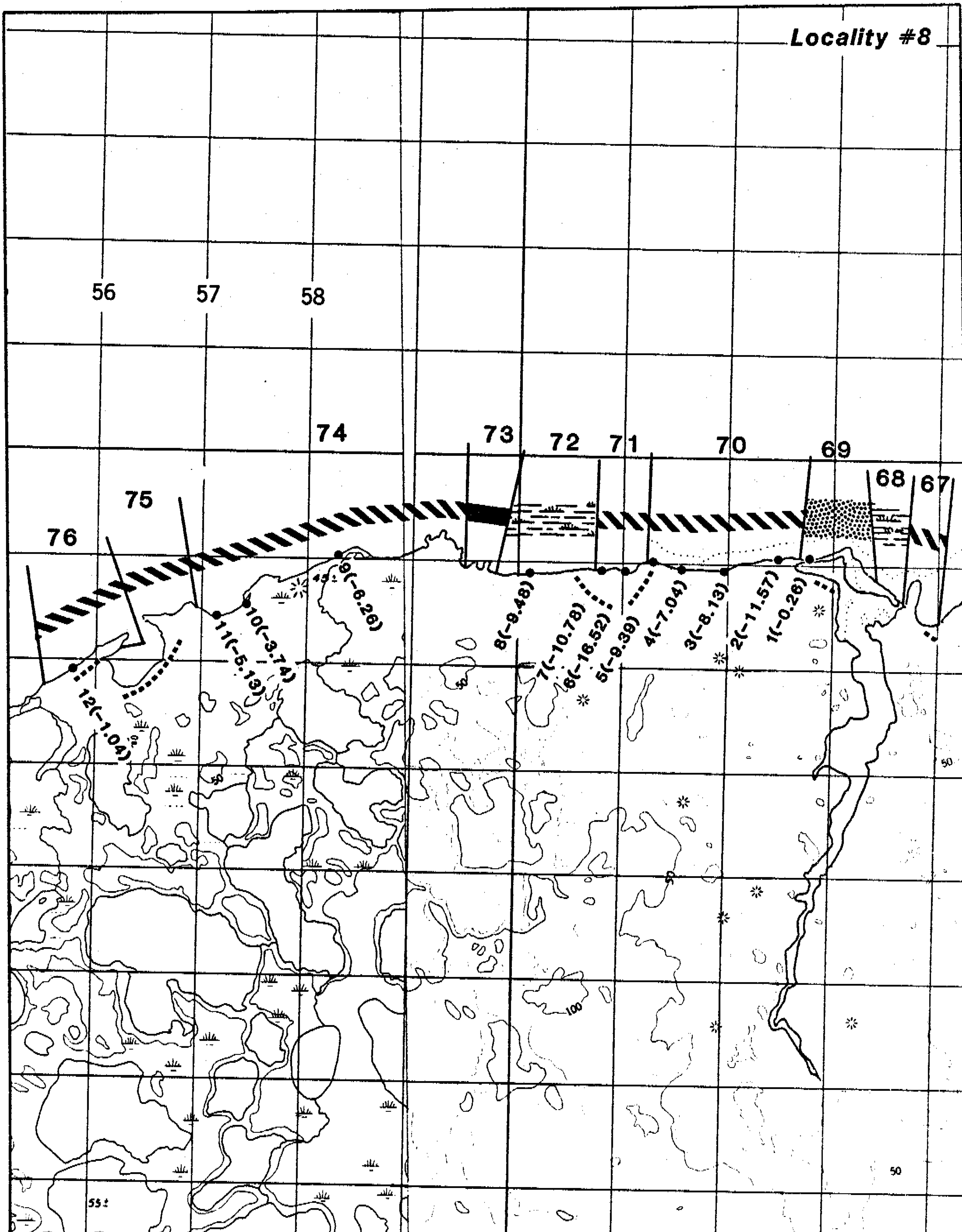
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78


Locality #8
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3(-8.13)
4(-7.04)
5(-9.39)
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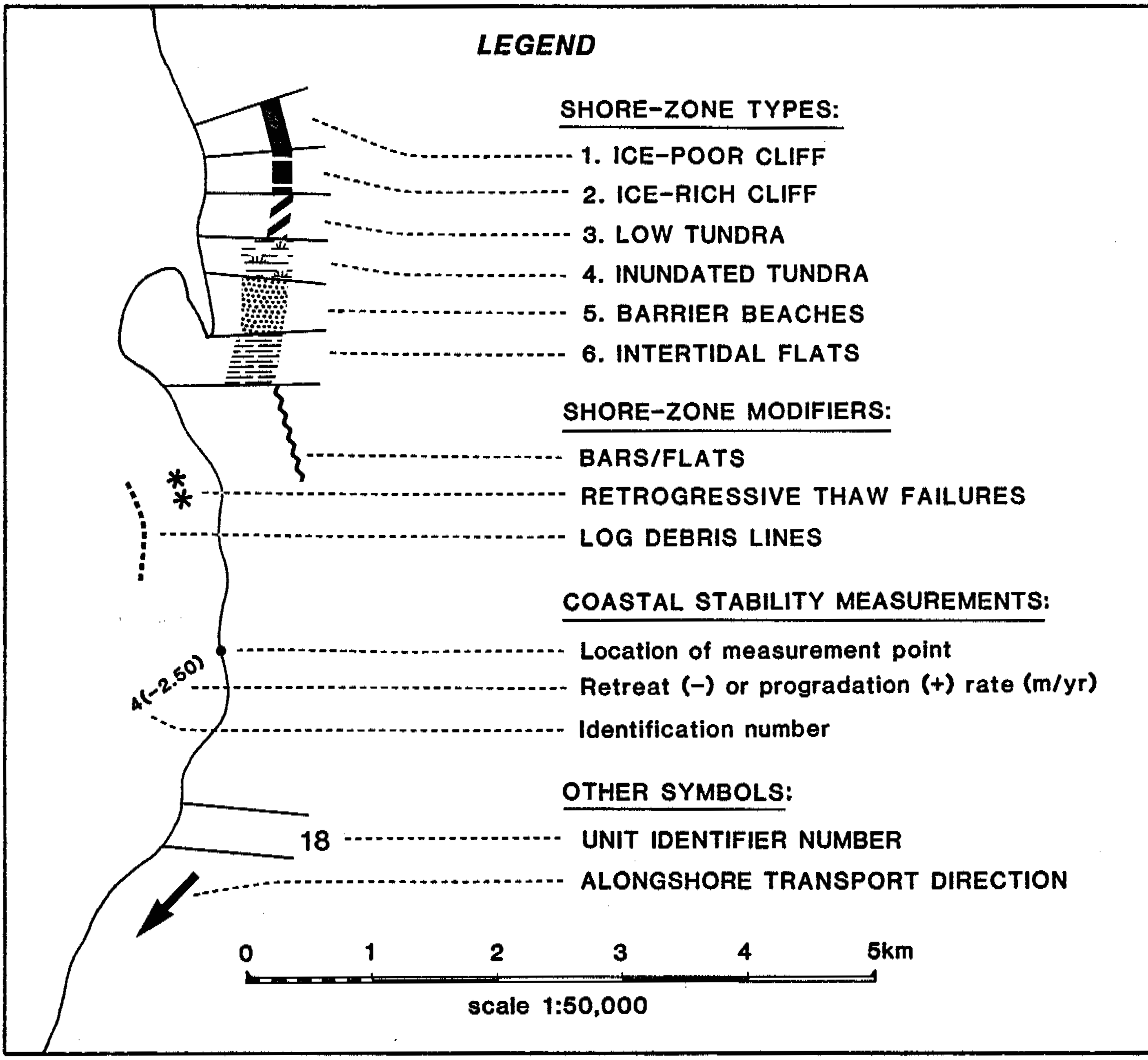
12(-1.04)
50
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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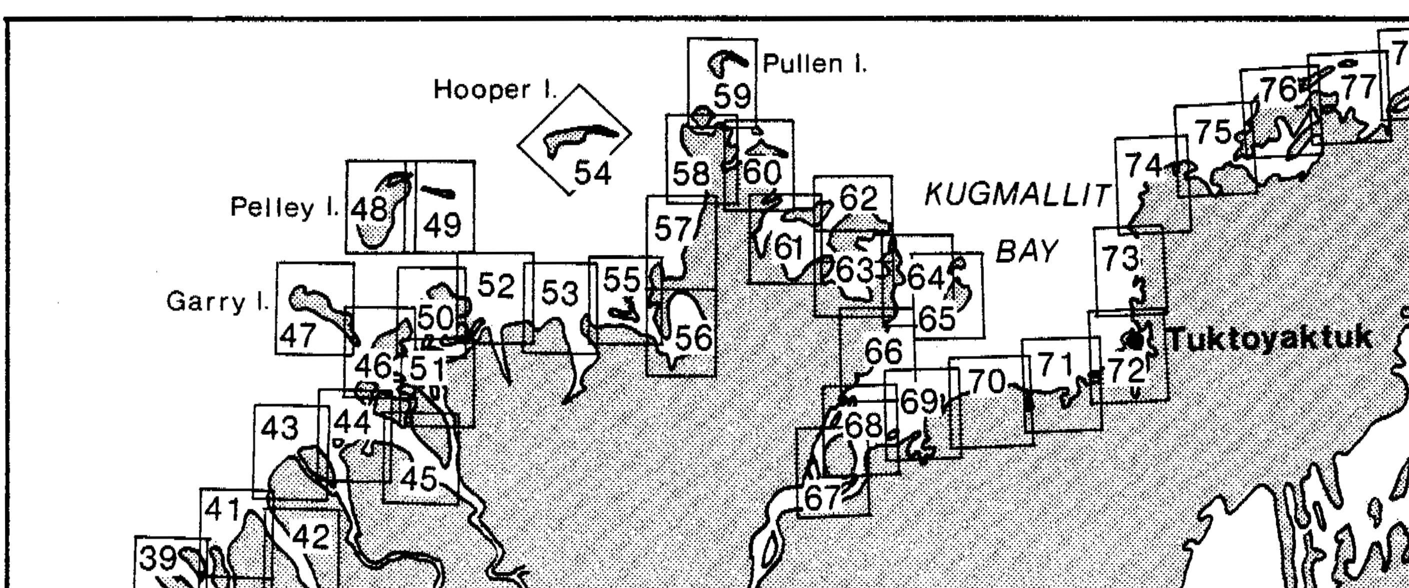
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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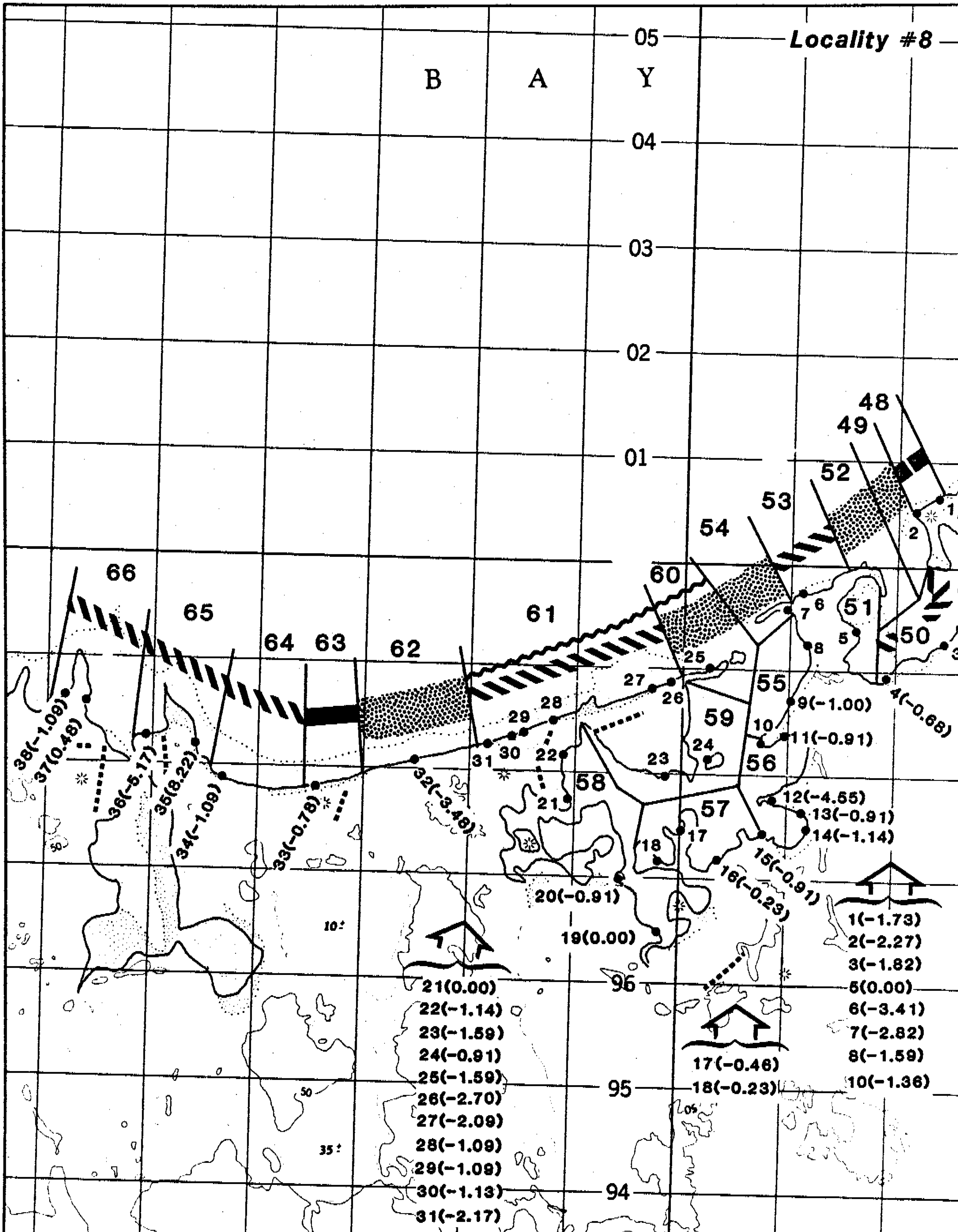
Locality #8
B A Y
05
04
03
02
01
96
95
94
48
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60
66
65
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63
62
61
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59
56
58
57
38(-1.09)
37(0.48)
36(-5.17)
35(8.22)
34(-1.09)
33(-0.78)
32(-3.48)
4(-0.68)
9(-1.00)
11(-0.91)
12(-4.55)
13(-0.91)
14(-1.14)
15(-0.91)
16(-0.23)
20(-0.91)
19(0.00)
21(0.00)
22(-1.14)
23(-1.59)
24(-0.91)
25(-1.59)
26(-2.70)
27(-2.09)
28(-1.09)
29(-1.09)
30(-1.13)
31(-2.17)
17(-0.46)
18(-0.23)
1(-1.73)
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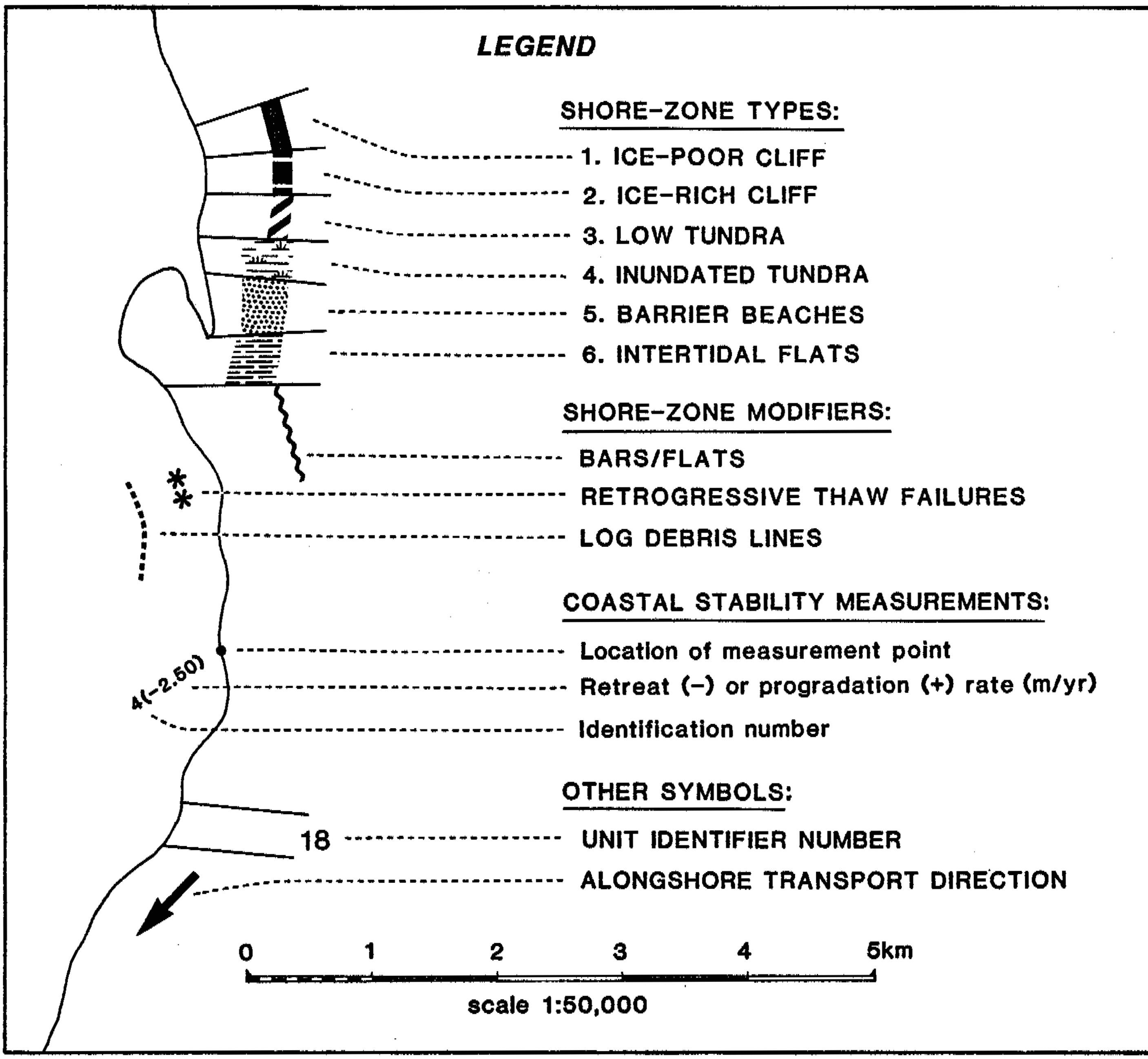
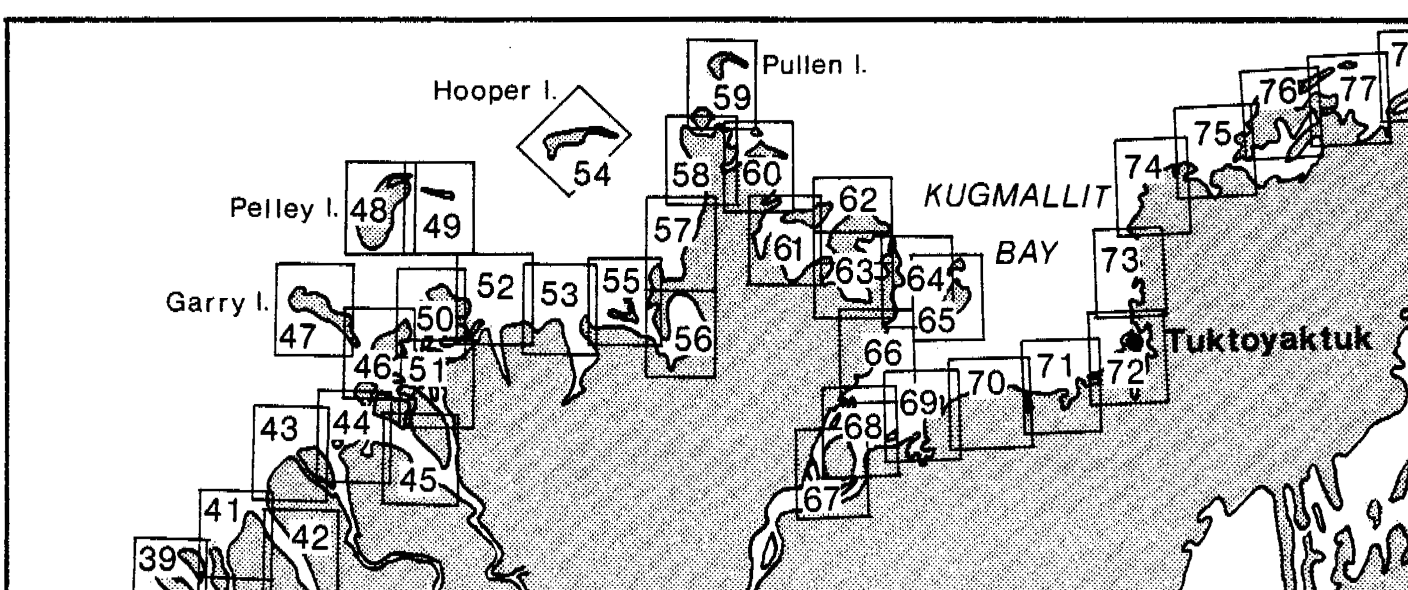
3(-1.82)
5(0.00)
6(-3.41)
7(-2.82)
8(-1.59)
10(-1.36)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
39
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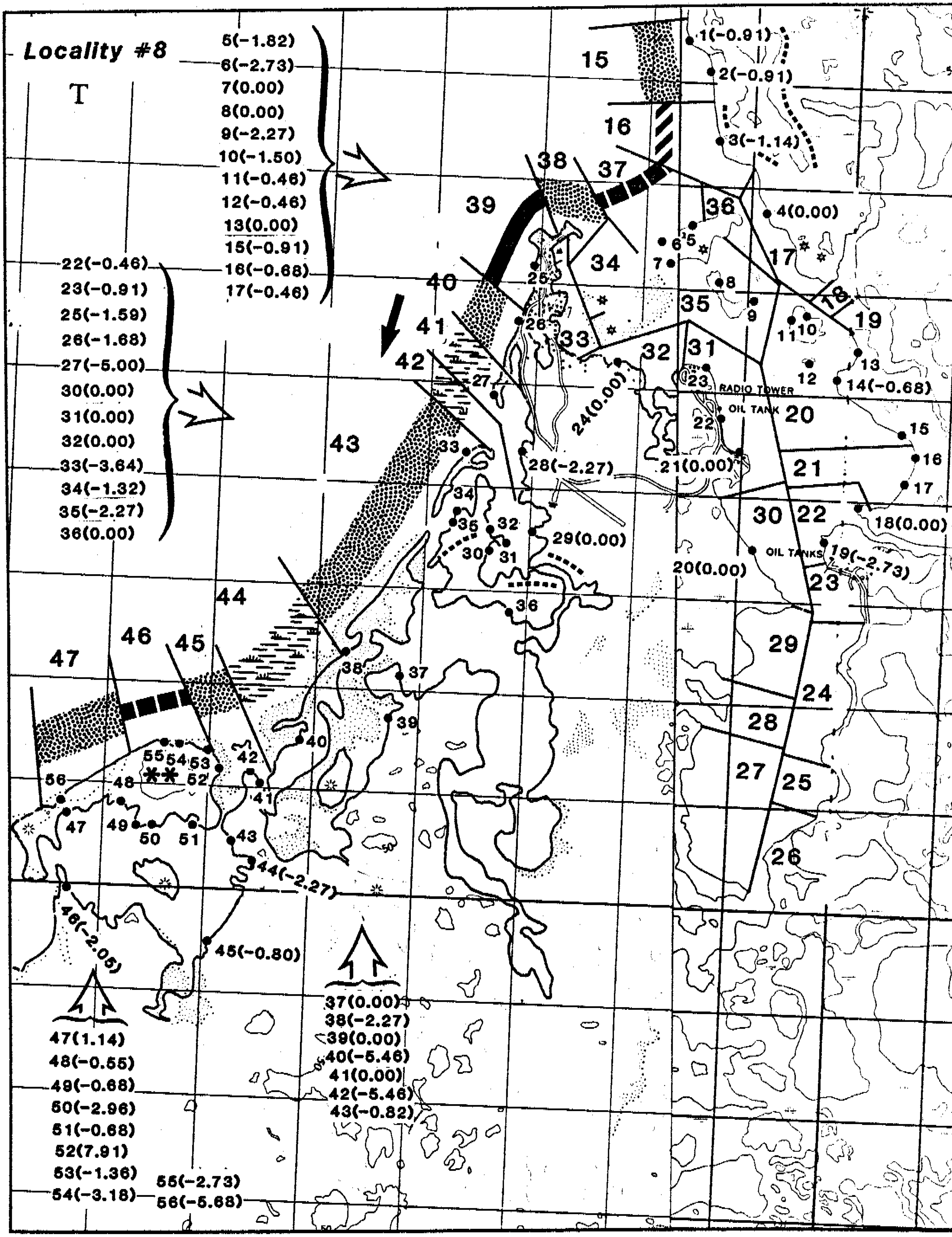
Locality #8
T
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6(-2.73)
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8(0.00)
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12(-0.46)
13(0.00)
15(-0.91)
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17(-0.46)
22(-0.46)
23(-0.91)
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26(-1.68)
27(-5.00)
30(0.00)
31(0.00)
32(0.00)
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34(-1.32)
35(-2.27)
36(0.00)
1(-0.91)
2(-0.91)
3(-1.14)
4(0.00)
14(-0.68)
RADIO TOWER
OIL TANK
OIL TANKS
24(0.00)
28(-2.27)
21(0.00)
29(0.00)
20(0.00)
18(0.00)
19(-2.73)
44(-2.27)
45(-0.80)
46(-2.05)
37(0.00)
38(-2.27)
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43(-0.82)
47(1.14)
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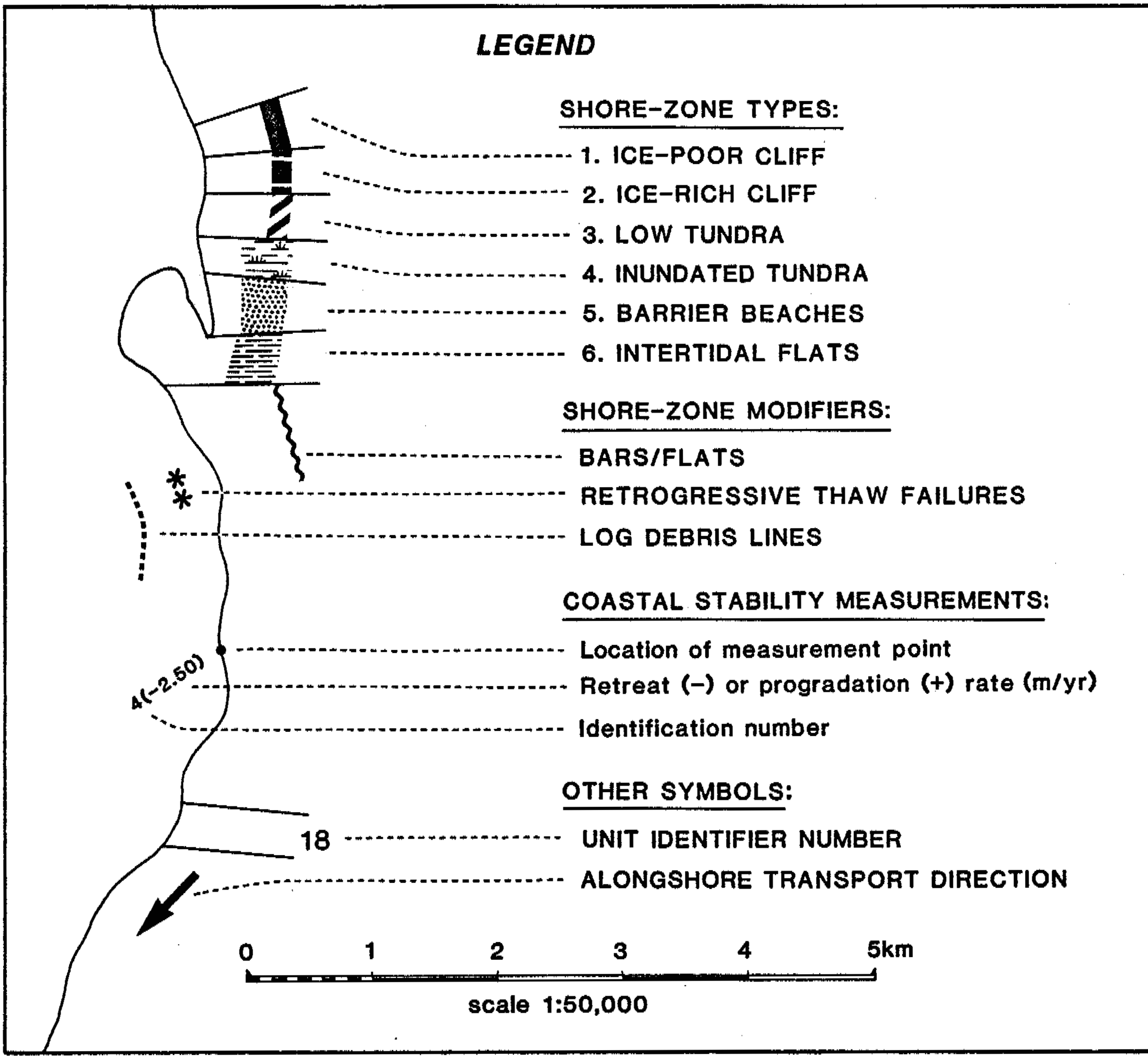
56(-5.68)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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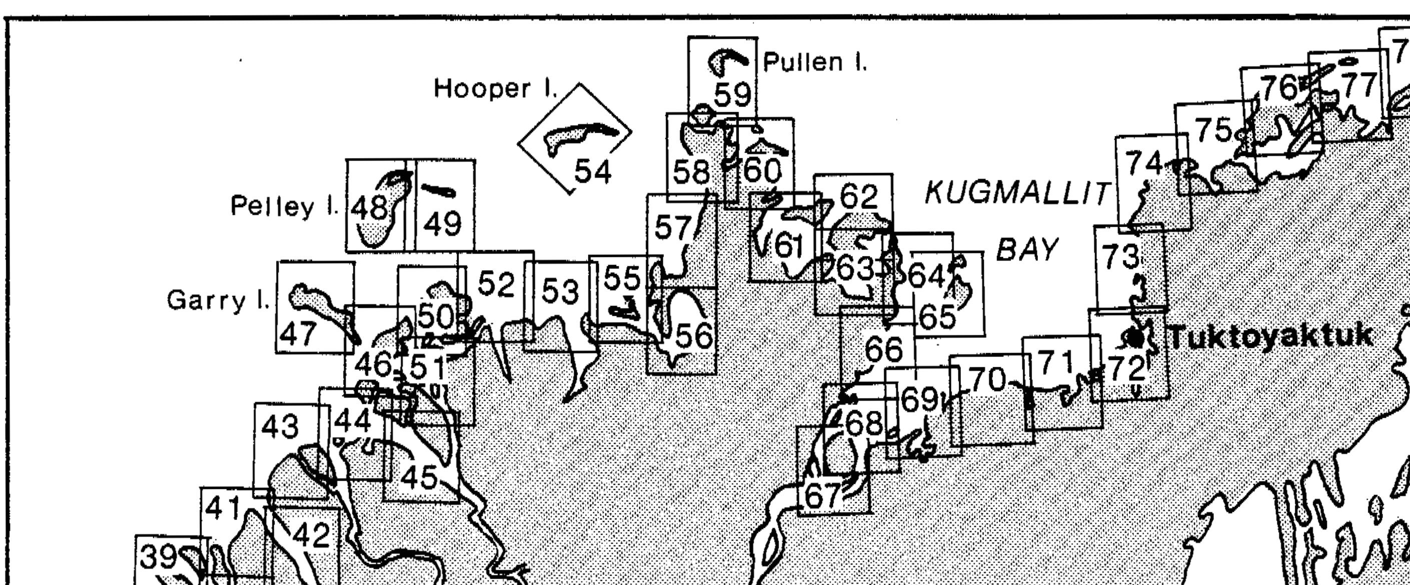
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT
BAY
Tuktoyaktuk
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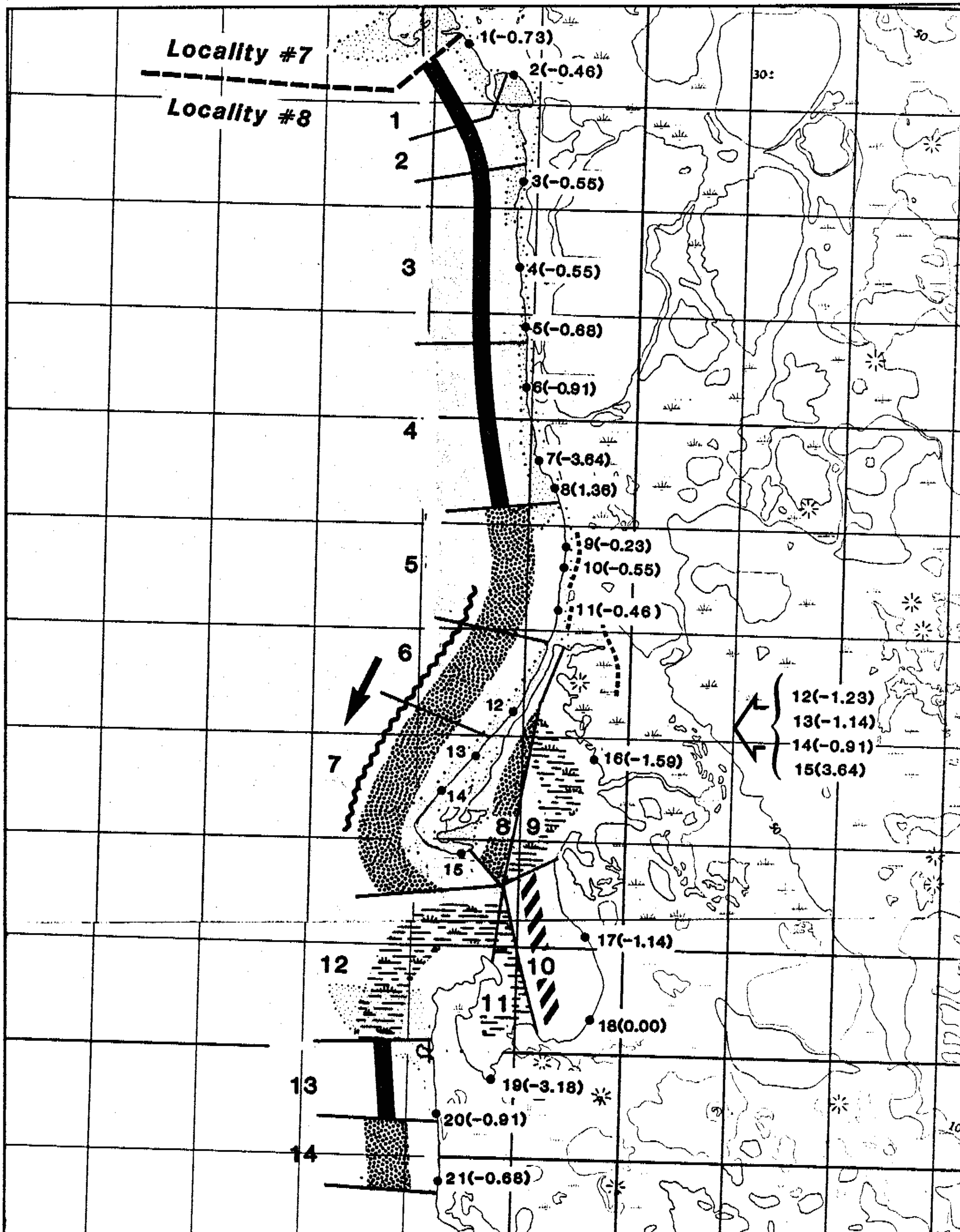

Locality #7
Locality #8
1(-0.73)
2(-0.46)
3(-0.55)
4(-0.55)
5(-0.68)
6(-0.91)
7(-3.64)
8(1.36)
9(-0.23)
10(-0.55)
11(-0.46)
12(-1.23)
13(-1.14)
14(-0.91)
15(3.64)
16(-1.59)
17(-1.14)
18(0.00)
19(-3.18)
20(-0.91)
21(-0.68)
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7
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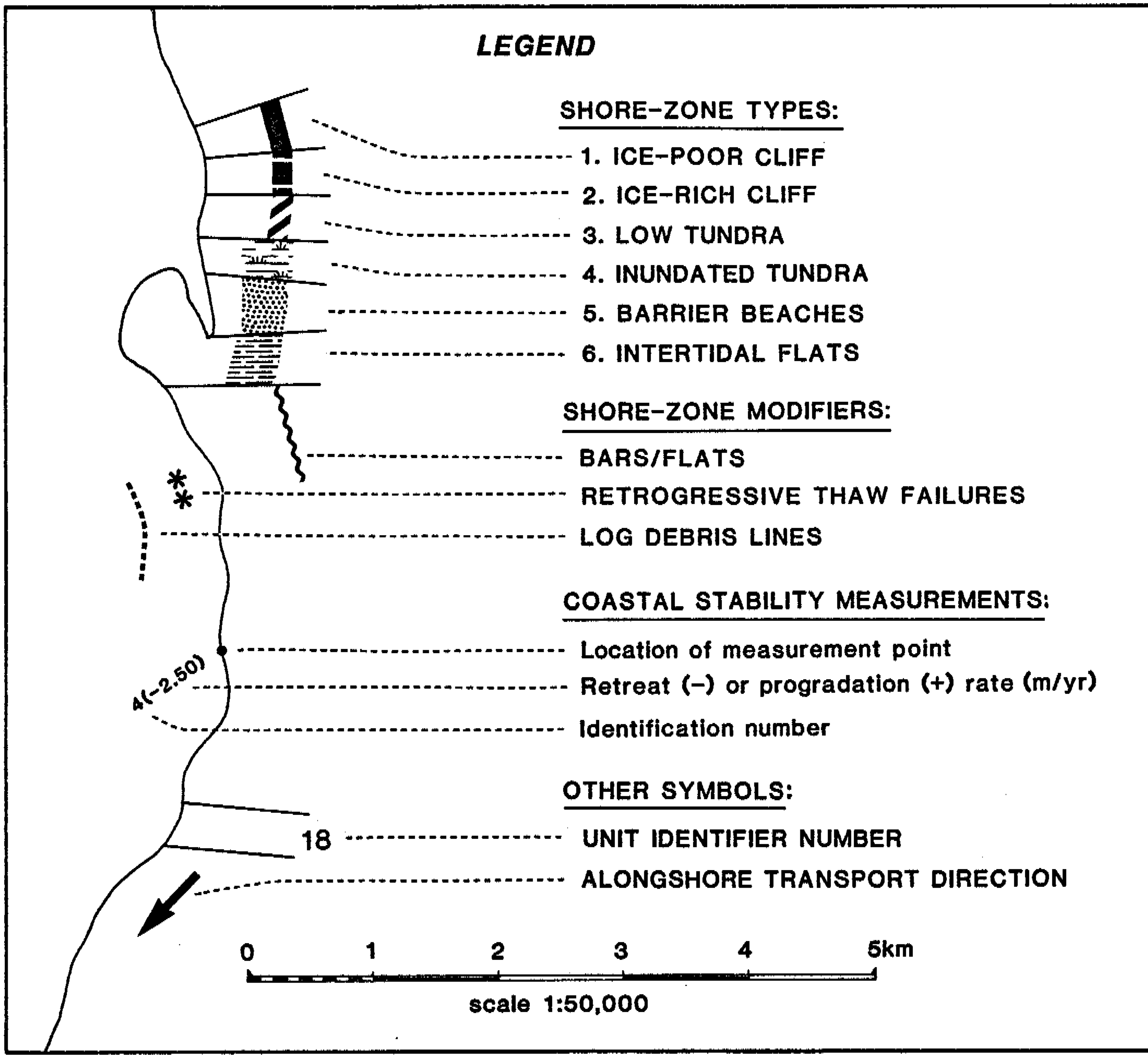
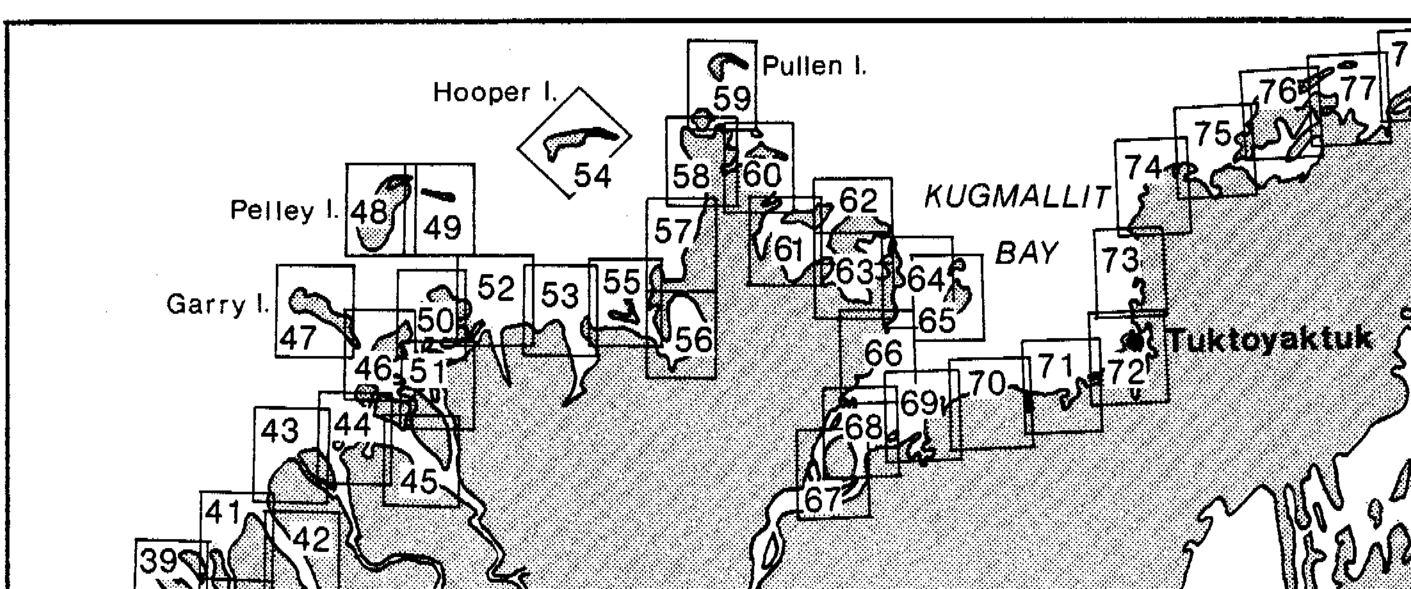
11
12
13
14


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


Pullen I.
59
Hooper I.
54
58
60
Pelley I.
48
49
57
62
KUGMALLIT
BAY
74
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76
77
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Garry I.
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Tuktoyaktuk
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42
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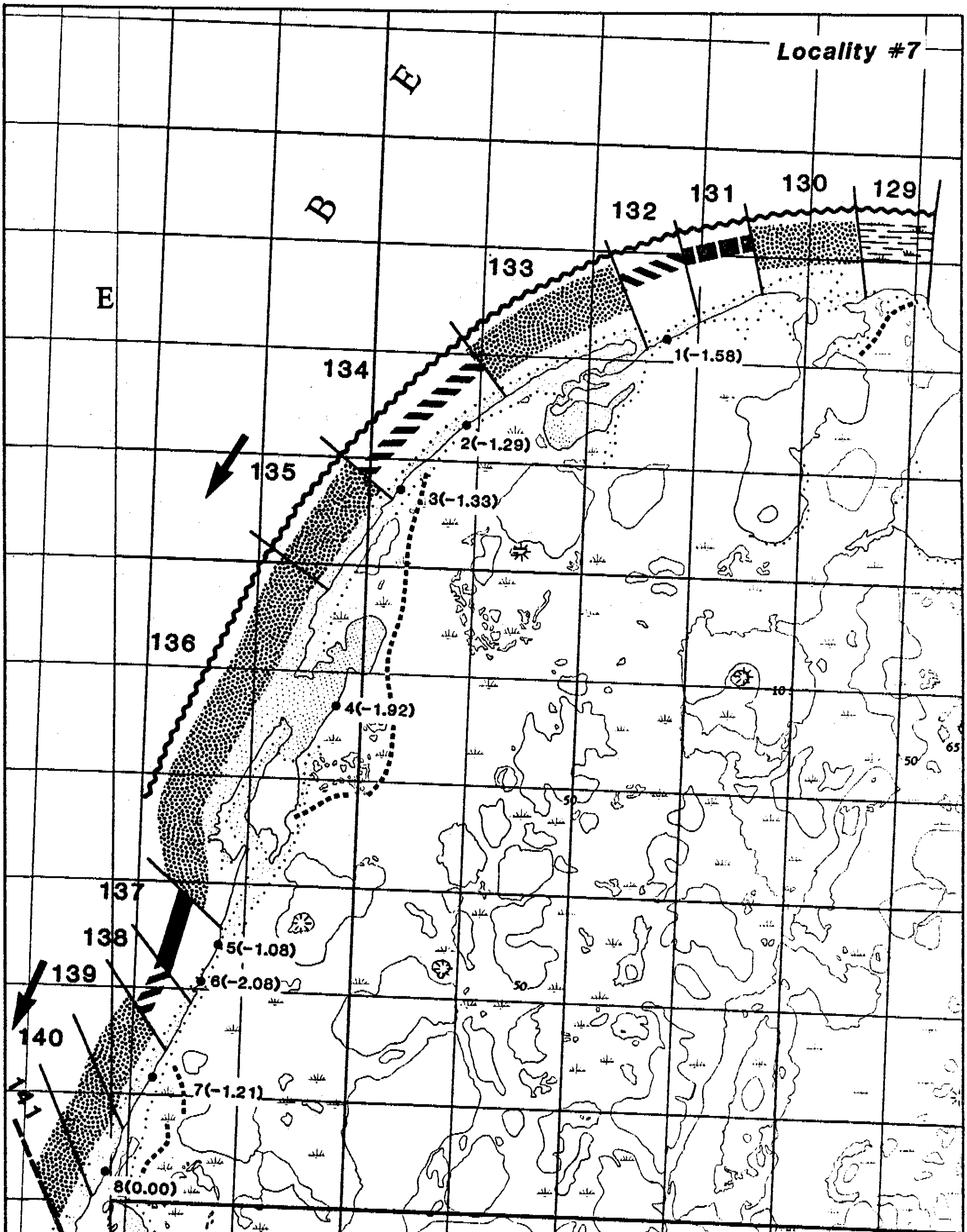
Locality #7
E
B
E
E
129
130
131
132
133
134
135
136
137
138
139
140
141
1(-1.58)
2(-1.29)
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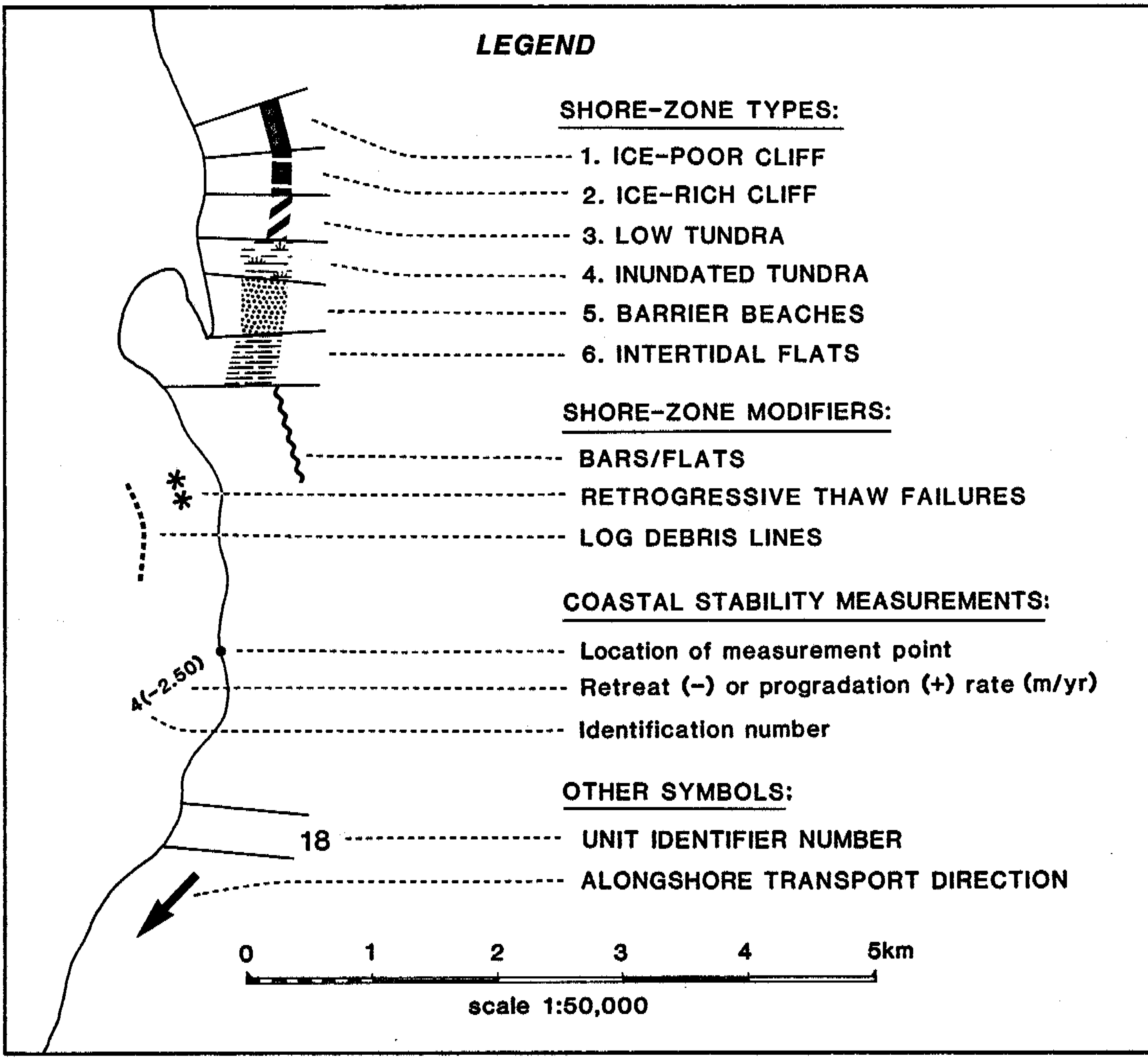
5(-1.08)
6(-2.08)
7(-1.21)
8(0.00)
10
50
65


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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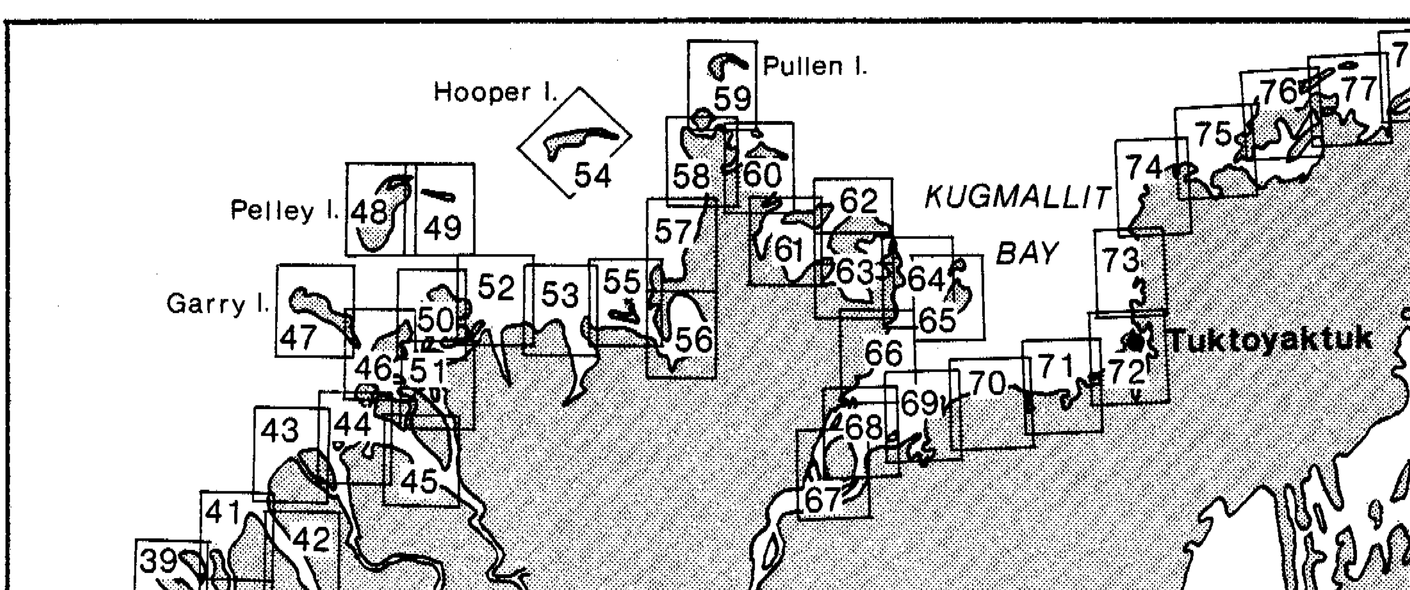
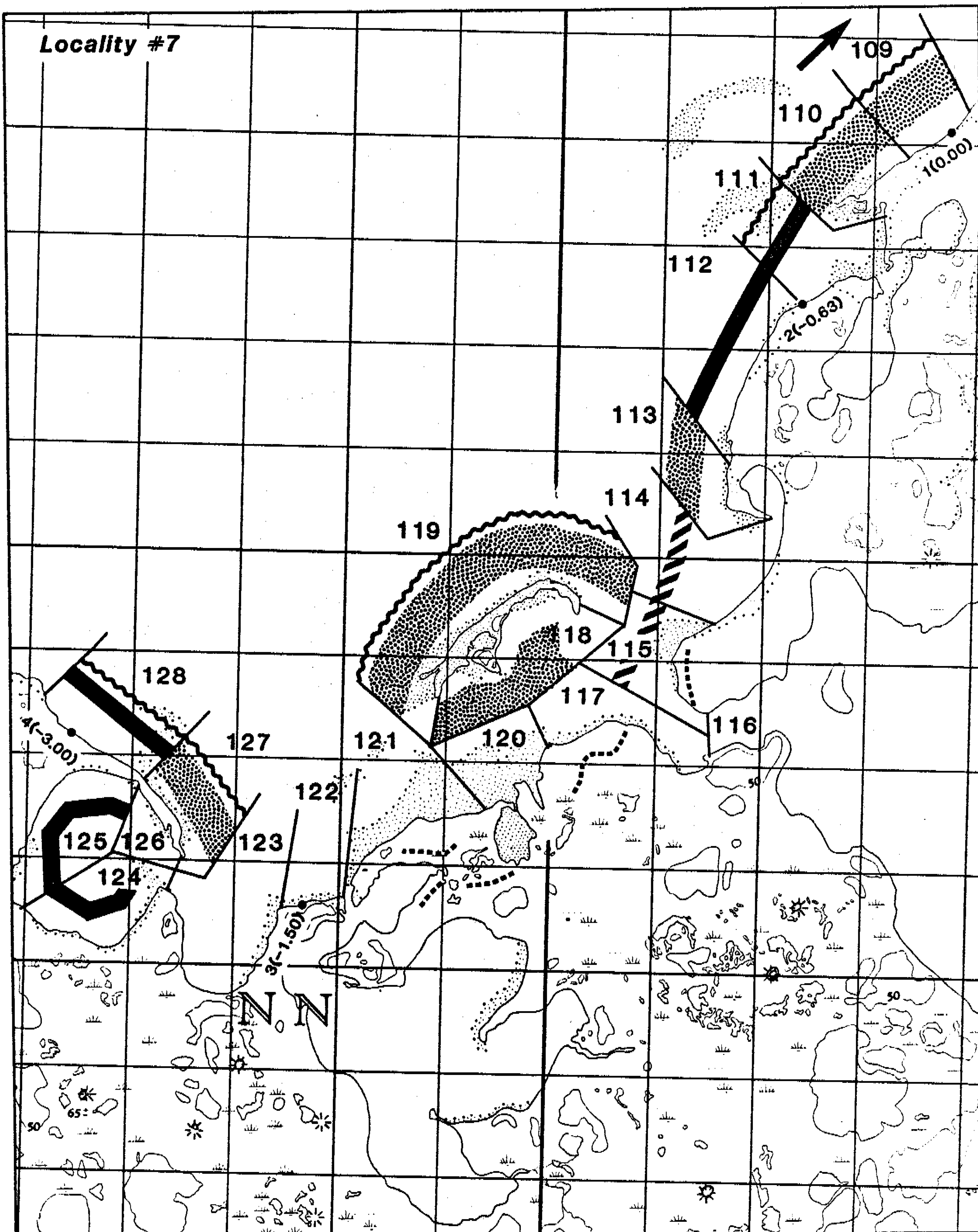
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #7
109
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1(0.00)
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112
2(-0.63)
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114
119
118
115
128
117
116
4(-3.00)
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121
120
122
125
126
123
124
3(-1.50)
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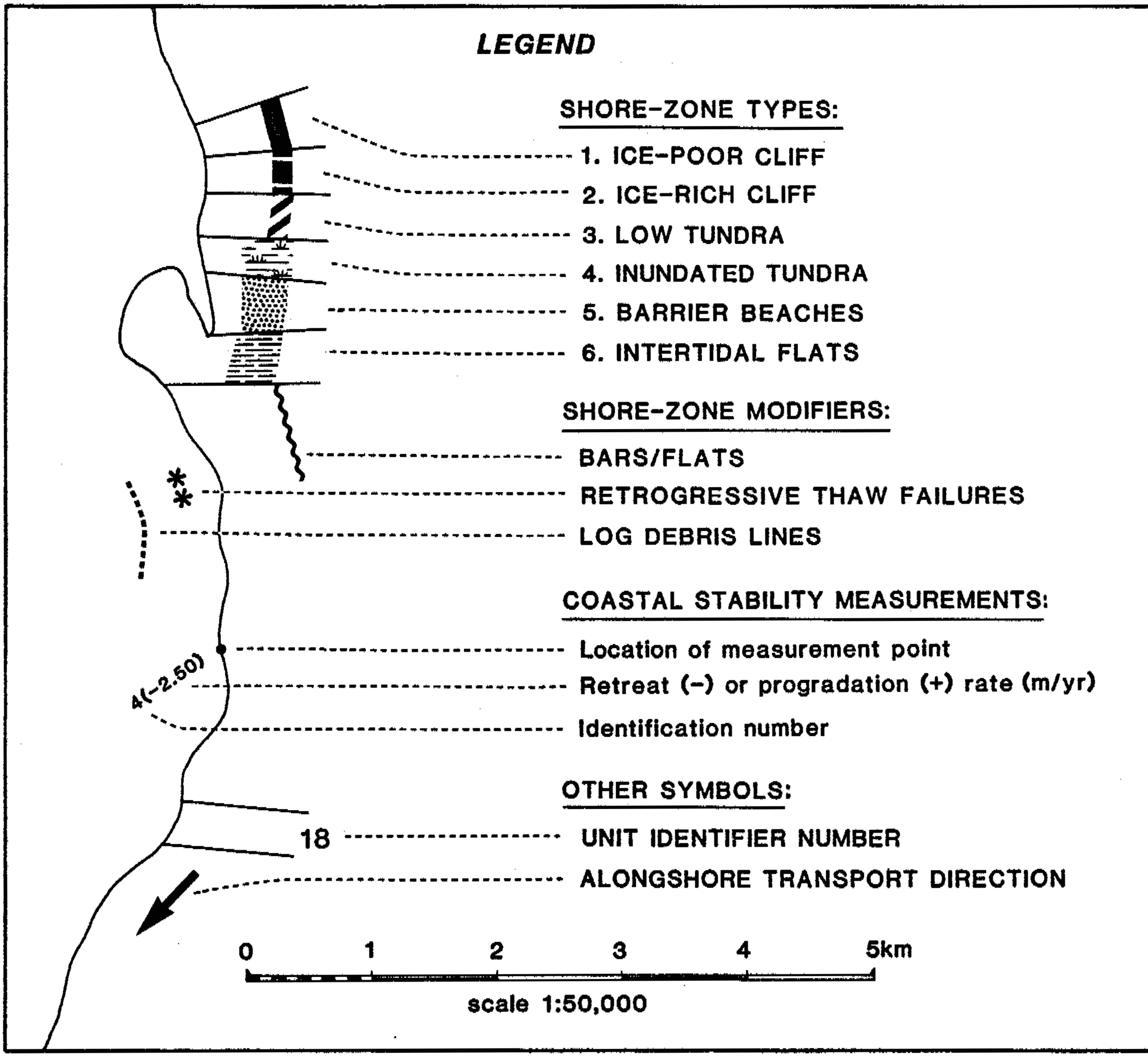
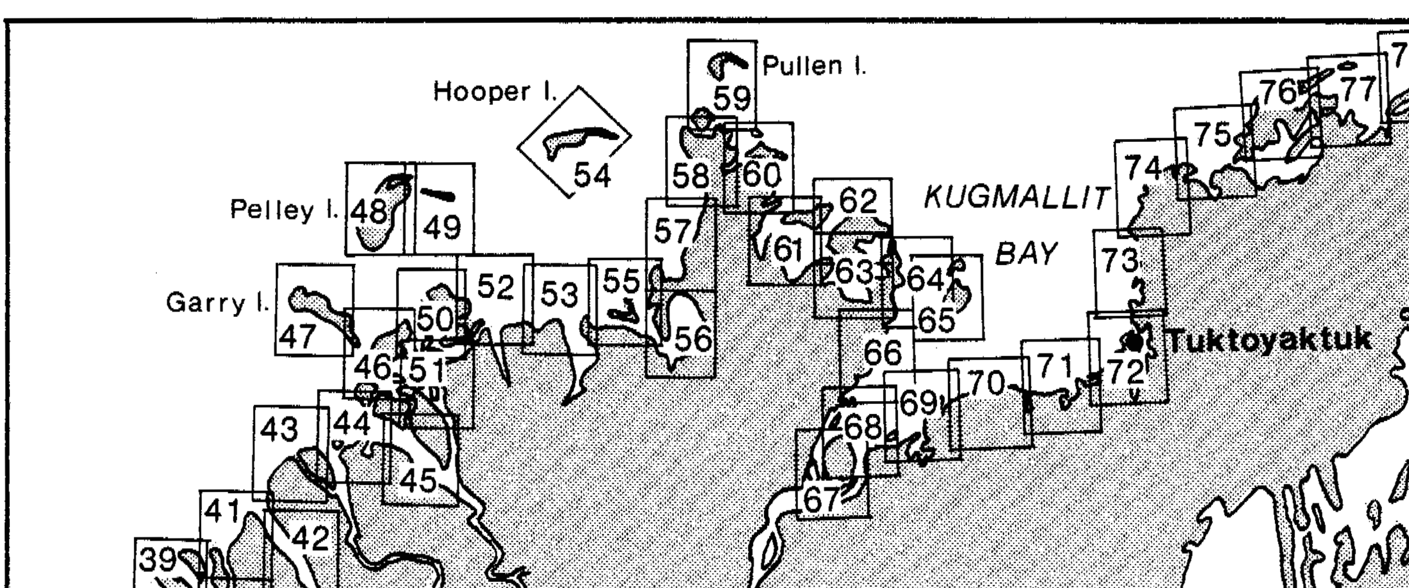
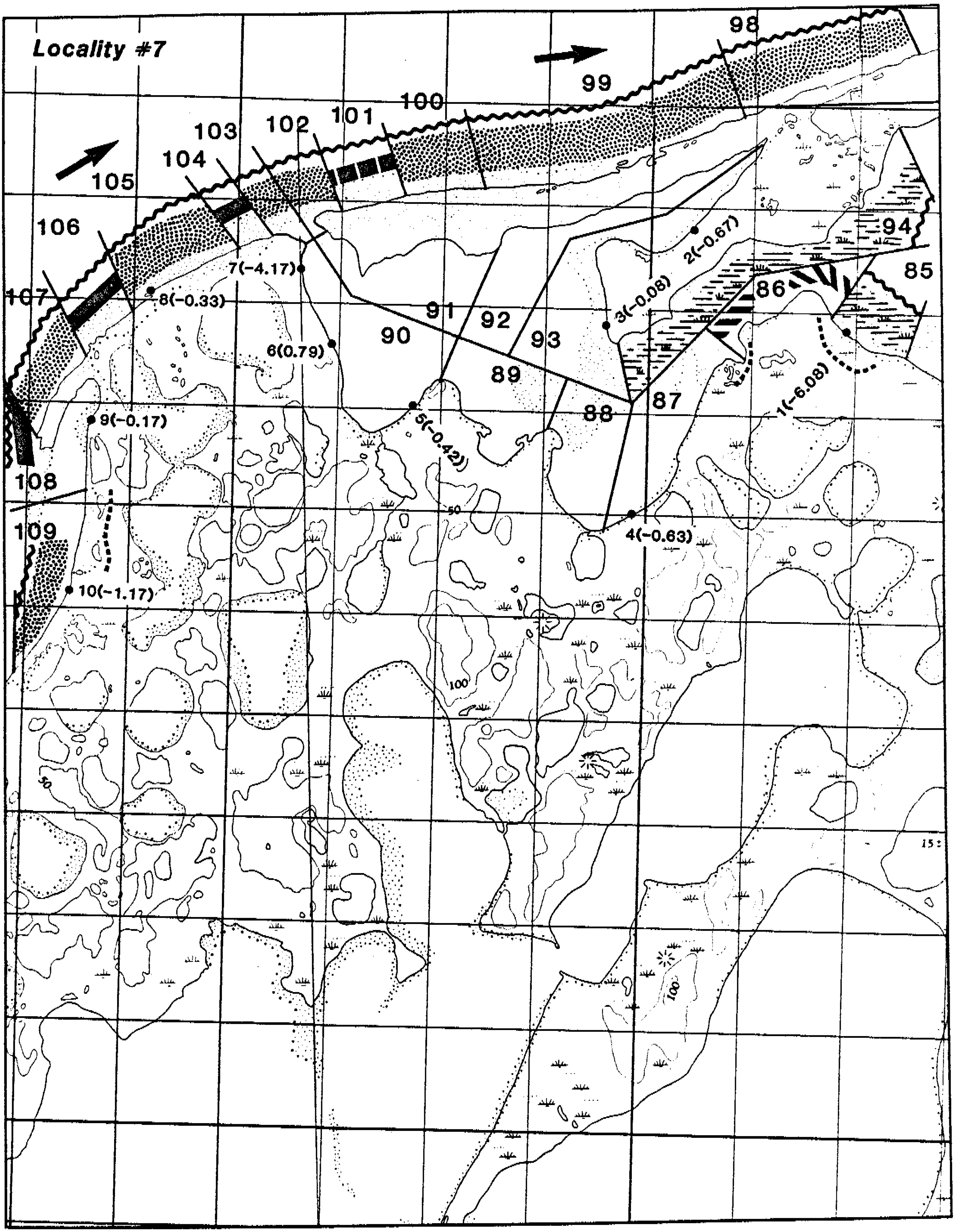
N
50
65
50
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


Pullen I.
Hooper I.
Pelley I.
Garry I.
KUGMALLIT BAY
Tuktoyaktuk
39 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


Locality #7
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100
101
102
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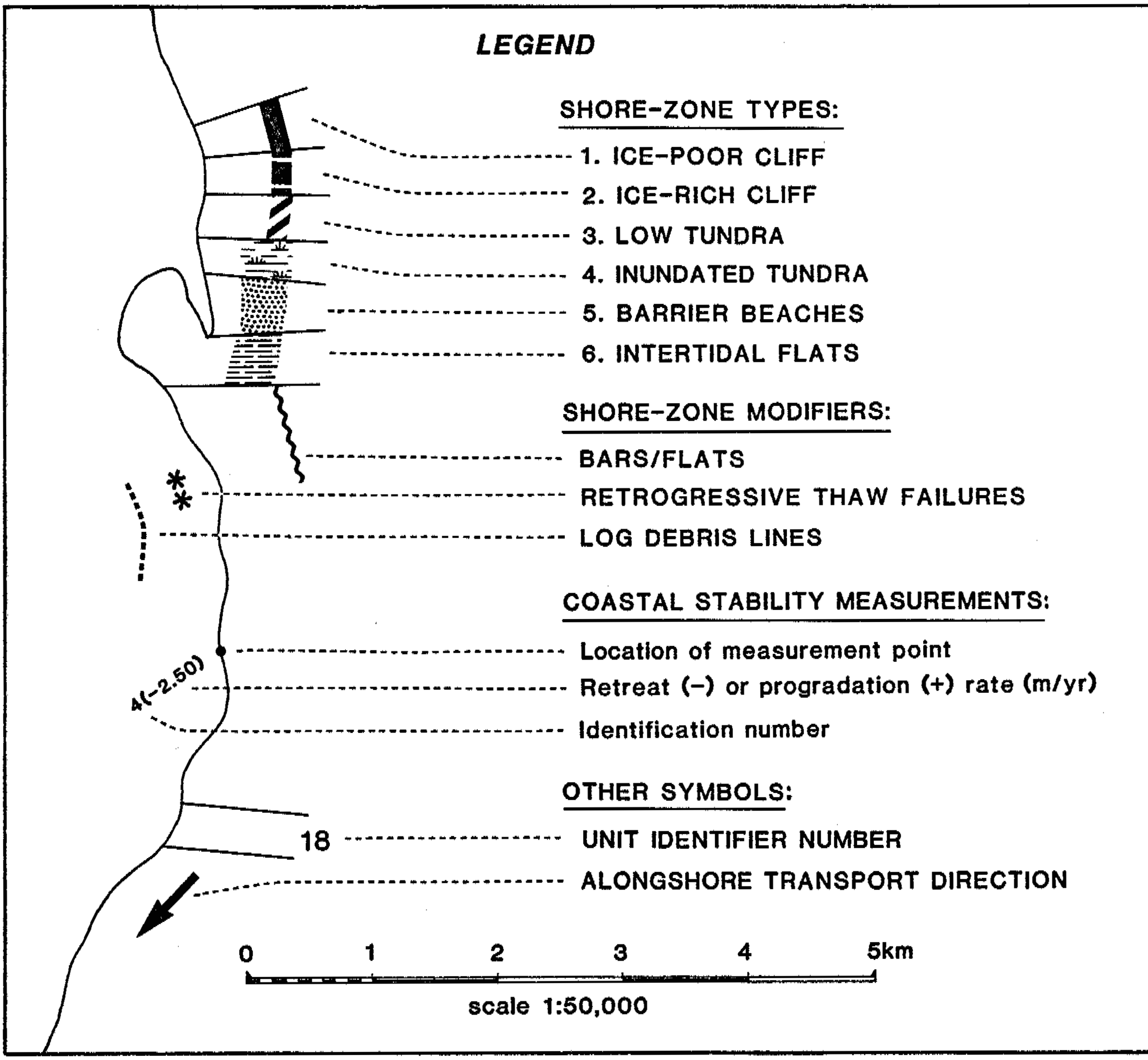
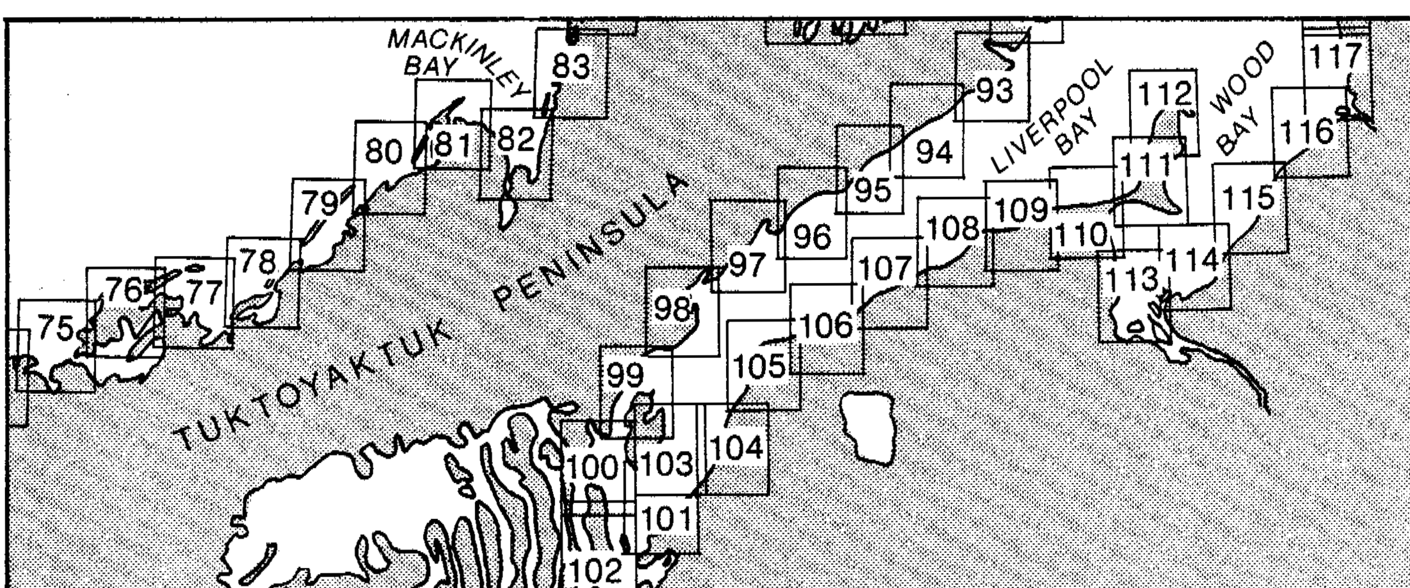
104
105
106
107
108
109
94
85
86
87
88
89
90
91
92
93
1(-6.08)
2(-0.67)
3(-0.08)
4(-0.63)
5(-0.42)
6(0.79)
7(-4.17)
8(-0.33)
9(-0.17)
10(-1.17)
50
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75
76
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83
93
94
95
96
97
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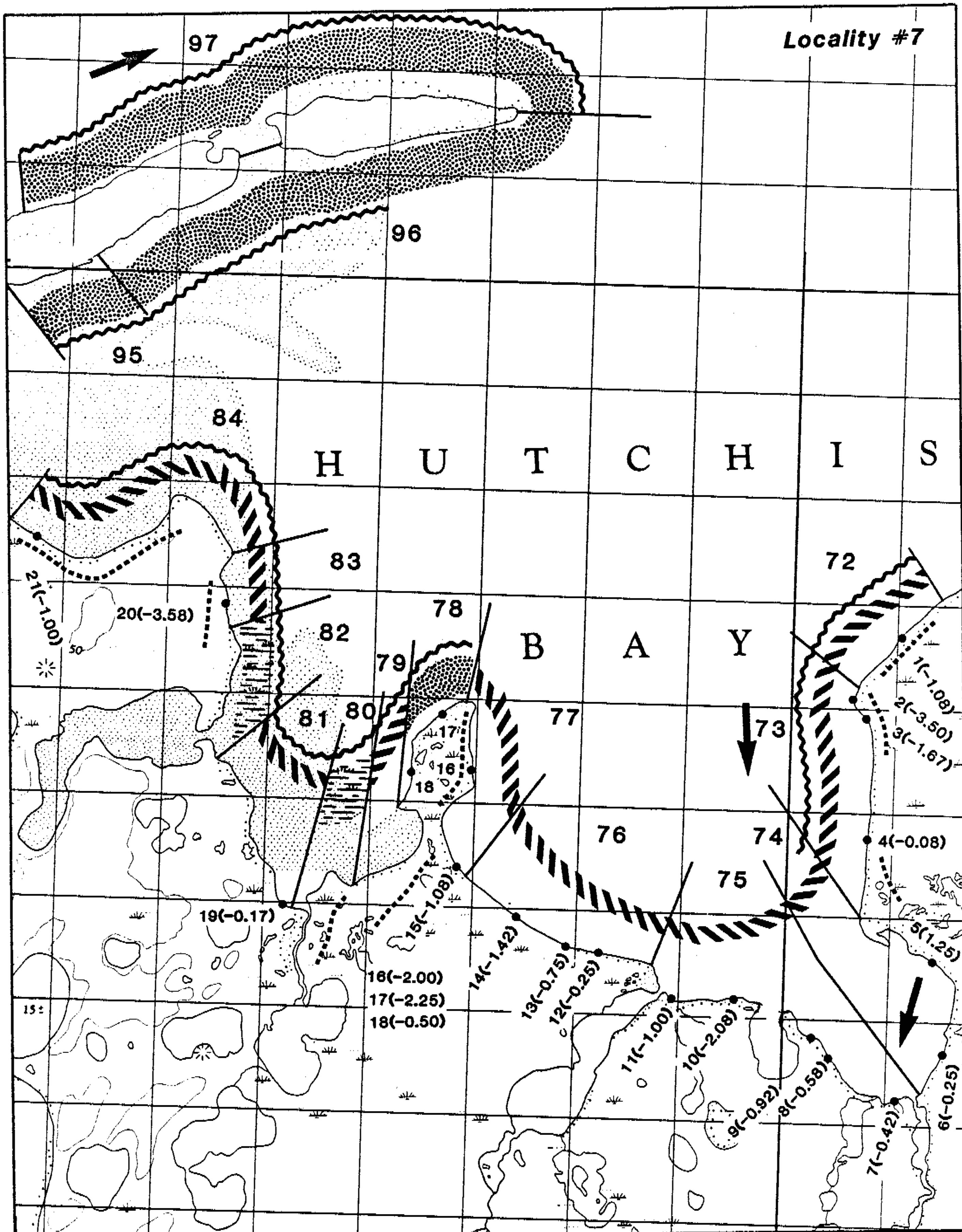
Locality #7
97
96
95
84
83
82
81
80
79
78
77
76
75
74
73
72
HUTCHIS
BAY
1(-1.08)
2(-3.50)
3(-1.67)
4(-0.08)
5(1.25)
6(-0.25)
7(-0.42)
8(-0.58)
9(-0.92)
10(-2.08)
11(-1.00)
12(-0.25)
13(-0.75)
14(-1.42)
15(-1.08)
16(-2.00)
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20(-3.58)
21(-1.00)
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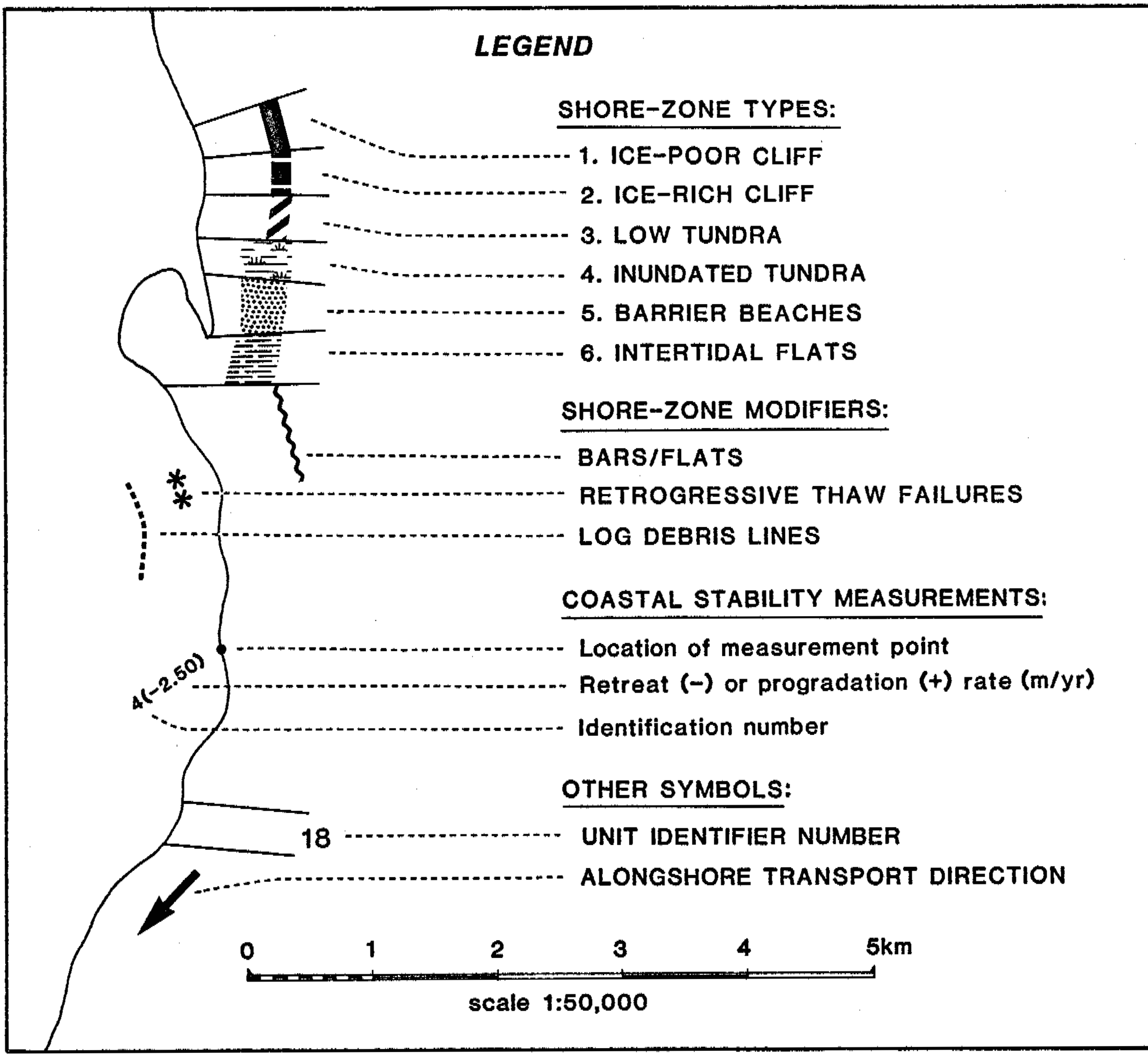
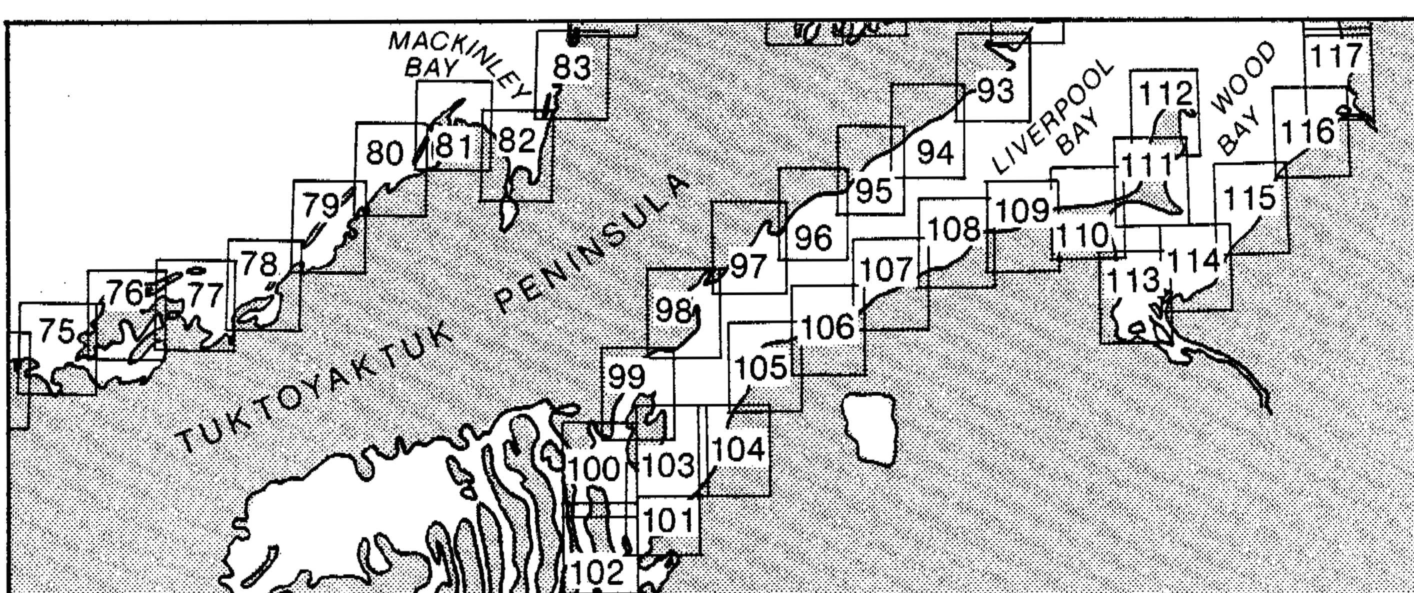
16
18
50
15±



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKINLEY BAY
83
80
81
82
79
78
76
77
75
TUKTOYAKTUK PENINSULA
93
94
95
96
97
98
99
100
101
102
103
104
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108
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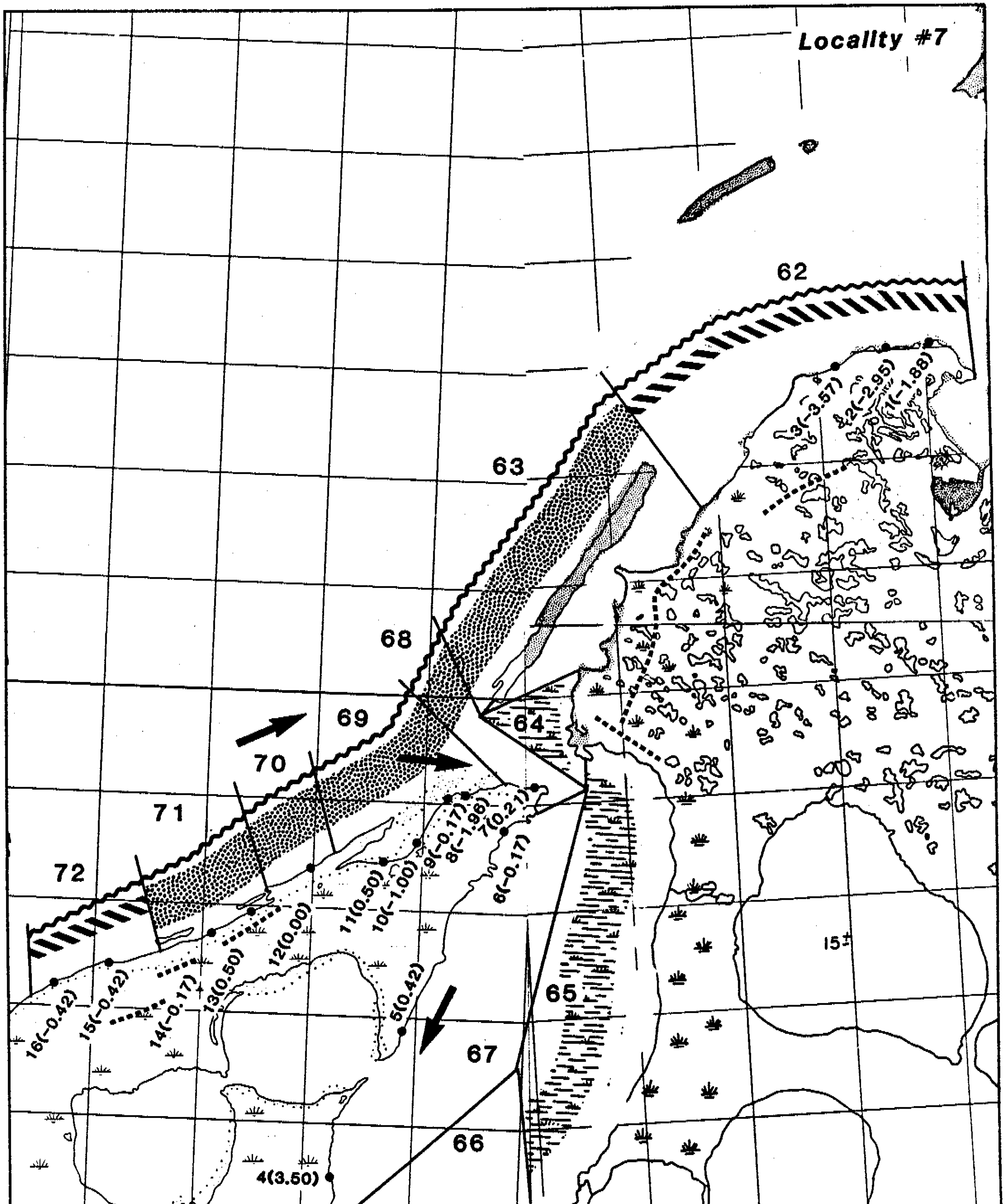
110
LIVERPOOL BAY
111
112
WOOD BAY
113
114
115
116
117


Locality #7
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72
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65
66
67
1(-1.88)
2(-2.95)
3(-3.57)
4(3.50)
5(0.42)
6(-0.17)
7(0.21)
8(-1.96)
9(-0.17)
10(-1.00)
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12(0.00)
13(0.50)
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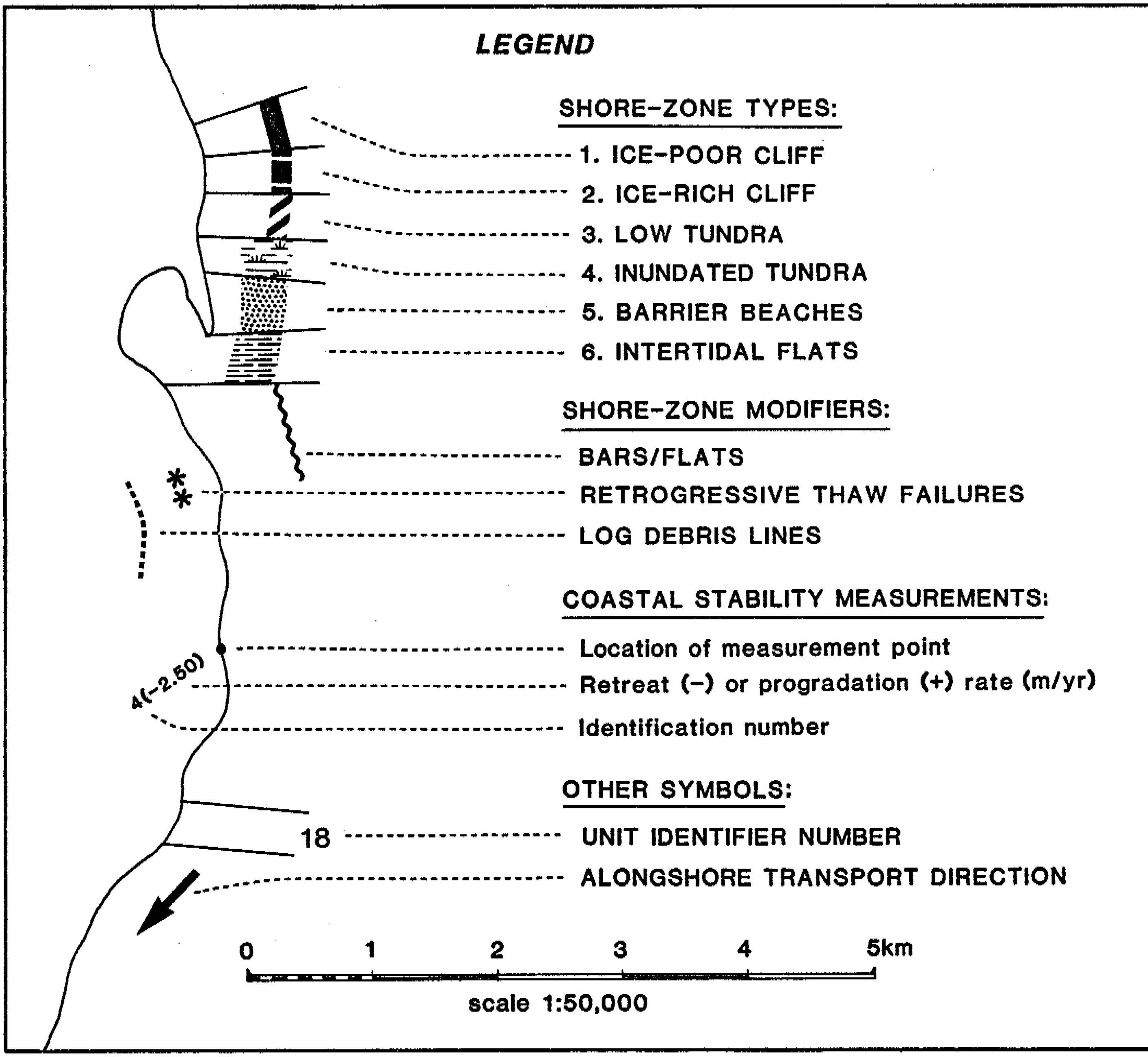
15(-0.42)
16(-0.42)
15±



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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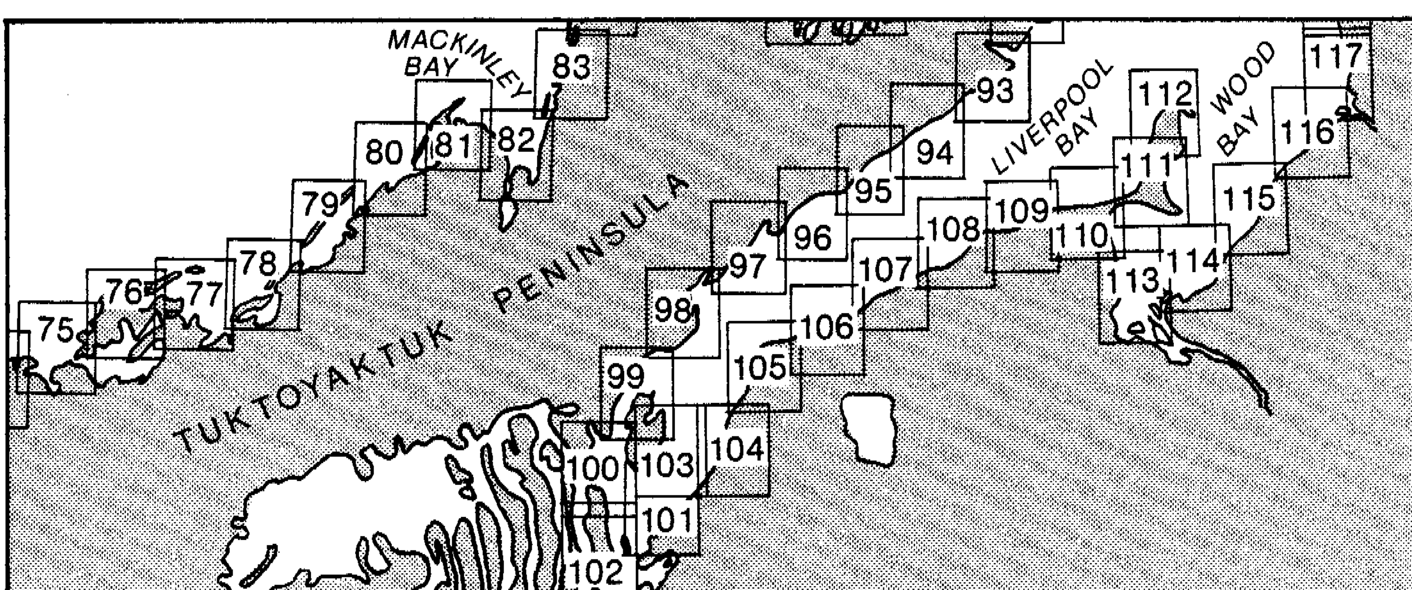
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
76
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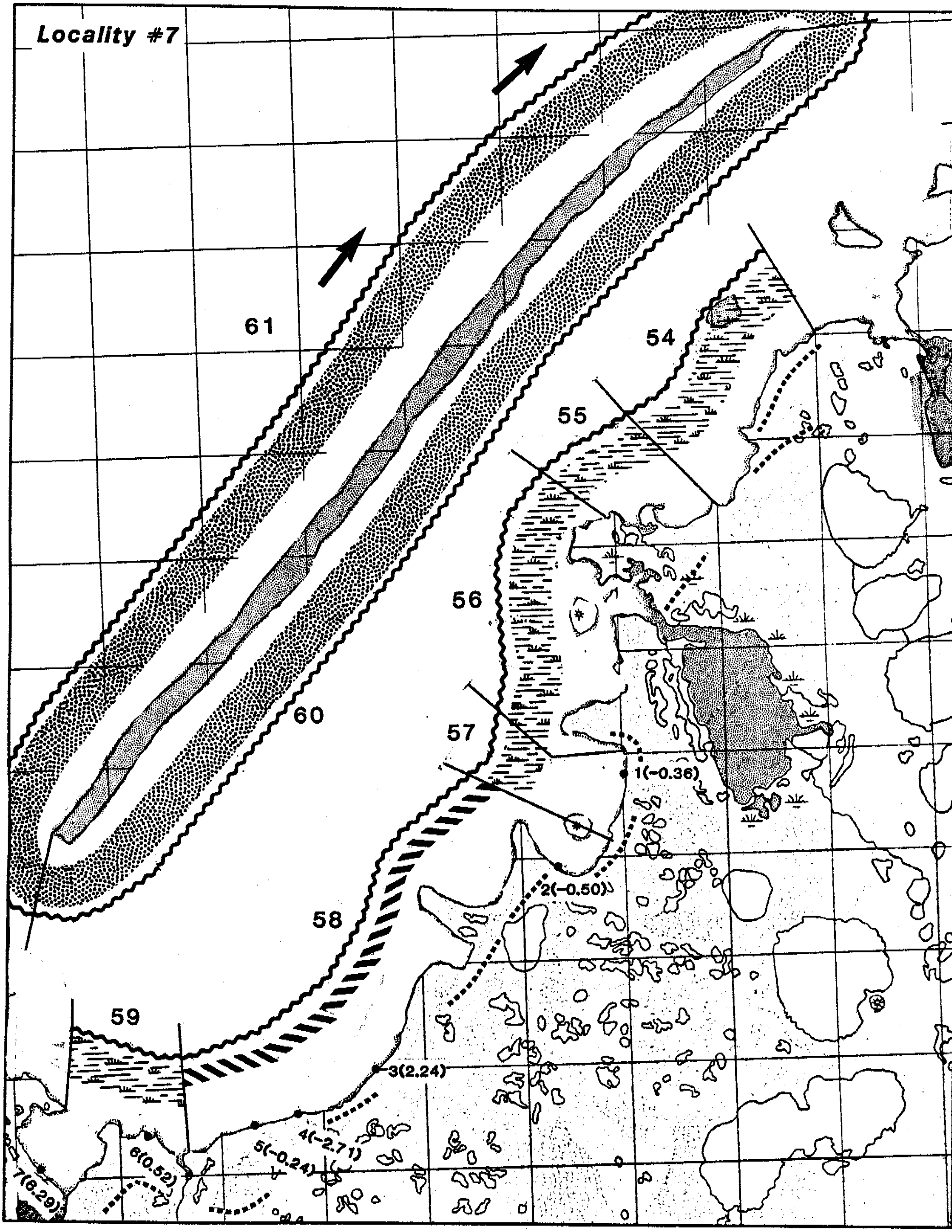

Locality #7
61
54
55
56
60
57
1(−0.36)
2(−0.50)
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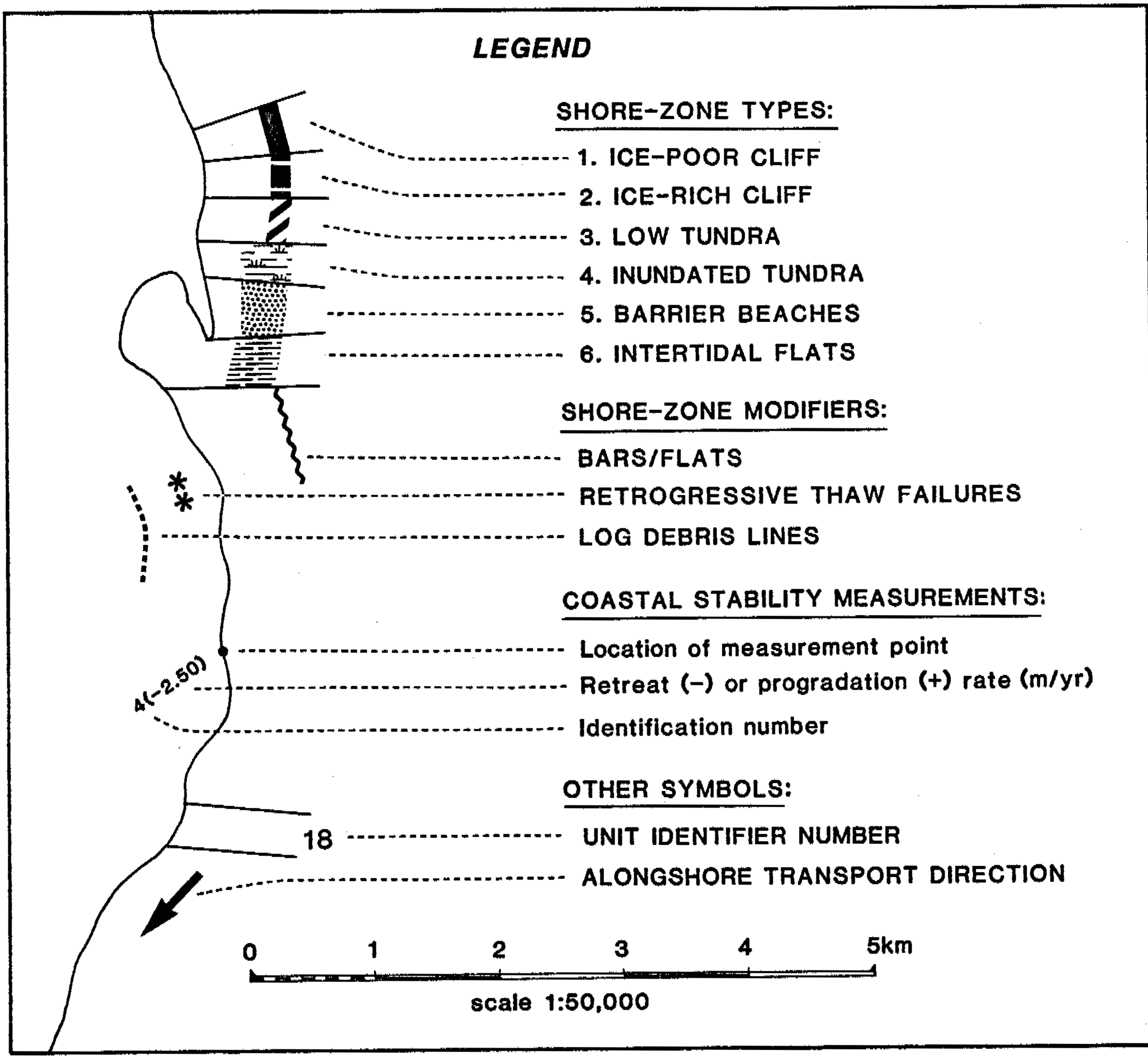
59
3(2.24)
4(−2.71)
5(−0.24)
6(0.52)
7(6.29)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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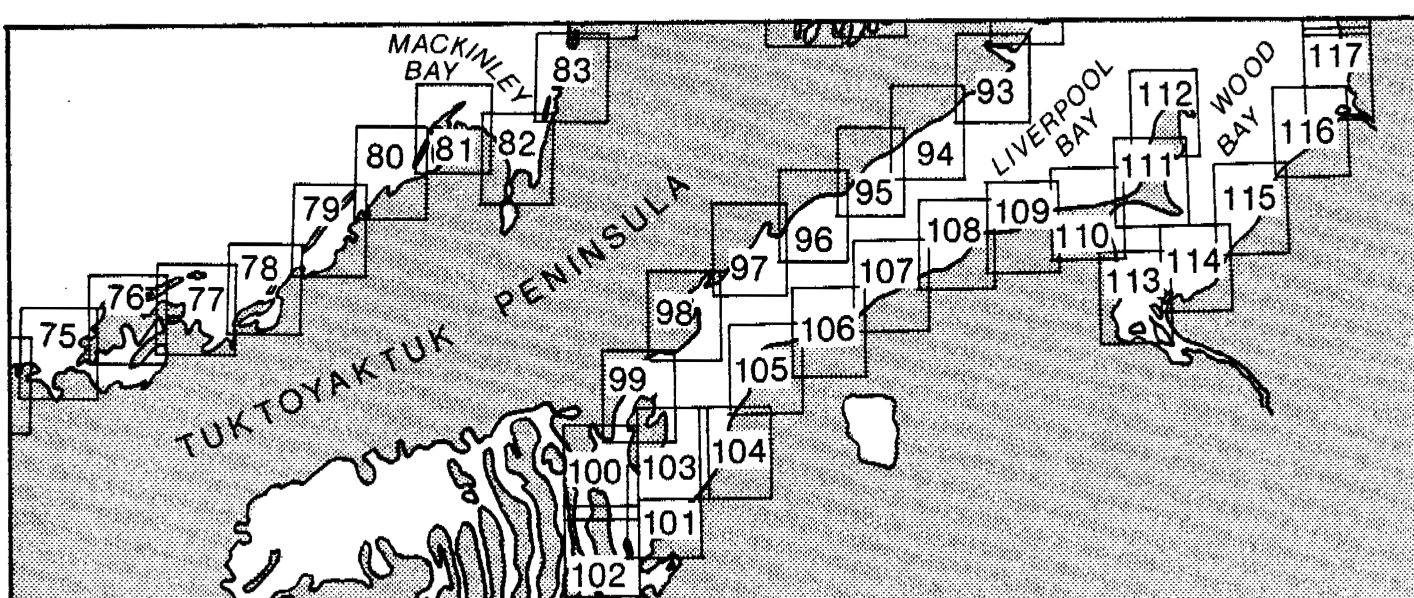
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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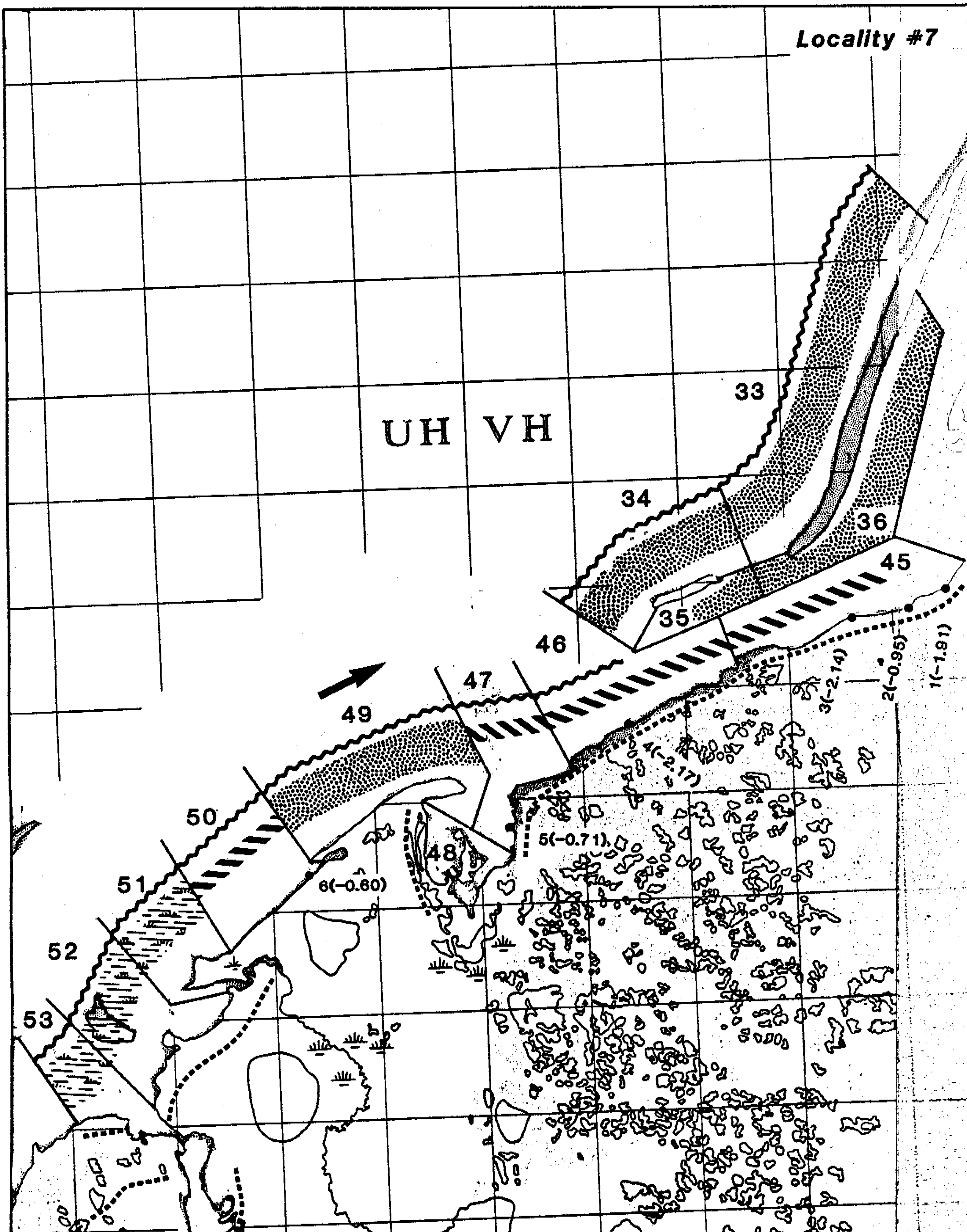
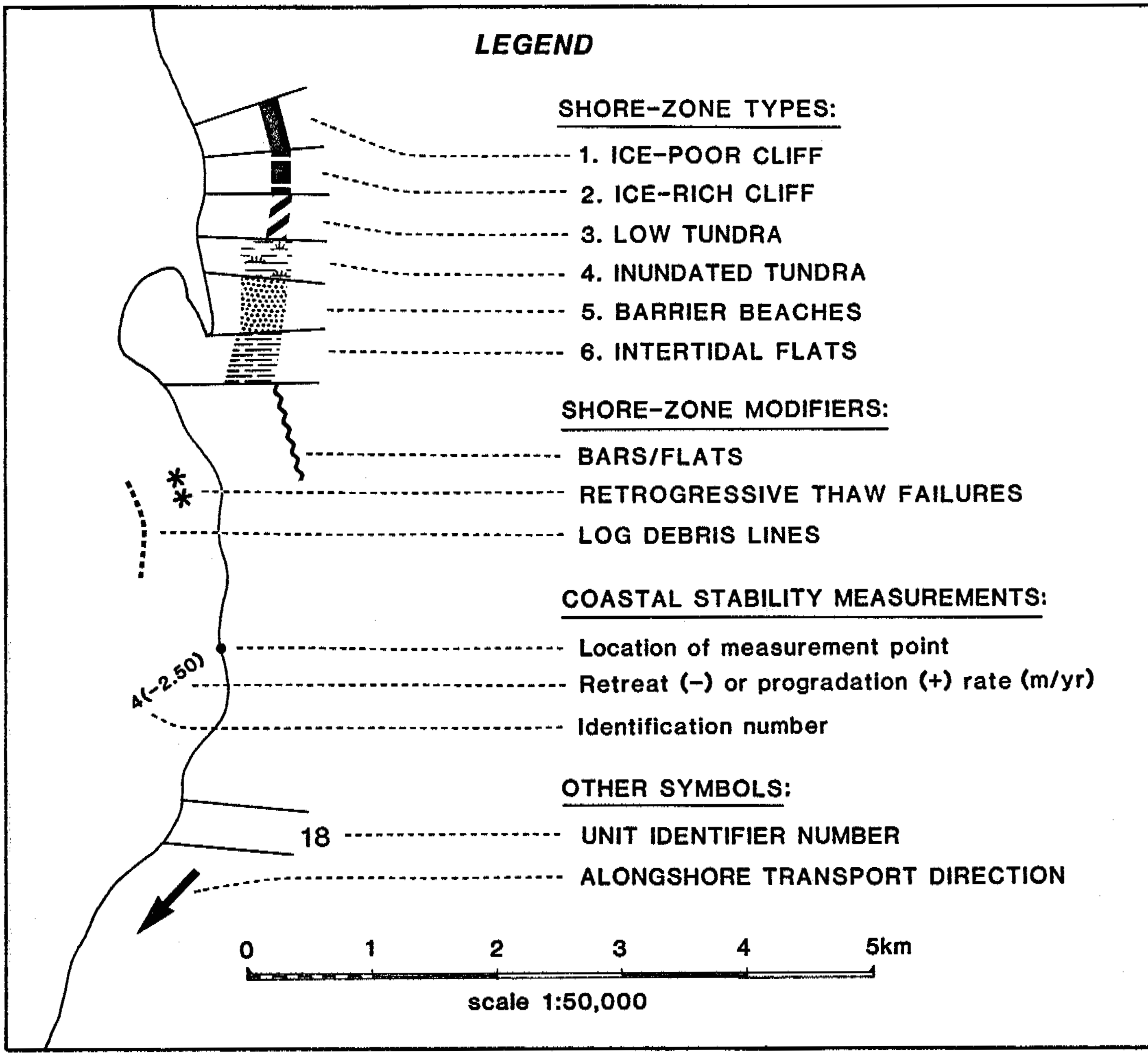
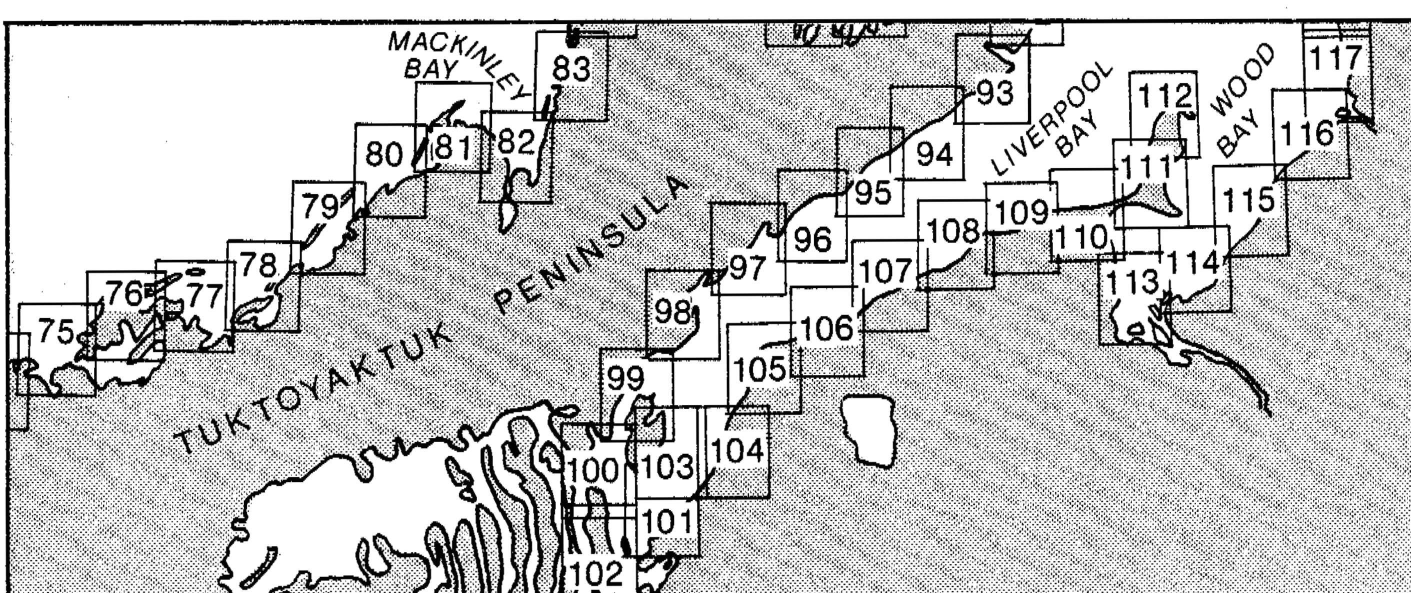
117



Locality #7
UH
VH
33
34
35
36
45
46
47
48
49
50
51
52
53
1(−1.91)
2(−0.95)
3(−2.14)
4(−2.17)
5(−0.71)
6(−0.60)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
76
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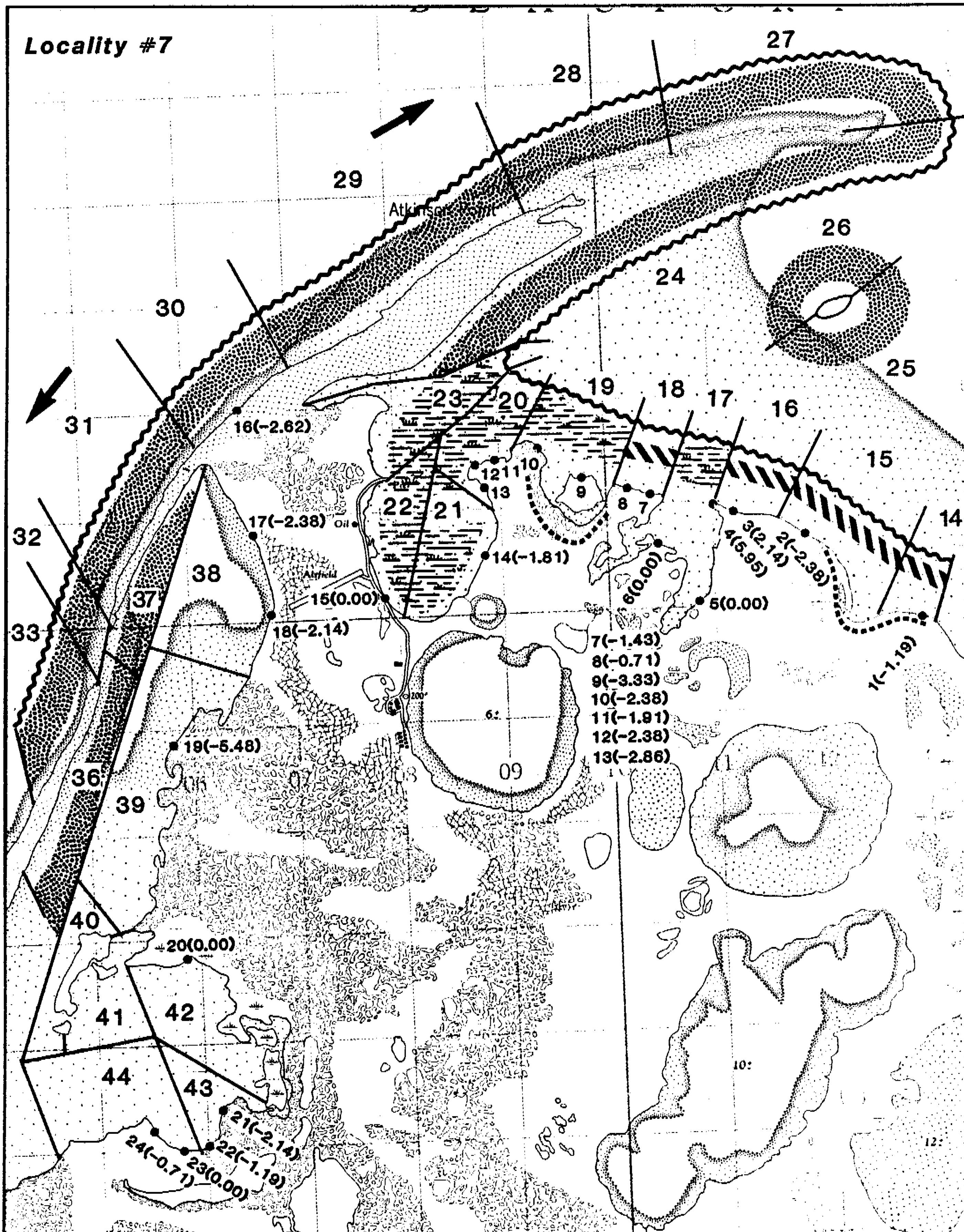
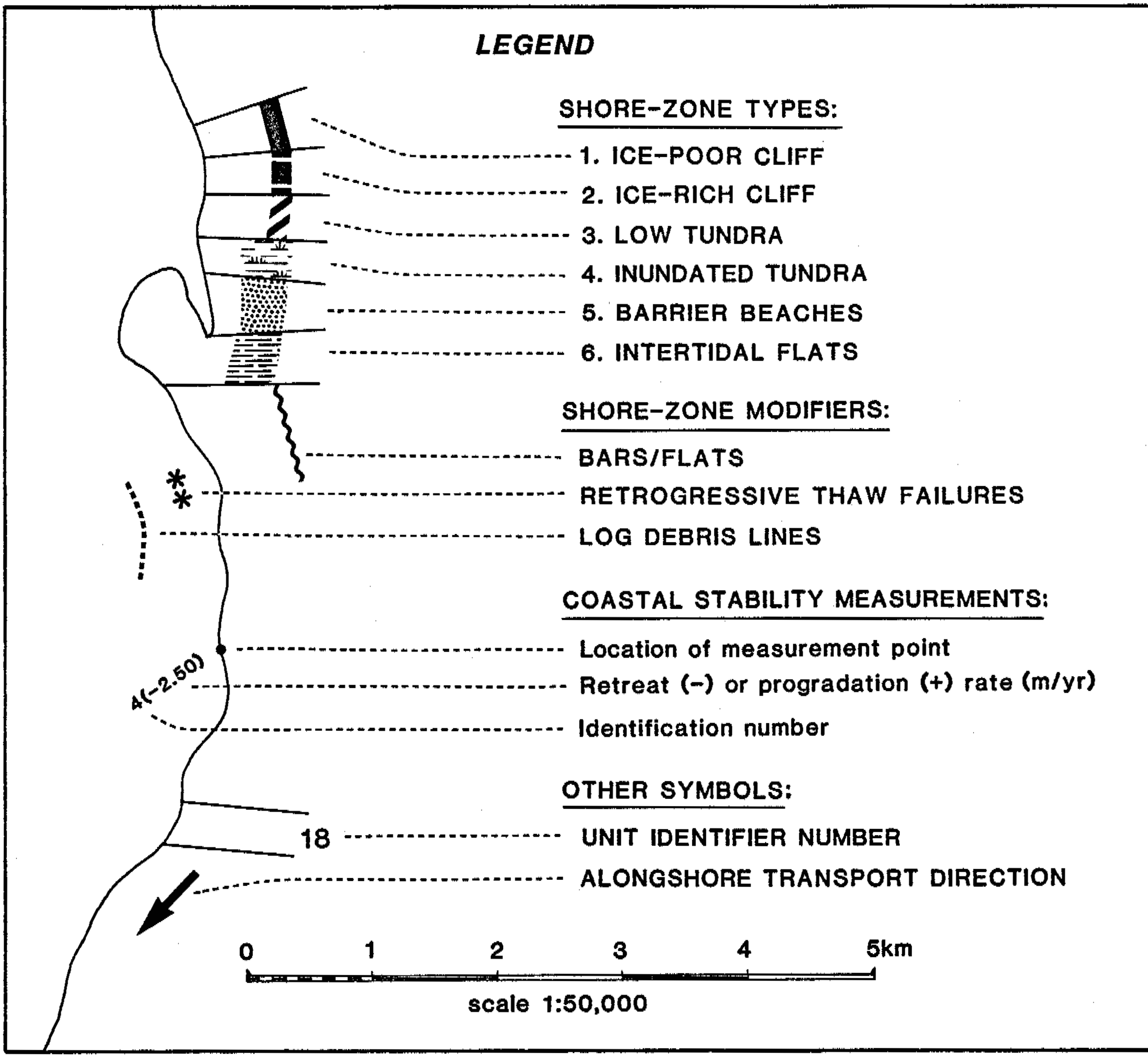


Locality #7
Atkinson Point
Airfield
Oil
16(-2.62)
17(-2.38)
15(0.00)
18(-2.14)
14(-1.81)
19(-5.48)
20(0.00)
21(-2.14)
22(-1.19)
23(0.00)
24(-0.71)
6(0.00)
5(0.00)
4(5.95)
3(2.14)
2(-2.38)
1(-1.19)
7(-1.43)
8(-0.71)
9(-3.33)
10(-2.38)
11(-1.91)
12(-2.38)
13(-2.86)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
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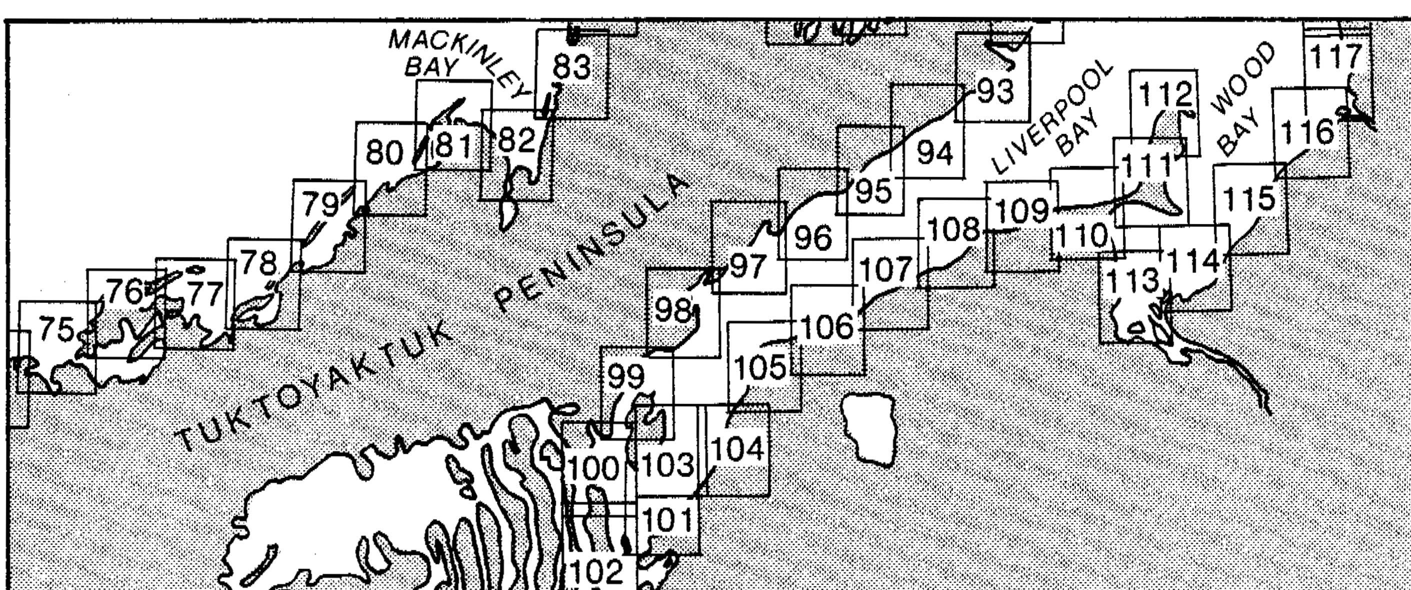
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
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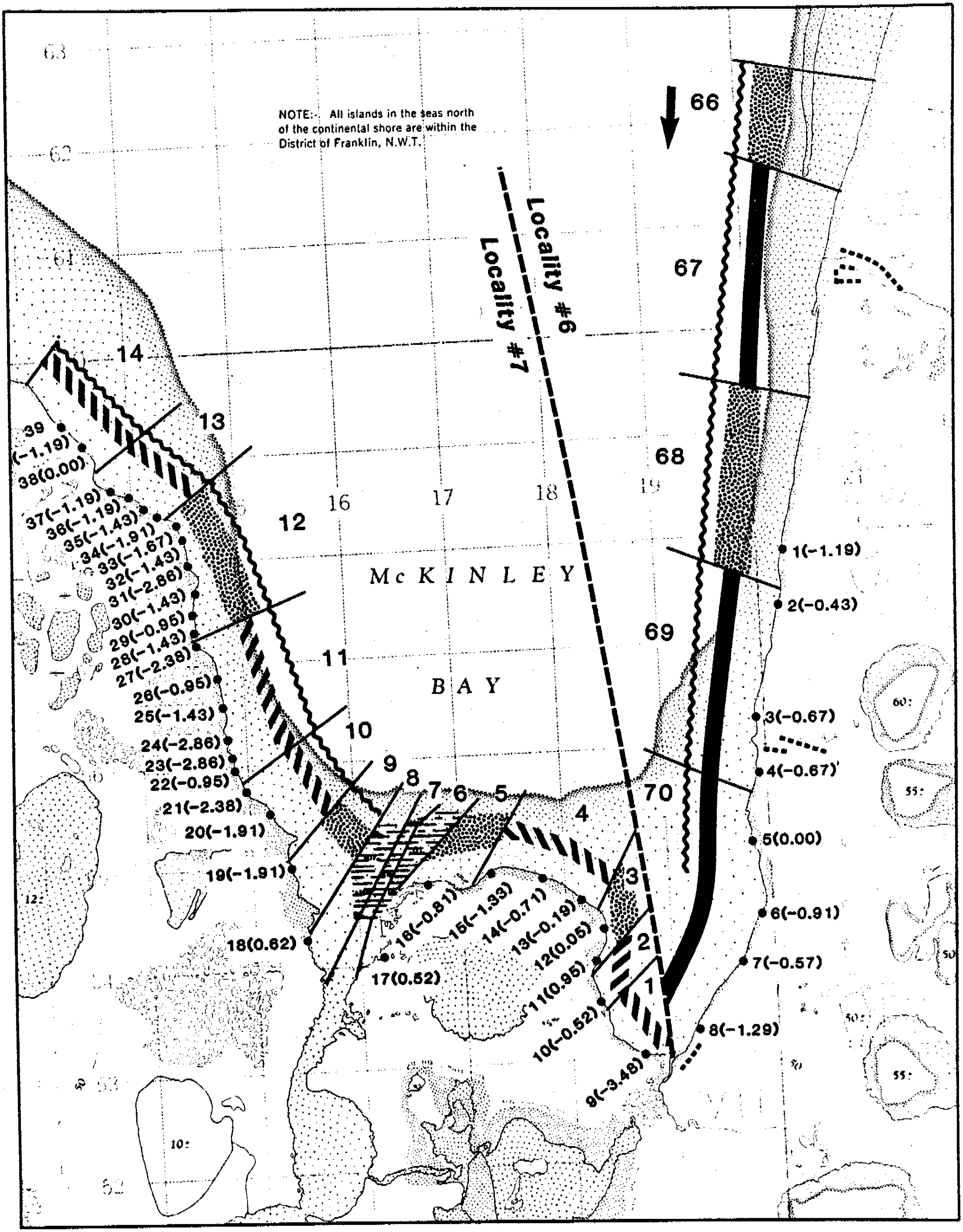
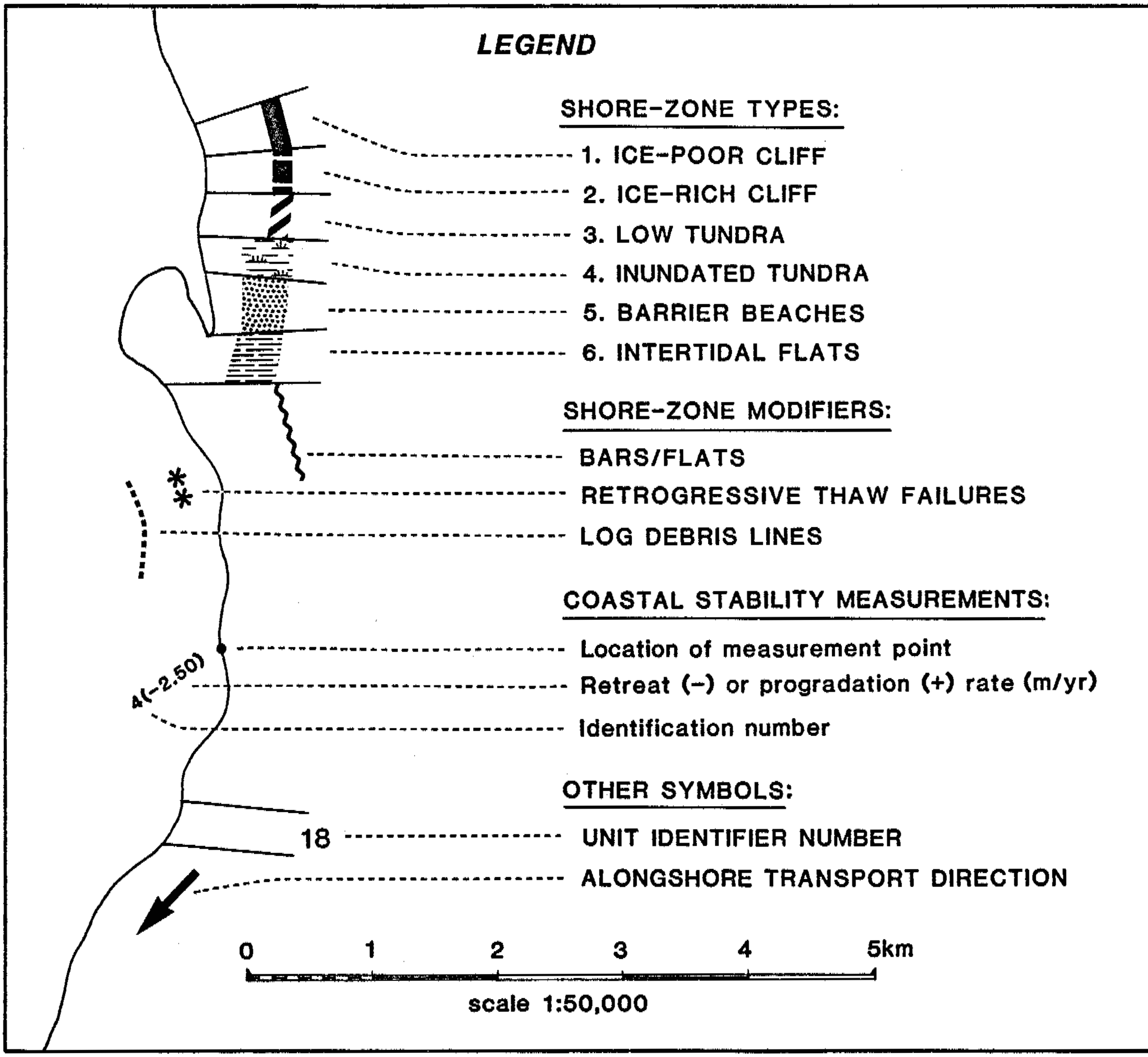
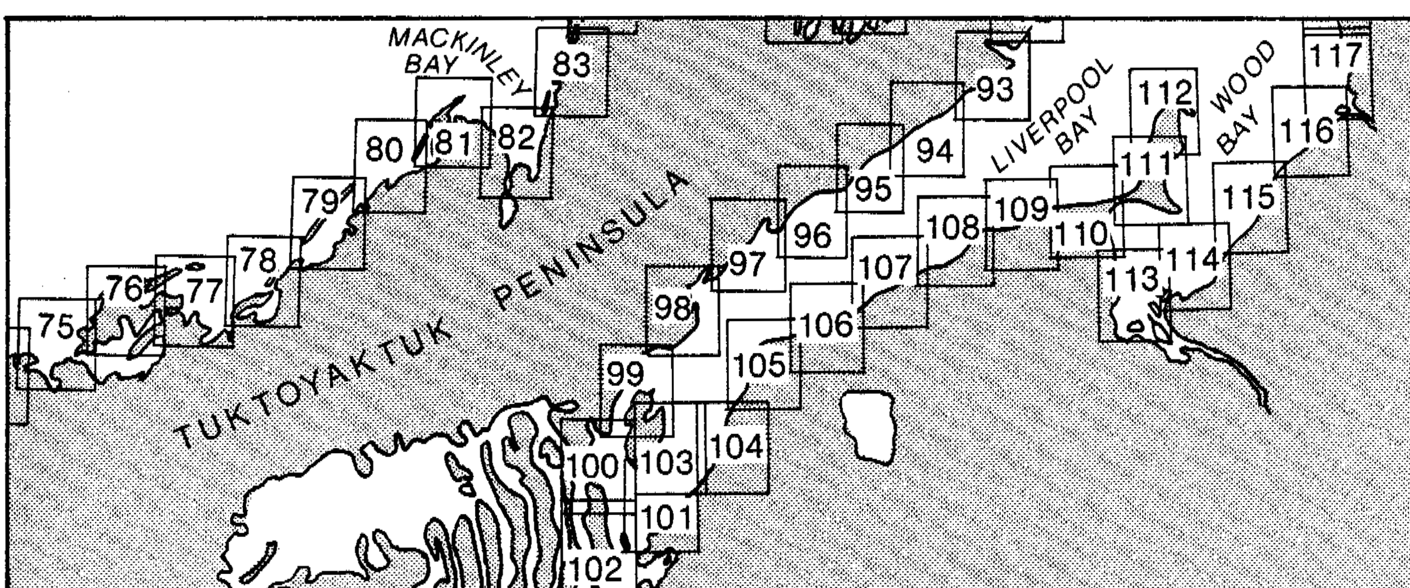

NOTE:- All islands in the seas north of the continental shore are within the District of Franklin, N.W.T.
Locality #6
Locality #7
McKINLEY
BAY
66
67
68
69
70
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1(-1.19)
2(-0.43)
3(-0.67)
4(-0.67)
5(0.00)
6(-0.91)
7(-0.57)
8(-1.29)
9(-3.48)
10(-0.52)
11(0.95)
12(0.05)
13(-0.19)
14(-0.71)
15(-1.33)
16(-0.81)
17(0.52)
18(0.62)
19(-1.91)
20(-1.91)
21(-2.38)
22(-0.95)
23(-2.86)
24(-2.86)
25(-1.43)
26(-0.95)
27(-2.38)
28(-1.43)
29(-0.95)
30(-1.43)
31(-2.86)
32(-1.43)
33(-1.67)
34(-1.91)
35(-1.43)
36(-1.19)
37(-1.19)
38(0.00)
39
(-1.19)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75
76
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93
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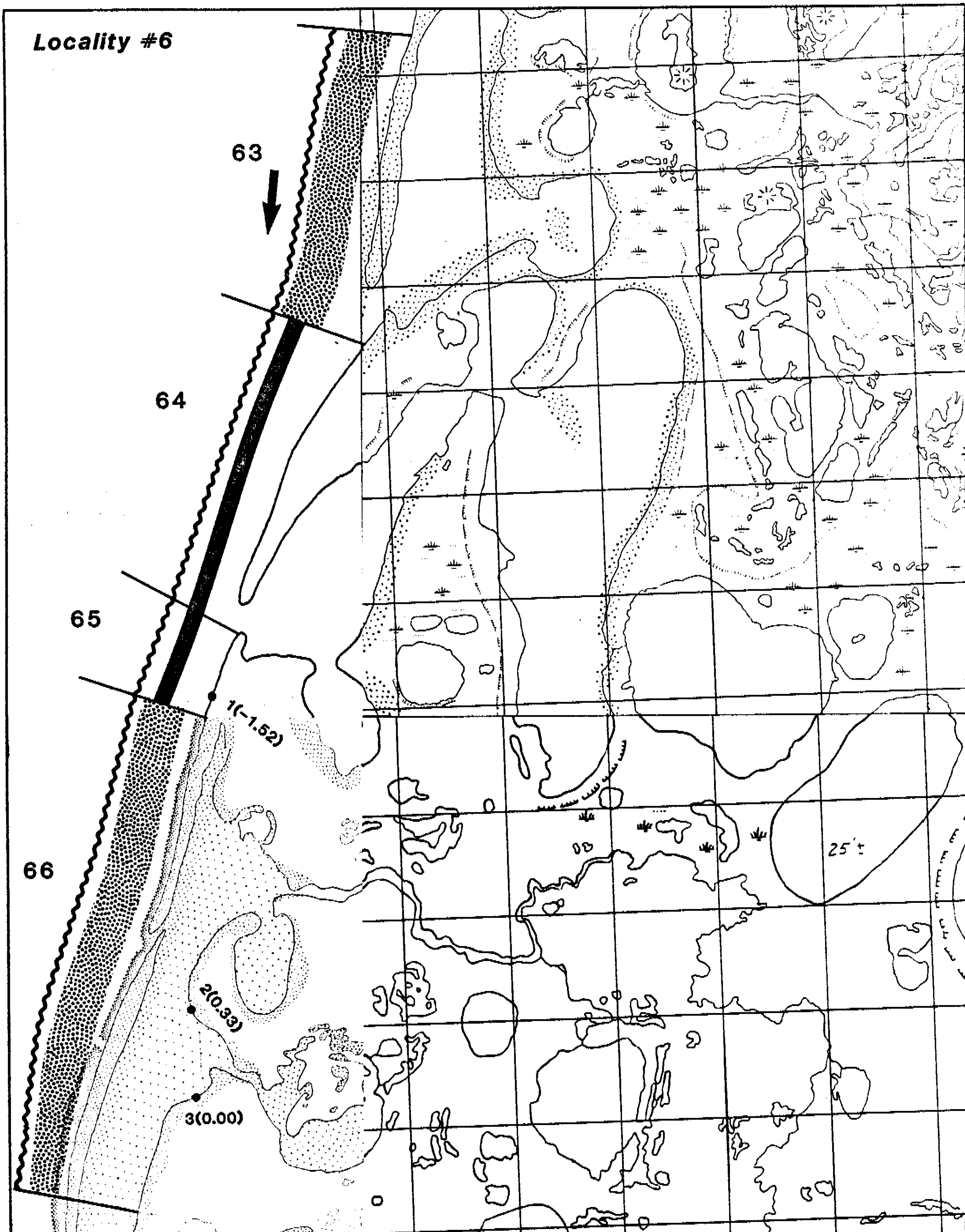
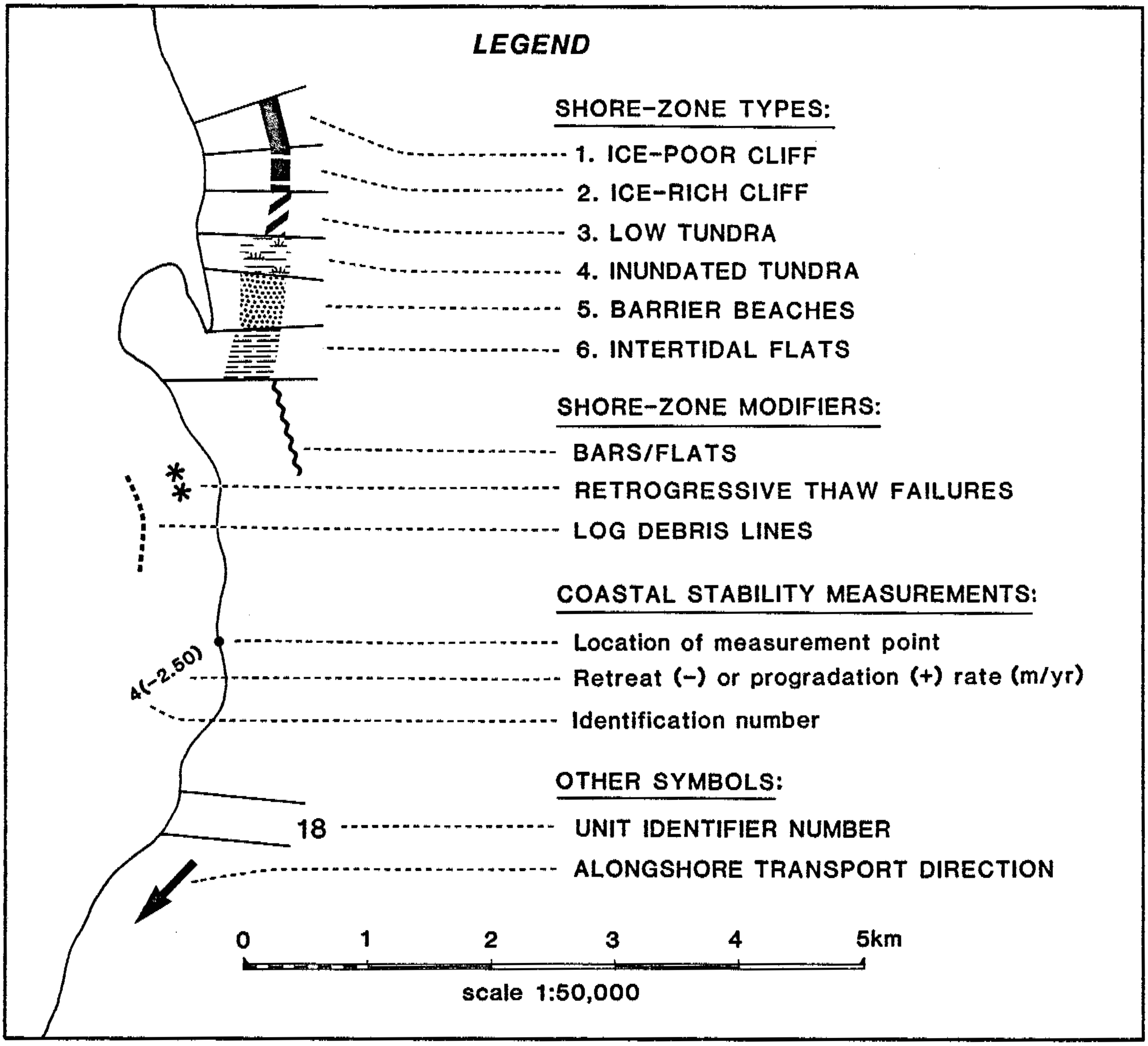
116
117


Locality #6
63
64
65
66
1(-1.52)
2(0.33)
3(0.00)
25'±



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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BARS/FLATS
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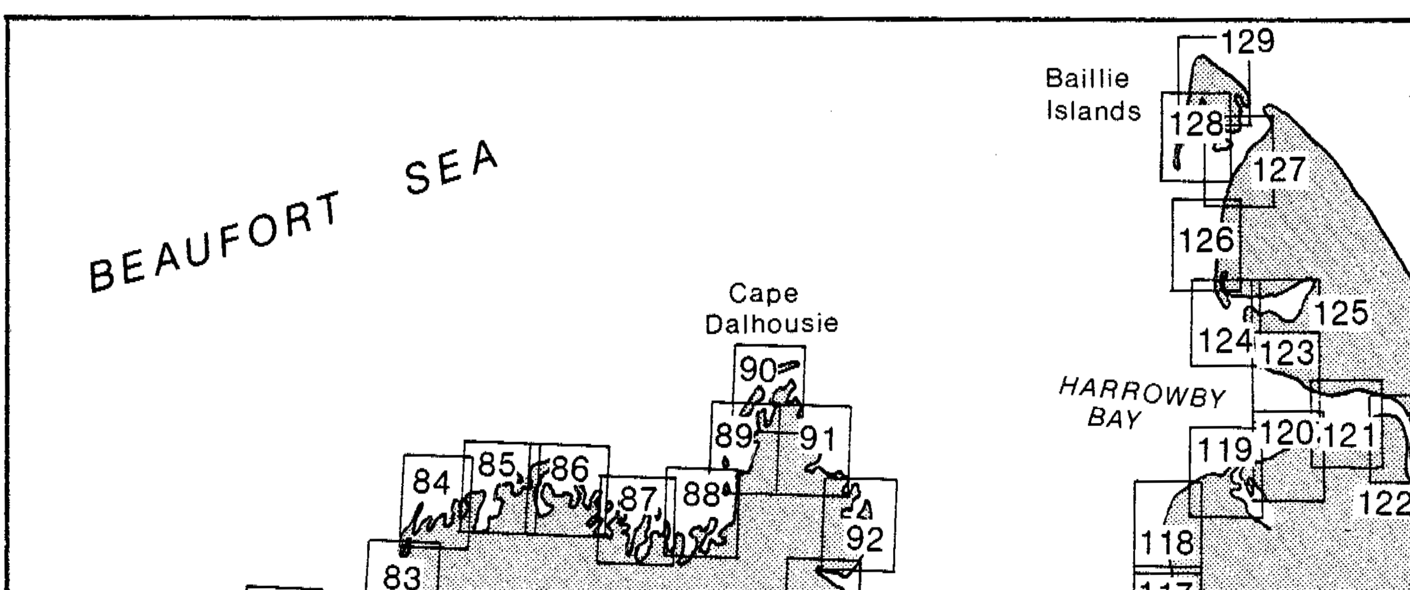
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
127
126
125
124
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118
117
92
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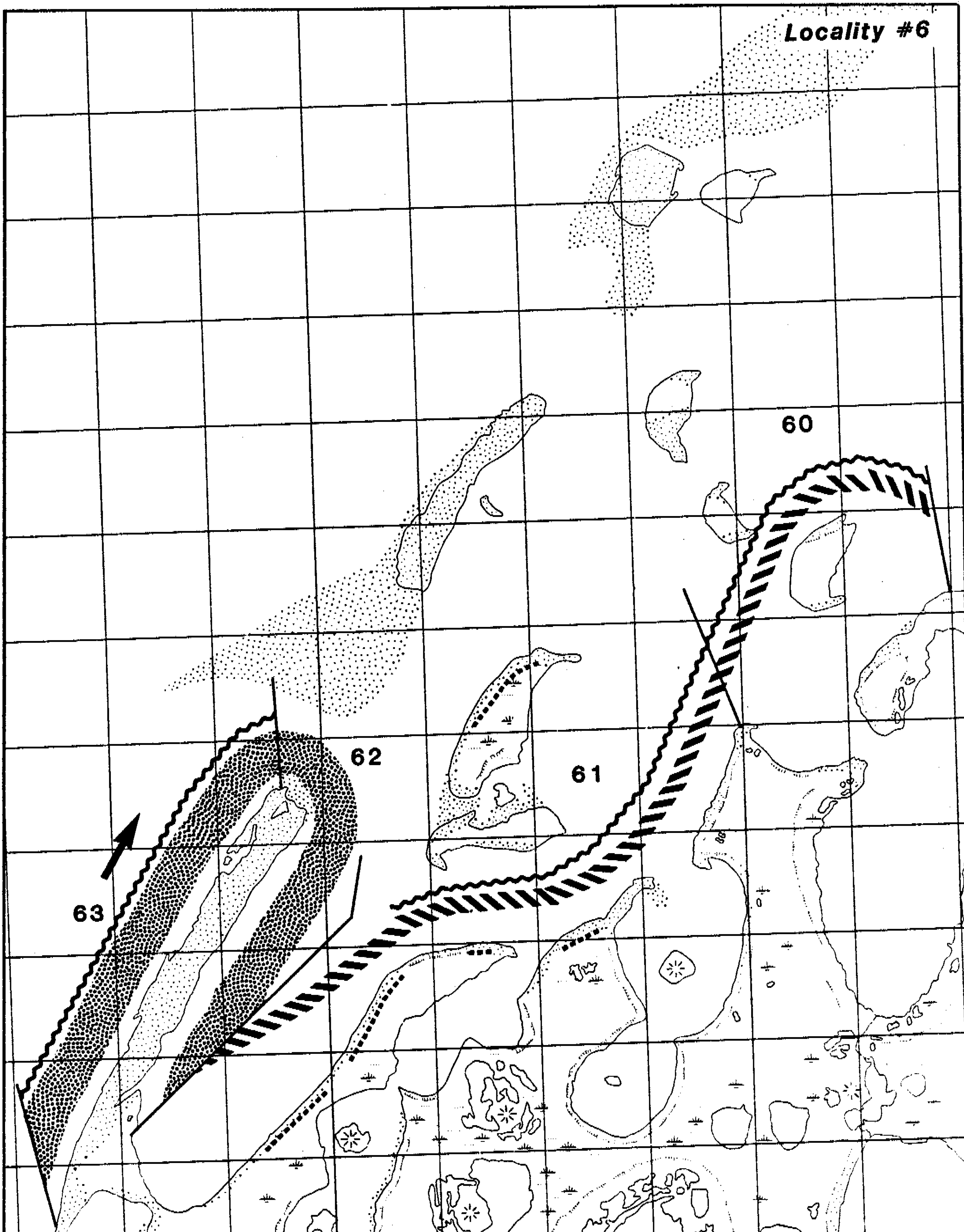
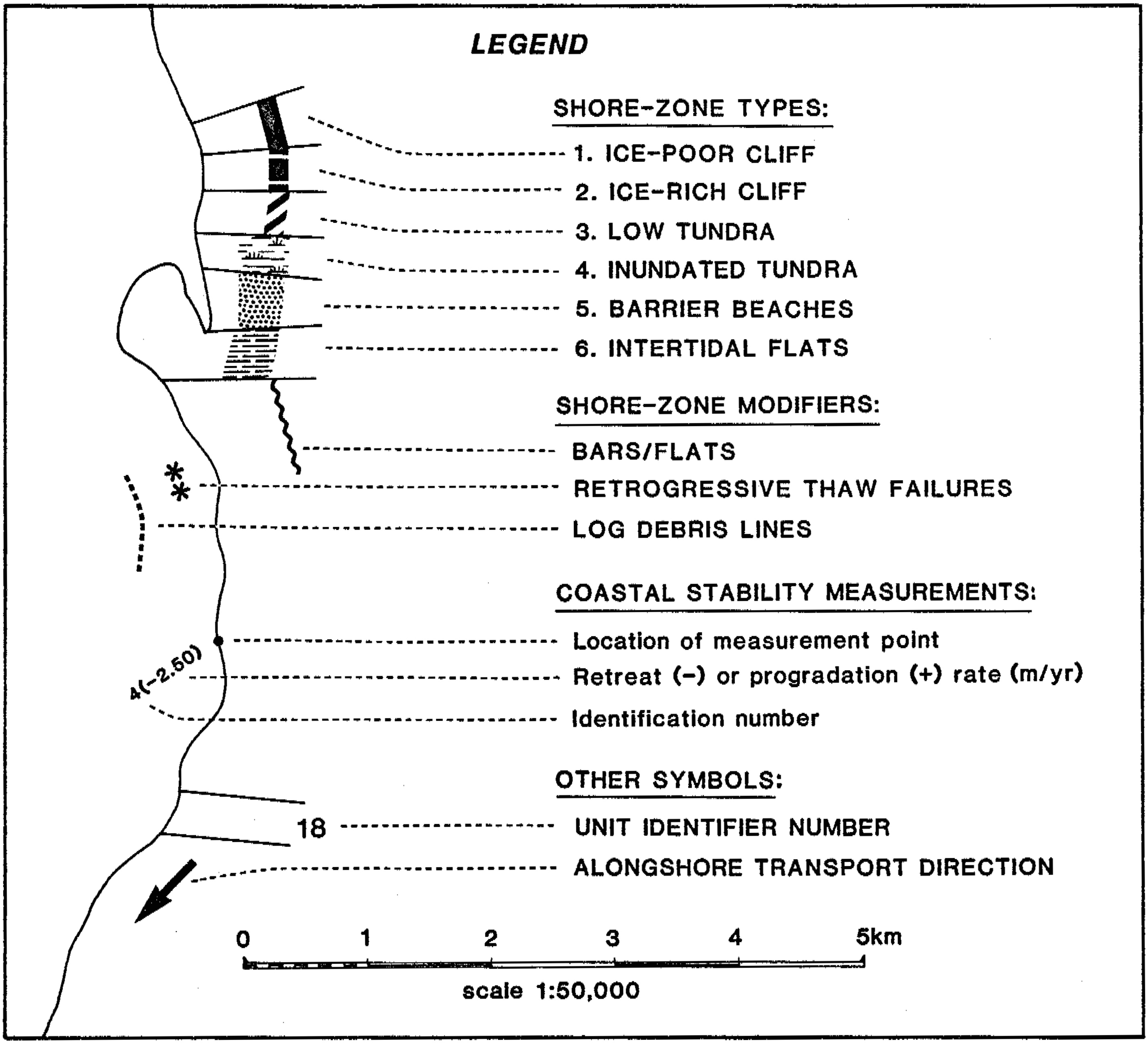
85
84
83


Locality #6
60
61
62
63


LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
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4(-2.50)
Location of measurement point
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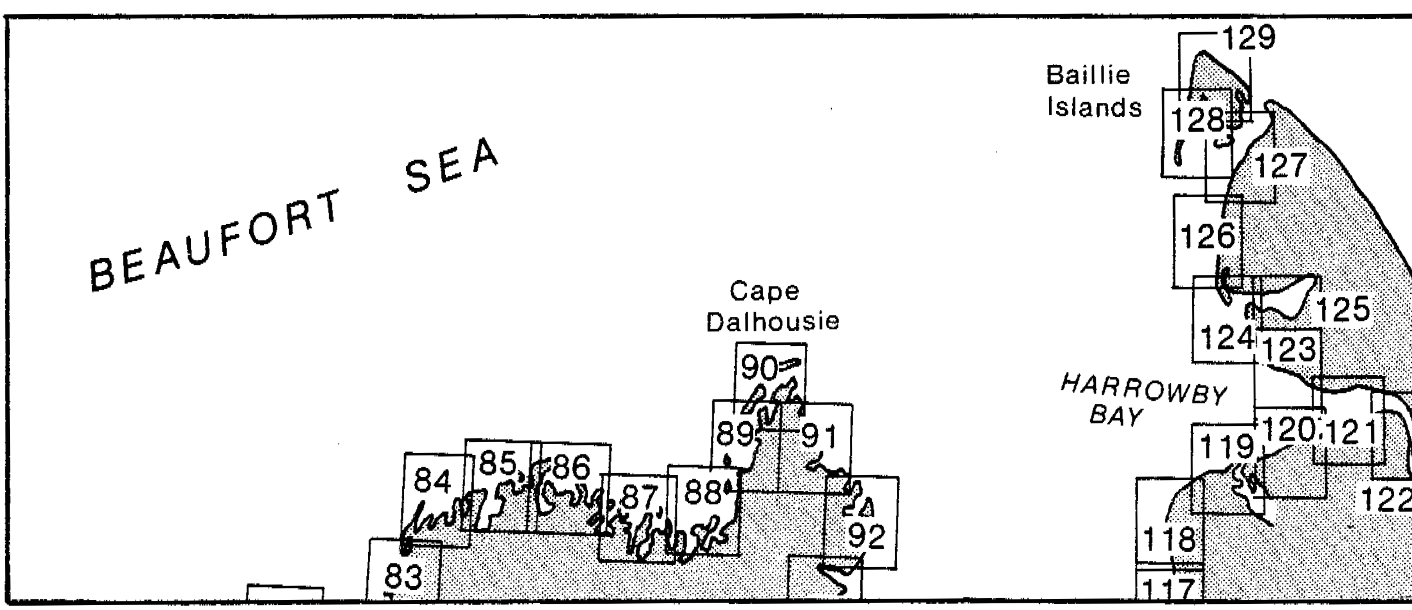
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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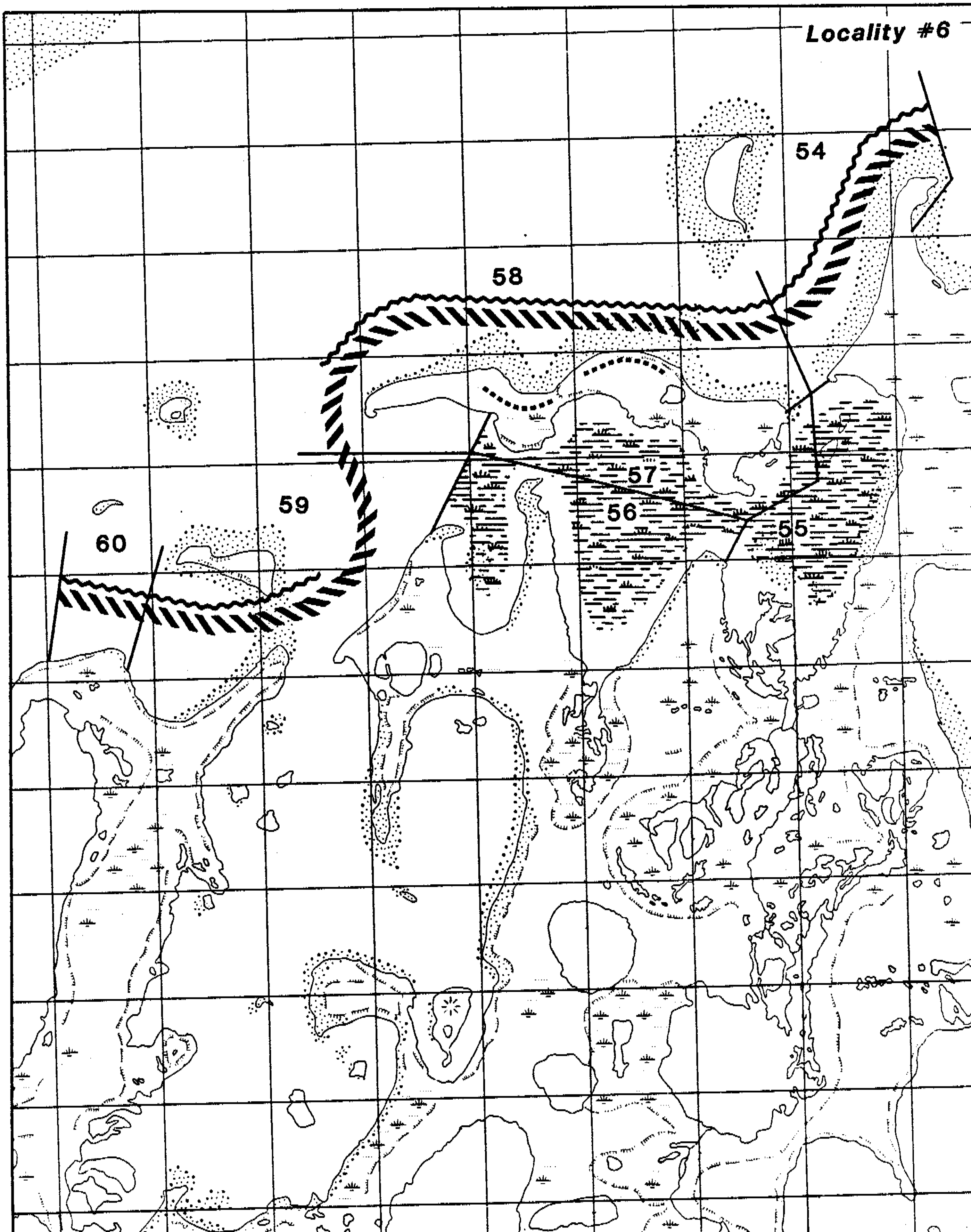
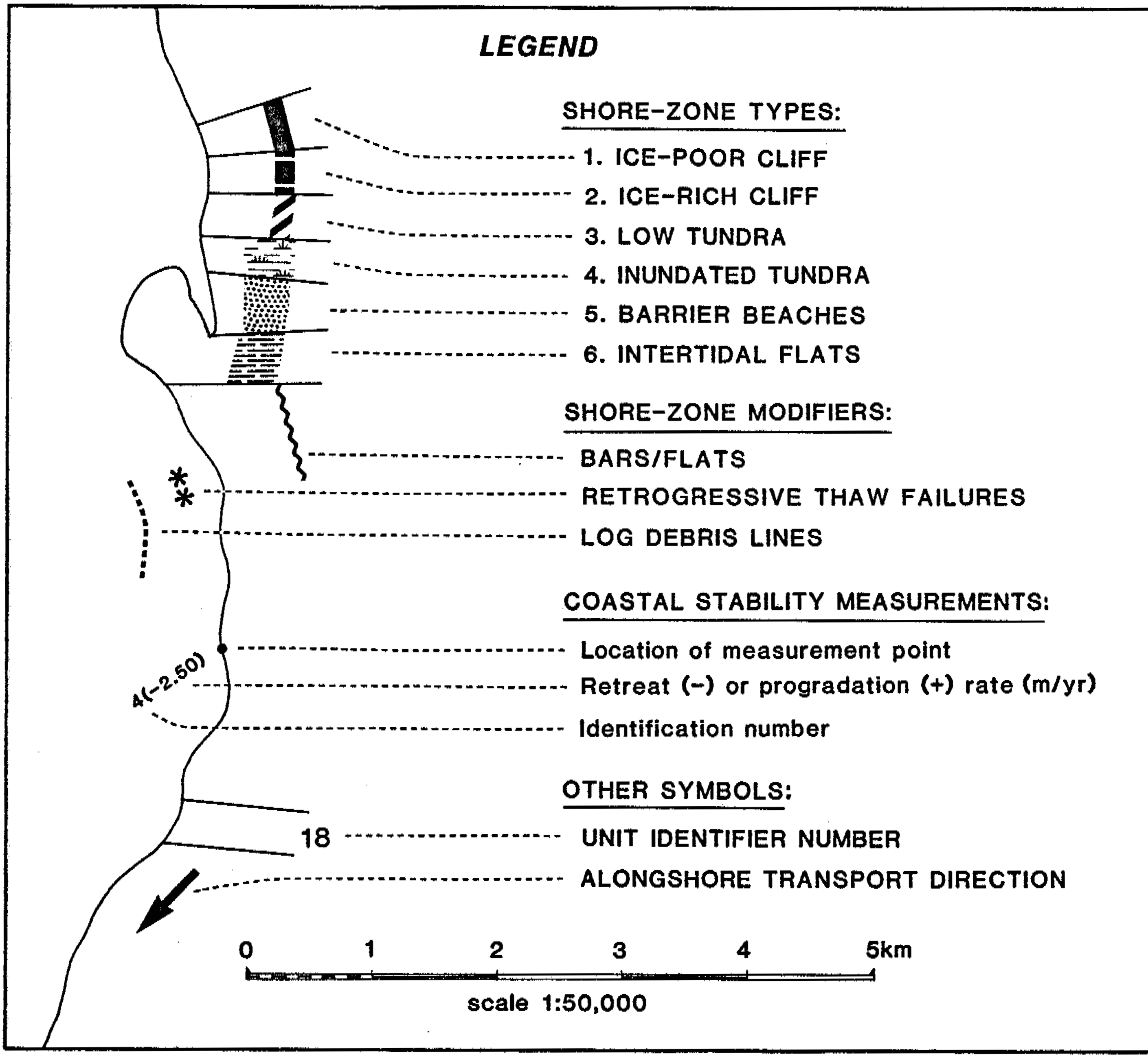

Locality #6
54
58
57
56
55
59
60


LEGEND
SHORE-ZONE TYPES:
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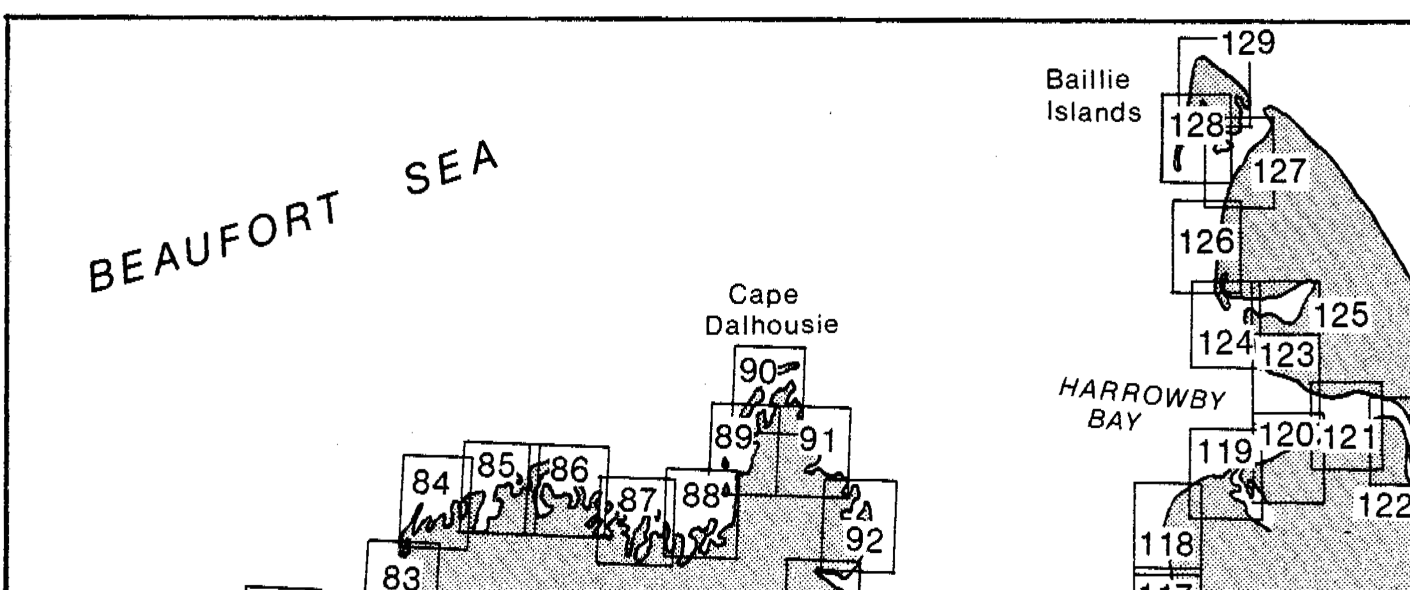
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Cape Dalhousie
Baillie Islands
HARROWBY BAY
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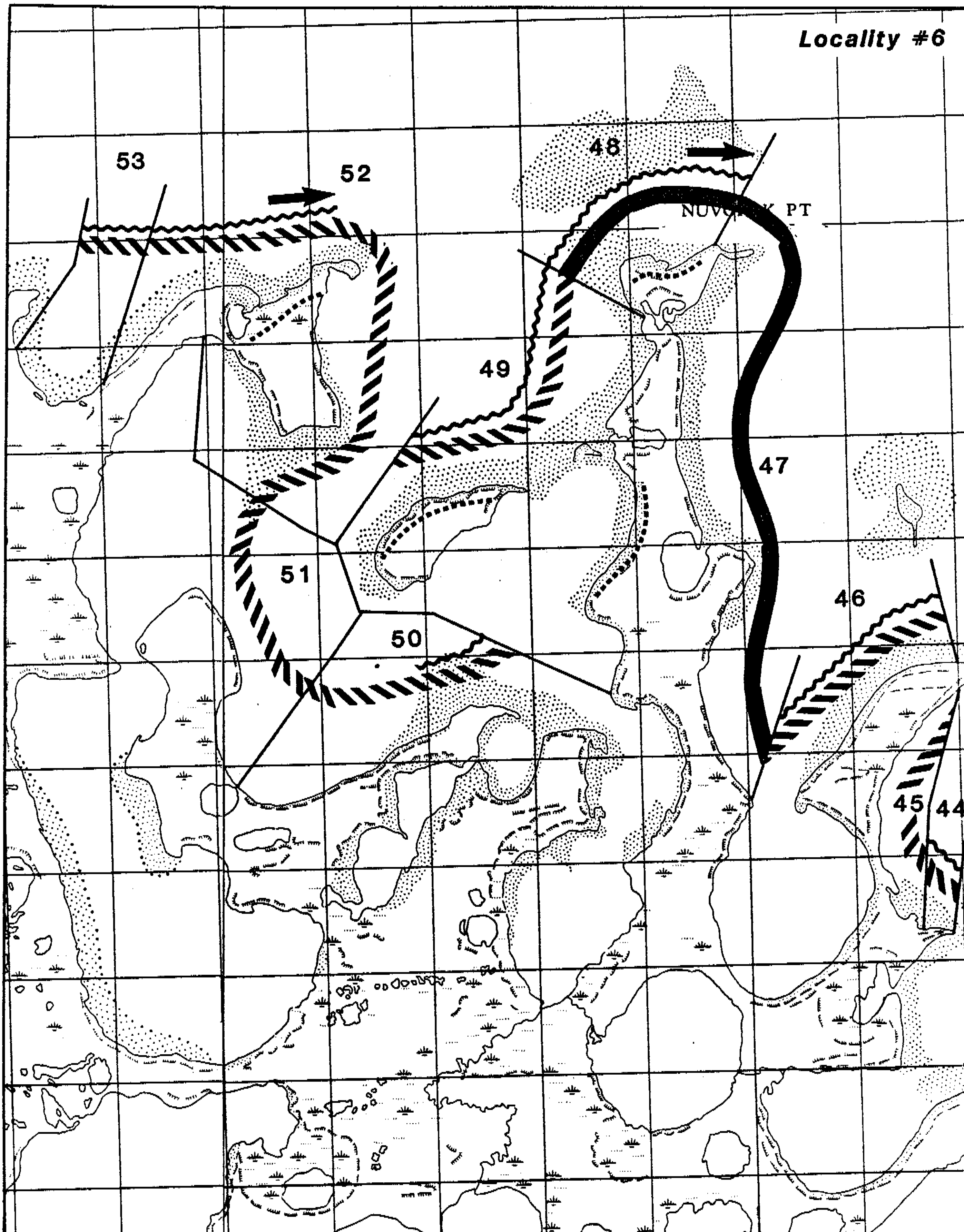
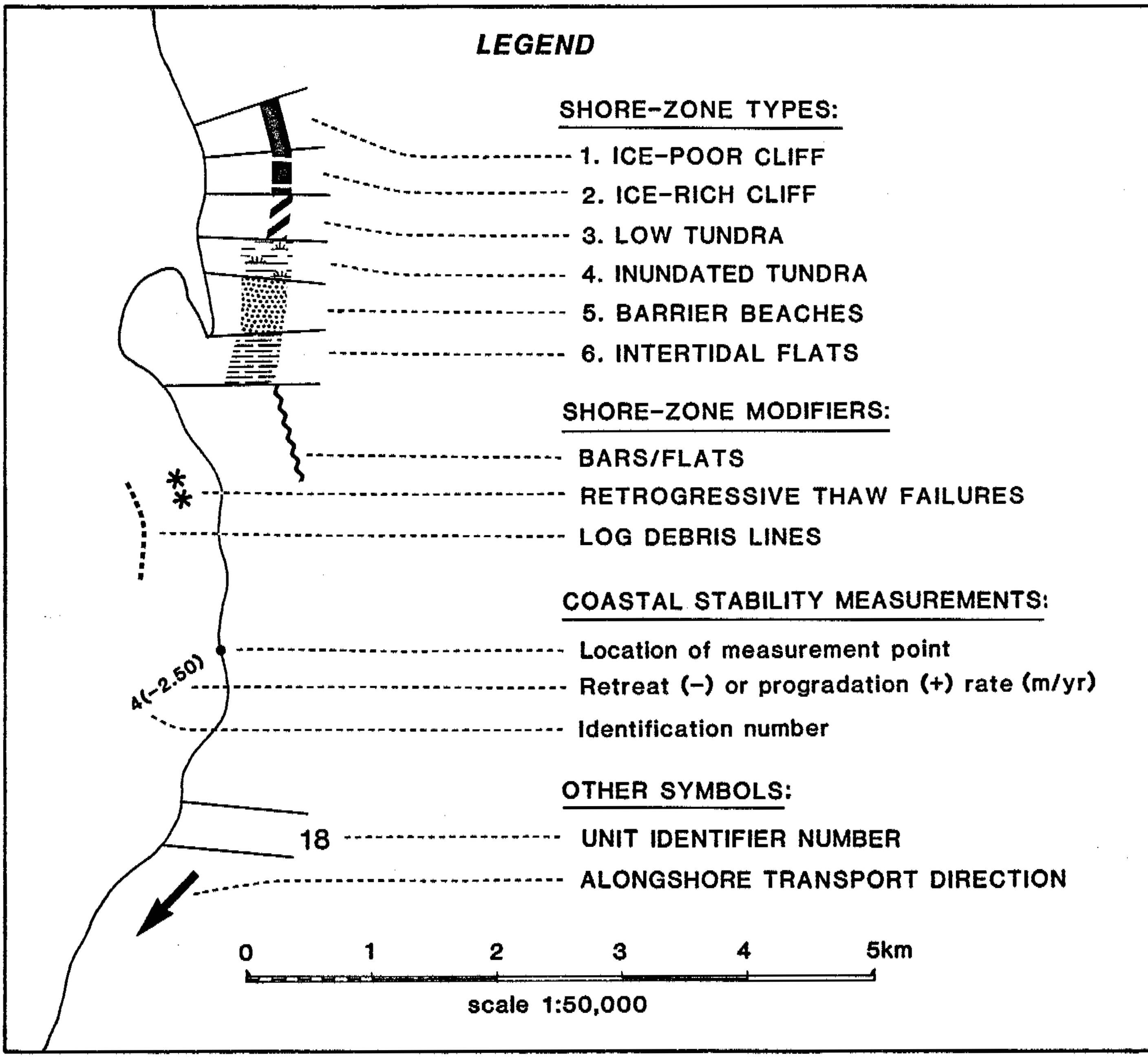


Locality #6
53
52
48
NUVO K PT
49
47
51
46
50
45
44


LEGEND
SHORE-ZONE TYPES:
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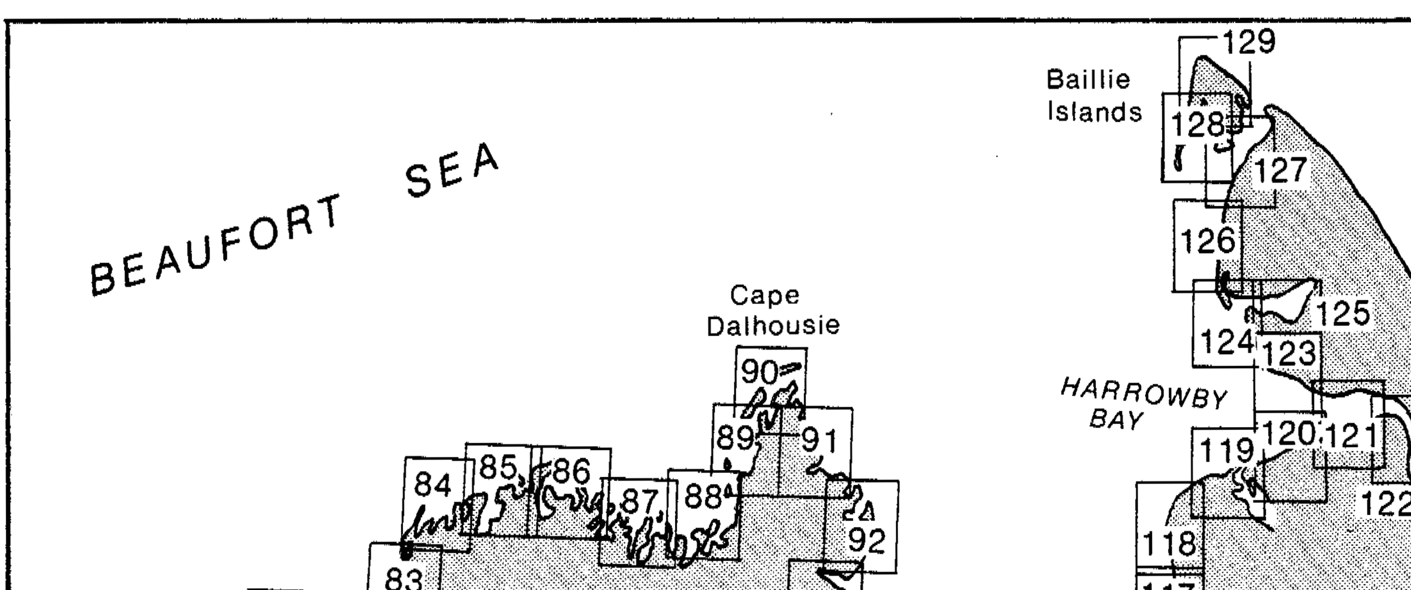
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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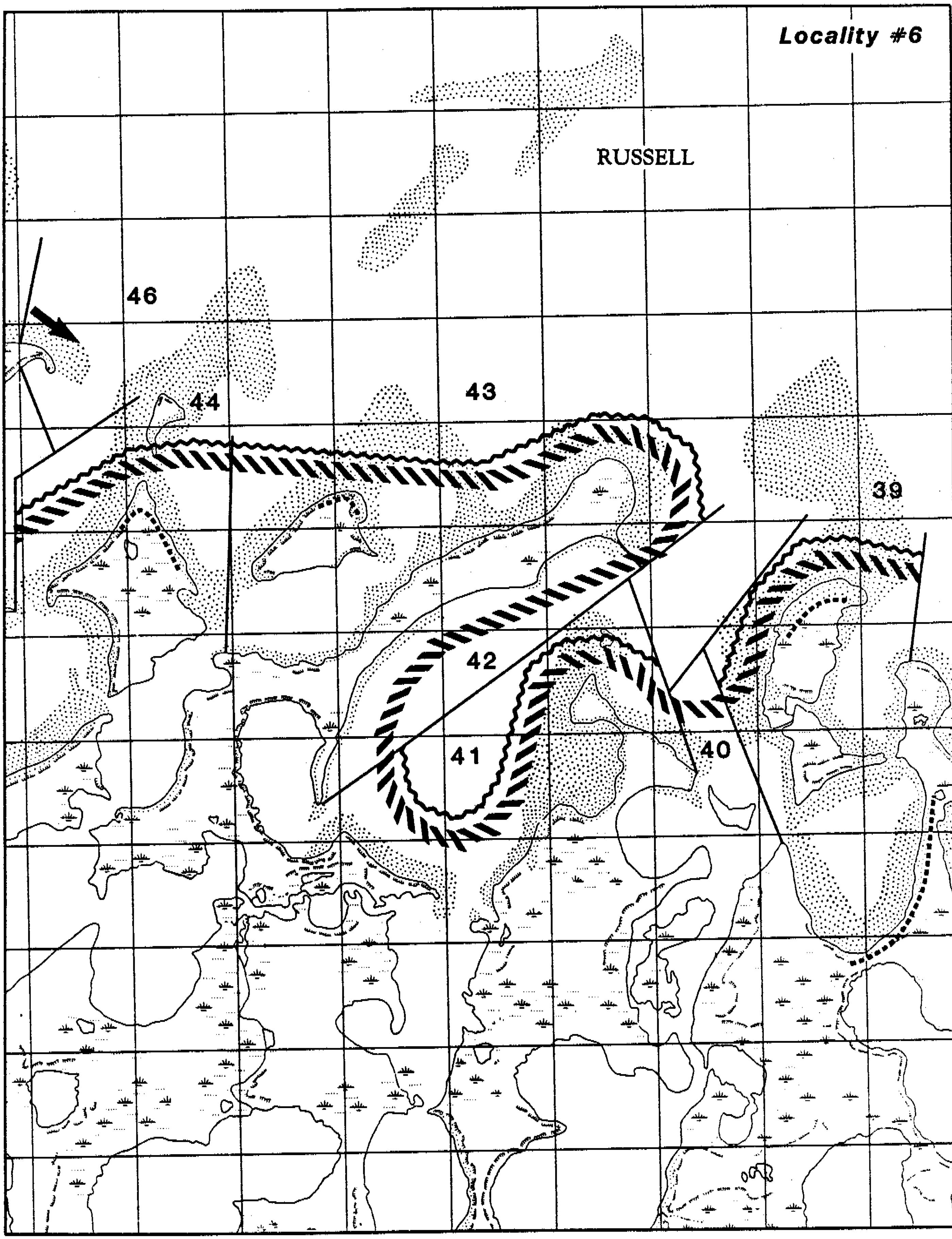
Locality #6
RUSSELL
46
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43
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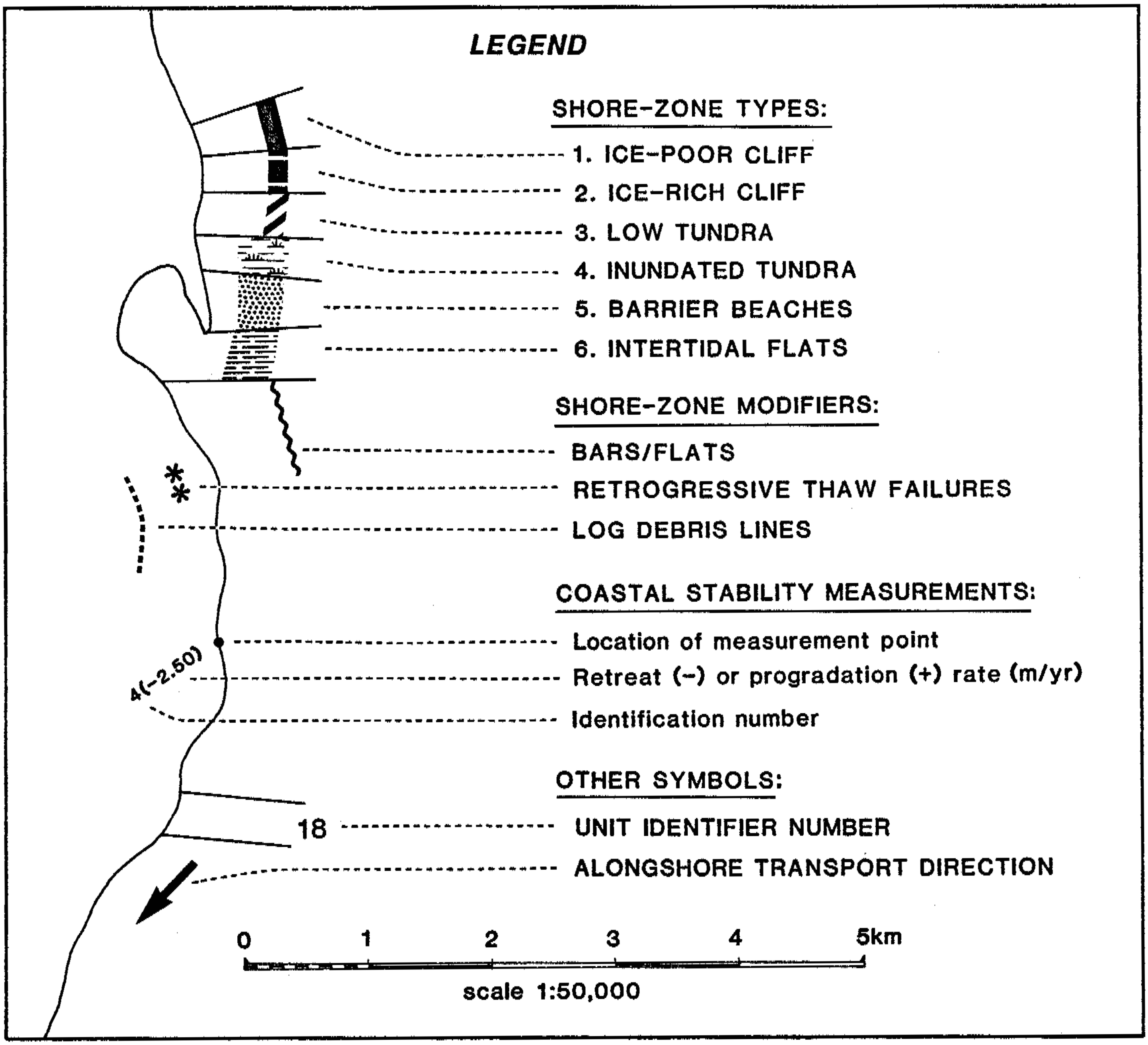
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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4(-2.50)
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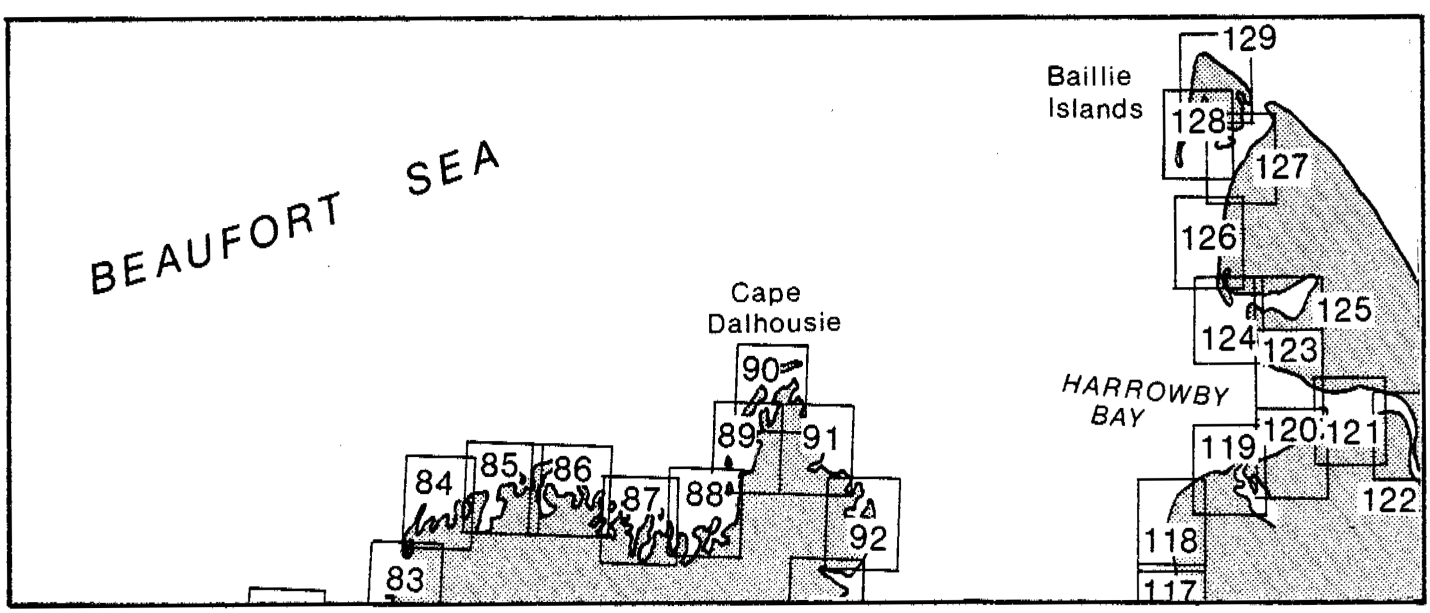
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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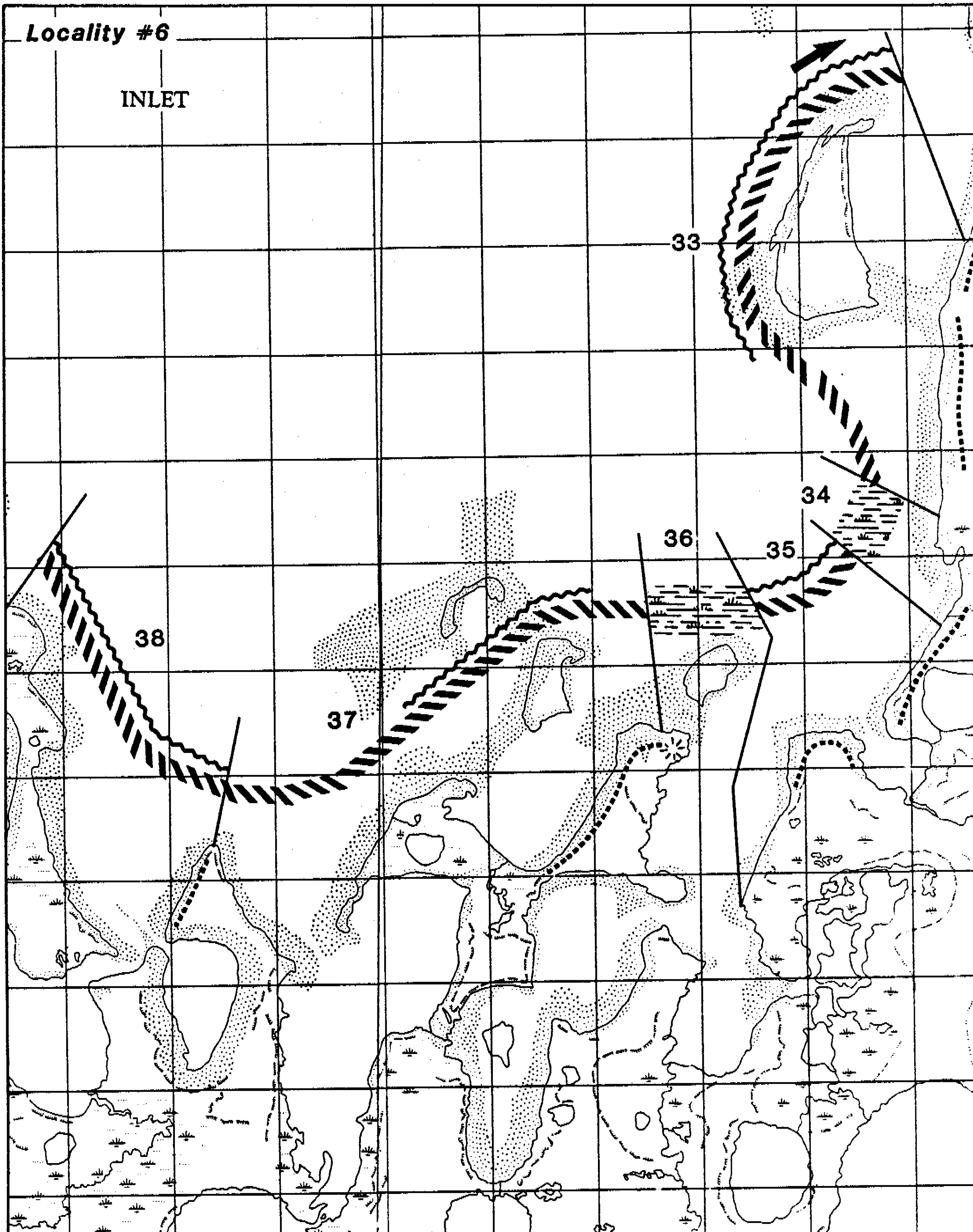
Locality #6
INLET
33
34
36
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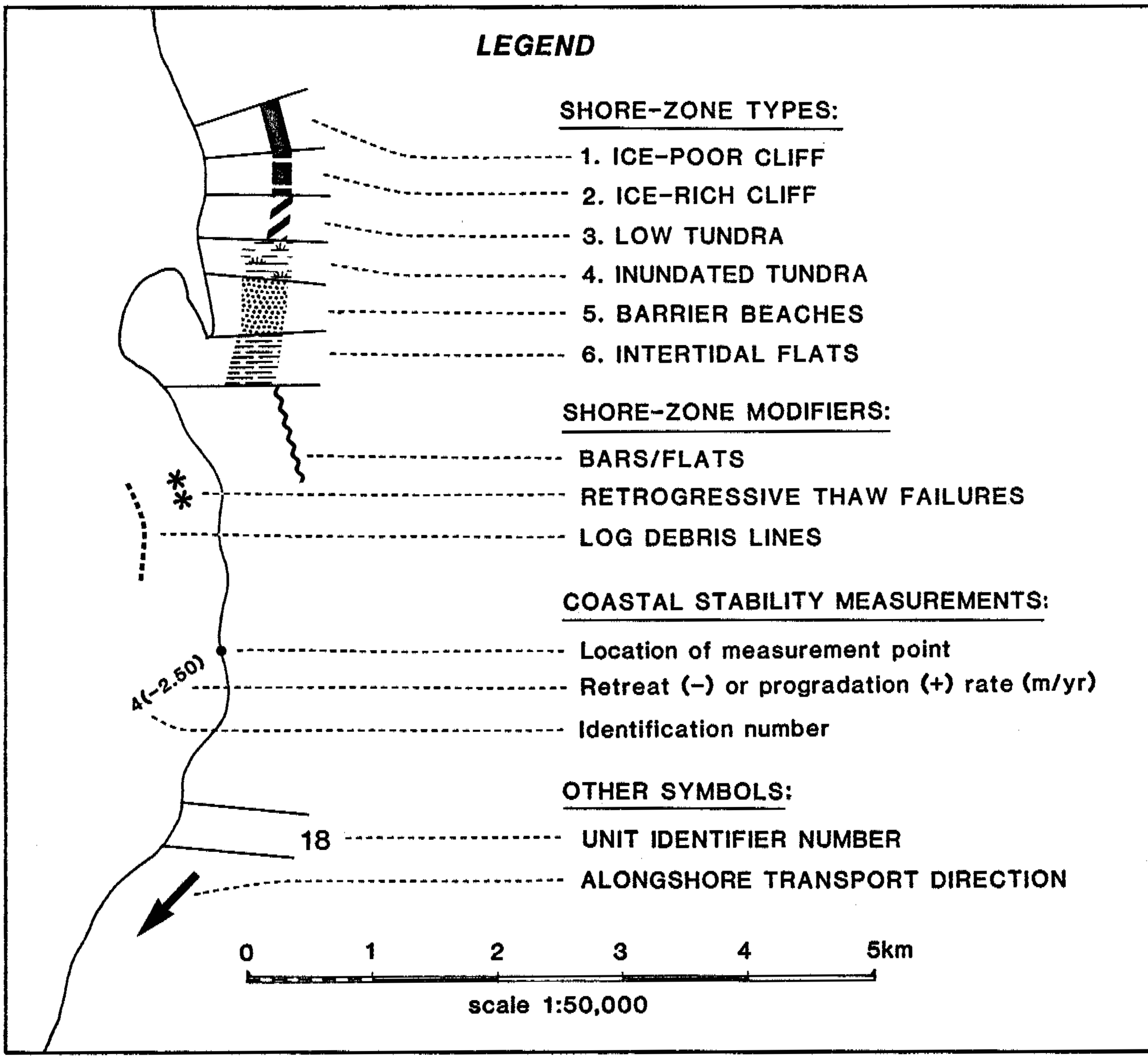
38
37


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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4. INUNDATED TUNDRA
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4(-2.50)
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Identification number
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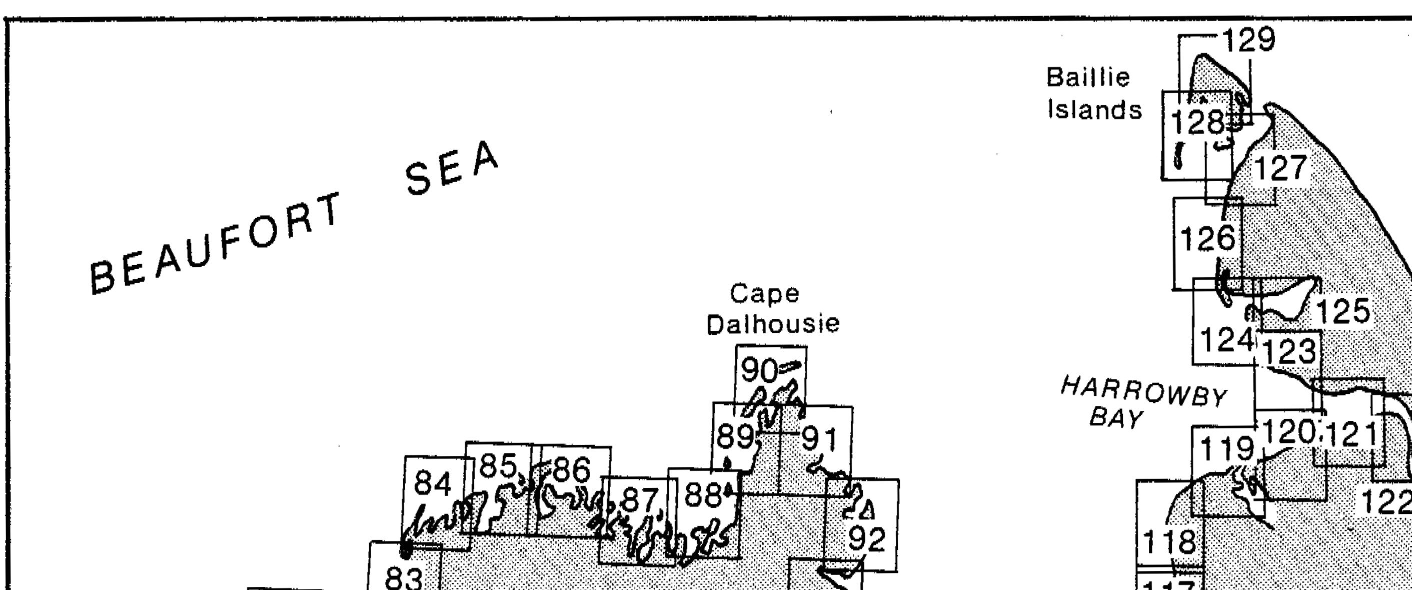
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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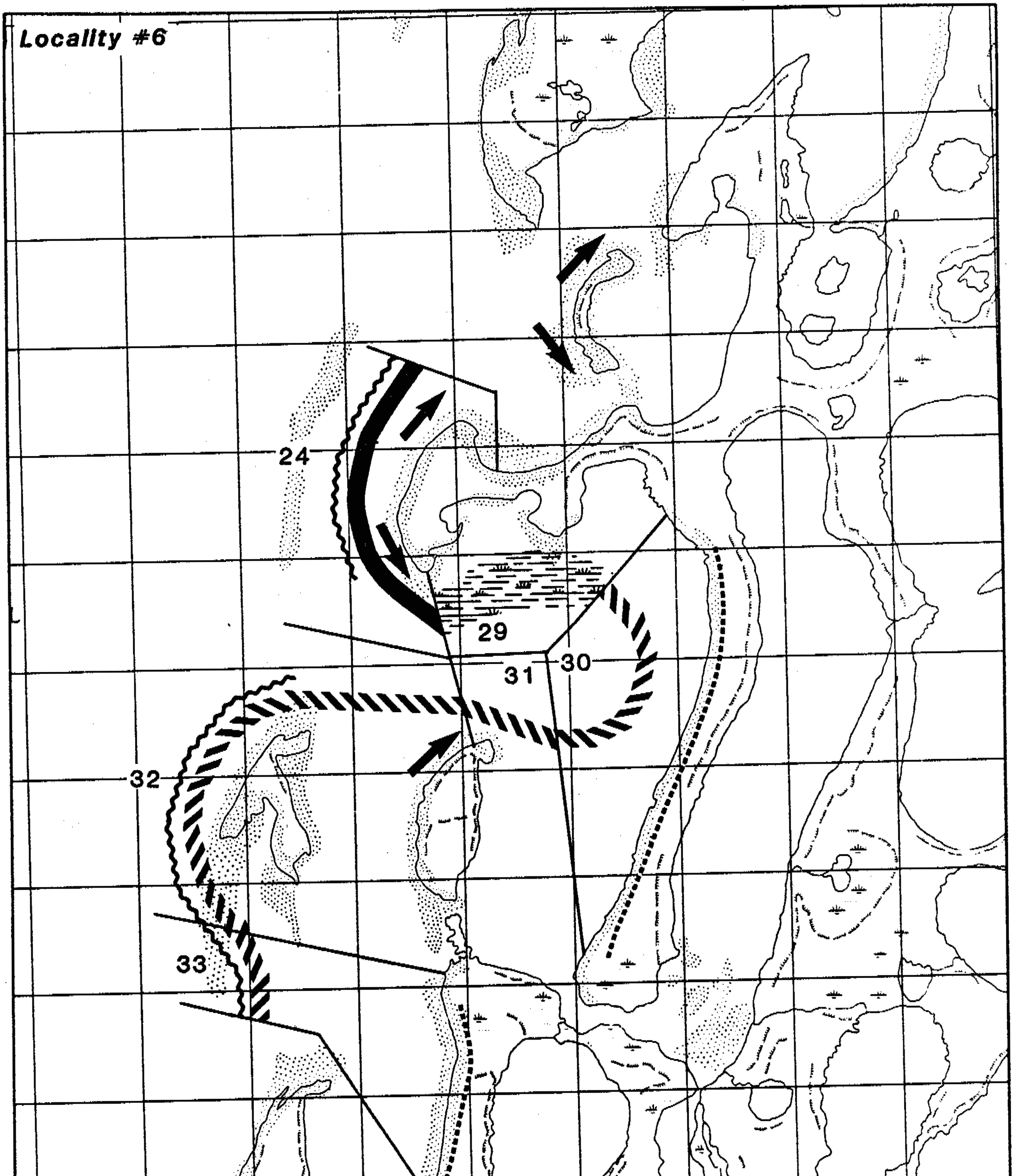
Locality #6
24
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32
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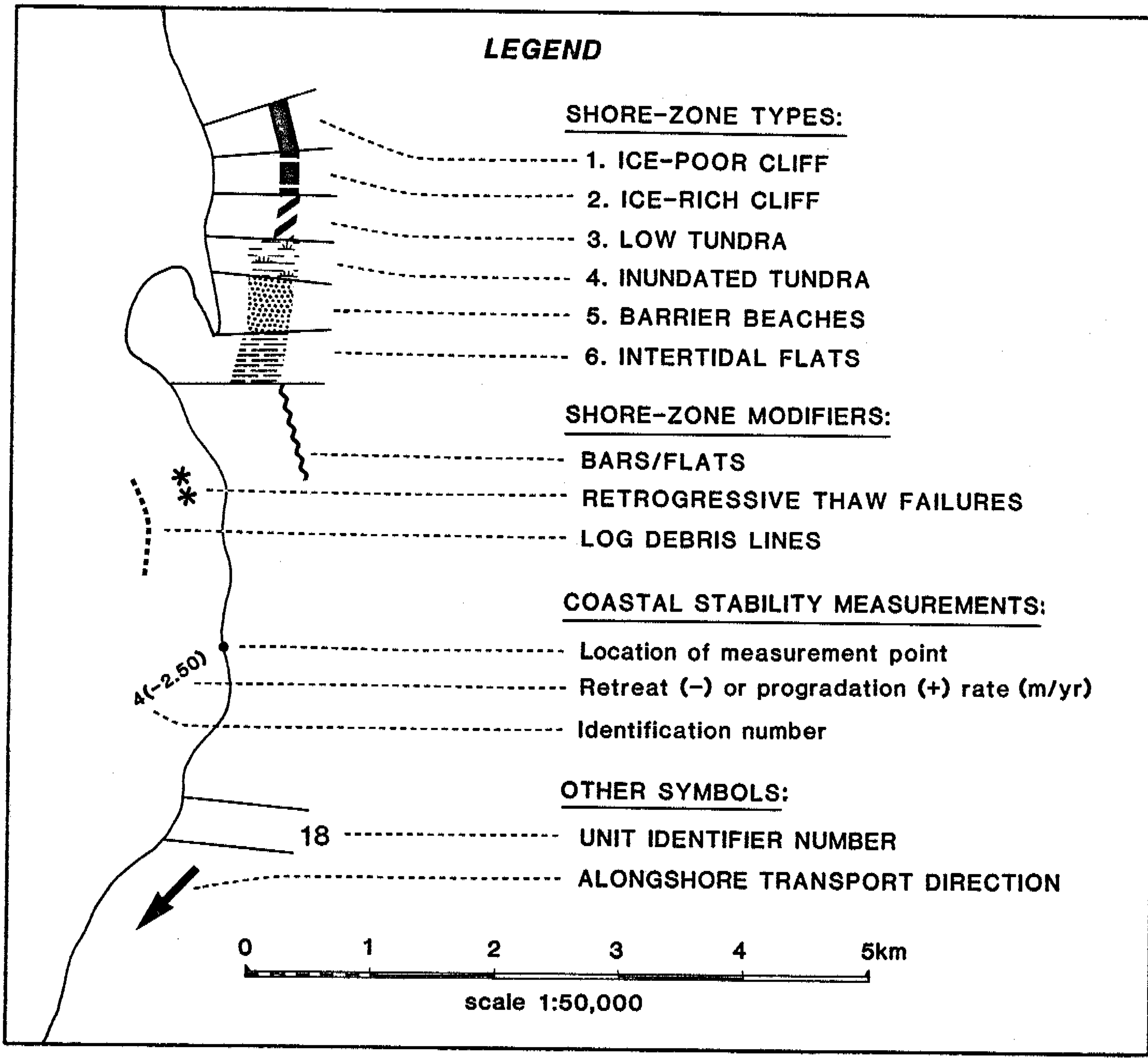

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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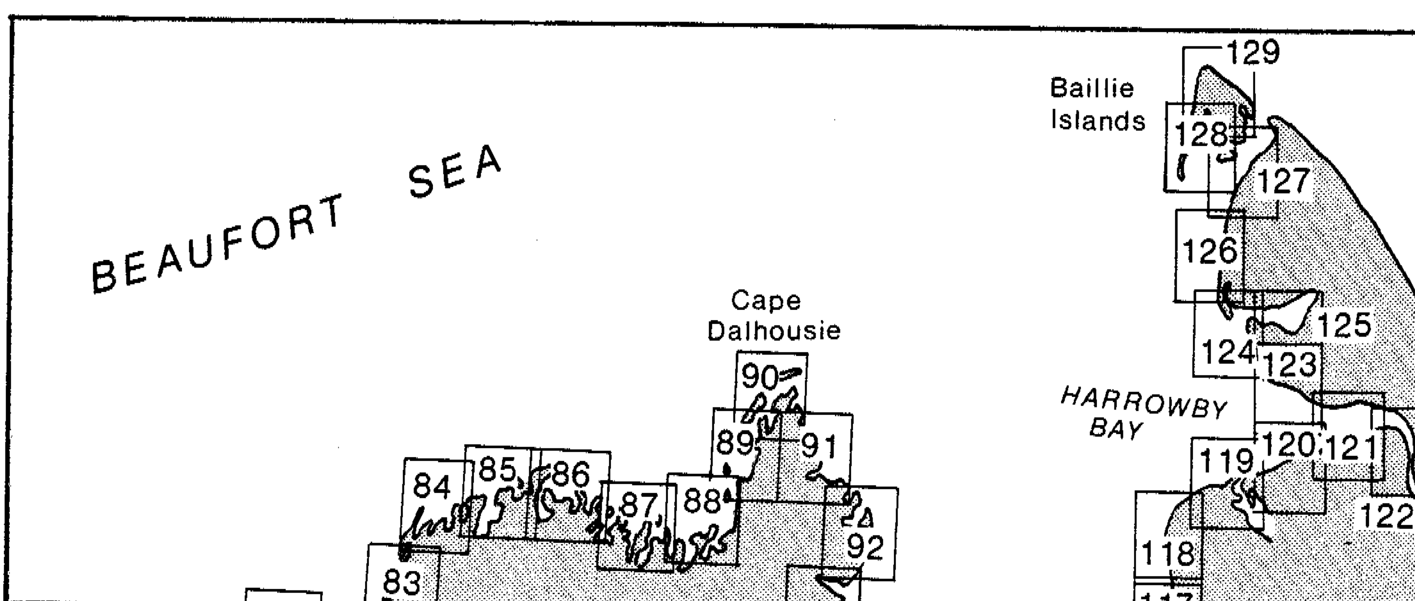
0 1 2 3 4 5km
scale 1:50,000



BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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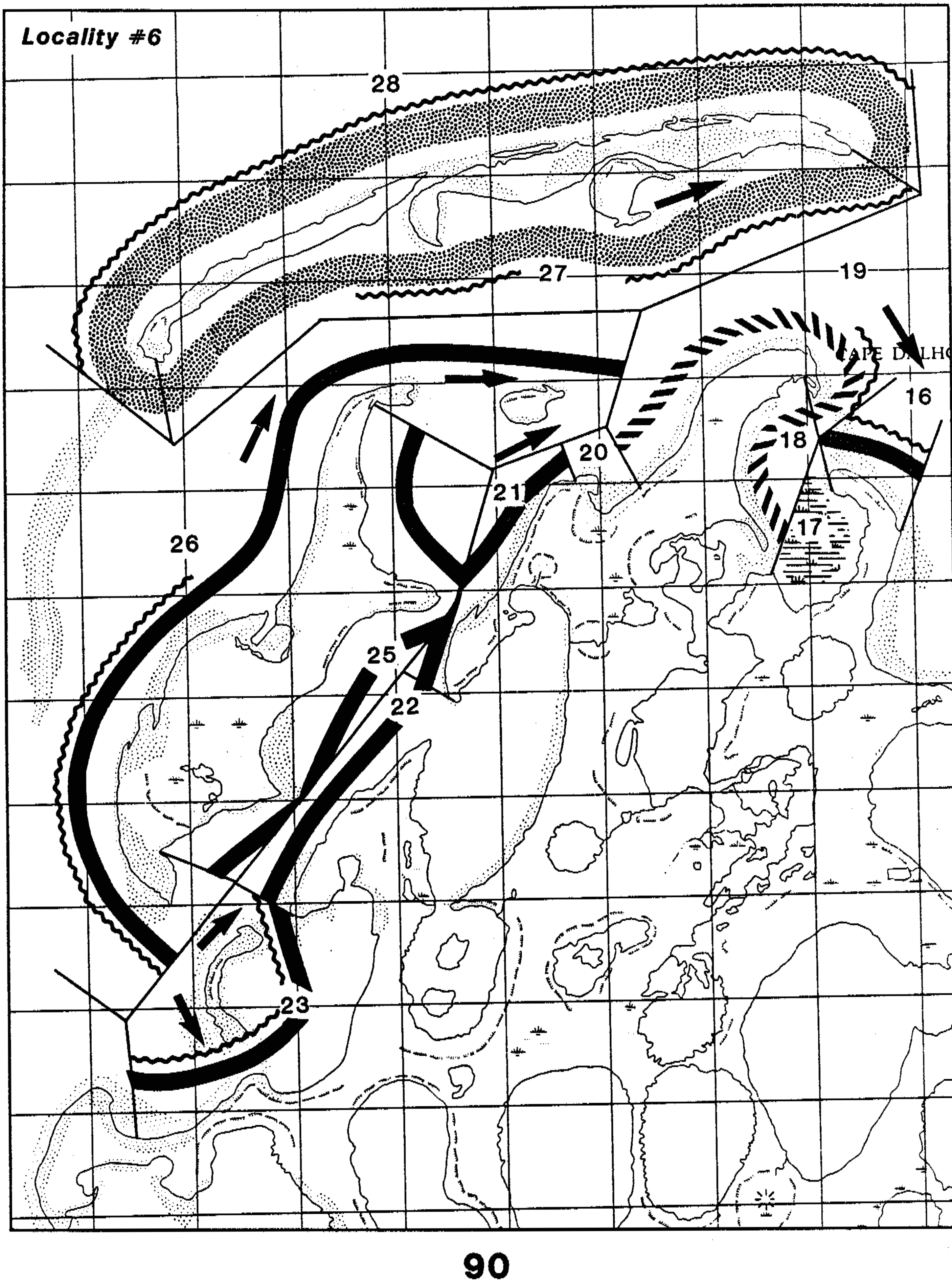
Locality #6
28
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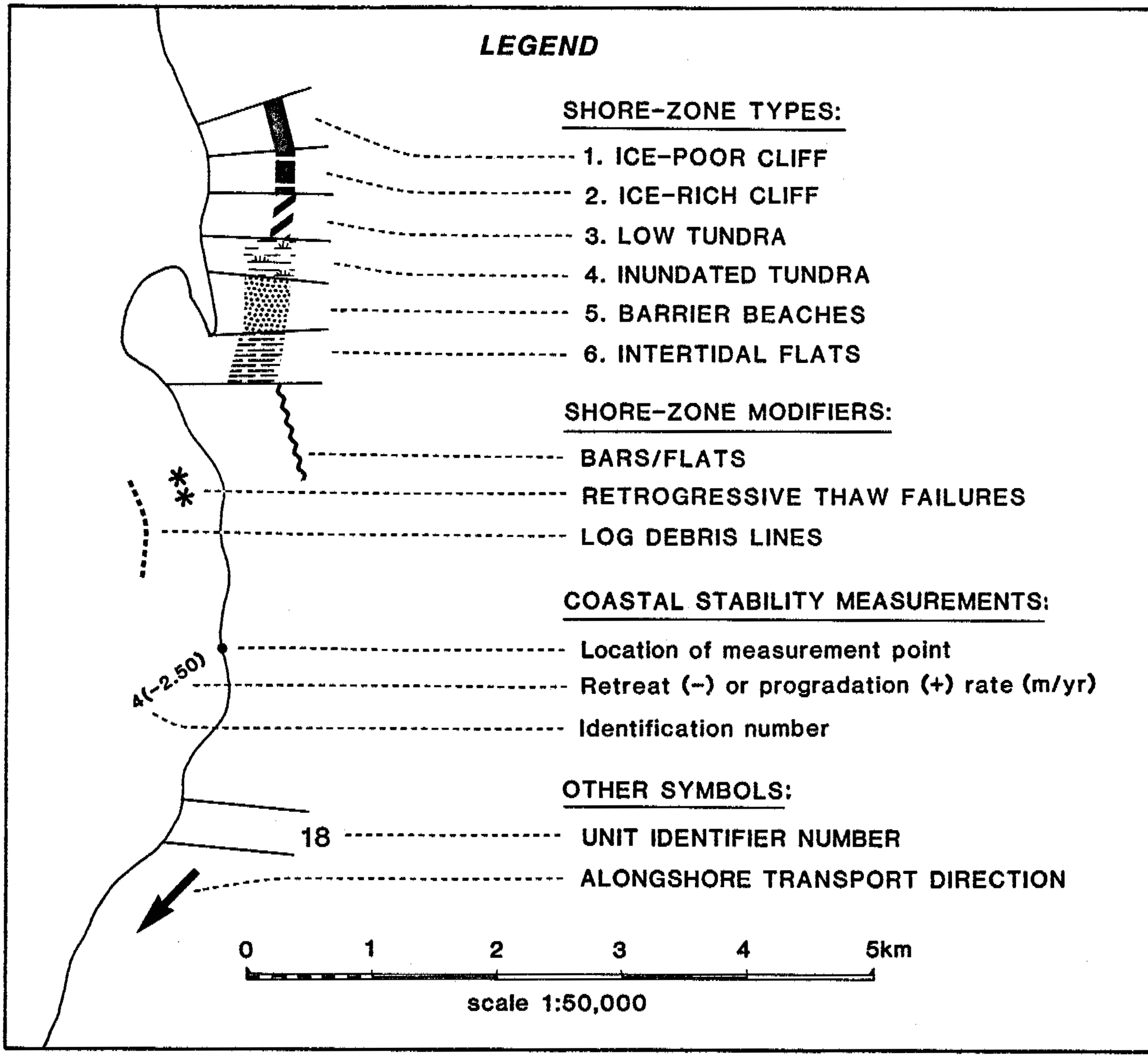
LEGEND
SHORE-ZONE TYPES:
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2. ICE-RICH CLIFF
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Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
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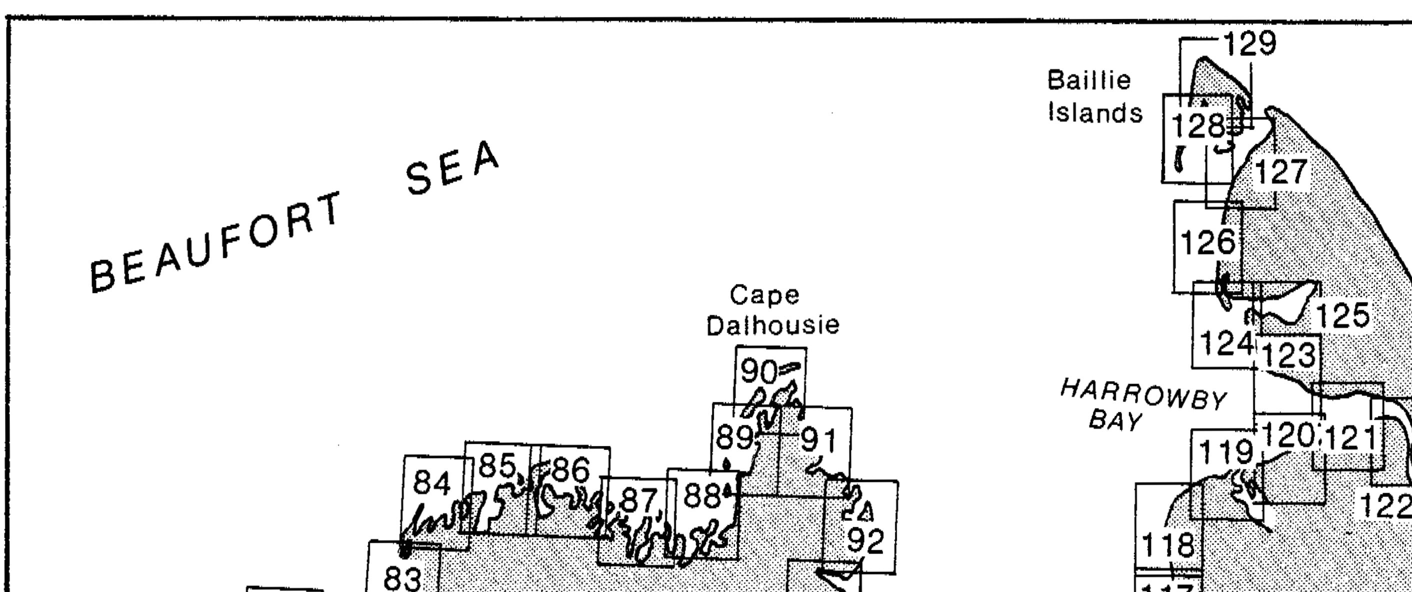
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
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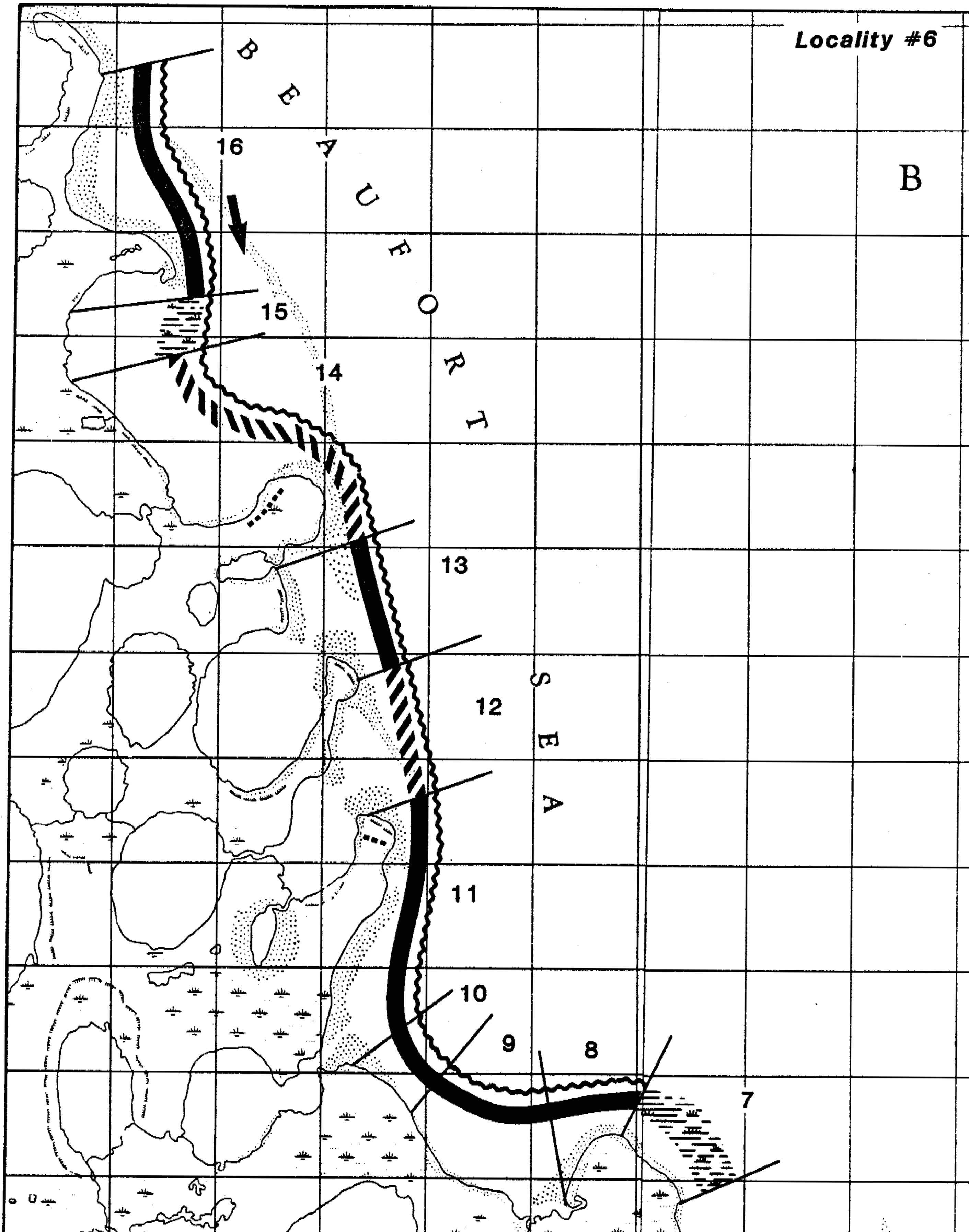
Locality #6
B E A U F O R T
S E A
B
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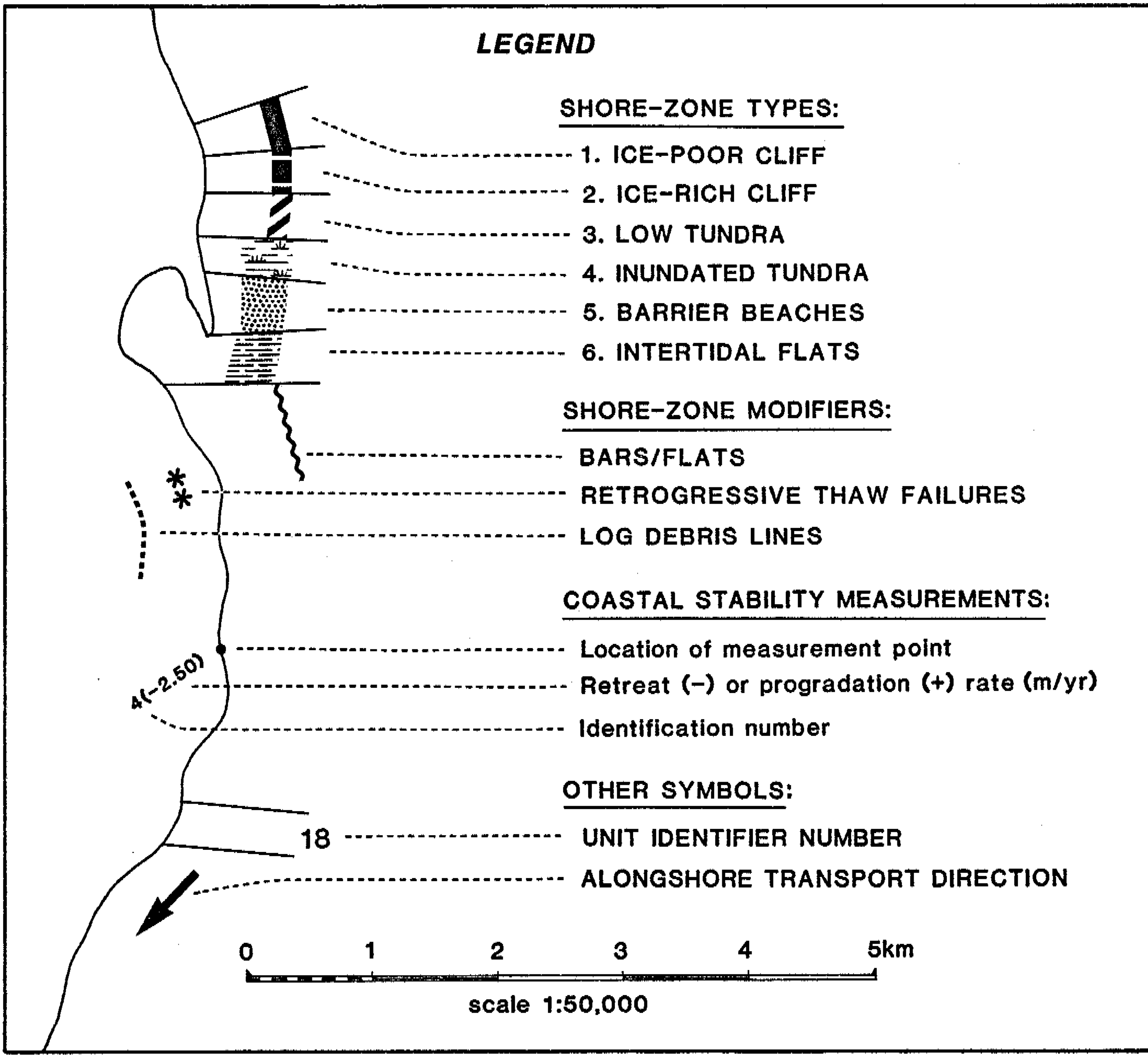
LEGEND
SHORE-ZONE TYPES:
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3. LOW TUNDRA
4. INUNDATED TUNDRA
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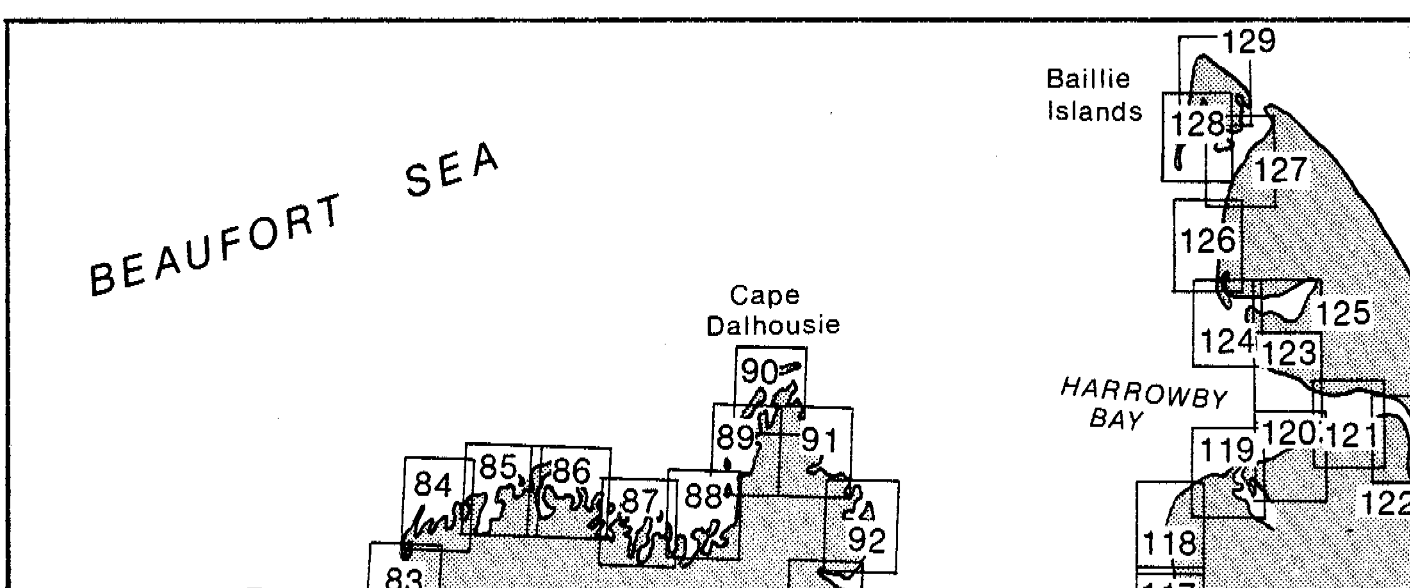
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
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90
89
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87
86
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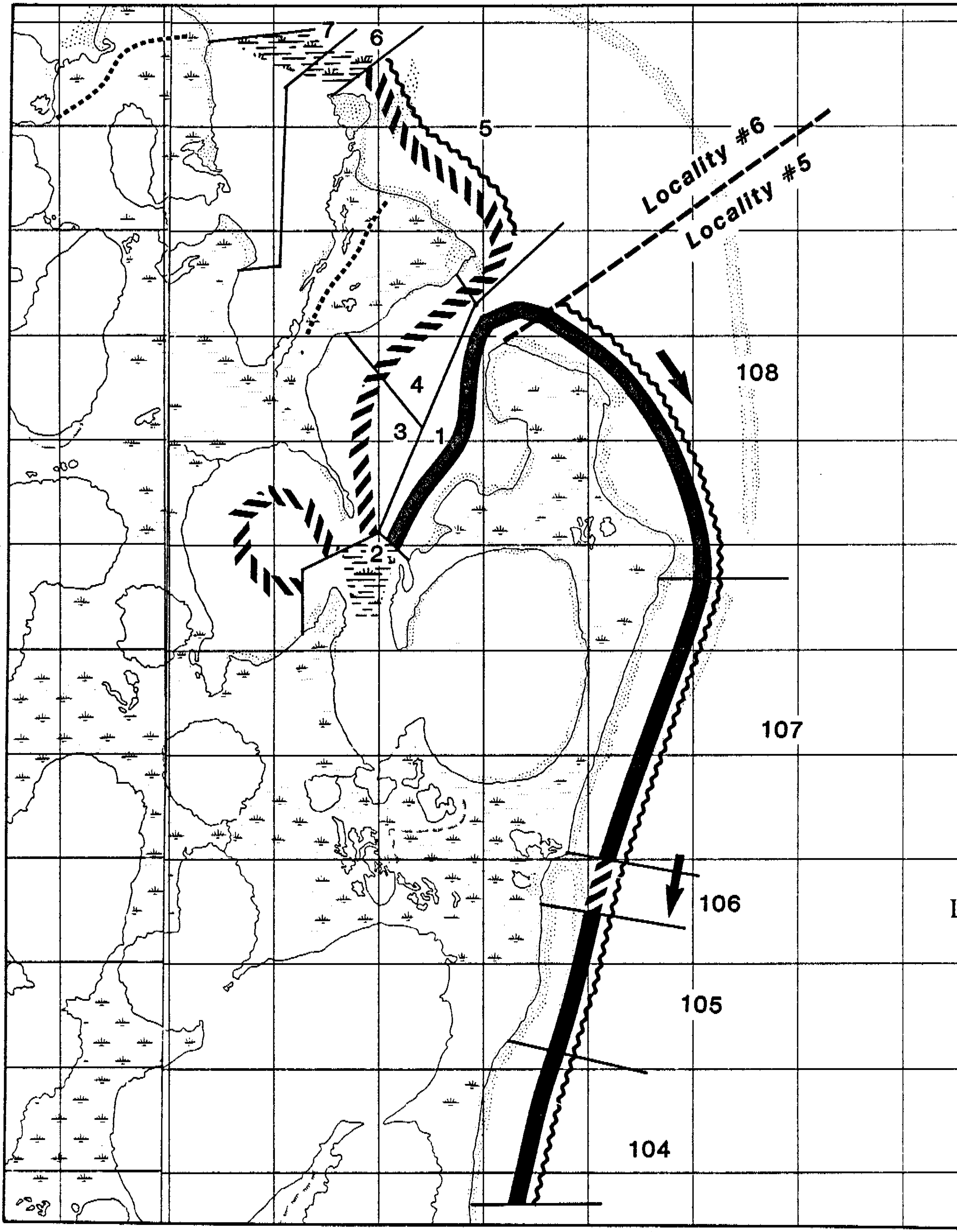
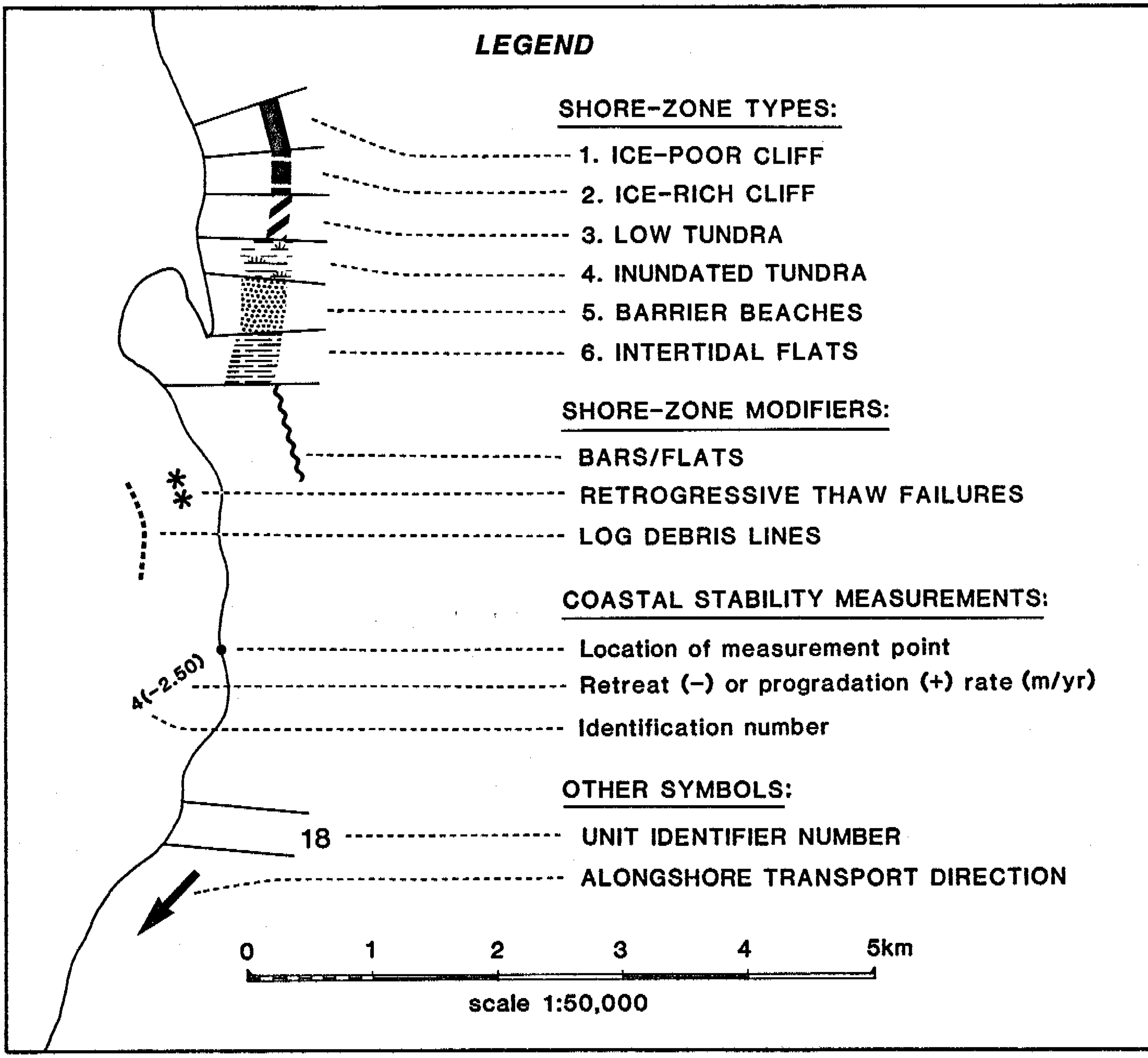
84
83


7
6
5
Locality #6
Locality #5
108
4
3
1
2
107
106
105
104
L


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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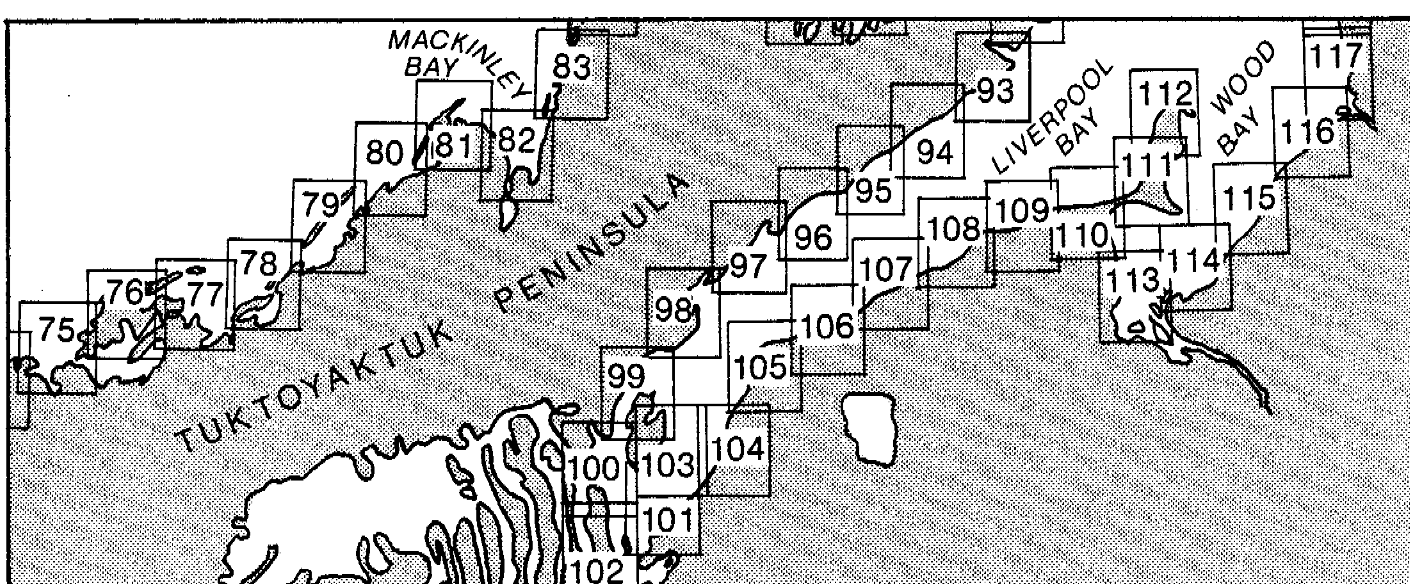
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75
76
77
78
79
80
81
82
83
93
94
95
96
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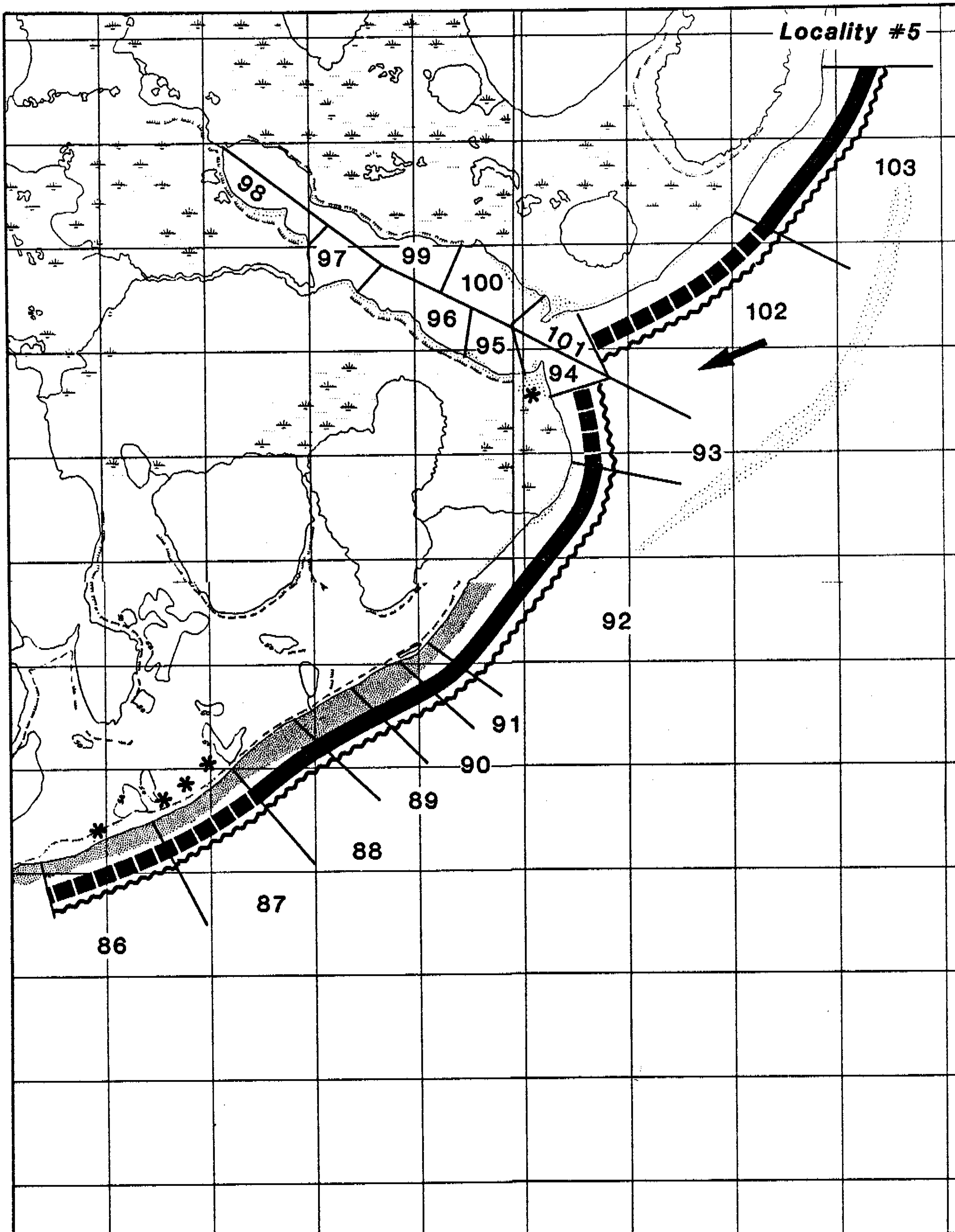
117


Locality #5
98
97
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100
96
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91
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89
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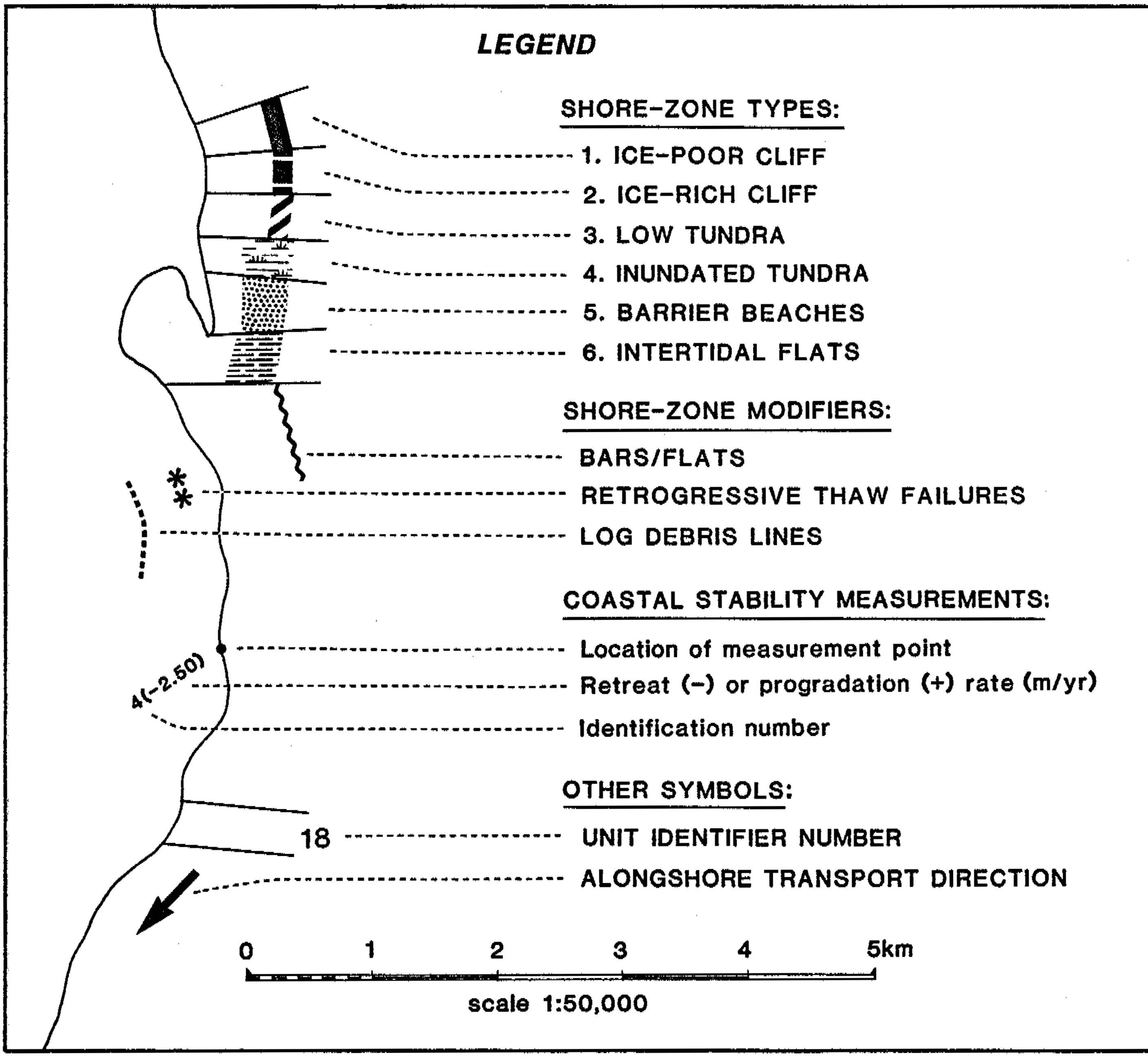
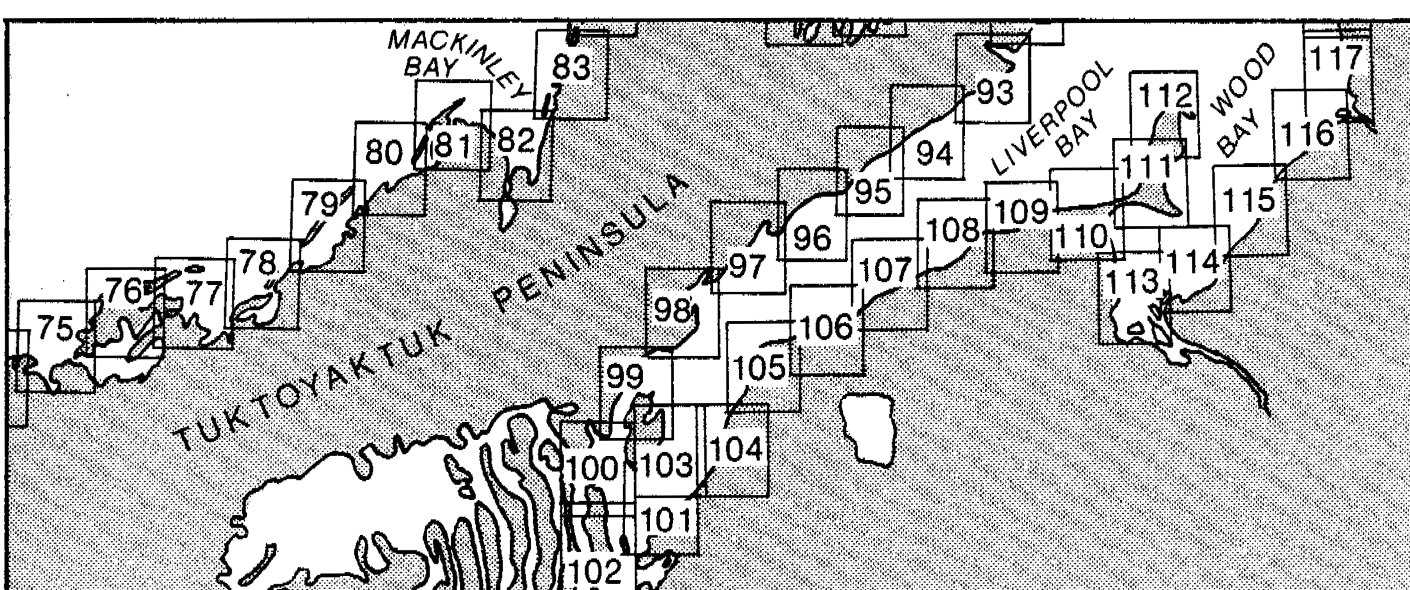
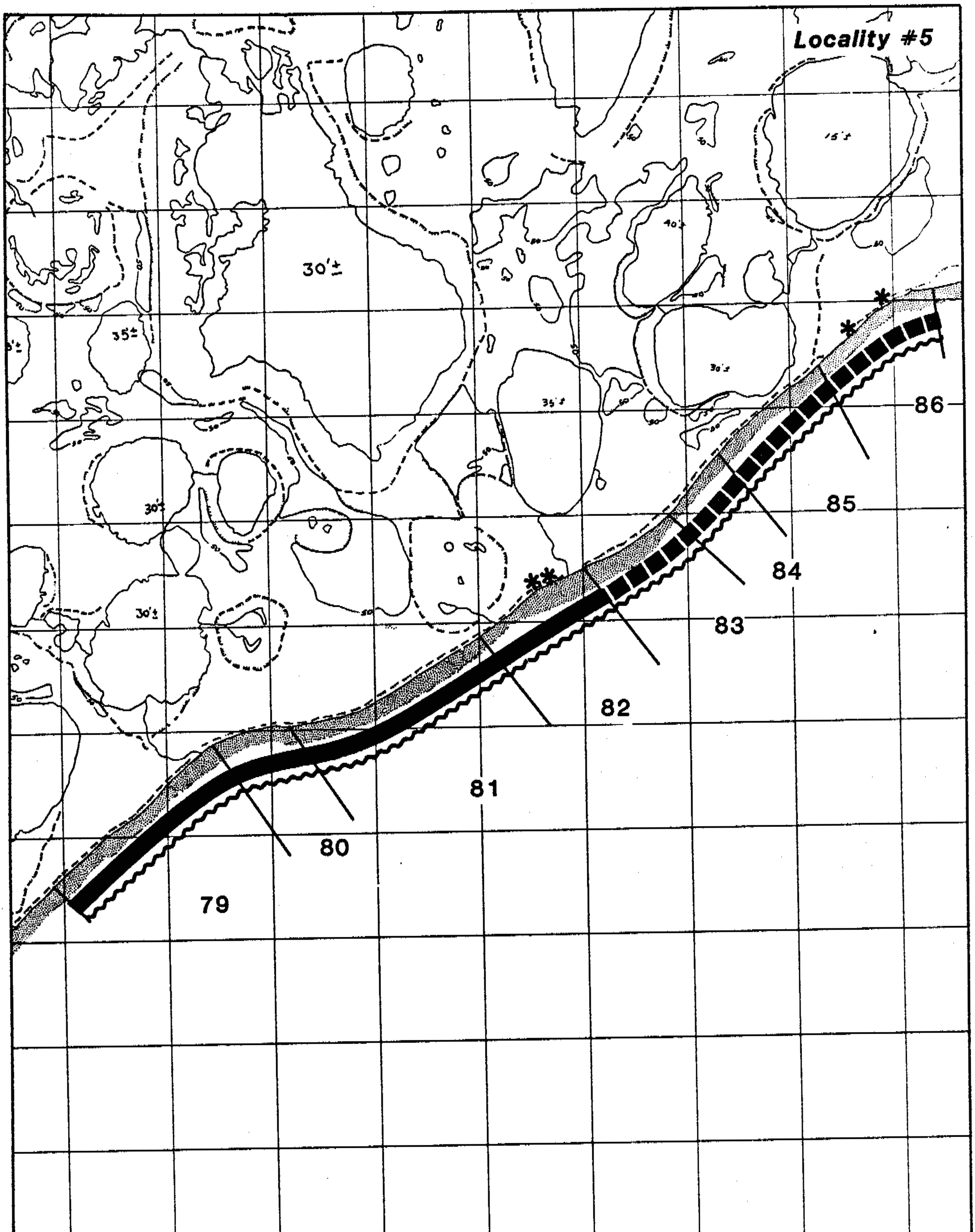
86
102
103

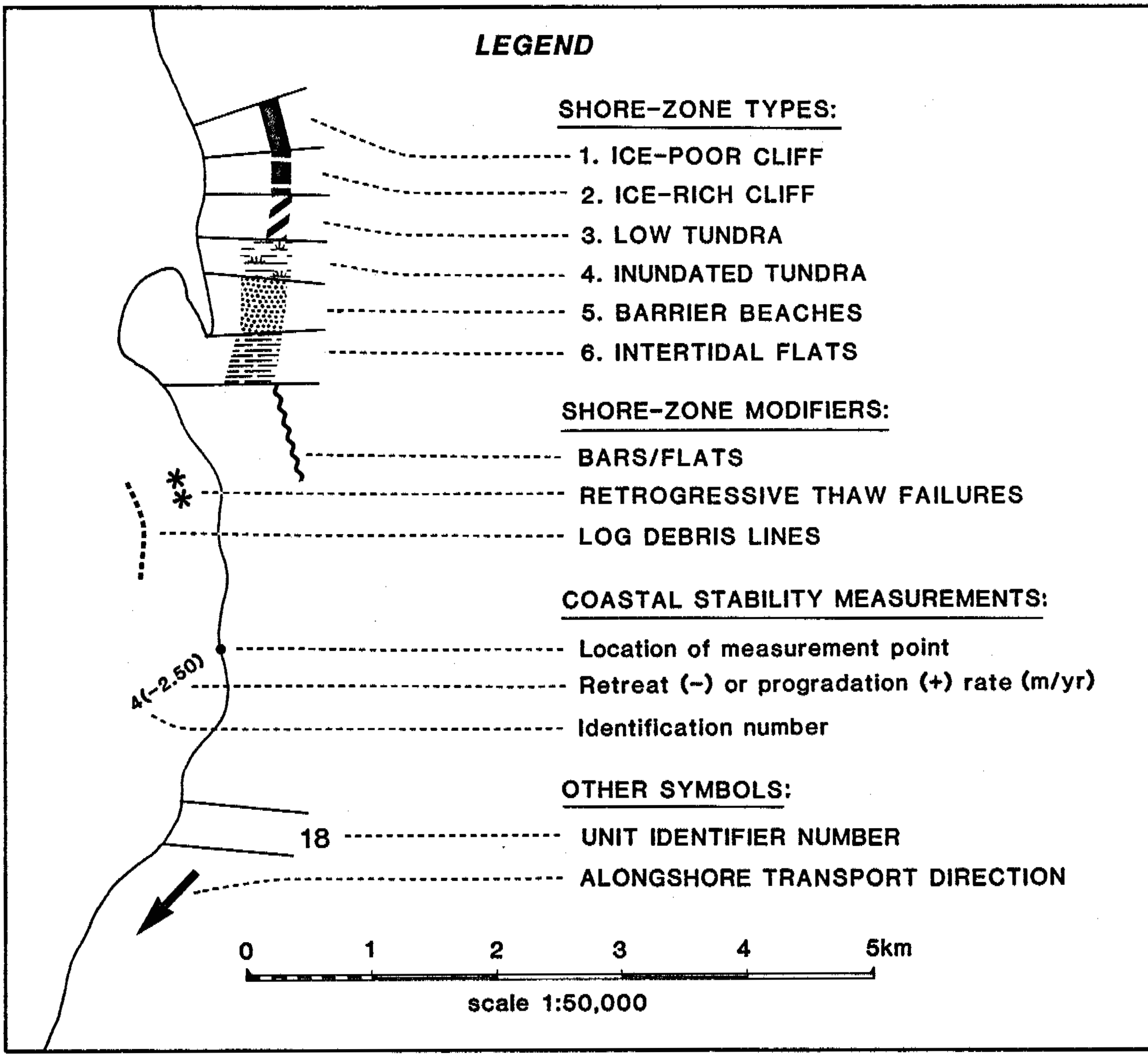


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKINLEY BAY
83
80
81
82
93
LIVERPOOL BAY
112
WOOD BAY
117
116
94
95
111
79
115
96
108
109
110
TUKTOYAKTUK PENINSULA
78
76
77
97
107
114
113
75
98
106
99
105
100
103
104
101
102


Locality #5
30'±
35±
30'±
30'±
79
80
81
82
83
84
85
86


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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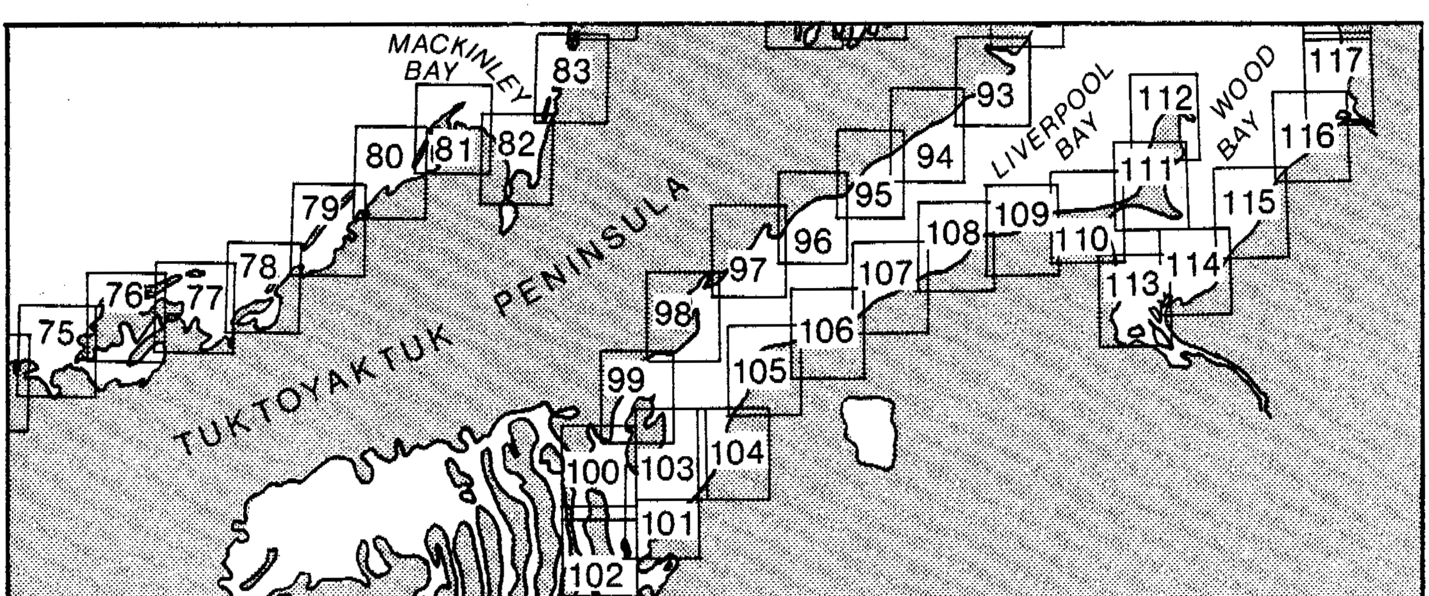
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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93
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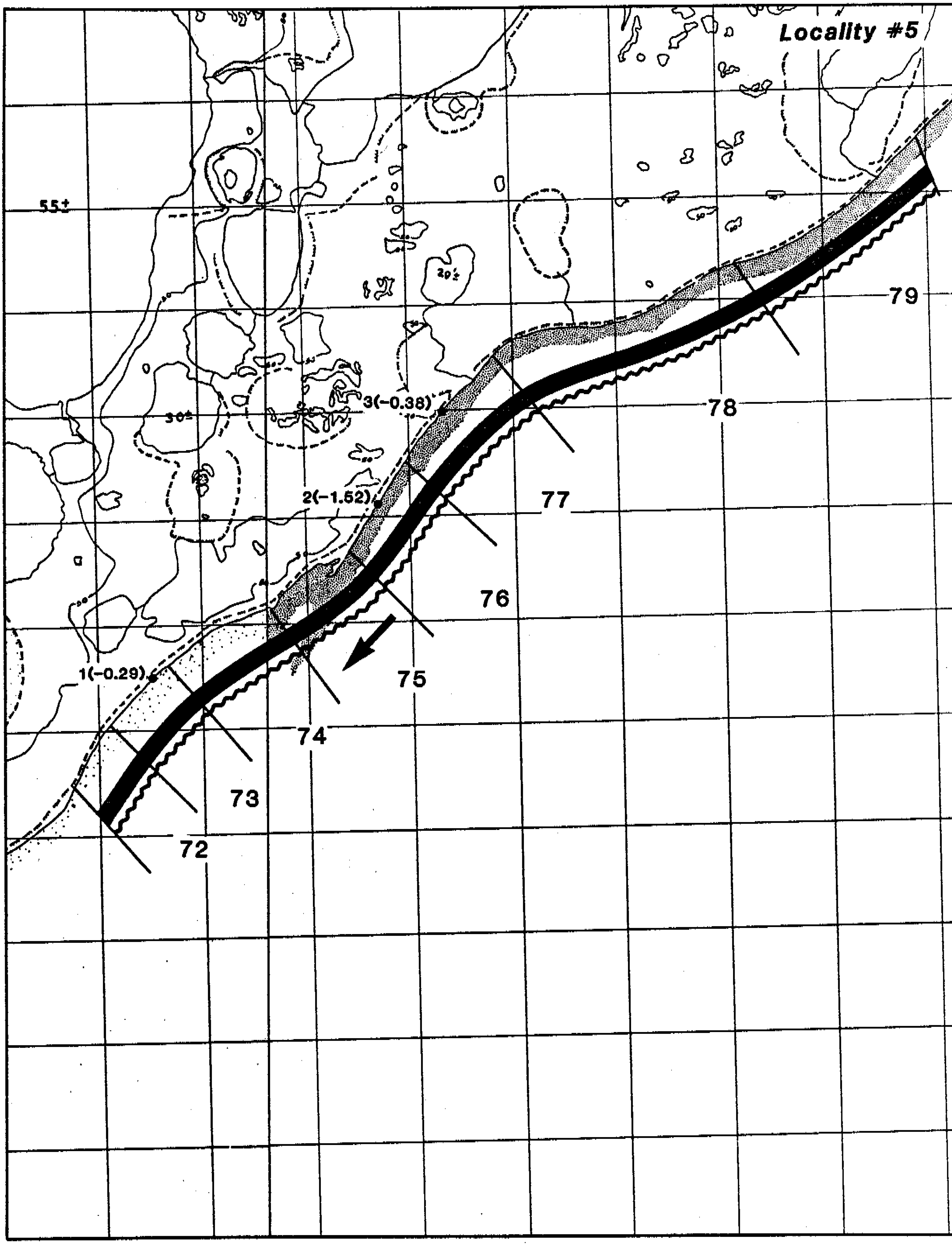
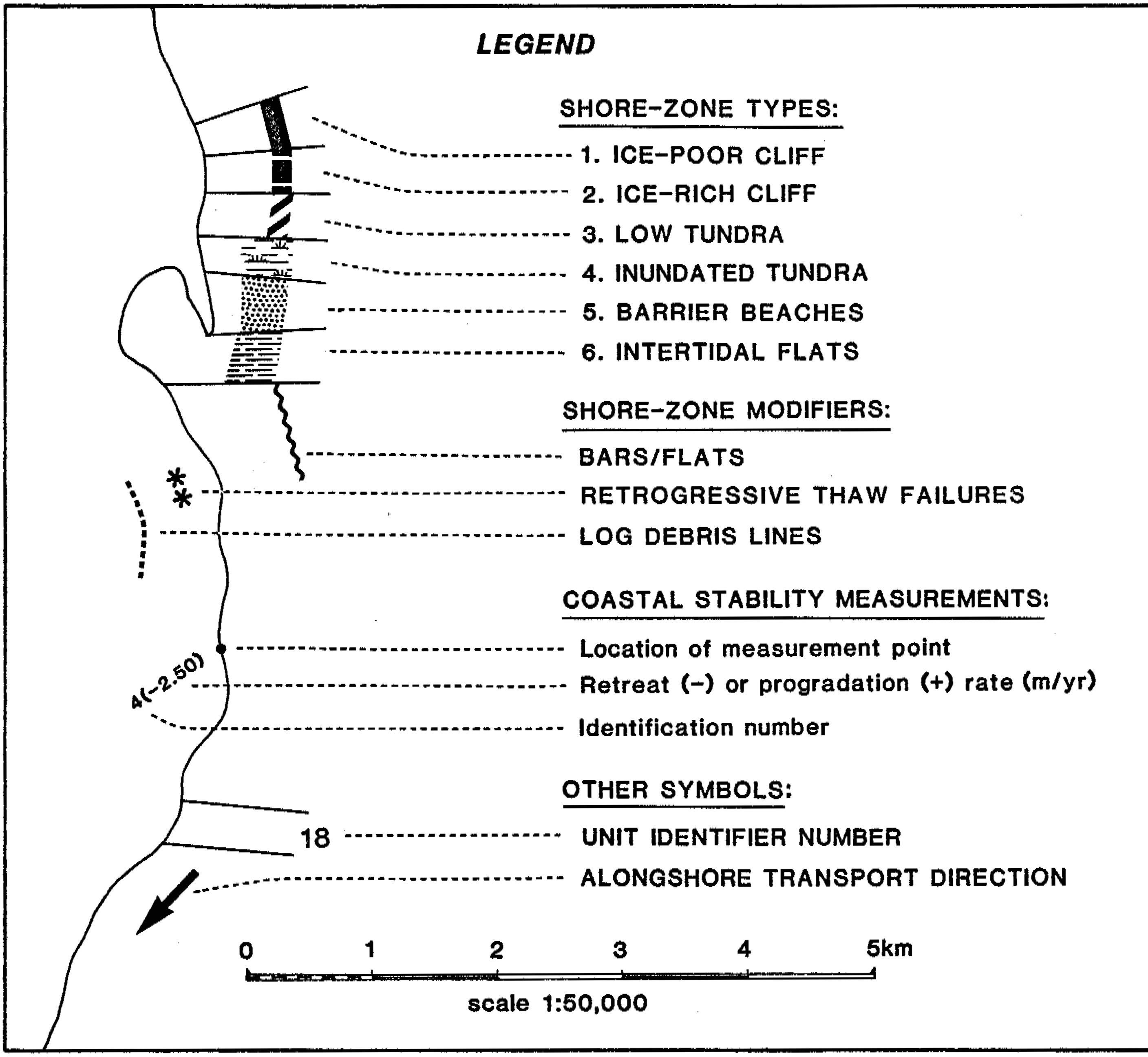
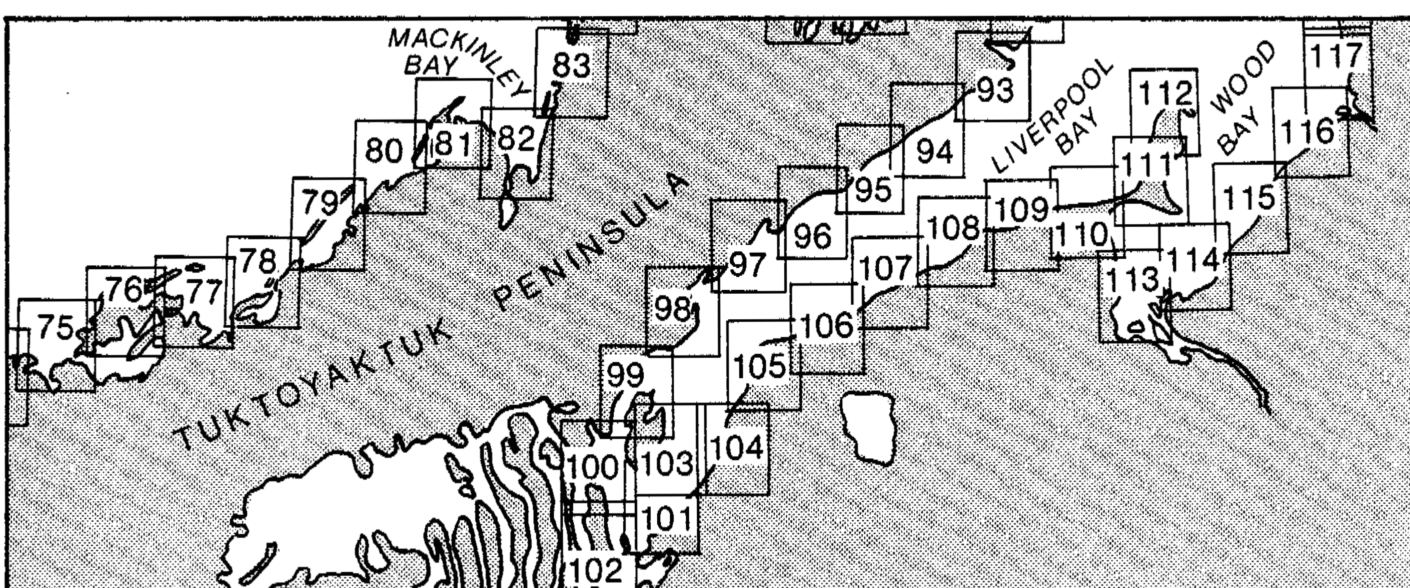


Locality #5
55±
30±
20±
3(-0.38)
2(-1.52)
1(-0.29)
72
73
74
75
76
77
78
79


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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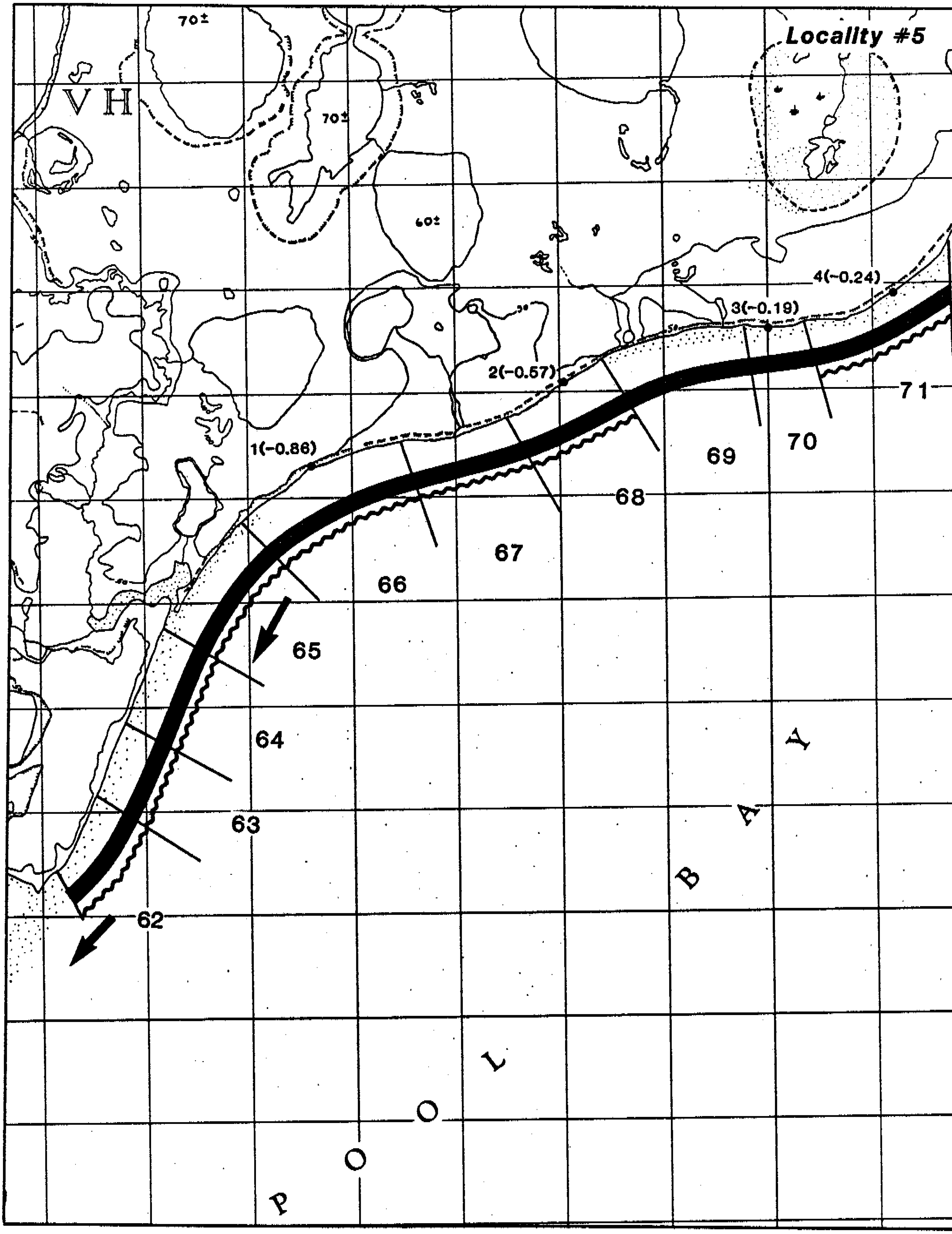
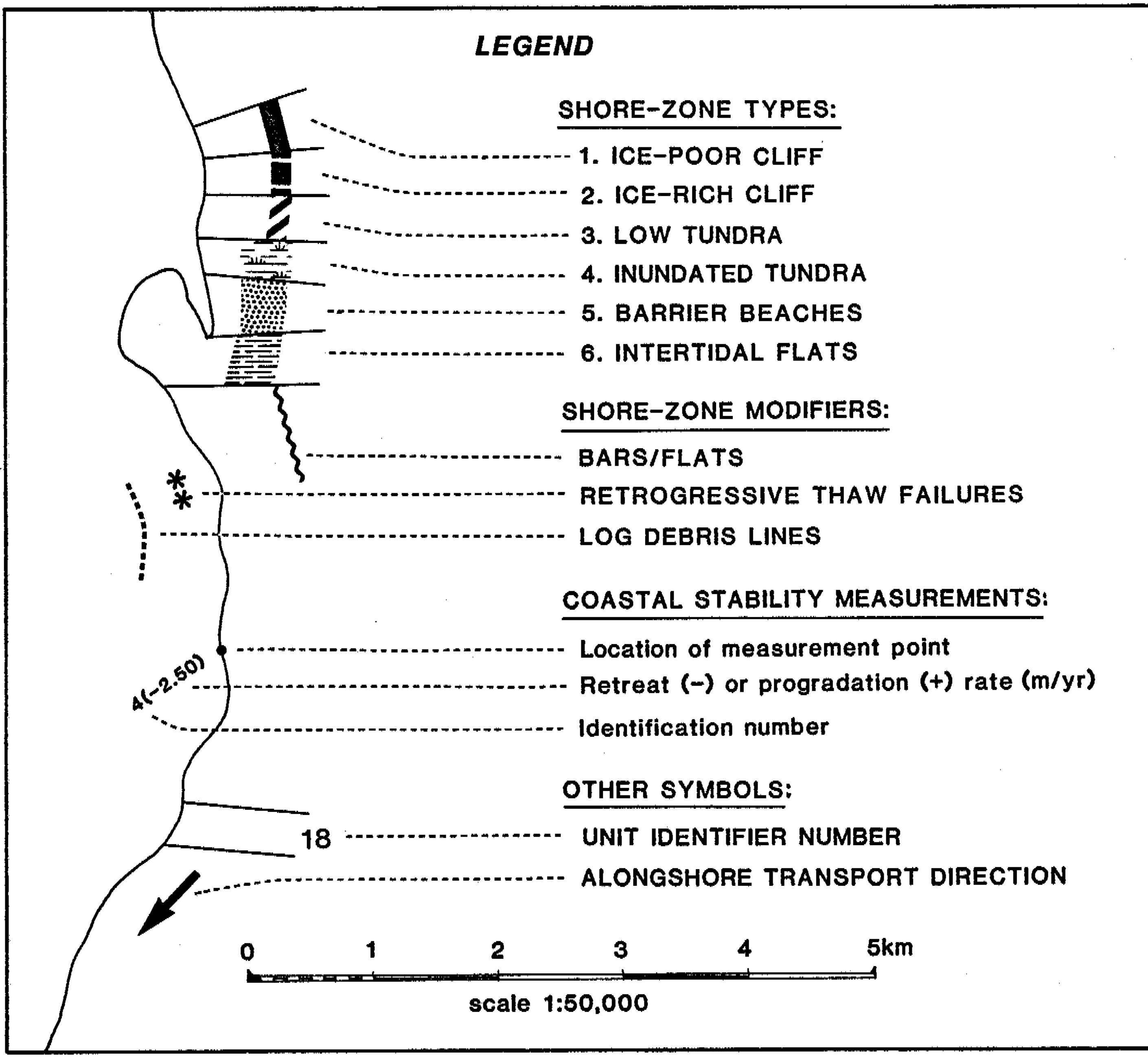
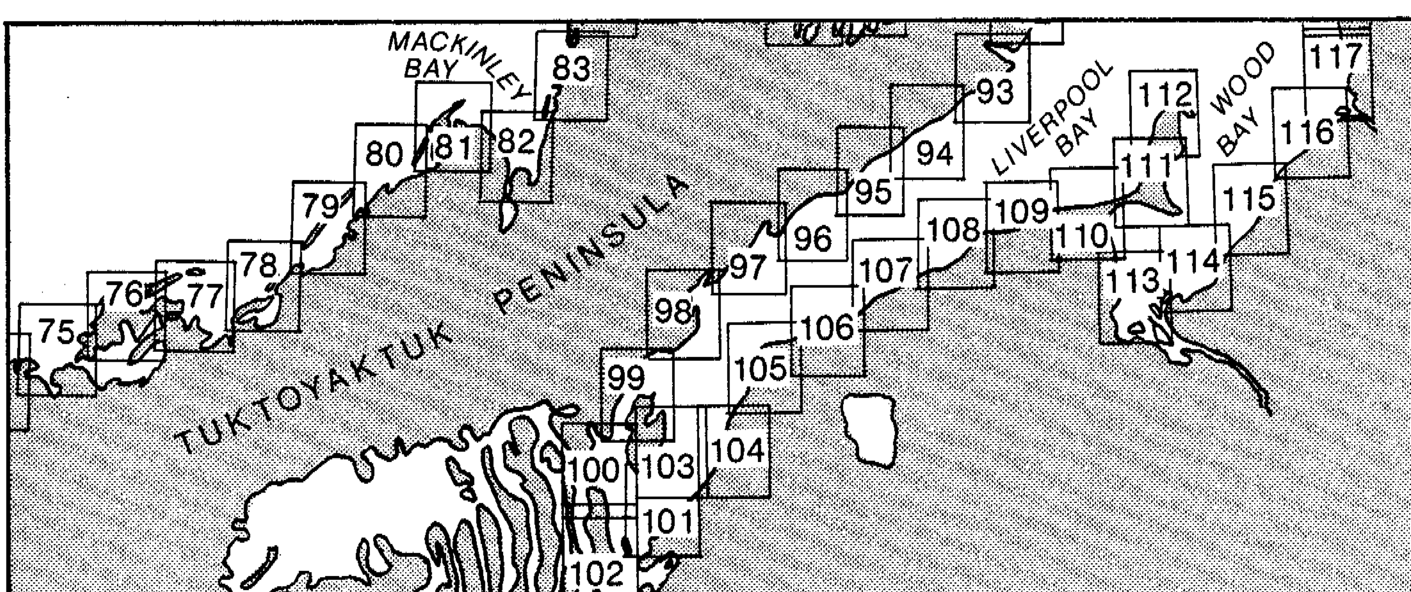

Locality #5
VH
70±
70±
60±
4(-0.24)
3(-0.19)
2(-0.57)
1(-0.86)
71
70
69
68
67
66
65
64
63
62
POOL BAY


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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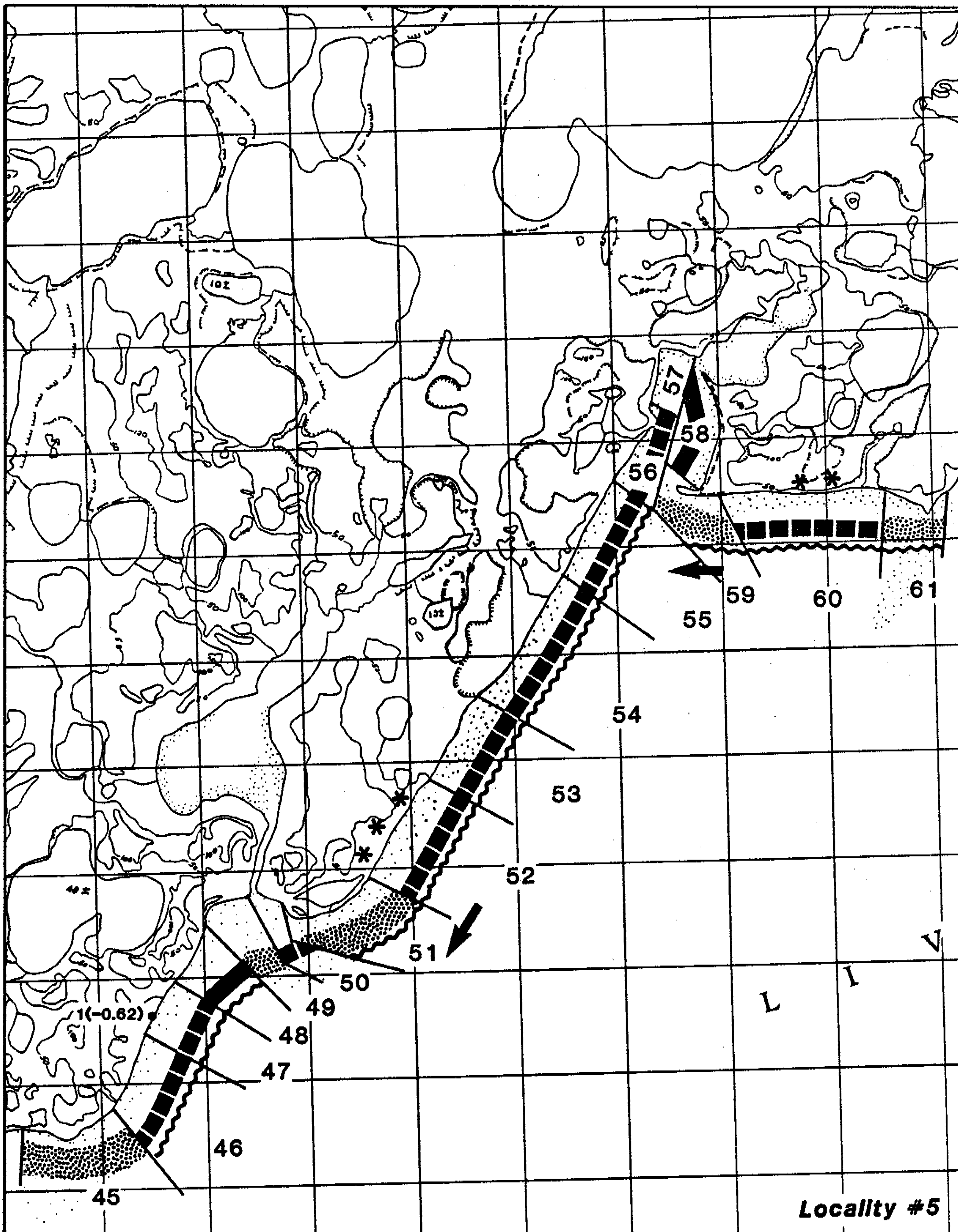
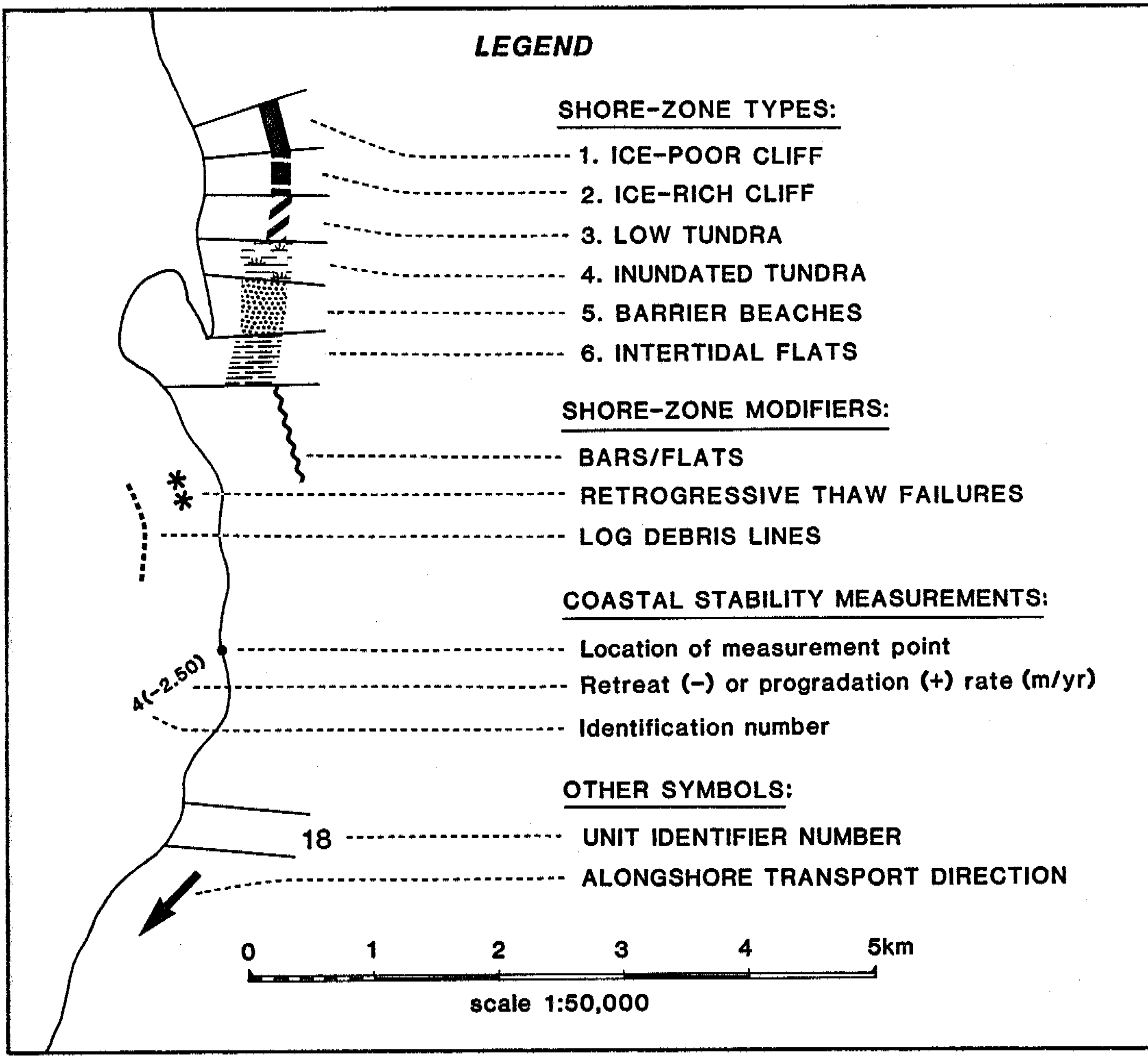
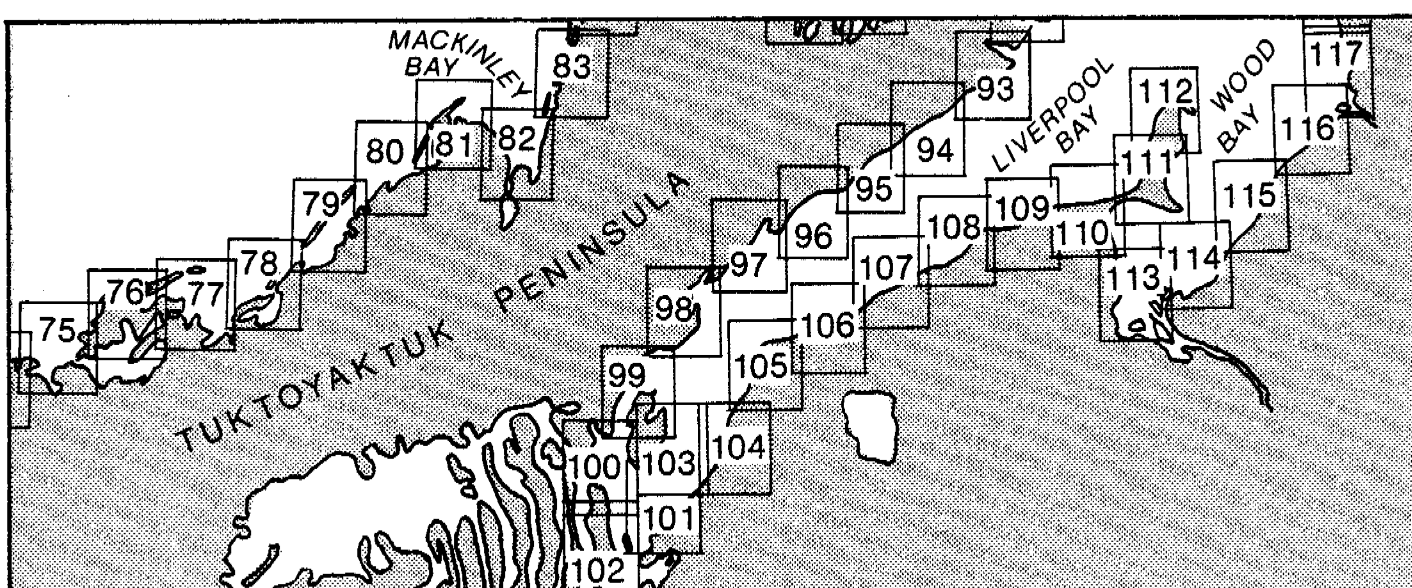
117



57
58
56
59
60
61
55
54
53
52
51
50
49
48
47
46
45
1(-0.62)
L I V
Locality #5



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000



MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75
76
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80
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82
83
93
94
95
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99
100
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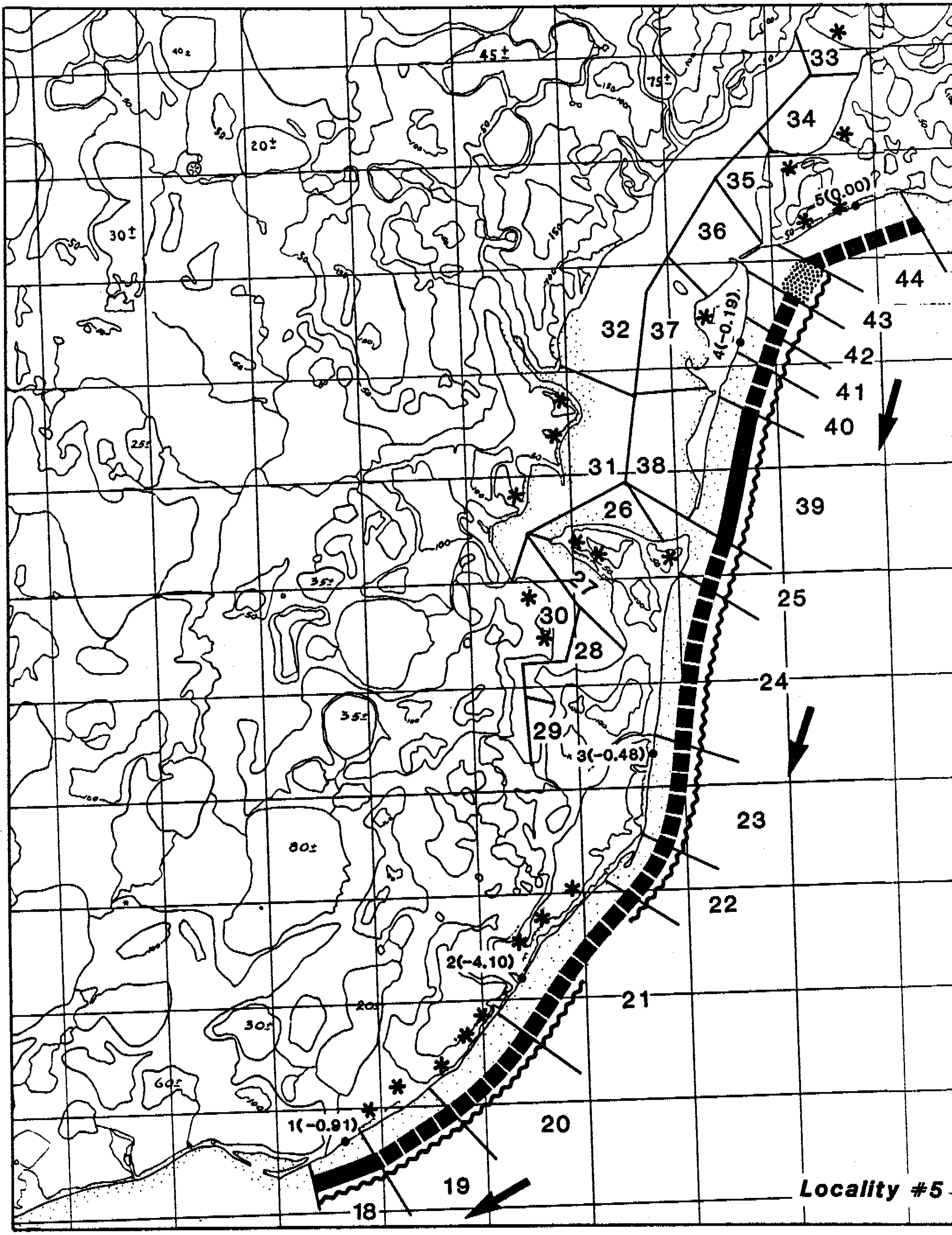
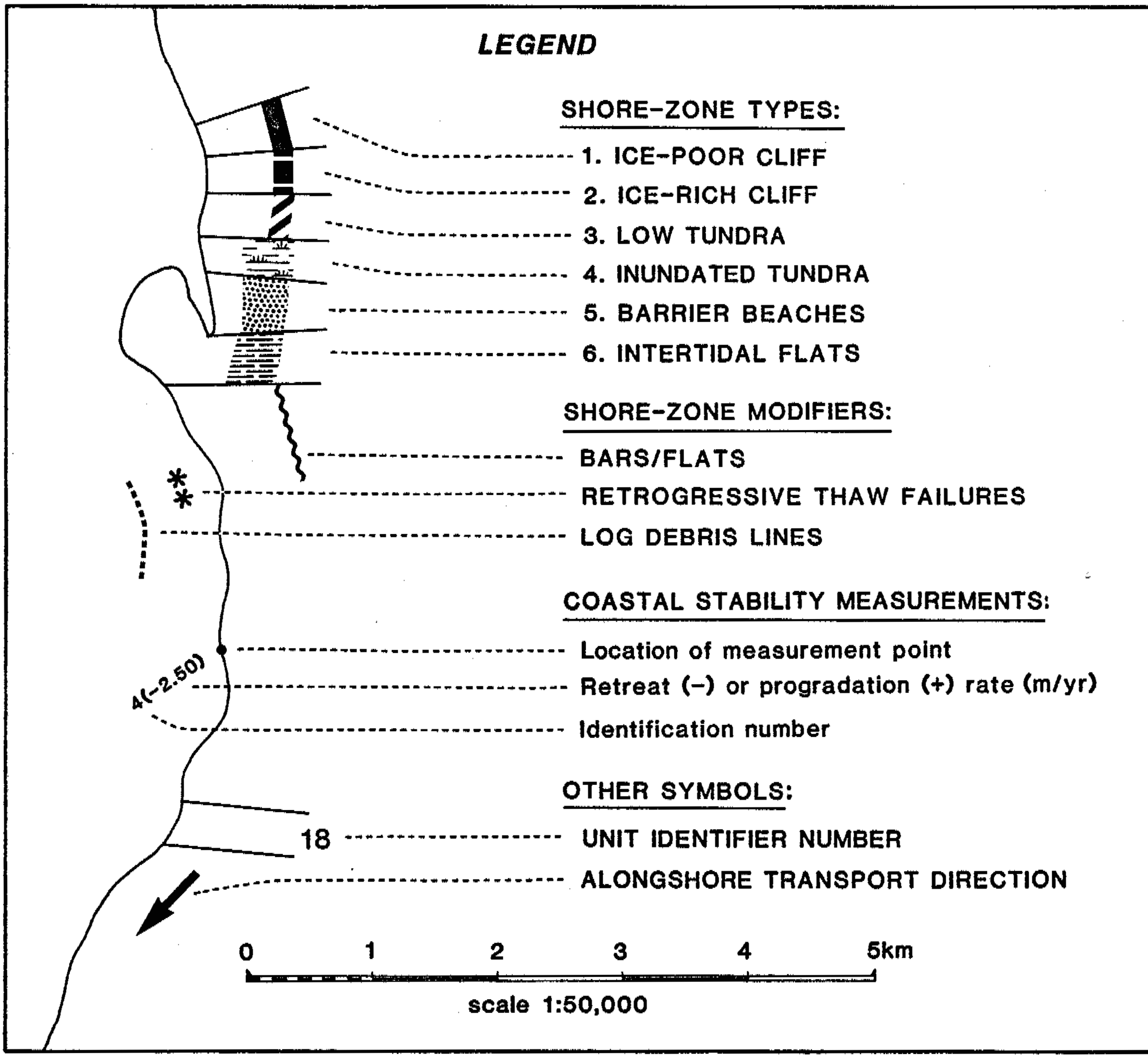

33
34
35
36
32
37
4(-0.19)
5(0.00)
44
43
42
41
40
31
38
39
26
27
30
28
25
24
29
3(-0.48)
23
22
2(-4.10)
21
20
1(-0.91)
19
18
Locality #5
45±
75±
40±
20±
30±
25±
35±
35±
80±
30±
60±


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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4(-2.50)
Location of measurement point
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Identification number
OTHER SYMBOLS:
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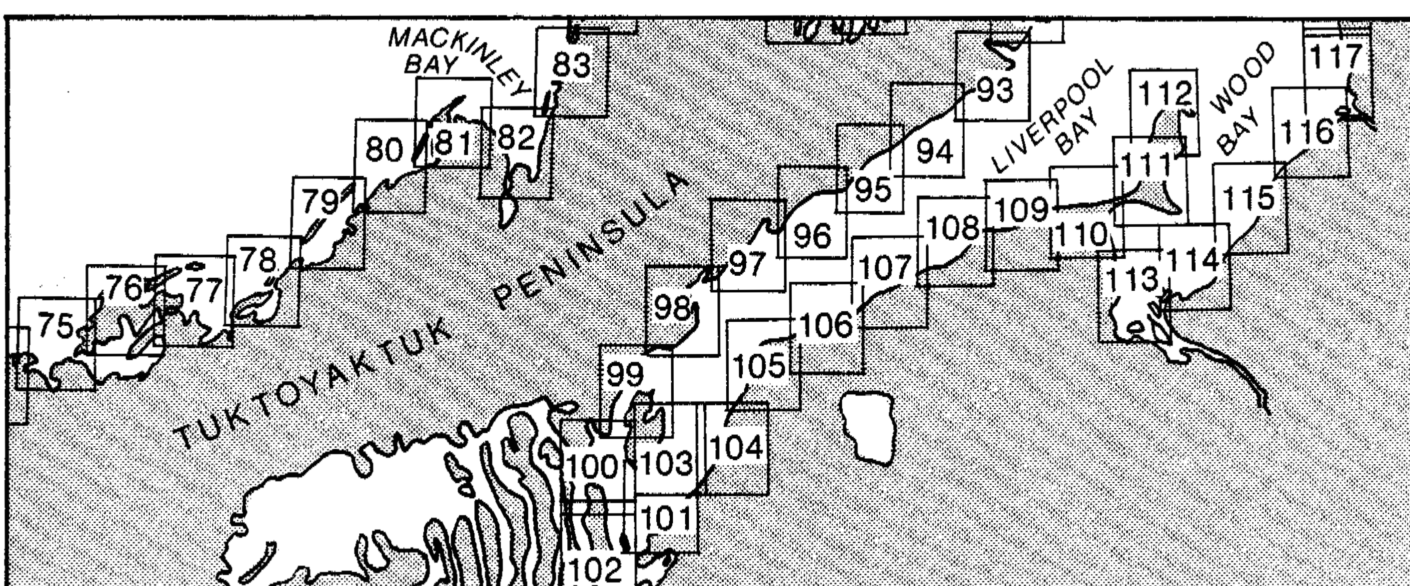
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75
76
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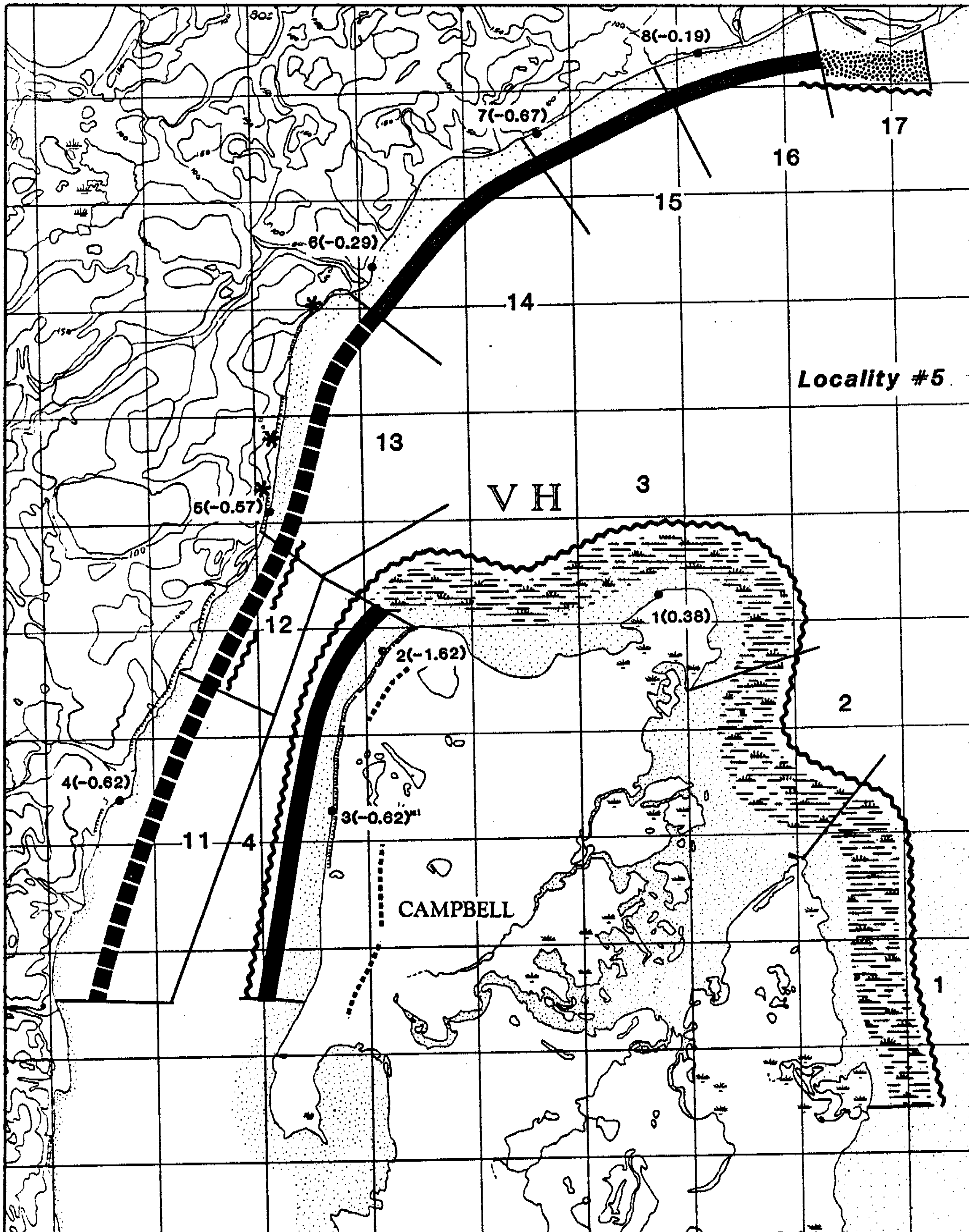
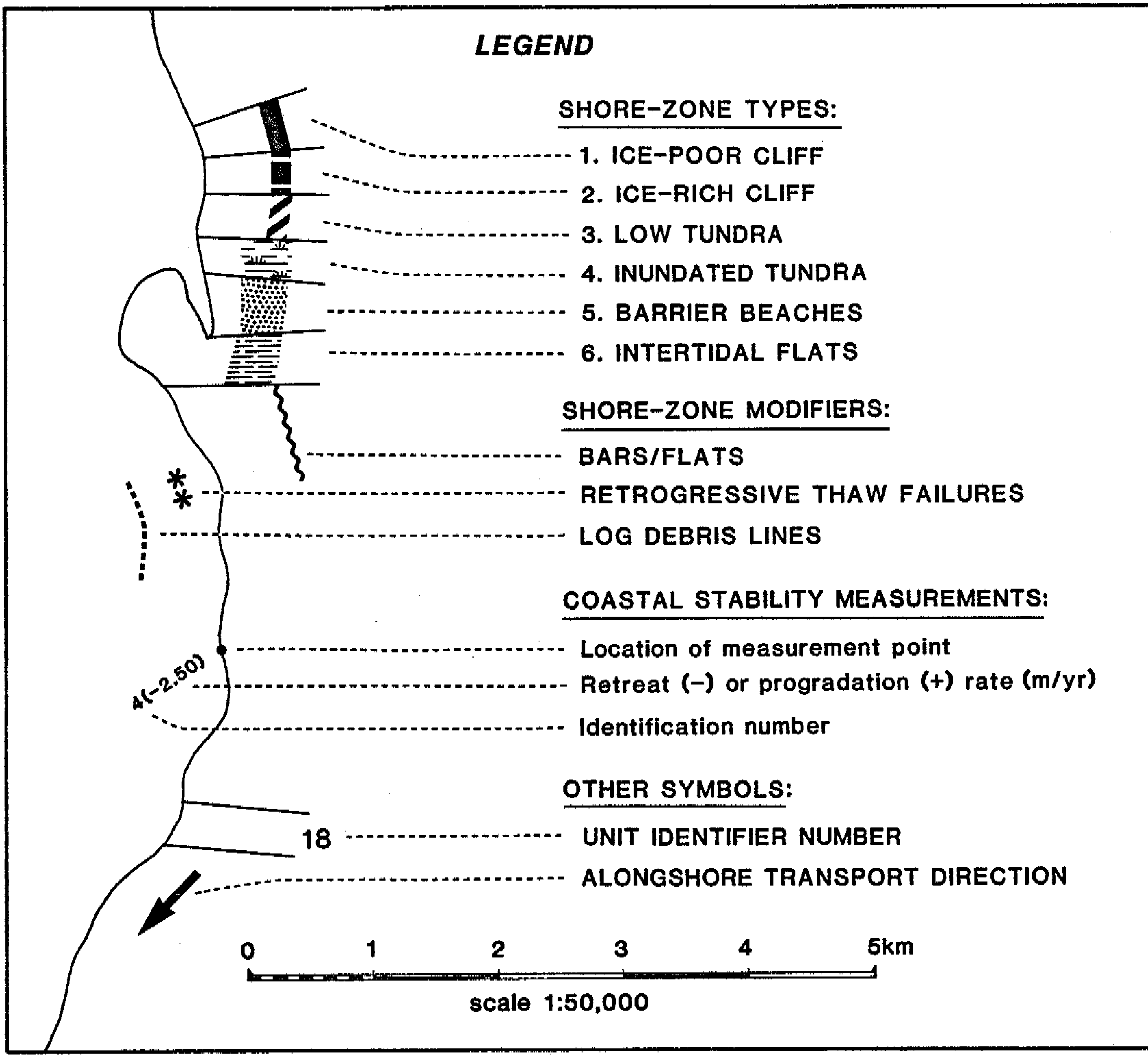
117


8(-0.19)
7(-0.67)
17
16
15
6(-0.29)
14
Locality #5
13
VH
3
5(-0.57)
1(0.38)
12
2(-1.62)
2
4(-0.62)
3(-0.62)
11
4
CAMPBELL
1


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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LOG DEBRIS LINES
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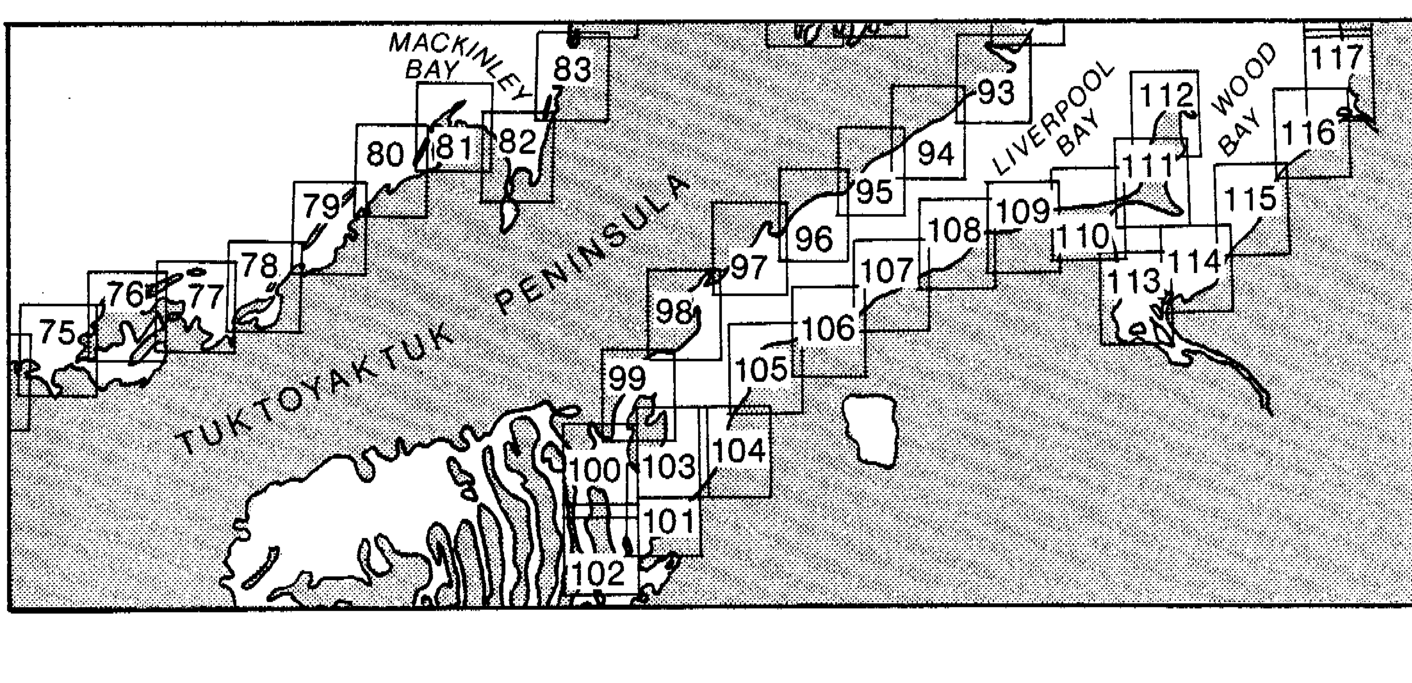
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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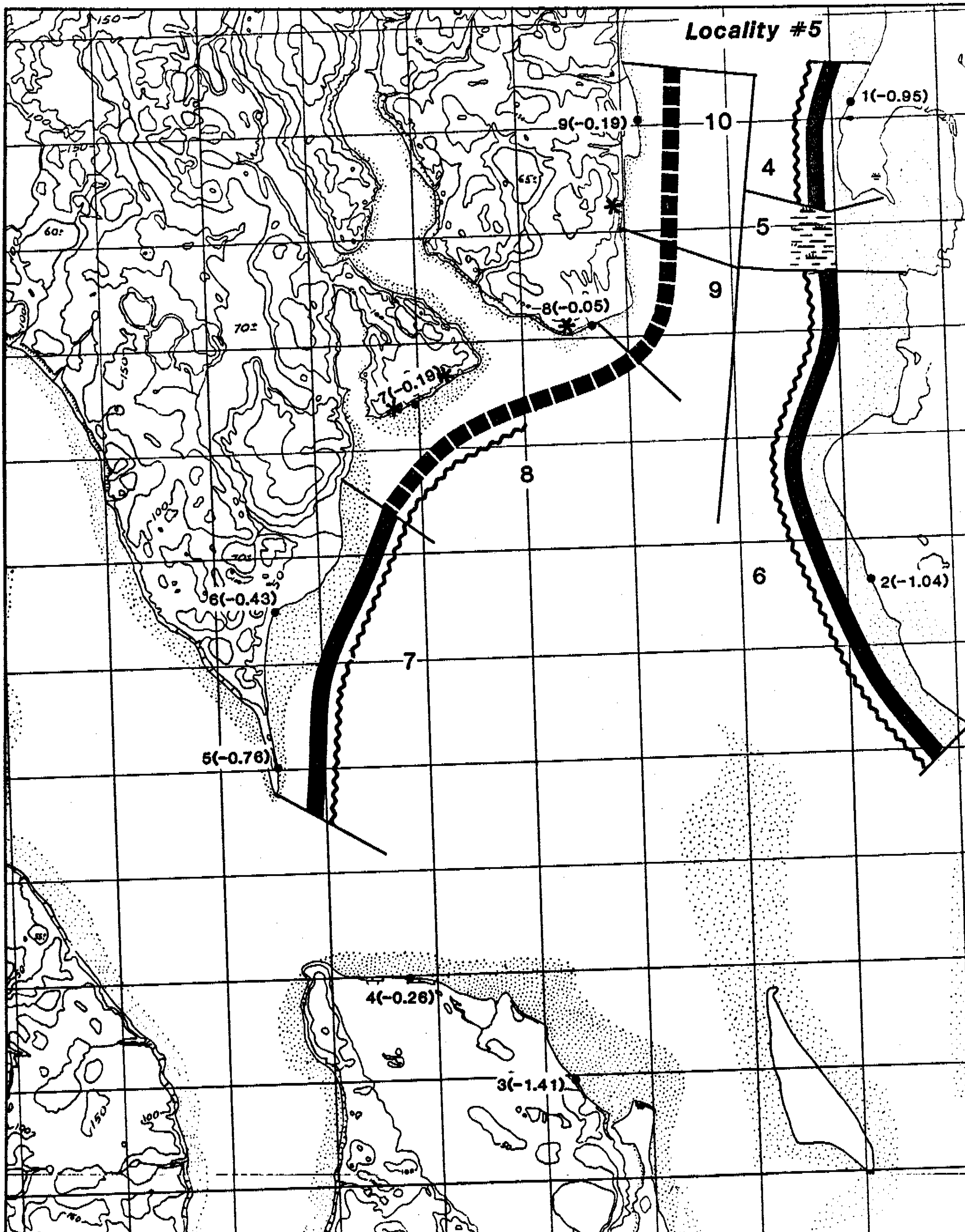
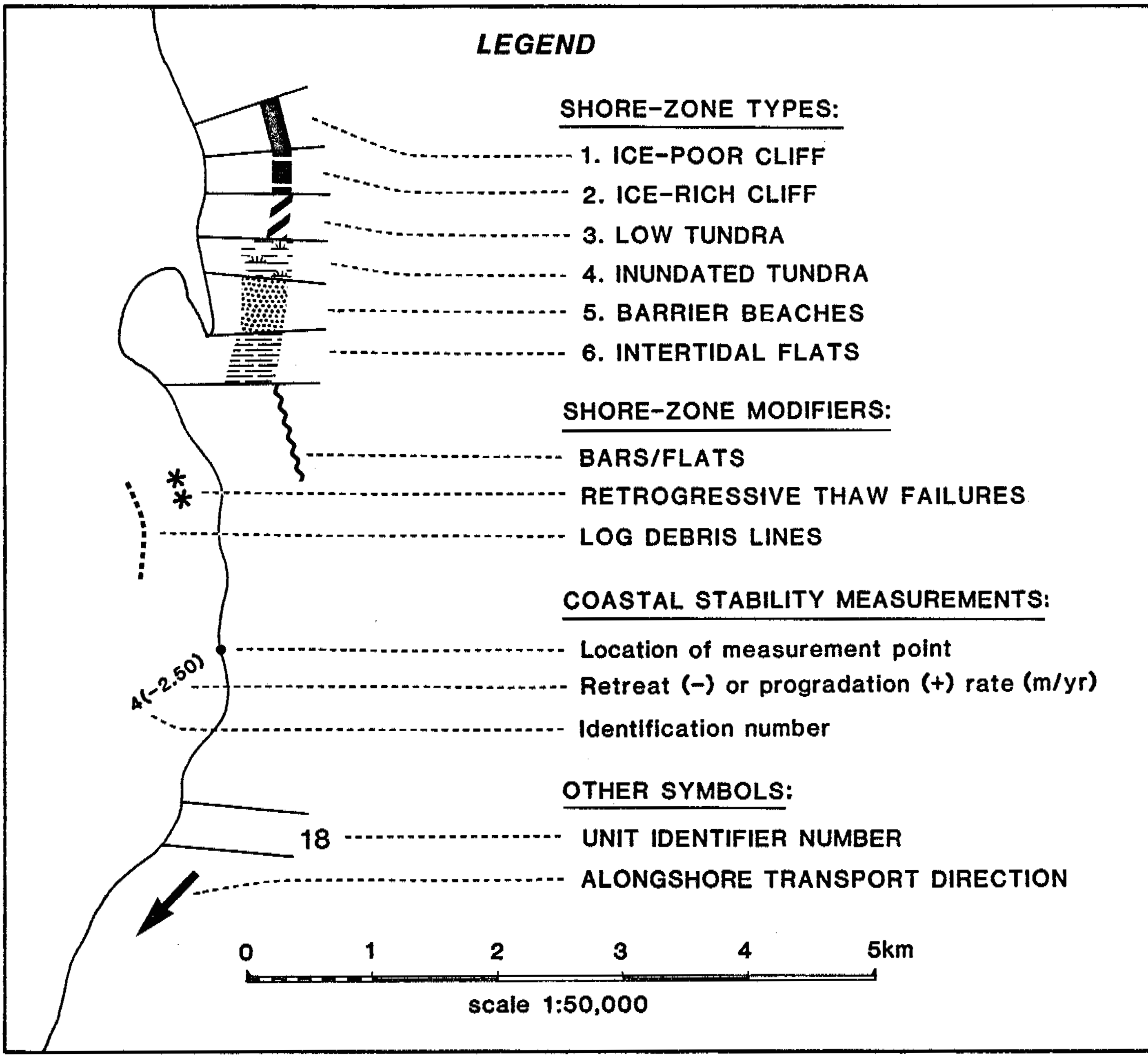


Locality #5
1(-0.95)
9(-0.19)
10
4
5
9
8(-0.05)
7(-0.19)
8
6
2(-1.04)
6(-0.43)
7
5(-0.76)
4(-0.26)
3(-1.41)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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SHORE-ZONE MODIFIERS:
BARS/FLATS
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COASTAL STABILITY MEASUREMENTS:
Location of measurement point
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Identification number
4(−2.50)
OTHER SYMBOLS:
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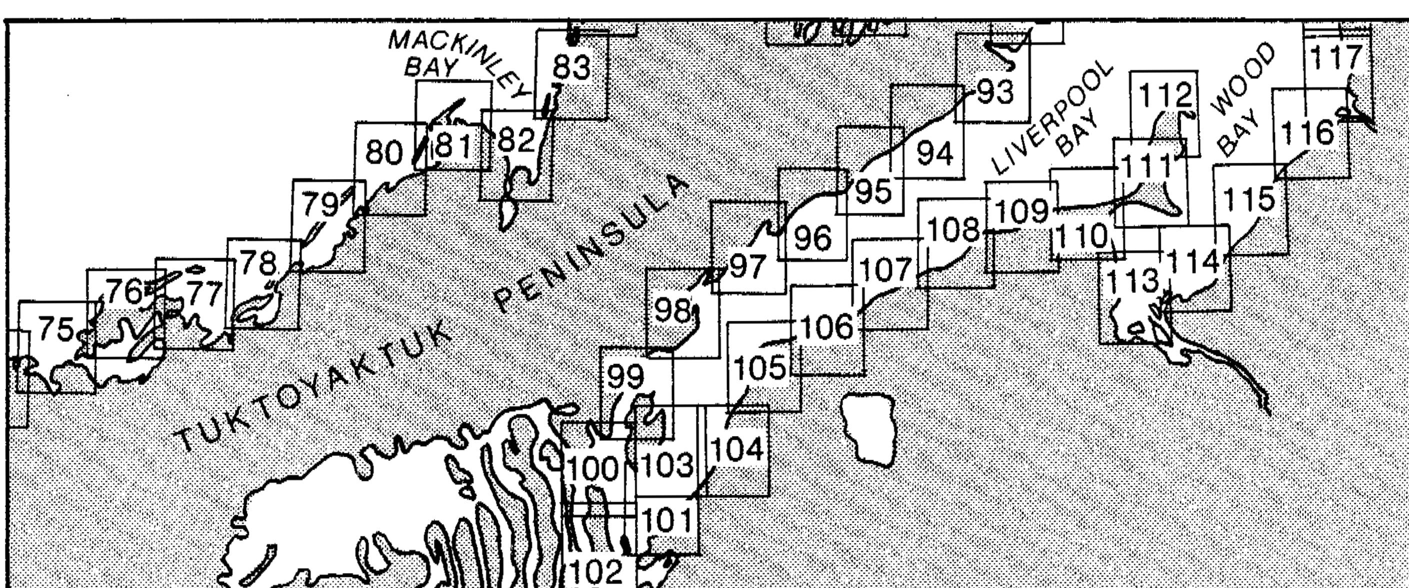
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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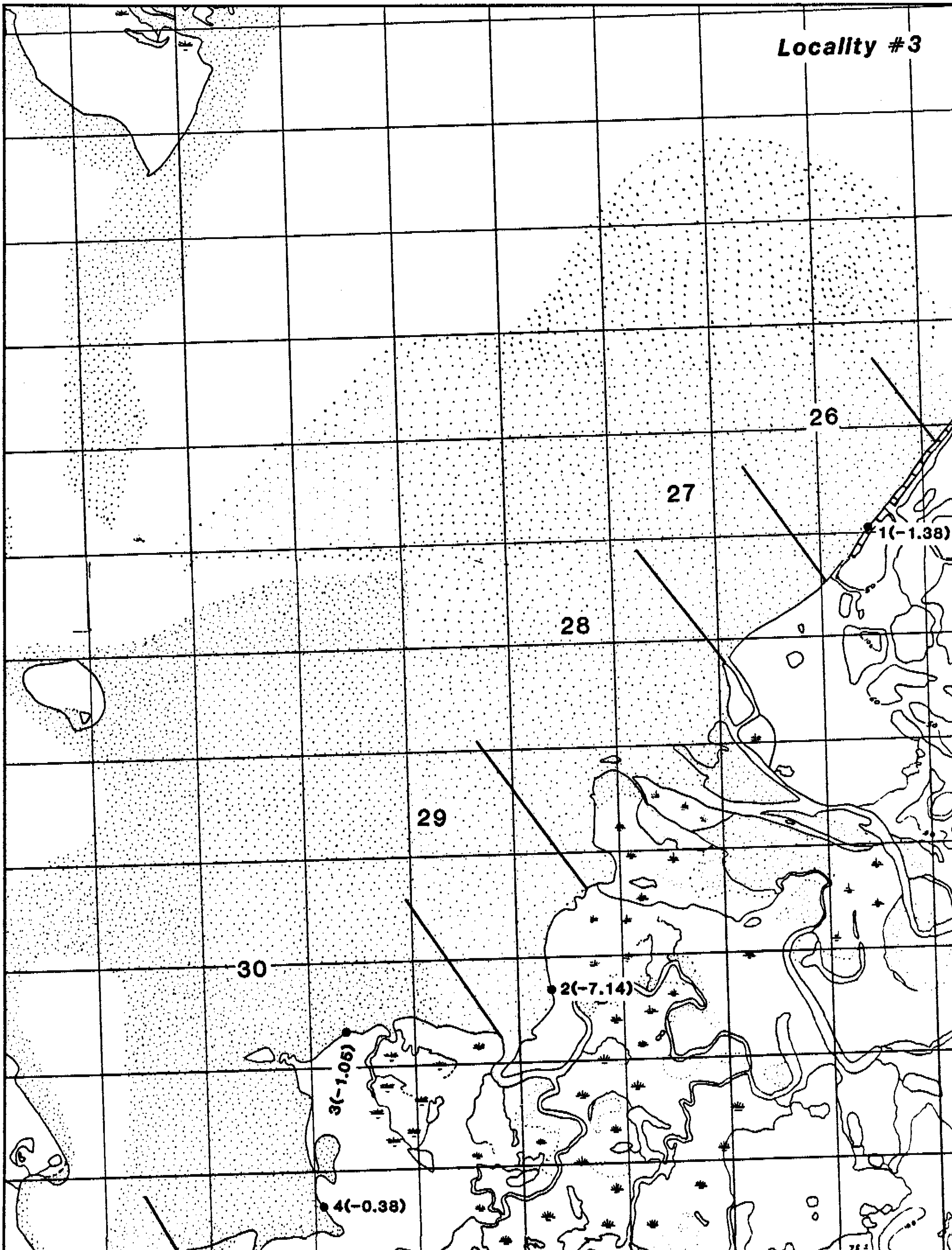
117

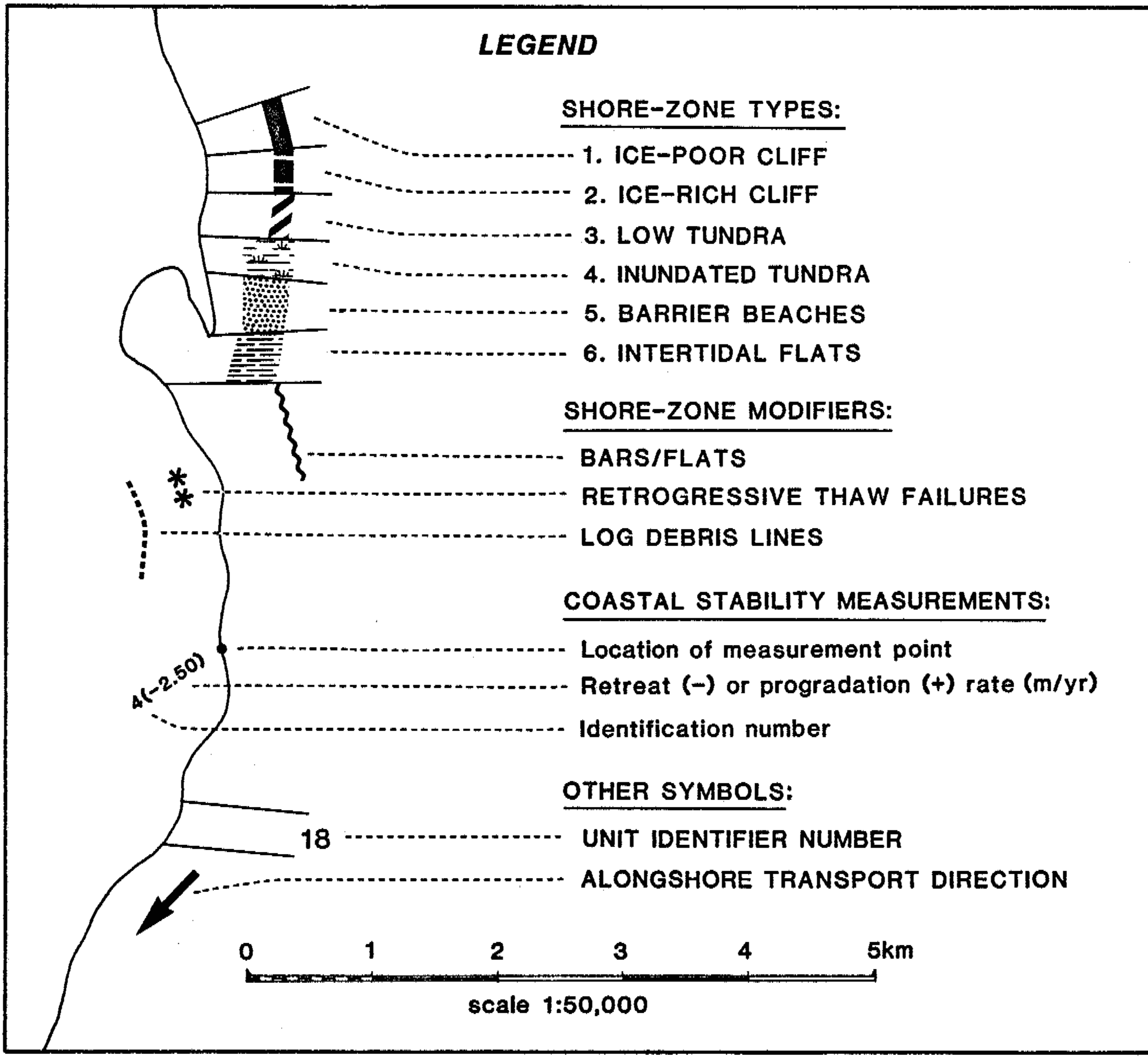
Coastal Information System Database Output

The entire data base for the shore-zone analysis is contained on seperate computer print-outs and nine-track tapes. The information is catalogued systematically using the Geological Survey of Canada's Coastal Information System (Forbes and Fricker, 1985). The data base contains more detailed information on each of the units shown in the coastal resource maps (Appendix 2) and includes description of across-shore morphologic components, characterization of across-shore sediment texture, shore-zone width estimates, shore-zone relief estimates, data sources that were used in the interpretation and geographic coordinates of the unit boundaries.

For additional information on this data base, contact Dr. D. Forbes, Atlantic Geoscience Centre, Bedford Institute of Oceanography, Dartmouth, N.S.



Locality #3
26
27
1(-1.38)
28
29
30
2(-7.14)
3(-1.05)
4(-0.38)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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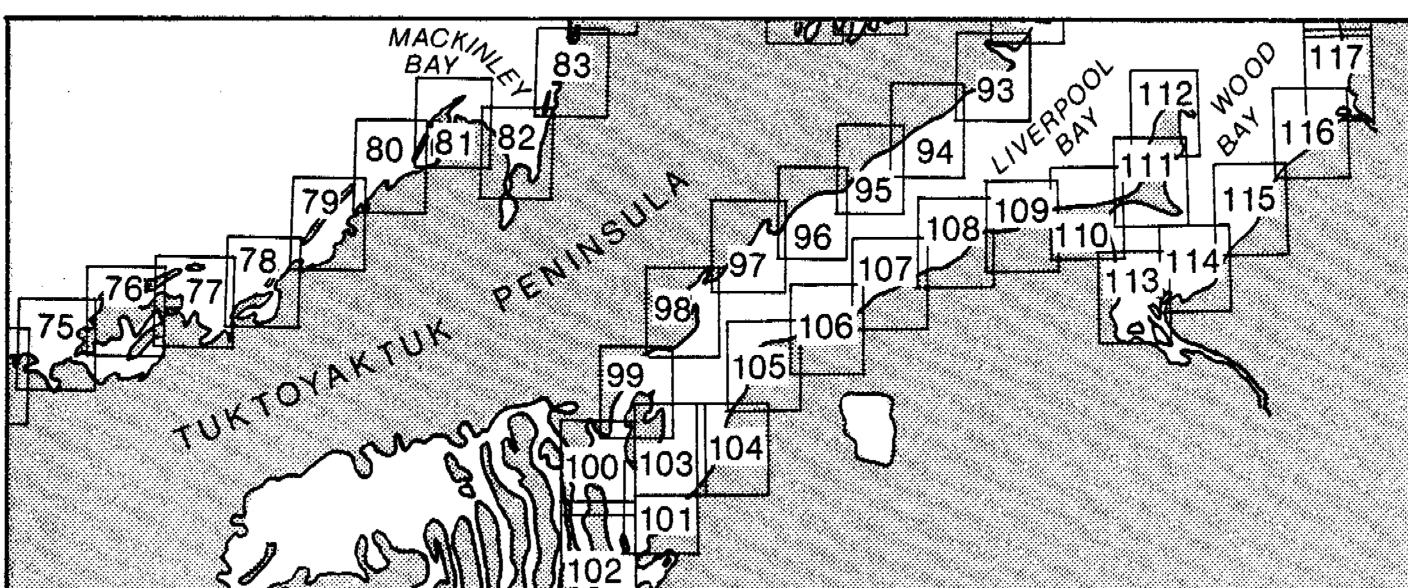
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
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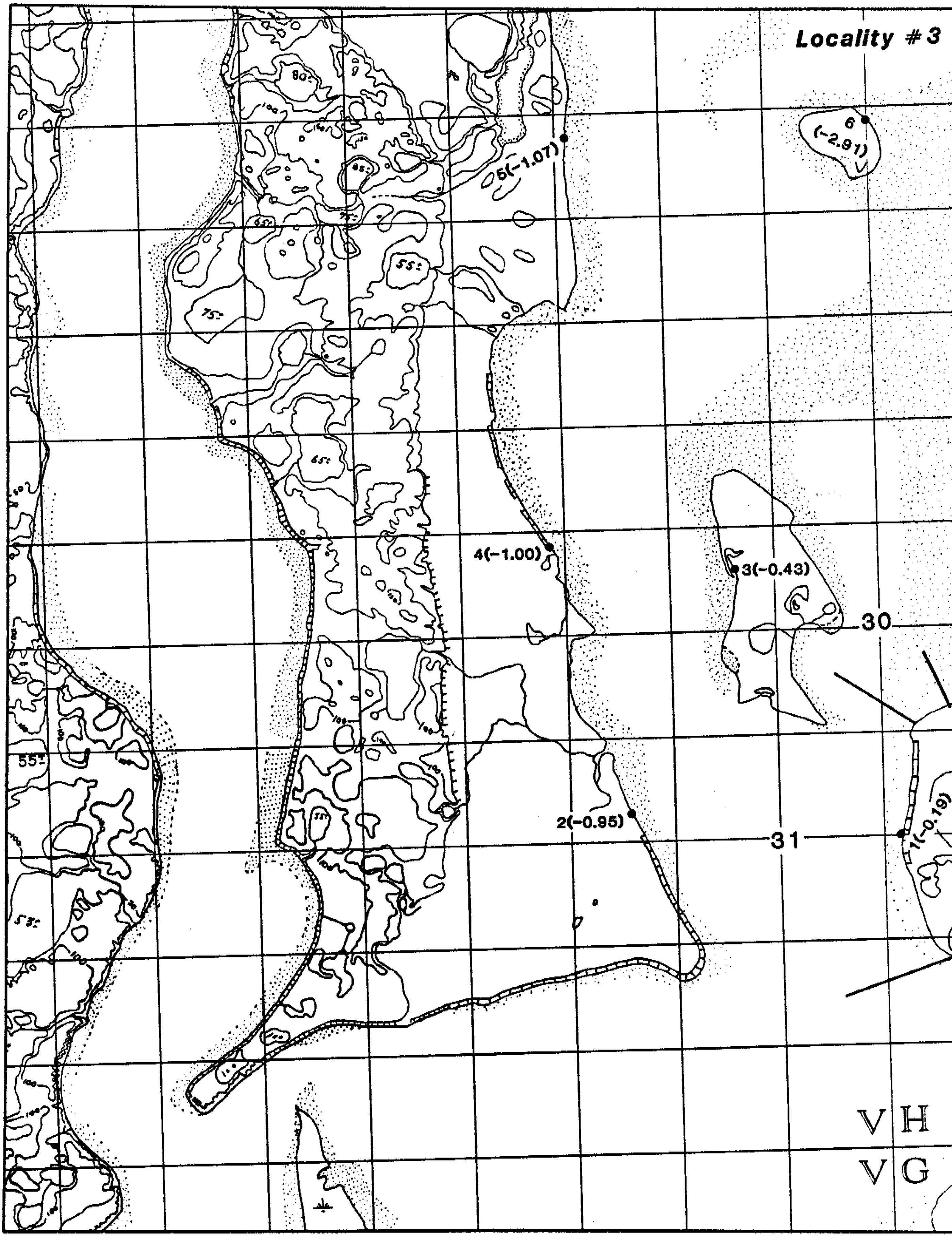
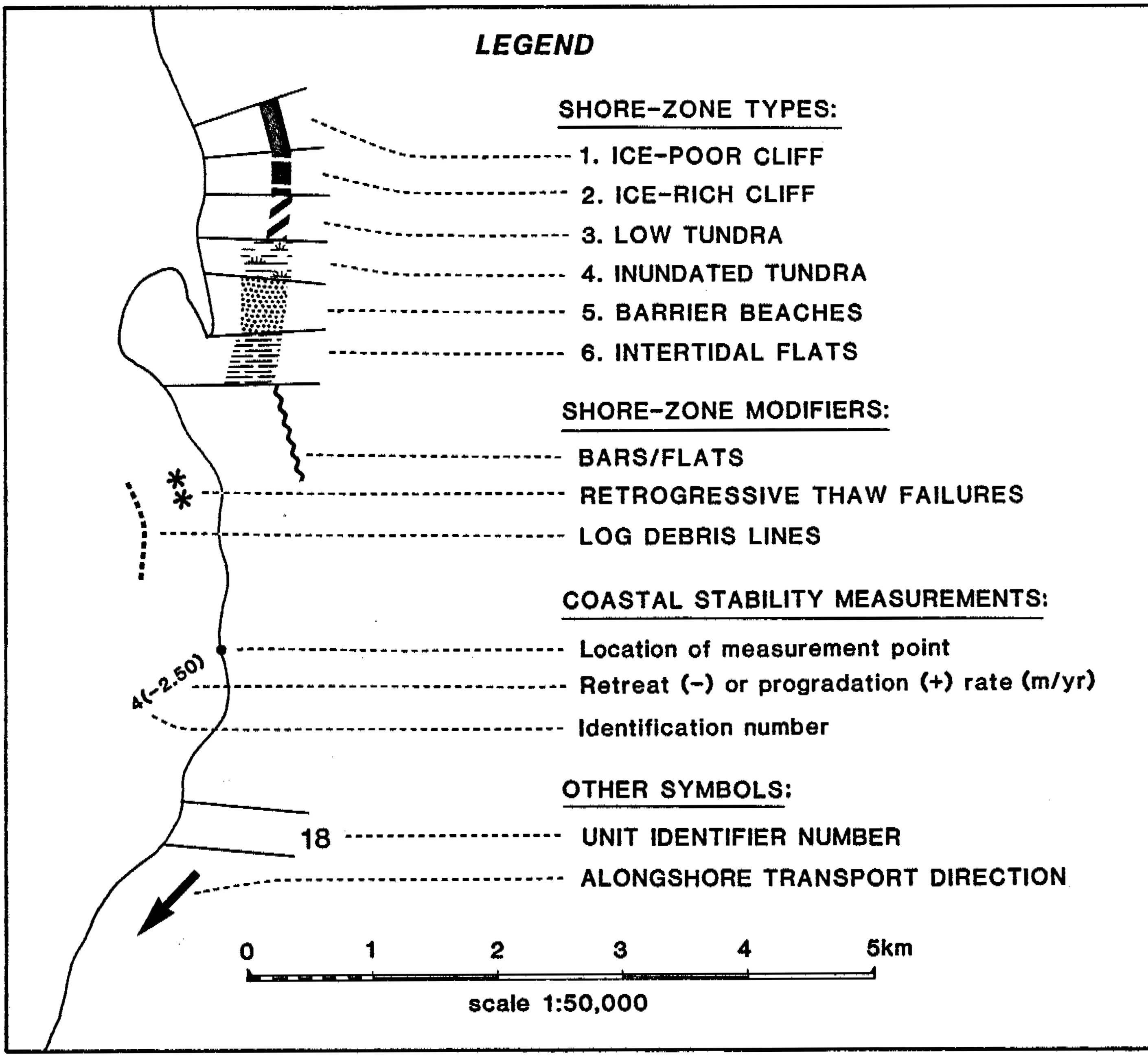
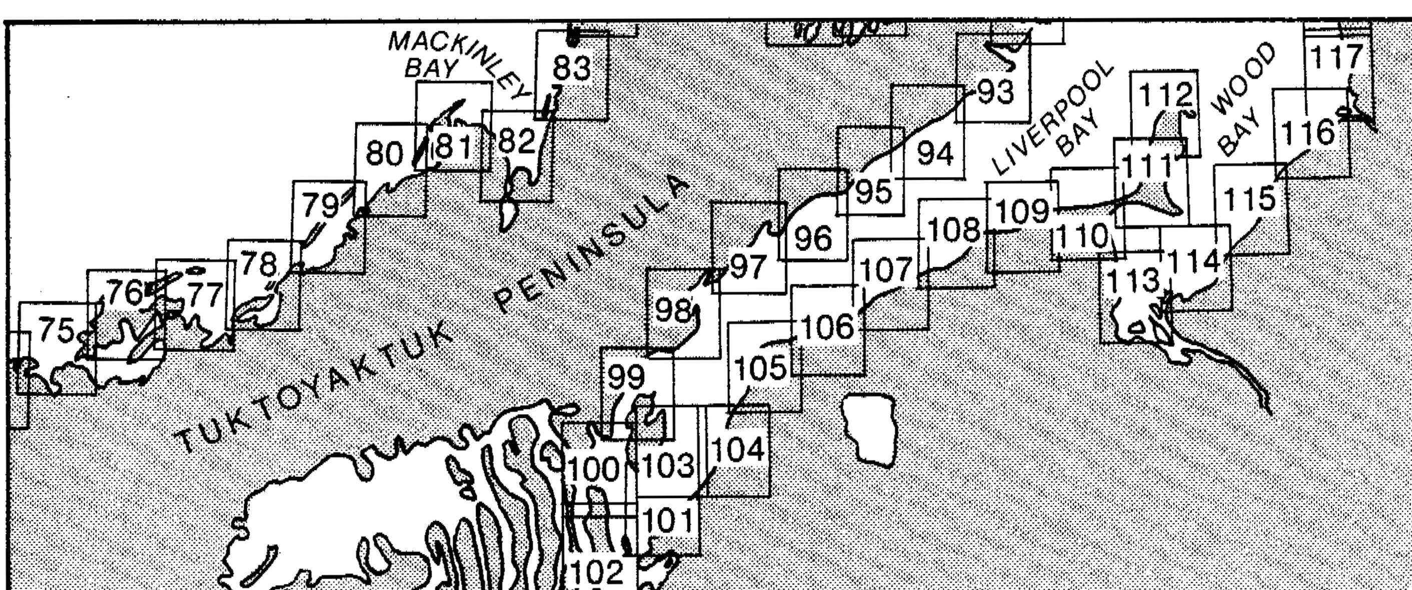

Locality # 3
6
(-2.91)
5(-1.07)
4(-1.00)
3(-0.43)
30
2(-0.95)
31
1(-0.19)
V H
V G


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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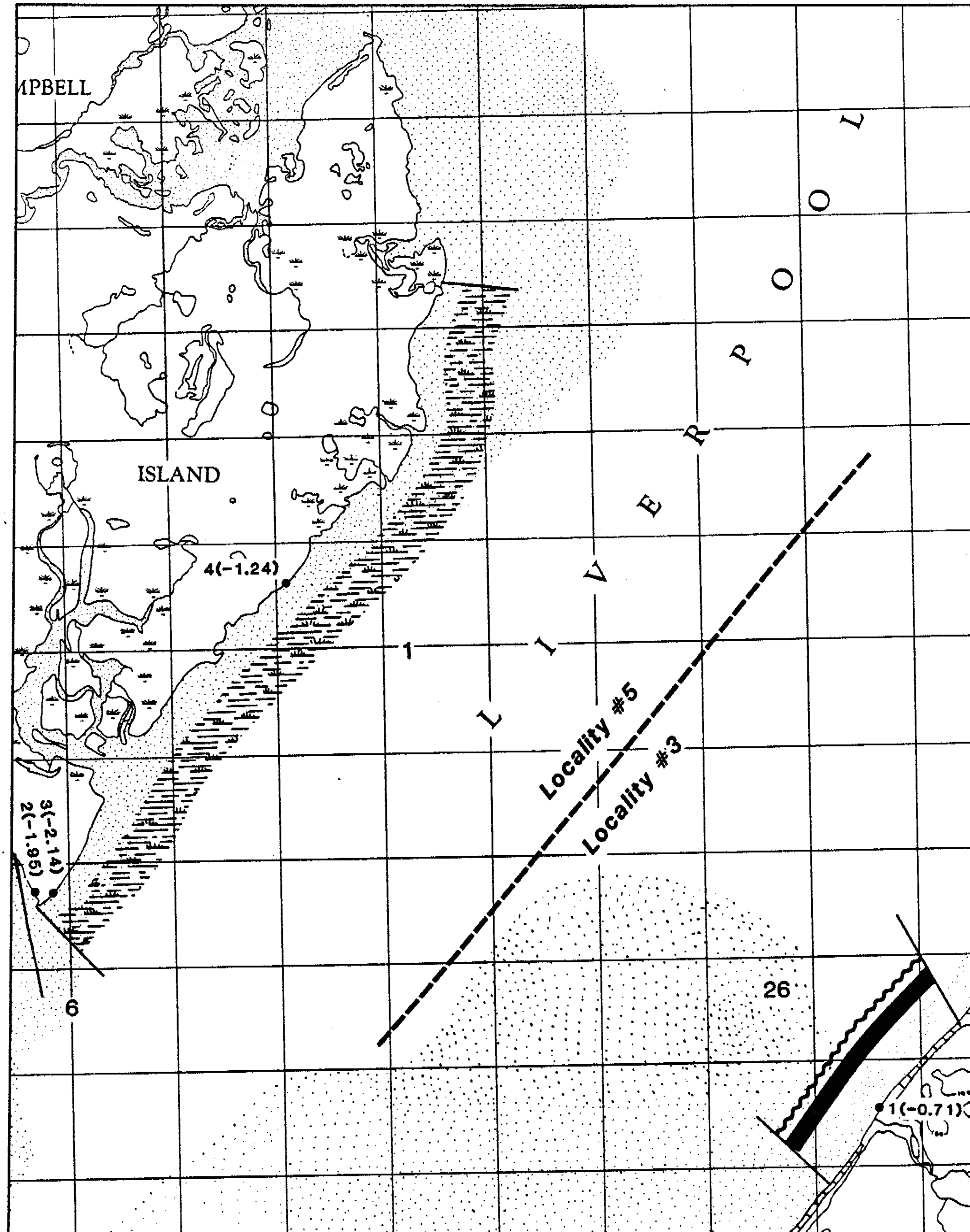
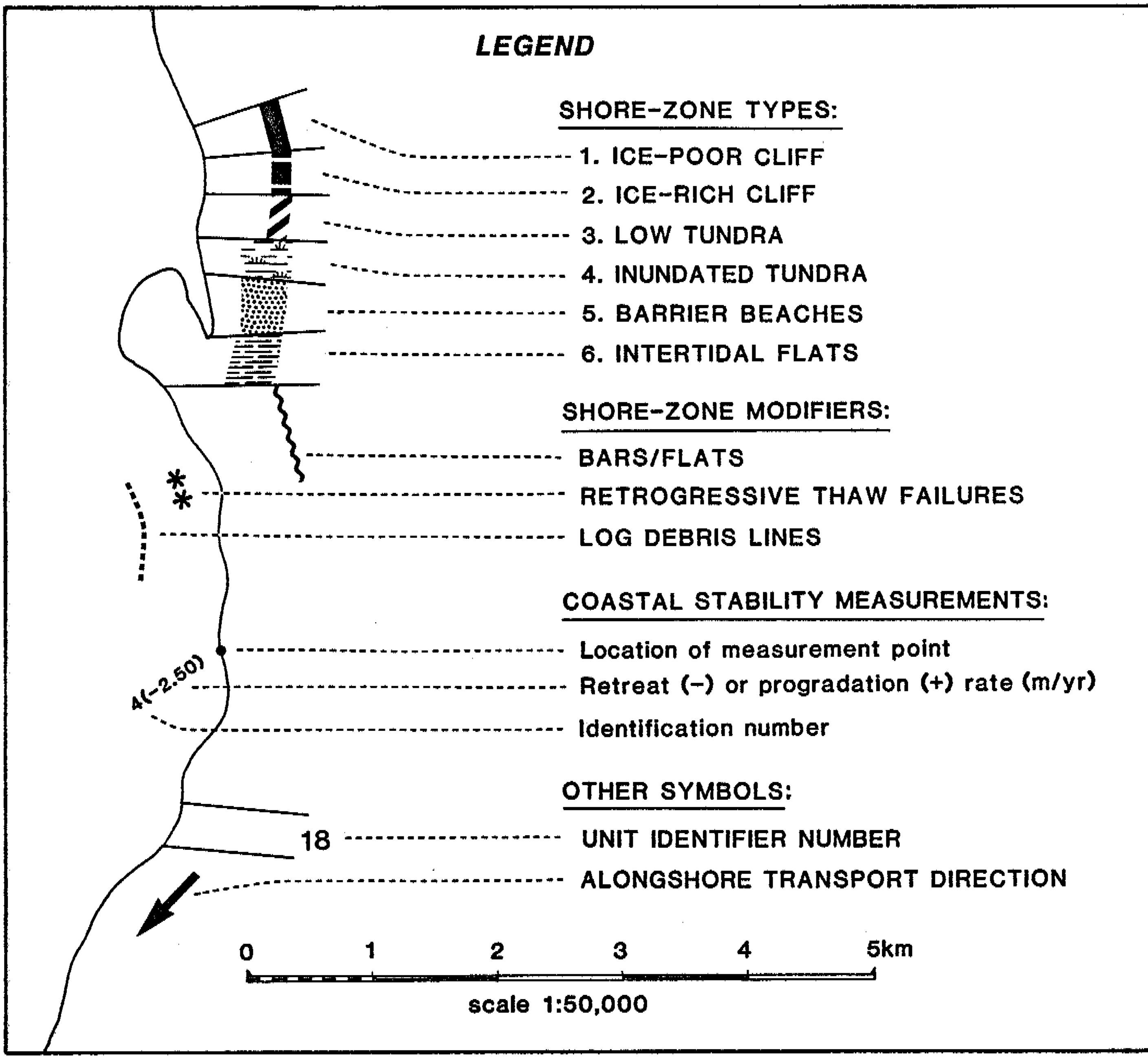


MPBELL
ISLAND
4(−1.24)
1
L I V E R P O O L
Locality #5
Locality #3
3(−2.14)
2(−1.95)
6
26
1(−0.71)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
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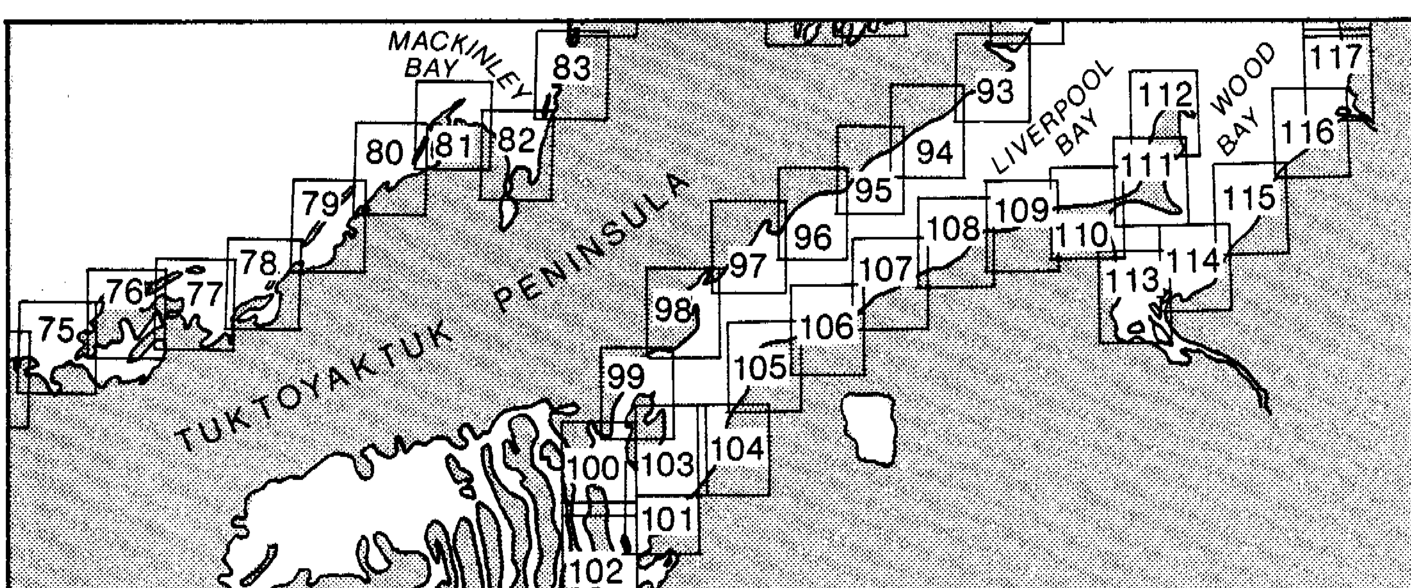
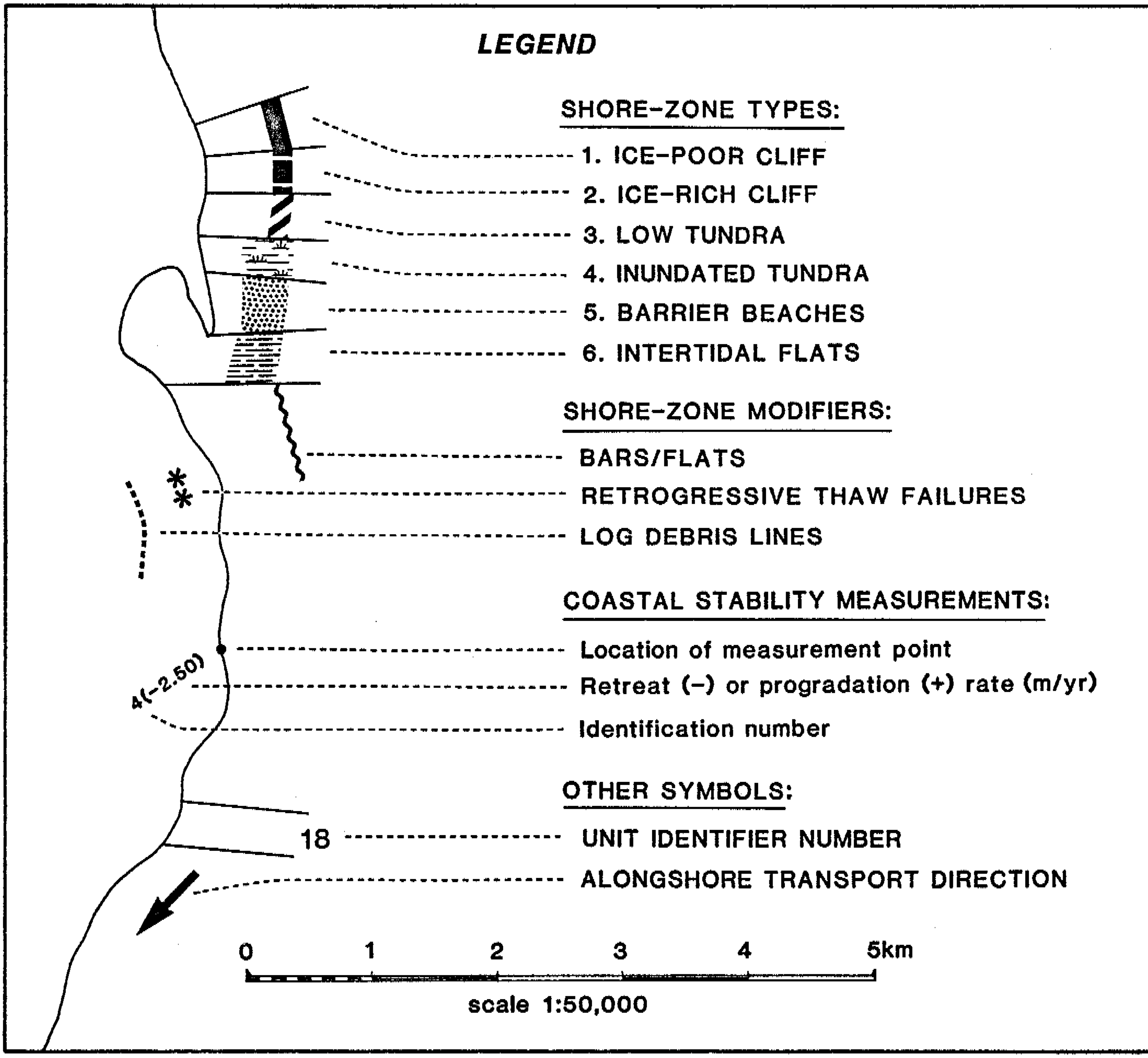
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
75 76 77 78 79 80 81 82 83 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117

Locality #3
25
26
1(-0.14)
2(-0.43)
3(-0.86)
4(-1.05)



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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LOG DEBRIS LINES
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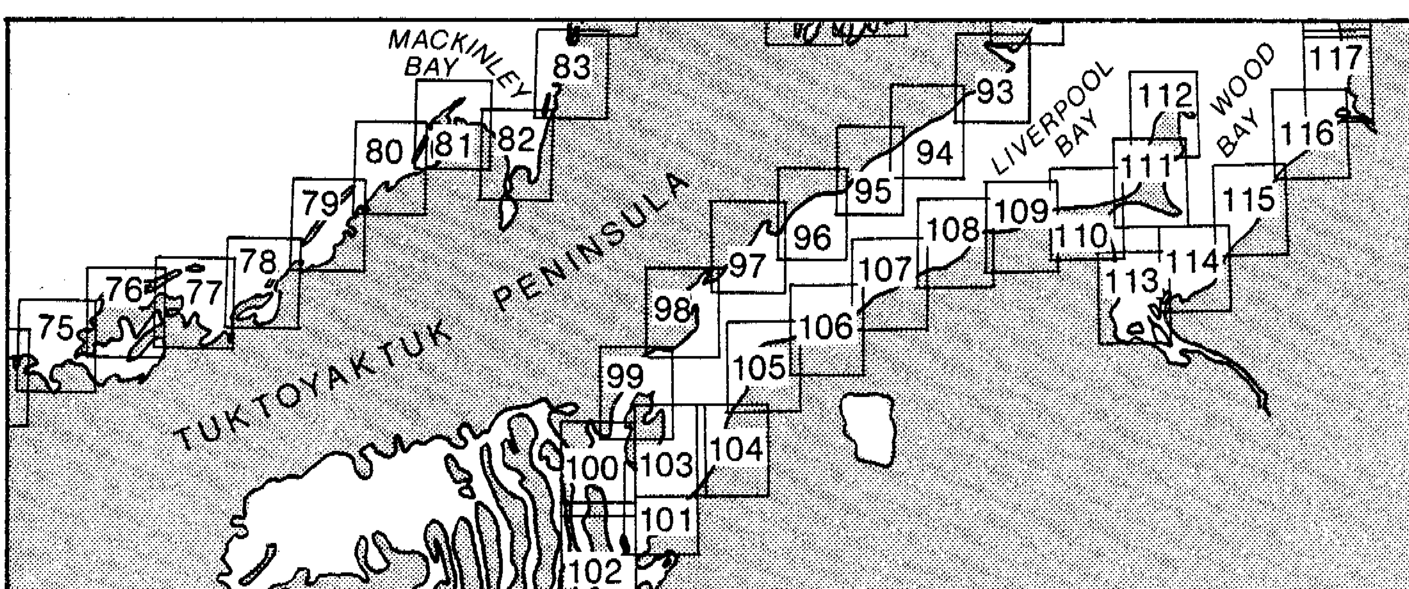
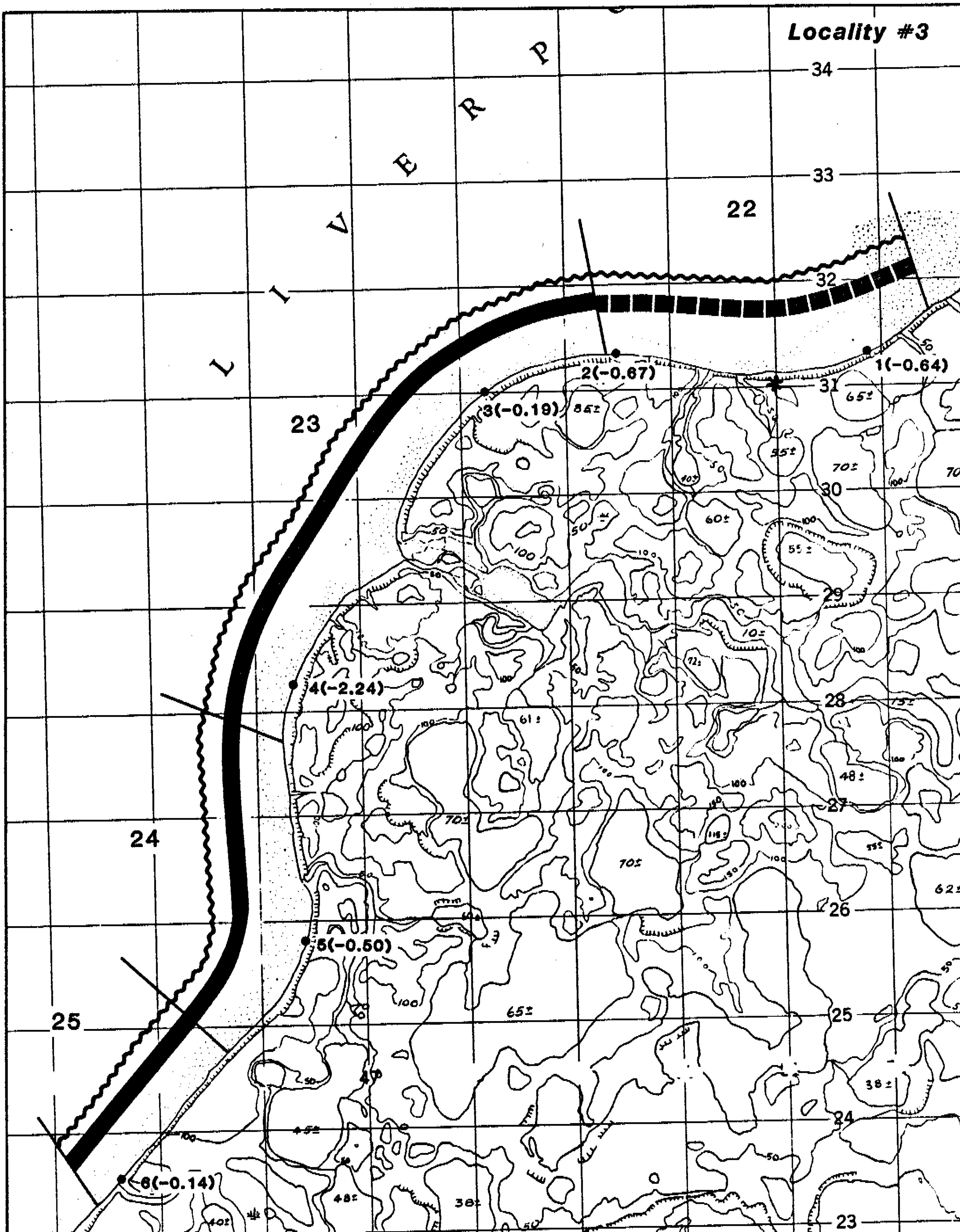
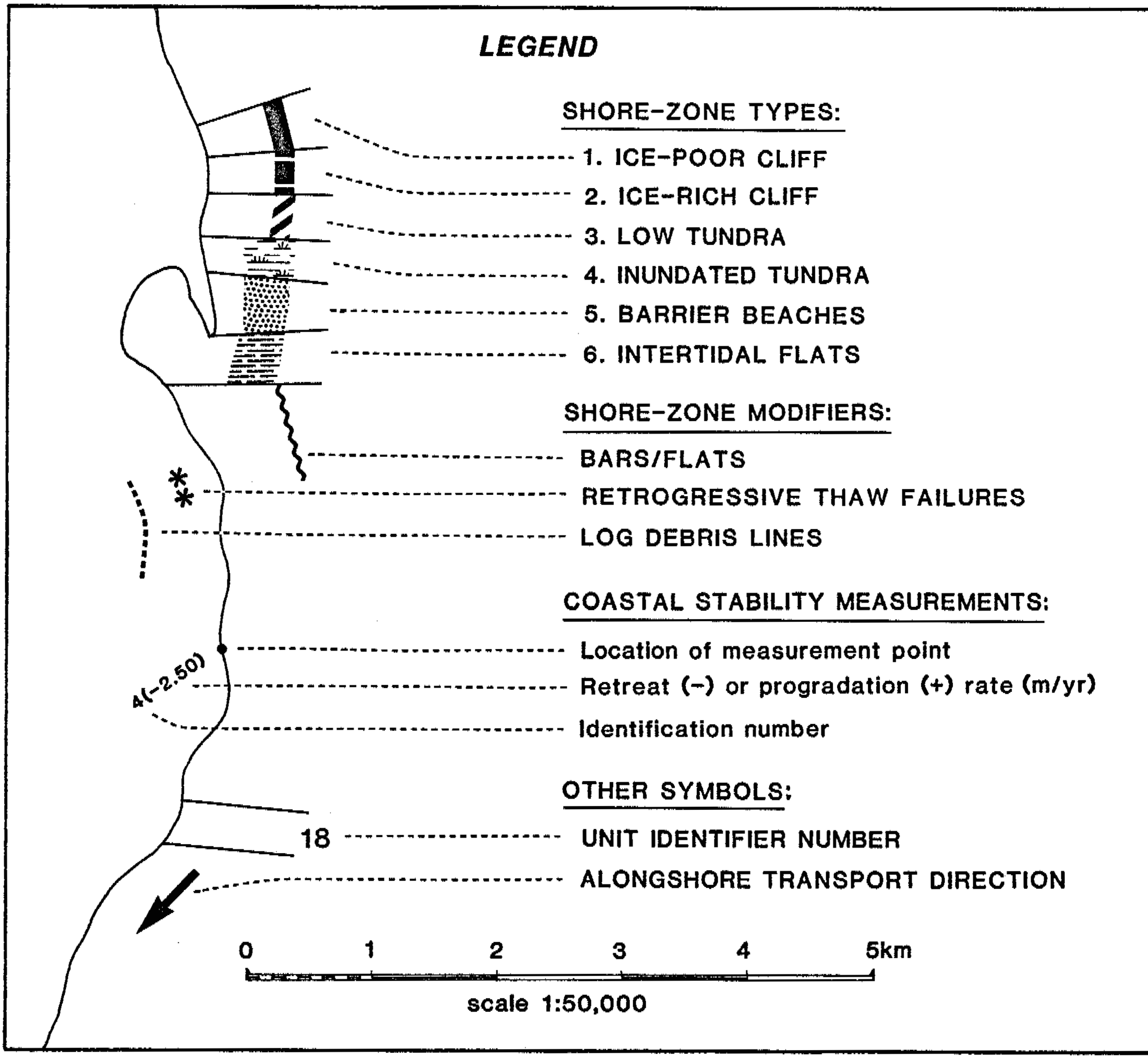
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75 76 77 78 79 80 81 82 83 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117



Locality #3
LIVERPOOL
1(-0.64)
2(-0.67)
3(-0.19)
4(-2.24)
5(-0.50)
6(-0.14)
22
23
24
25


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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BARS/FLATS
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LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
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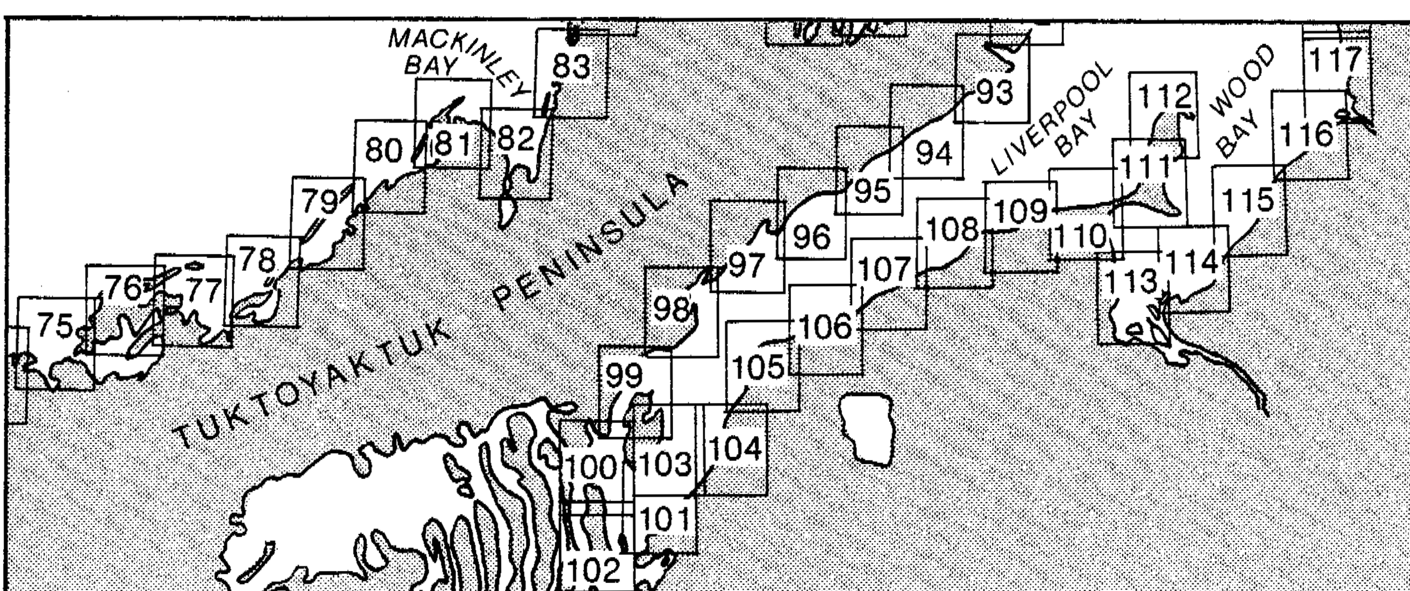
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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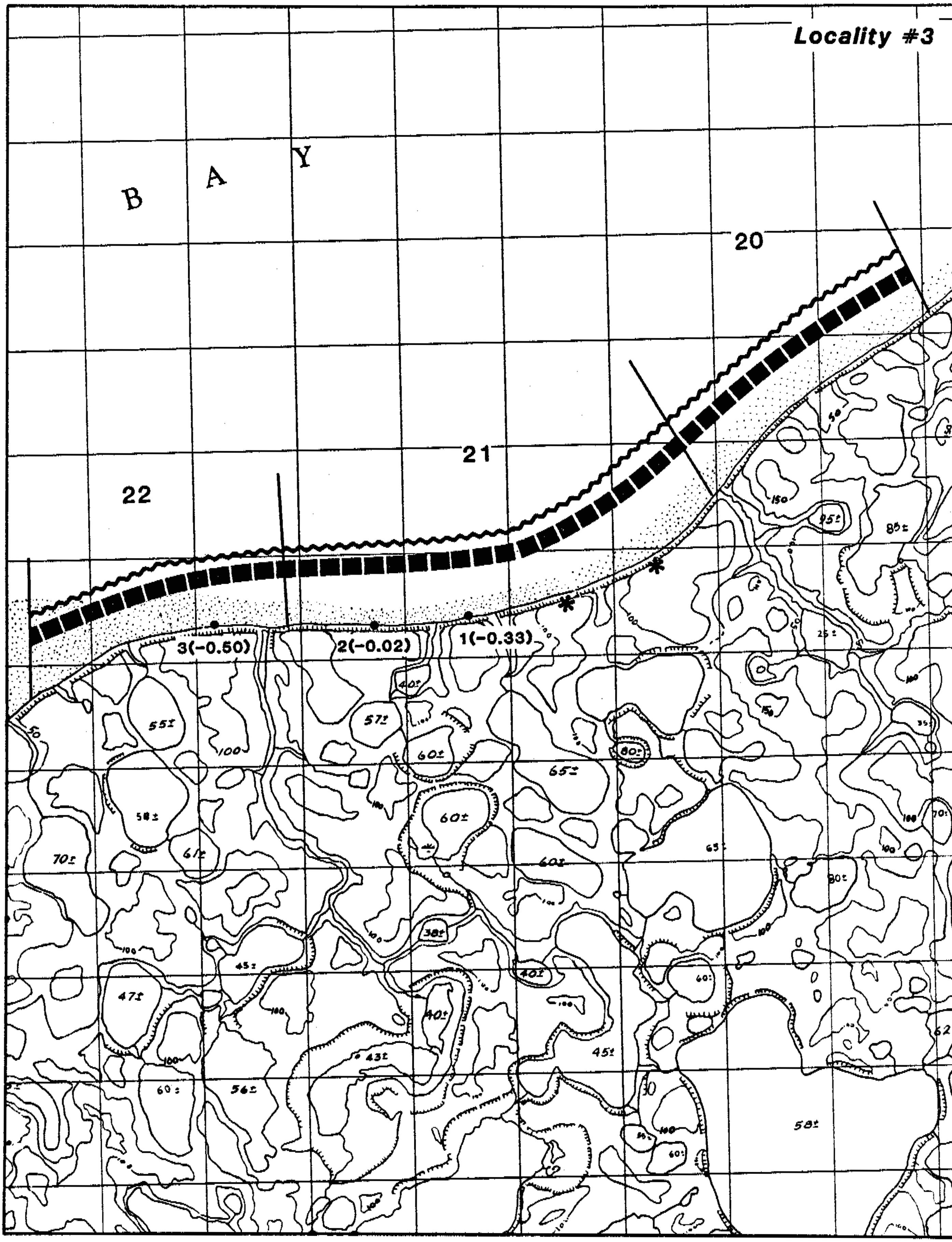
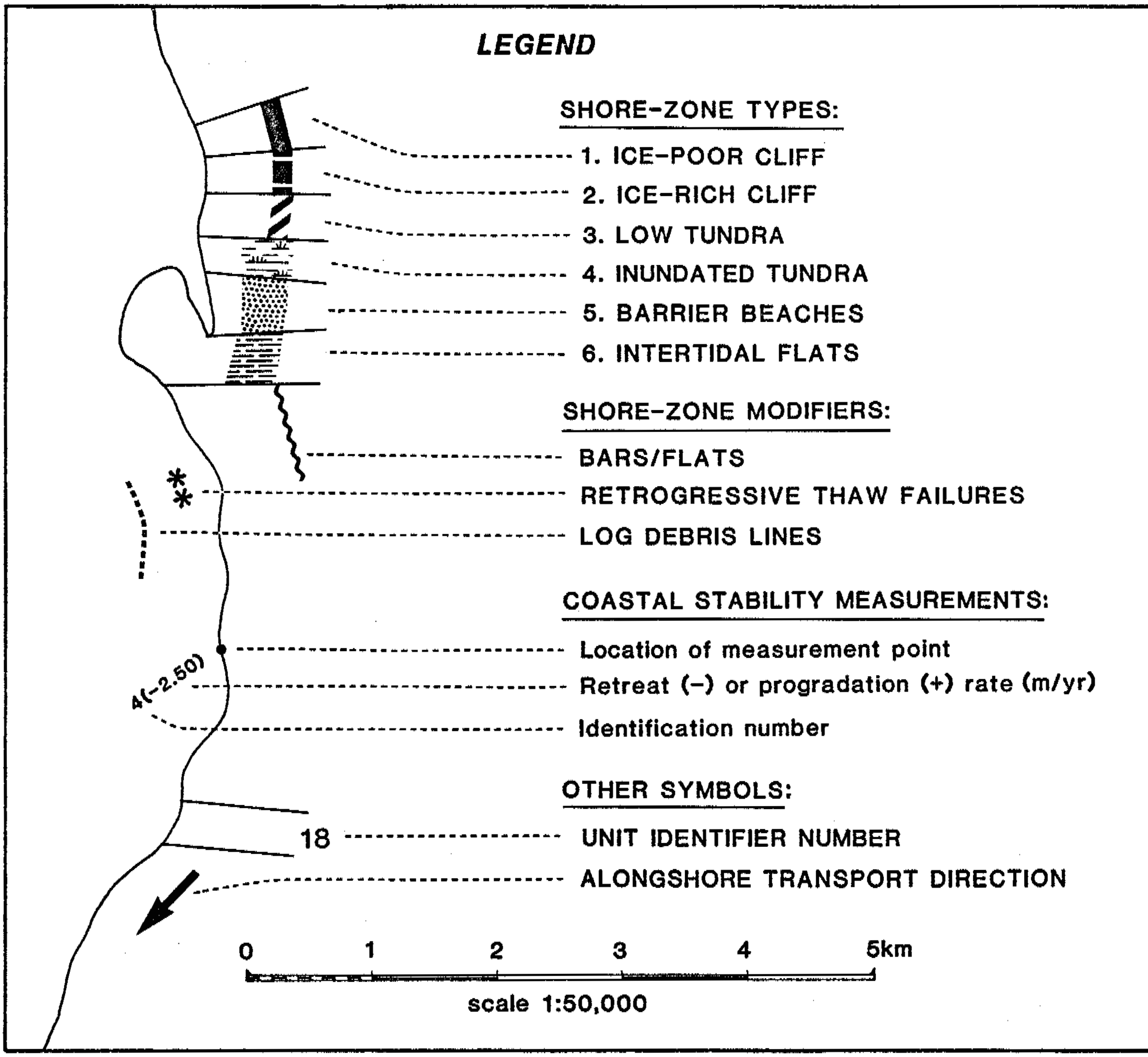


Locality #3
B A Y
20
21
22
3(-0.50)
2(-0.02)
1(-0.33)


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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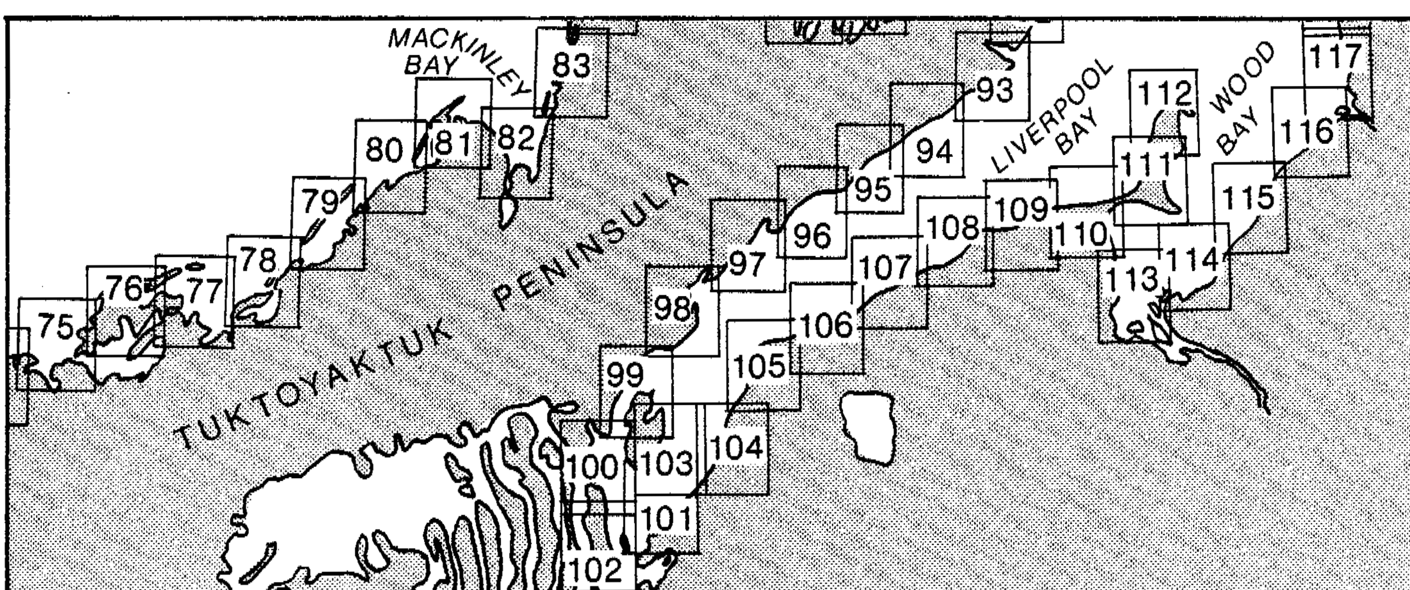
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
83
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TUKTOYAKTUK PENINSULA
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LIVERPOOL BAY
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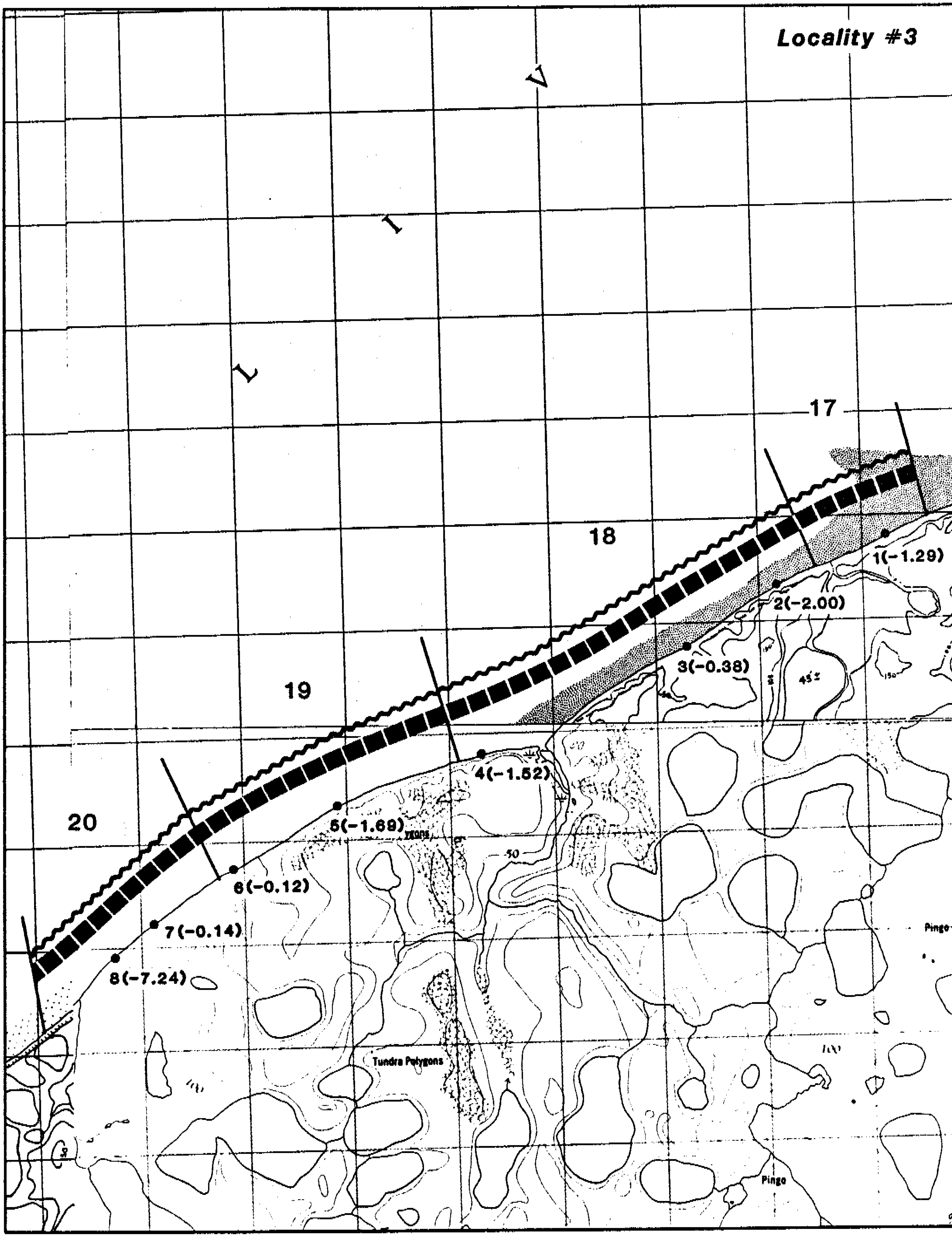
WOOD BAY


Locality #3
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17
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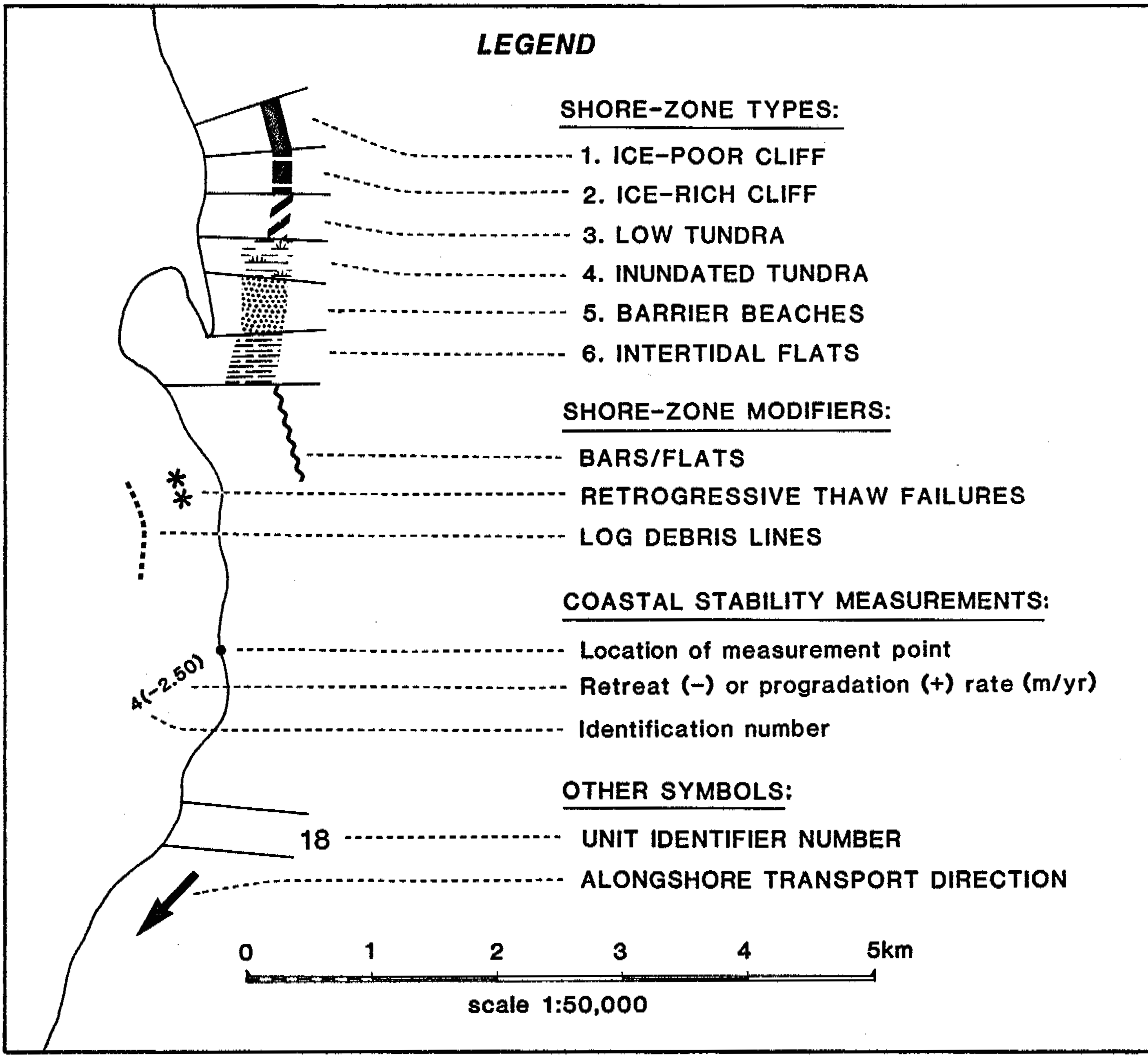
1(-1.29)
2(-2.00)
3(-0.38)
4(-1.52)
5(-1.69)
6(-0.12)
7(-0.14)
8(-7.24)
-50
Pingo
Tundra Polygons
Pingo


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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3. LOW TUNDRA
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RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
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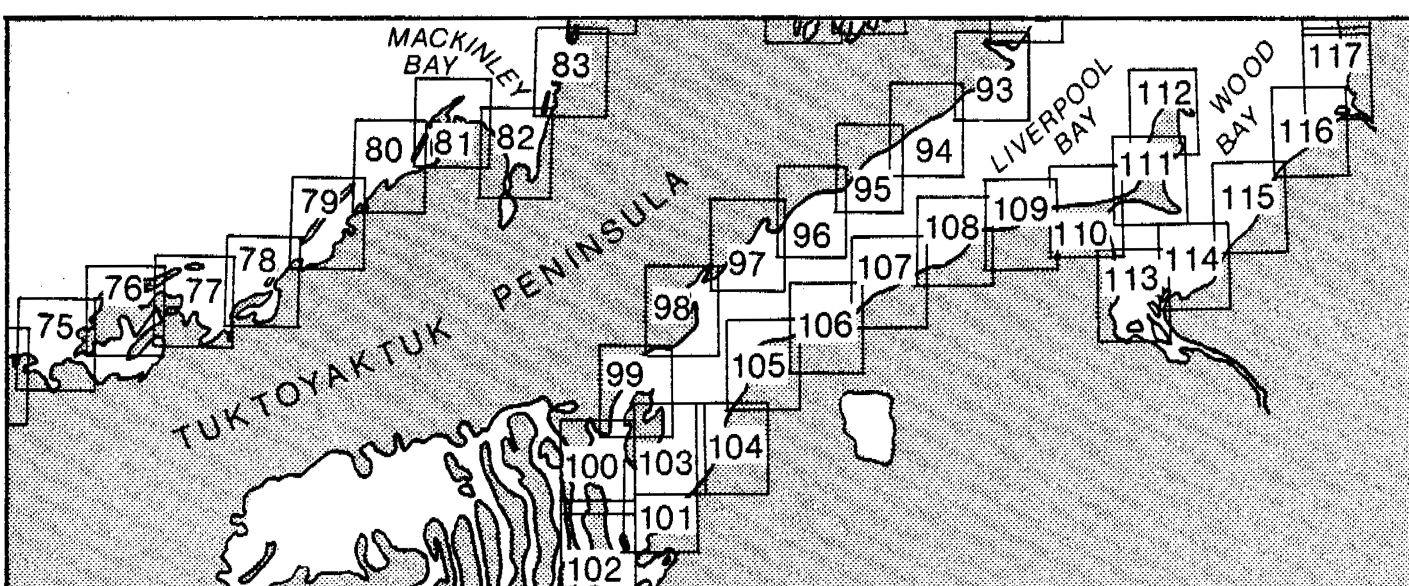
Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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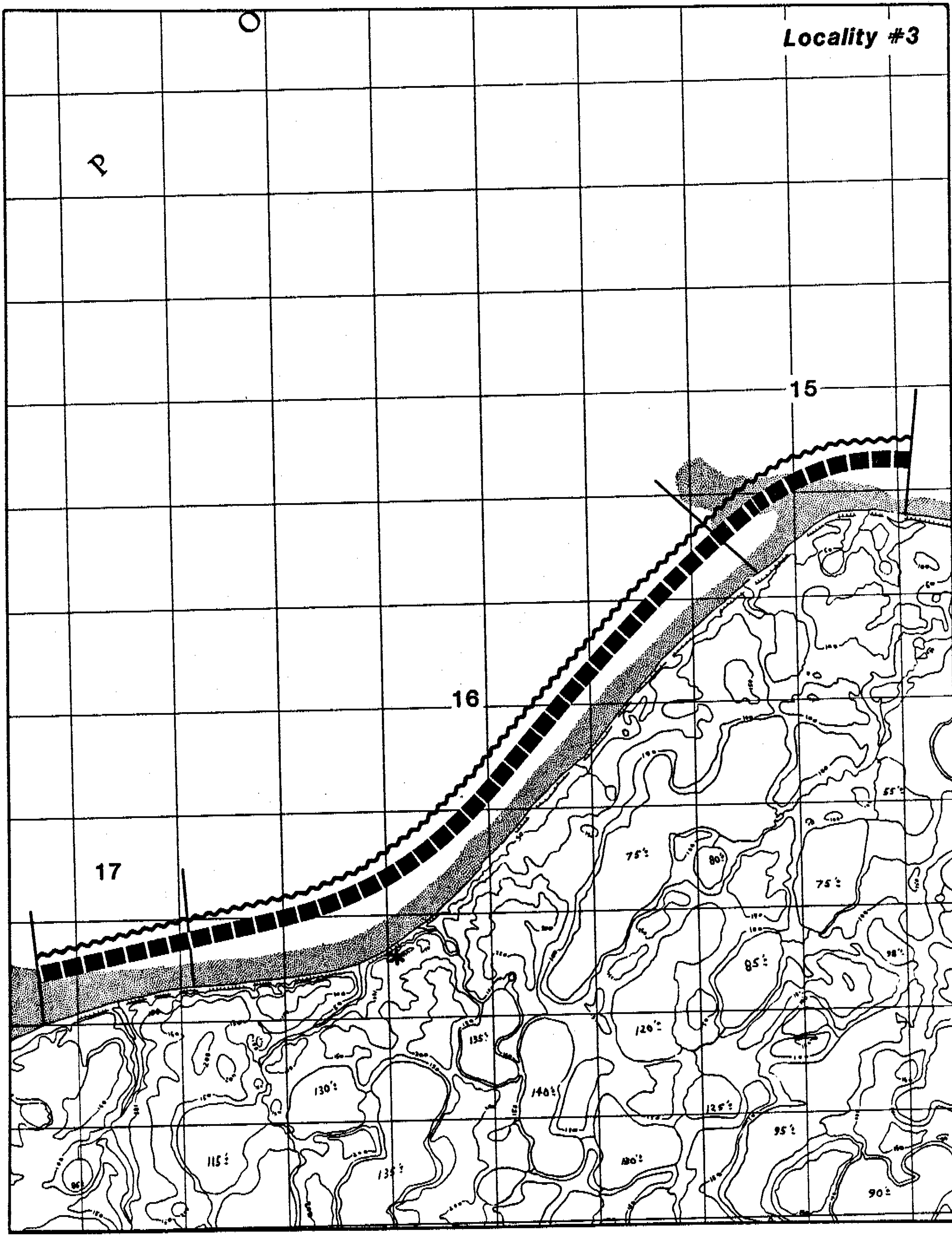
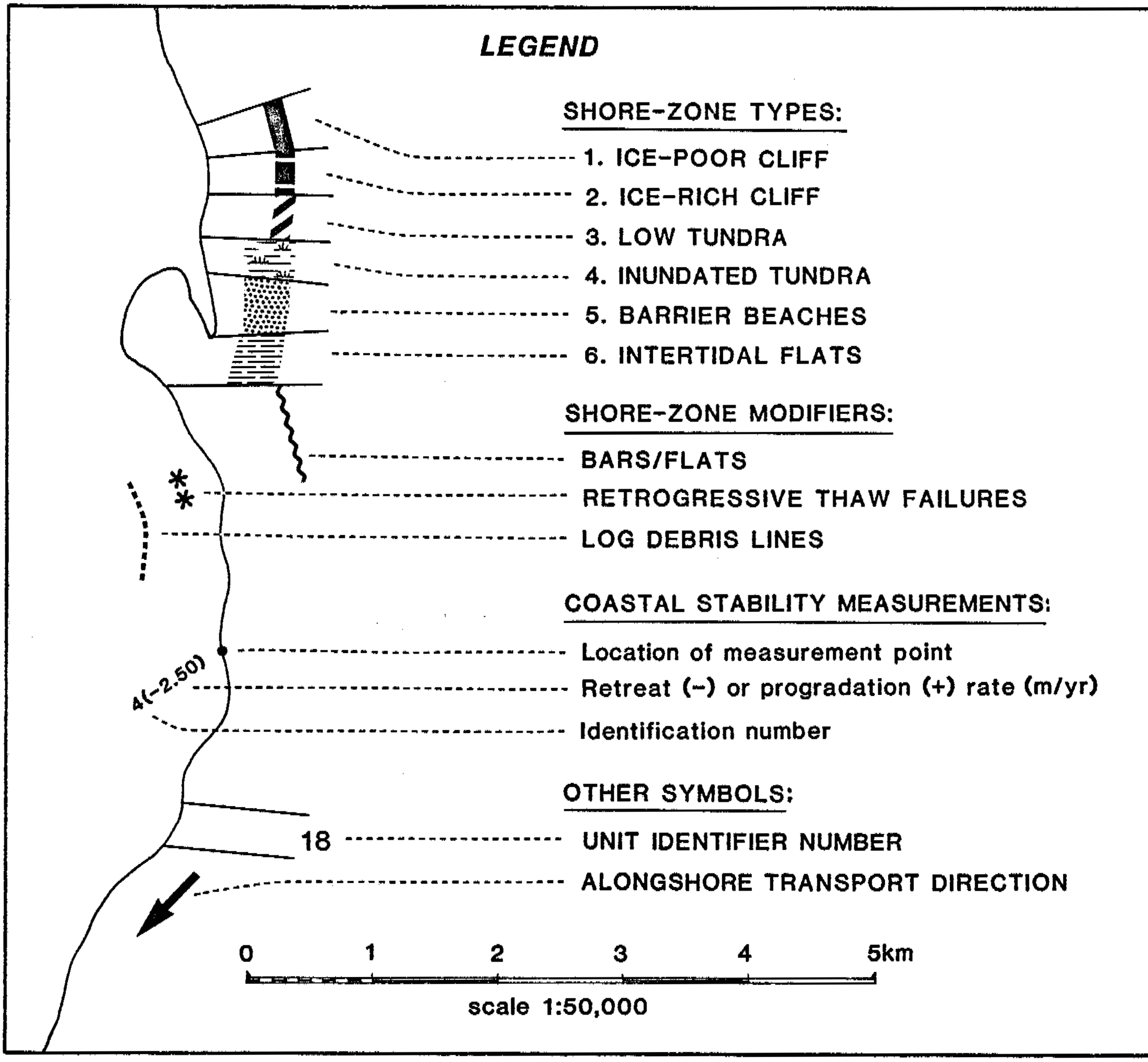

Locality #3
P
O
15
16
17
75'±
80'±
75'±
55'±
85'±
98'±
120'±
135'±
130'±
140'±
125'±
95'±
115'±
135'±
180'±
90'±


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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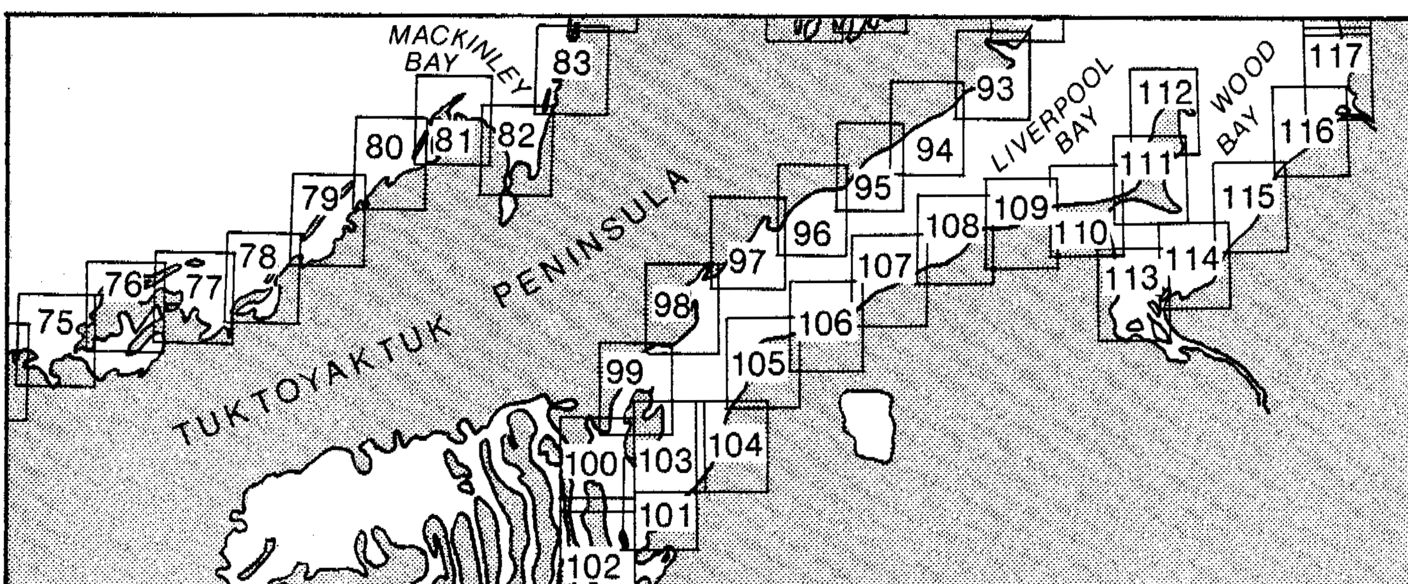
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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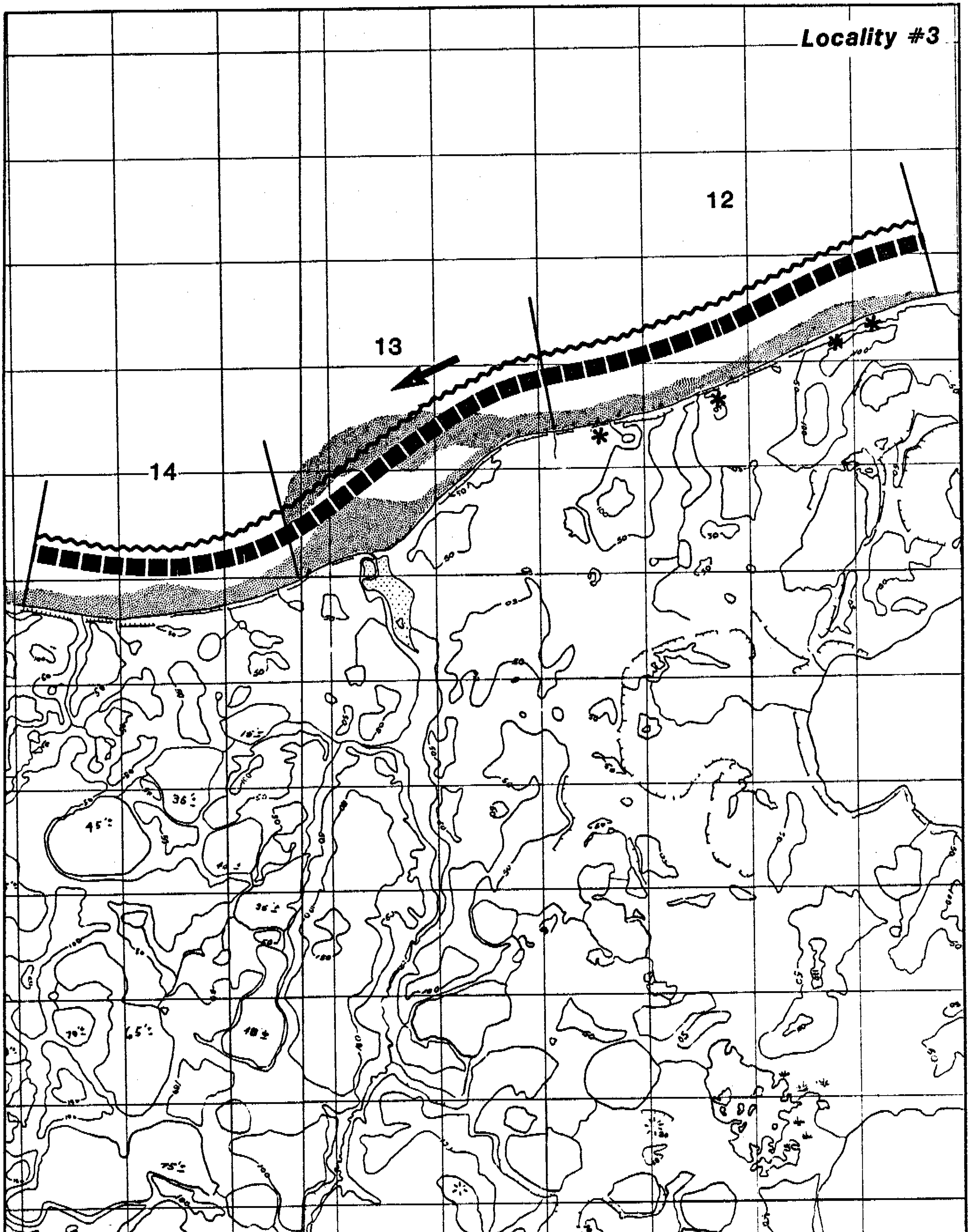
Locality #3
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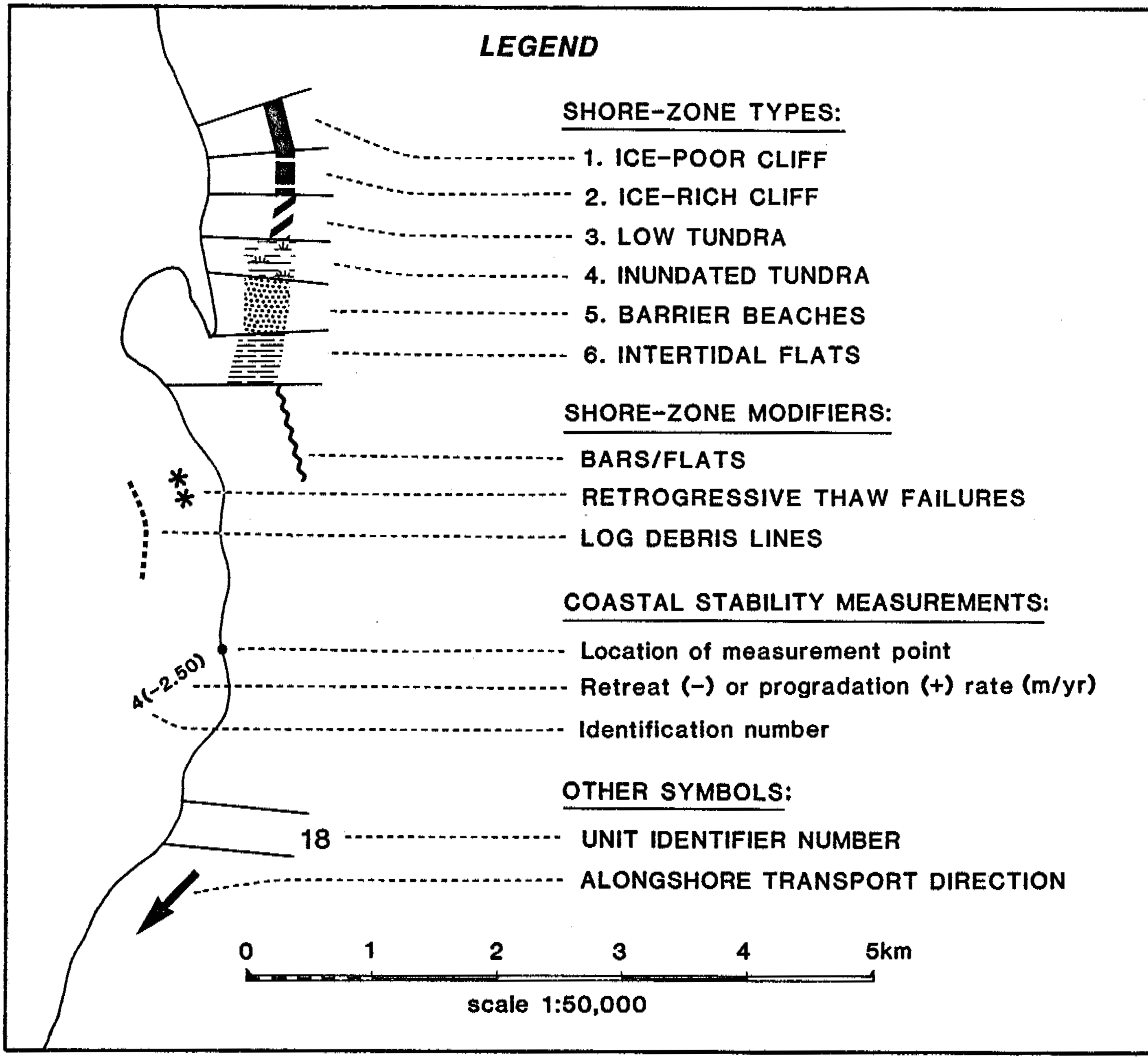
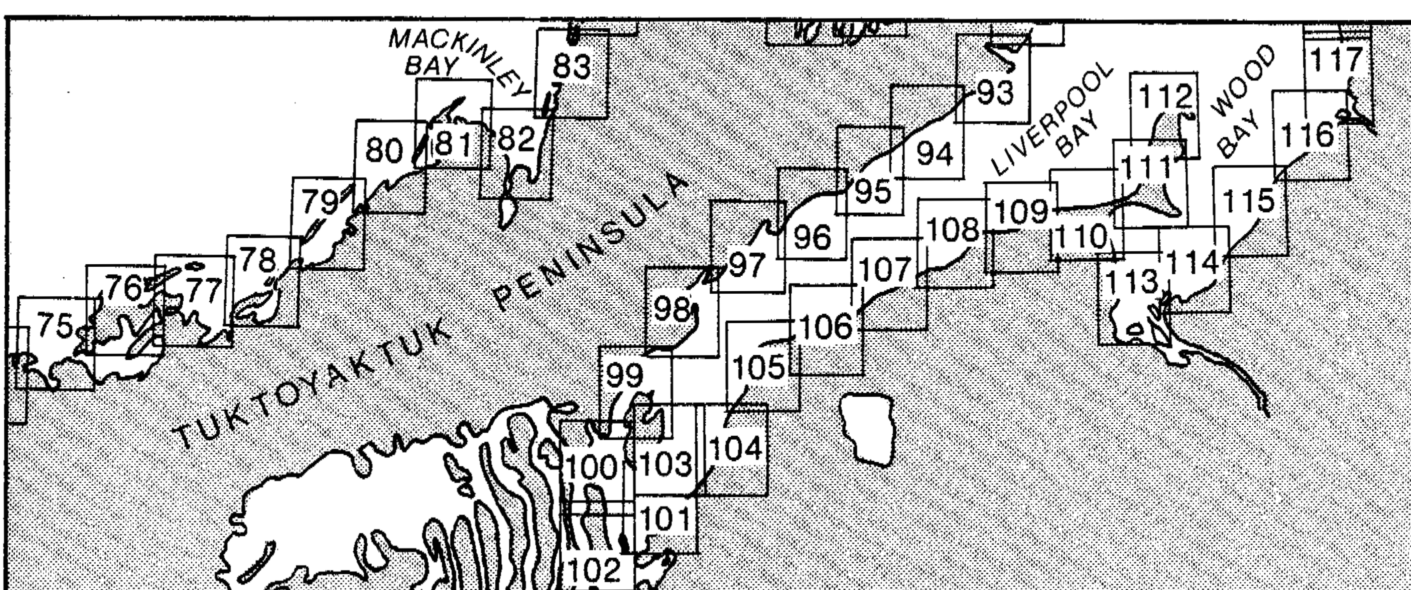

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
TUKTOYAKTUK PENINSULA
LIVERPOOL BAY
WOOD BAY
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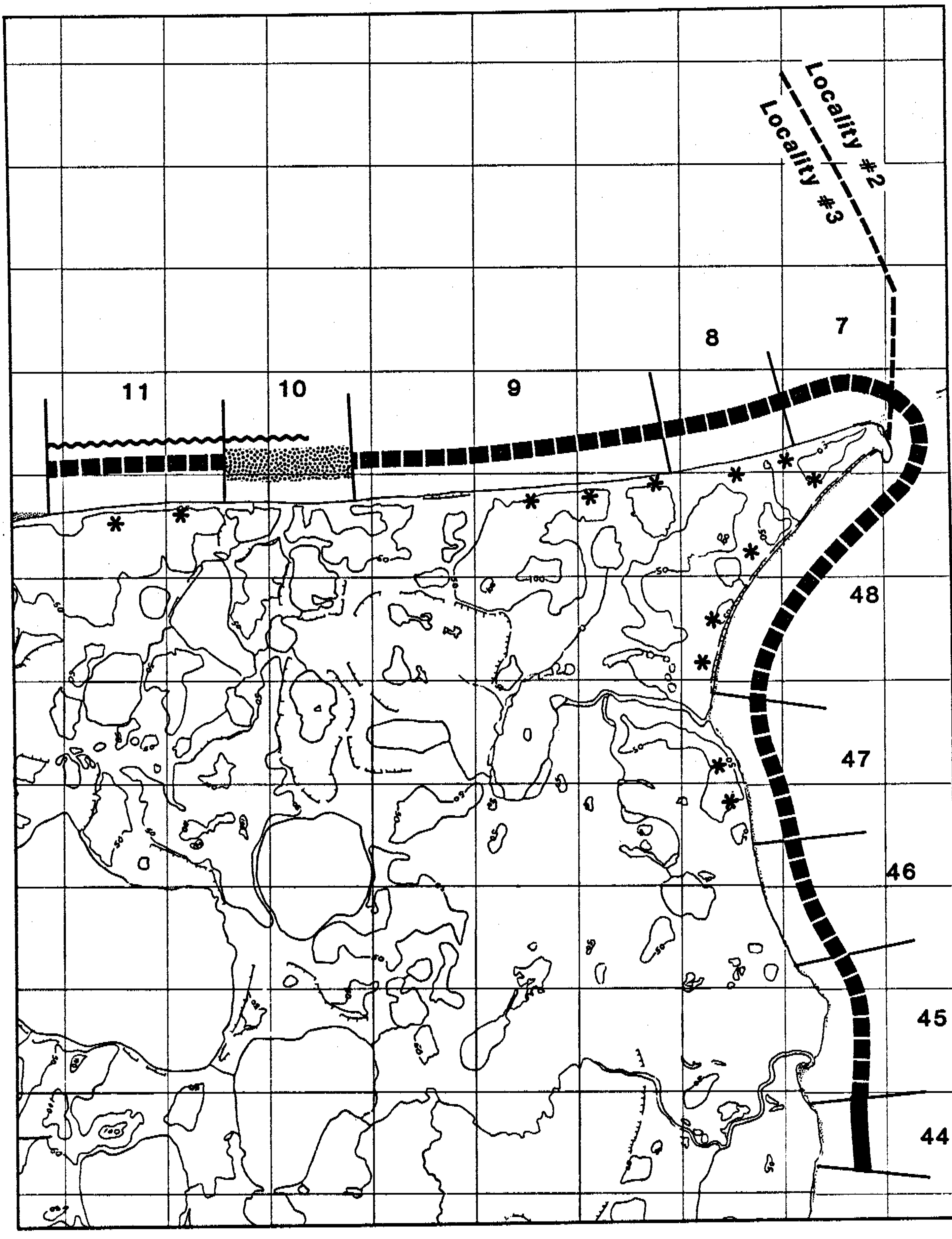
Locality #2
Locality #3
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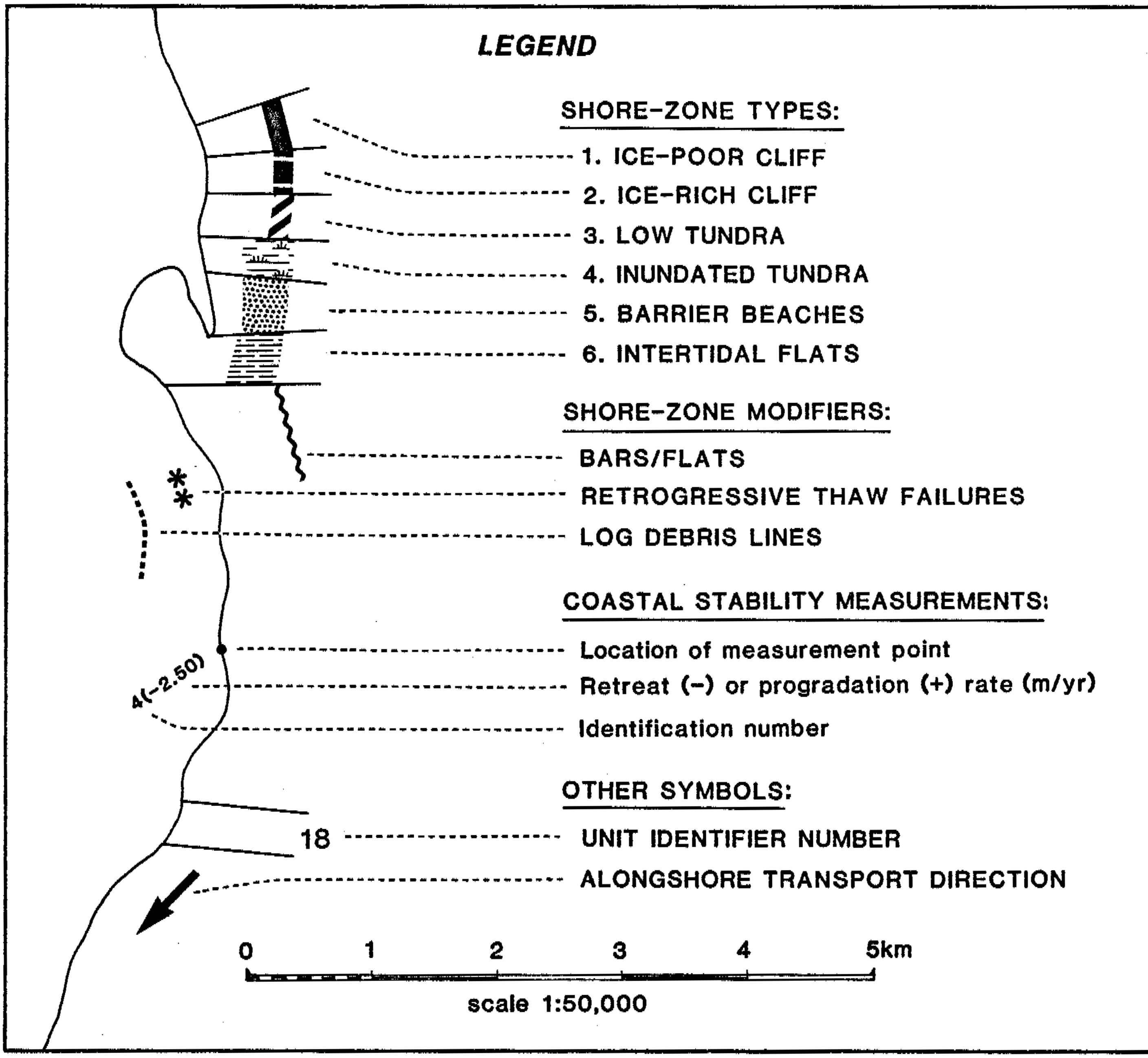
LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
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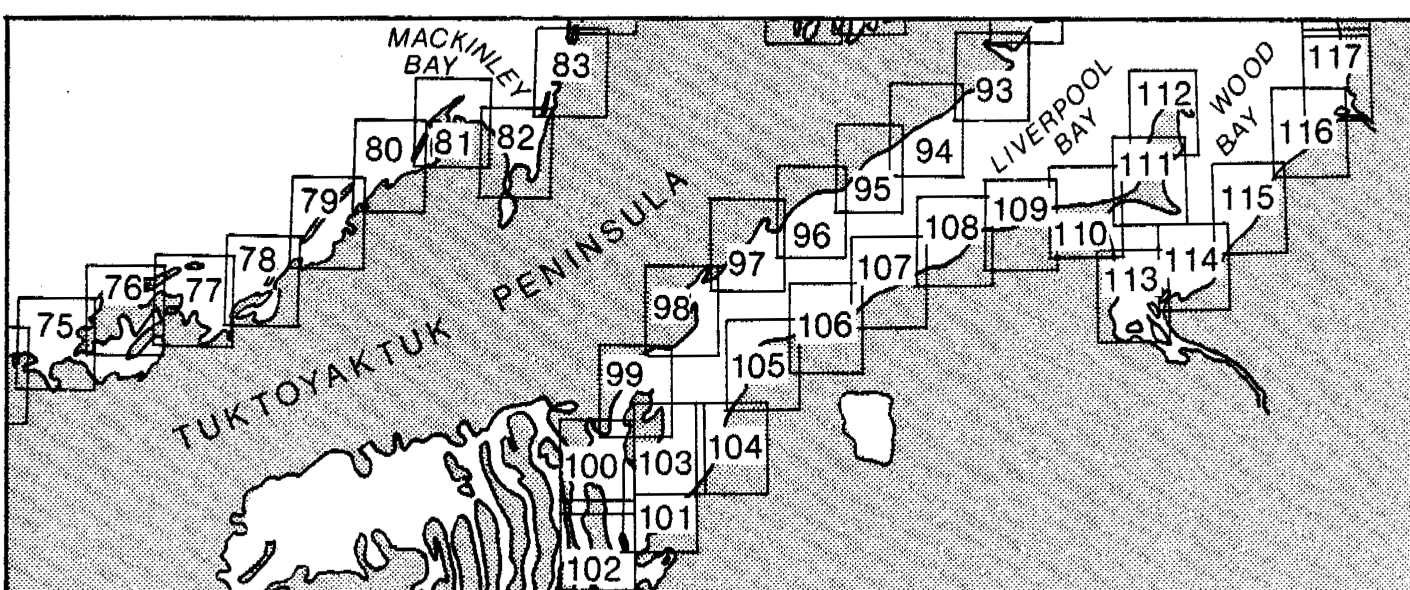
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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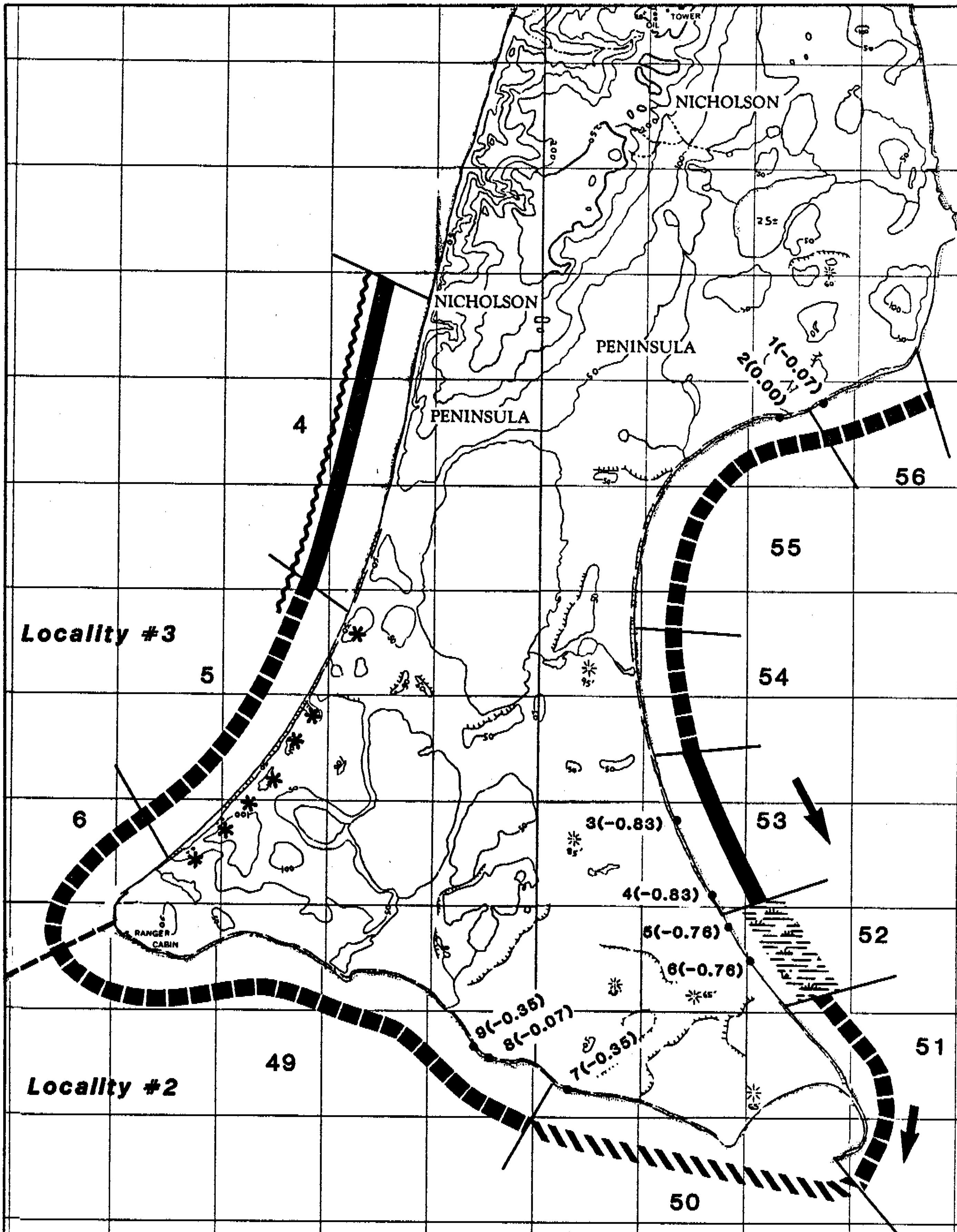
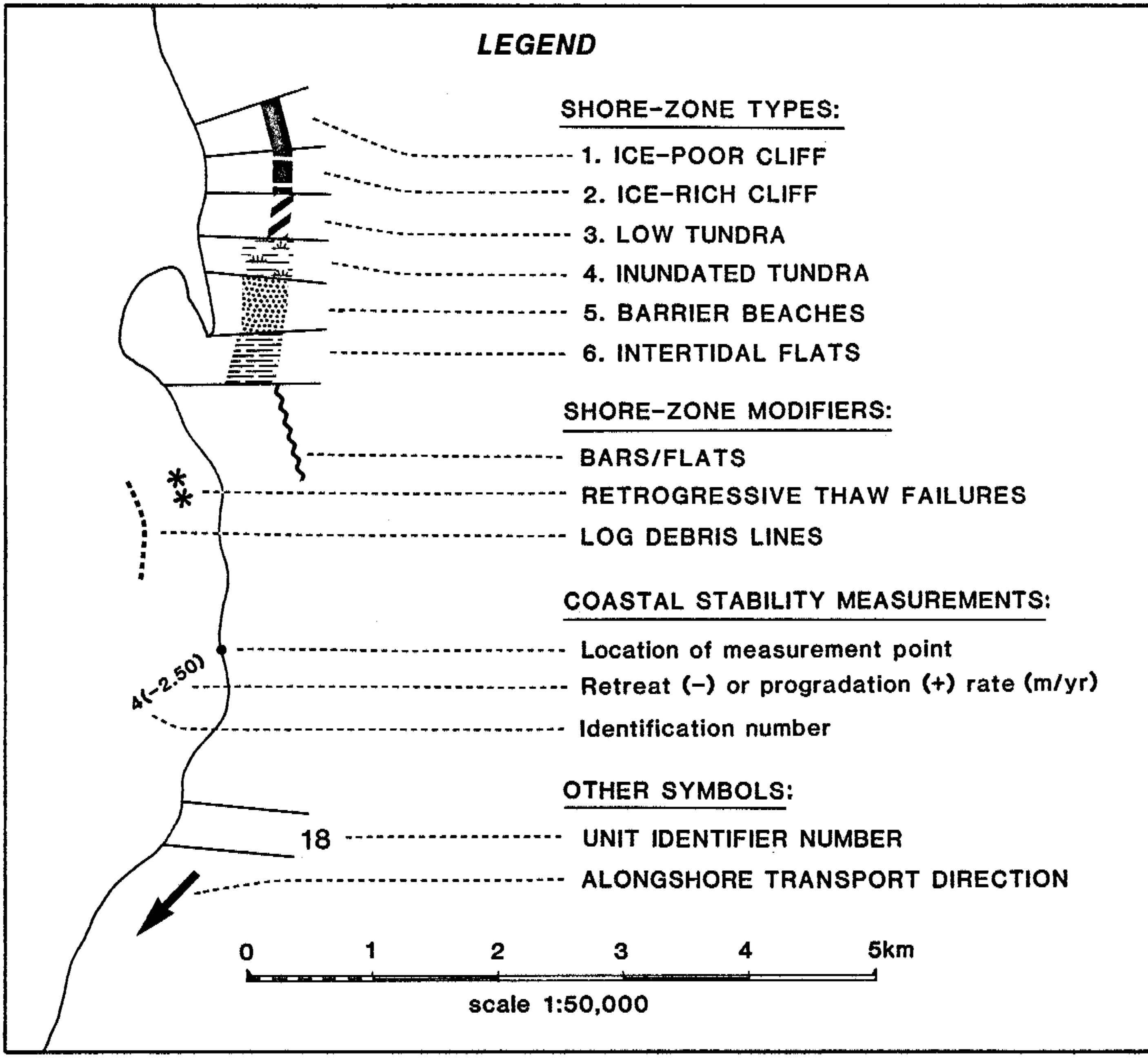


OIL
TOWER
NICHOLSON
NICHOLSON
PENINSULA
PENINSULA
1(-0.07)
2(0.00)
4
56
55
Locality #3
5
54
53
3(-0.83)
6
4(-0.83)
5(-0.76)
52
6(-0.76)
RANGER CABIN
9(-0.35)
8(-0.07)
7(-0.35)
51
49
Locality #2
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
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Location of measurement point
4(-2.50)
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Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
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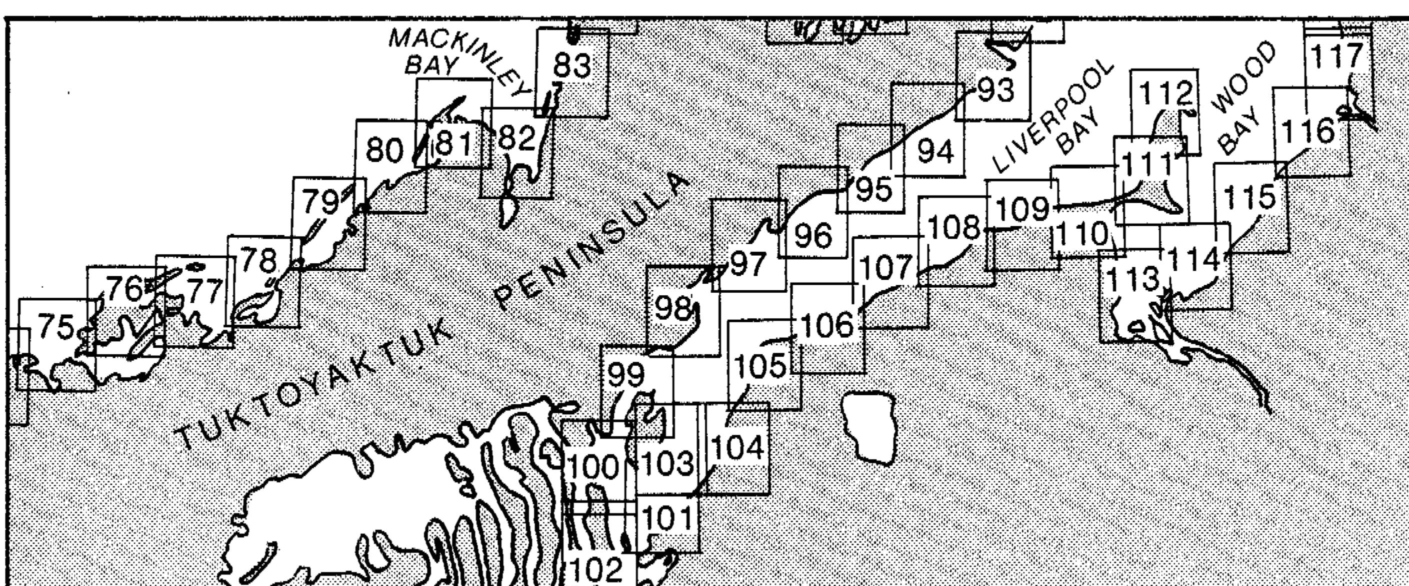
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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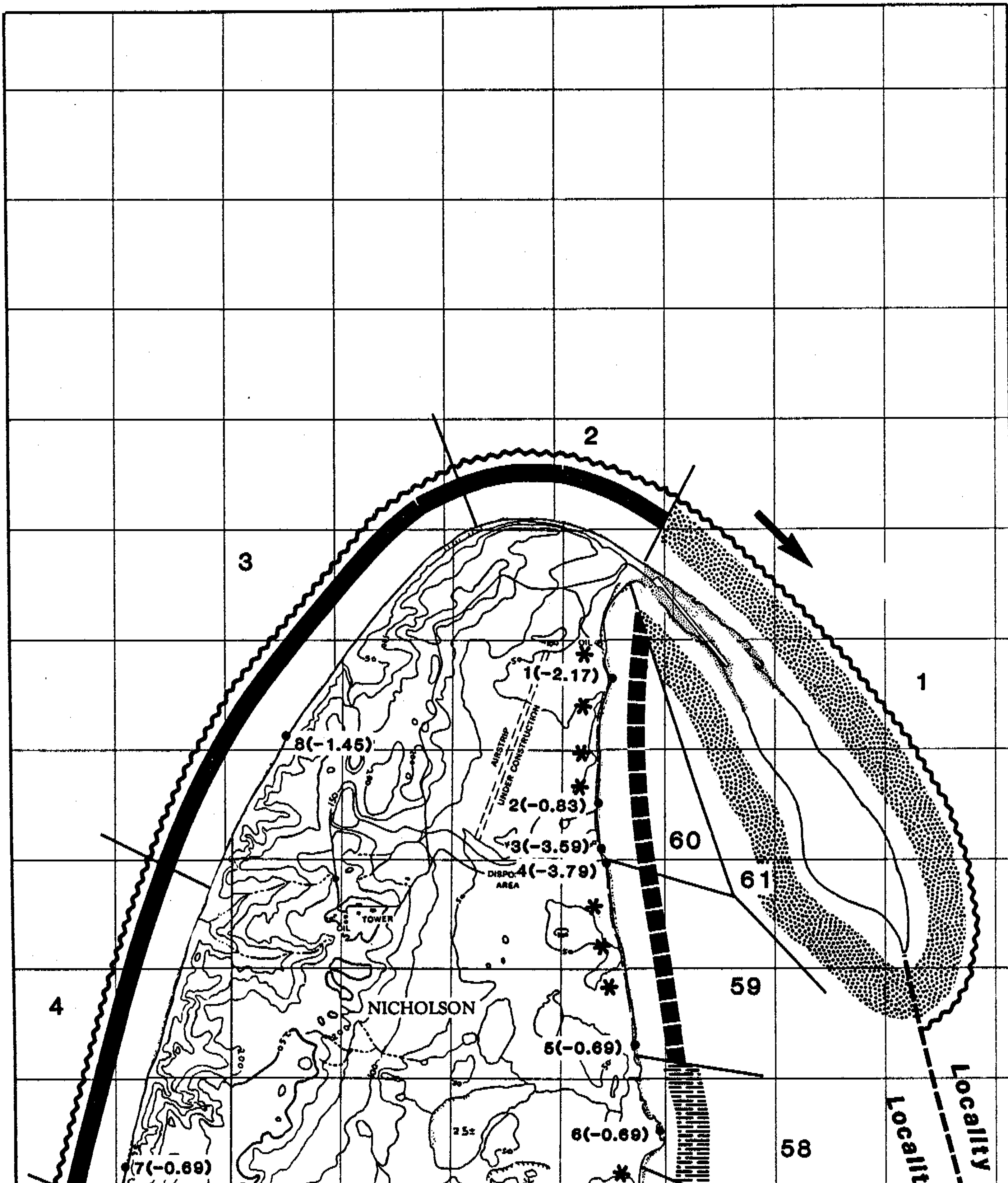
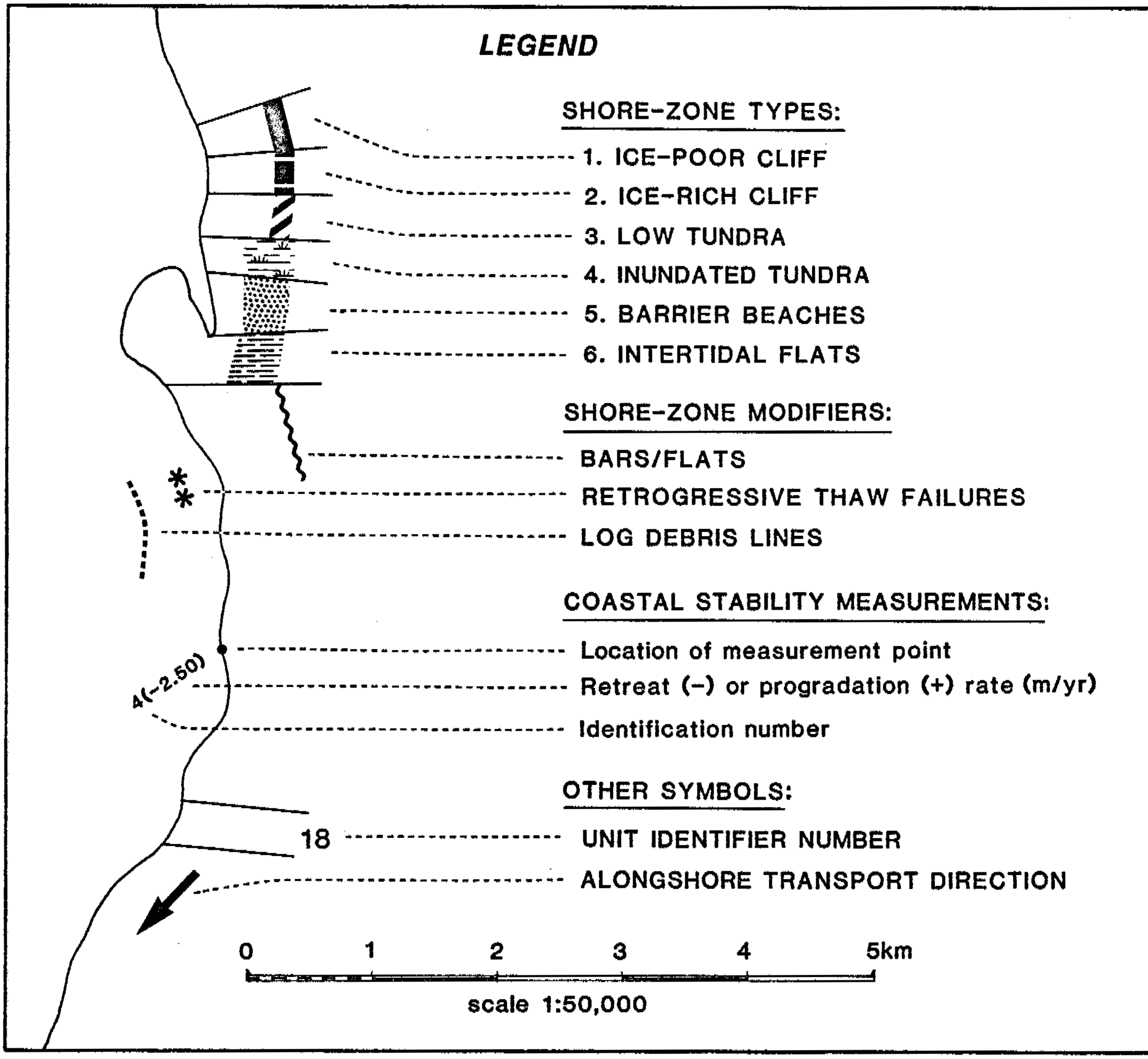


2
3
1
4
1(-2.17)
8(-1.45)
AIRSTRIP UNDER CONSTRUCTION
2(-0.83)
3(-3.59)
4(-3.79)
DISPO. AREA
TOWER
OIL
60
61
59
NICHOLSON
5(-0.69)
6(-0.69)
7(-0.69)
58
57
NICHOLSON
PENINSULA
Locality #3
Locality #2


LEGEND
SHORE-ZONE TYPES:
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4(-2.50)
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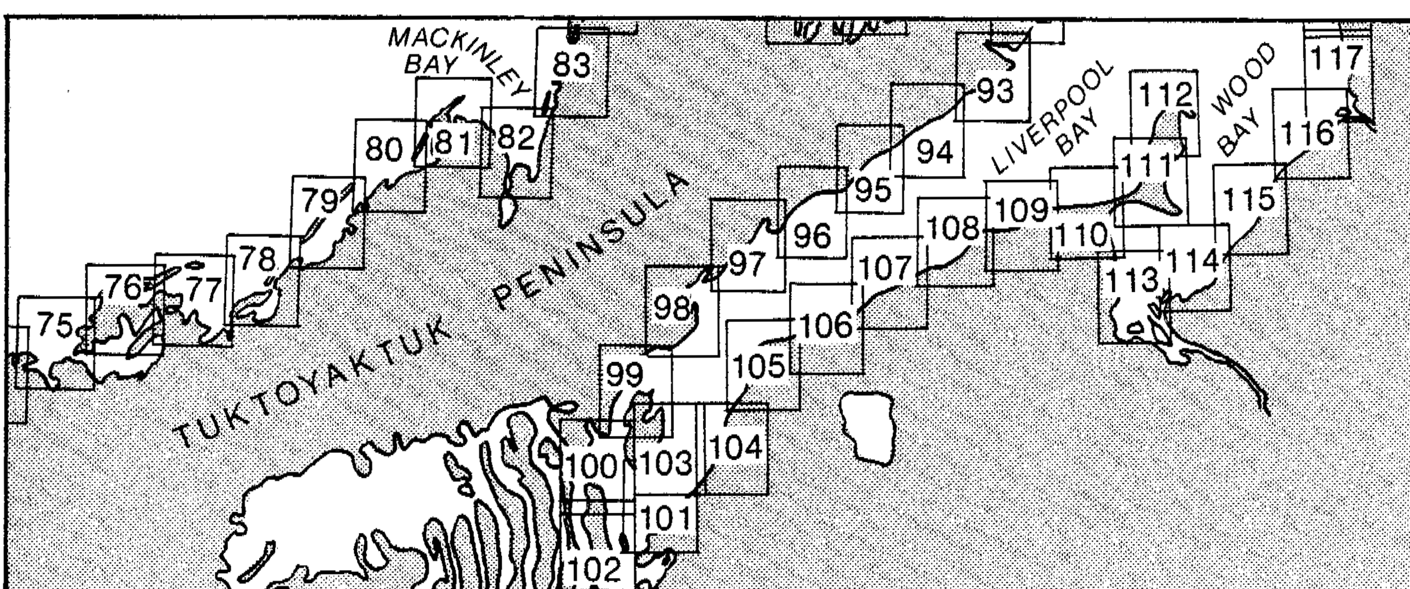
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
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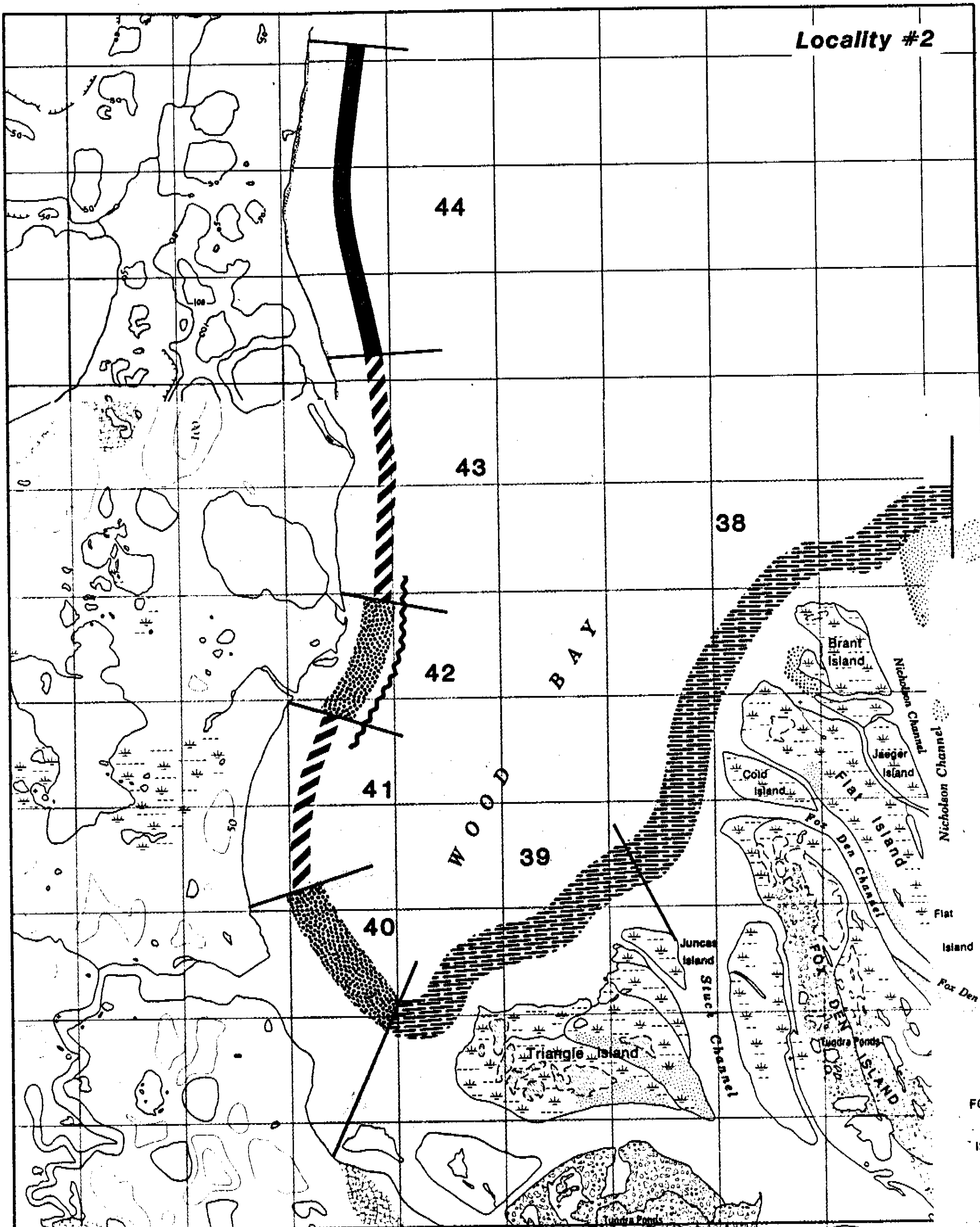
Locality #2
44
43
38
42
WOOD BAY
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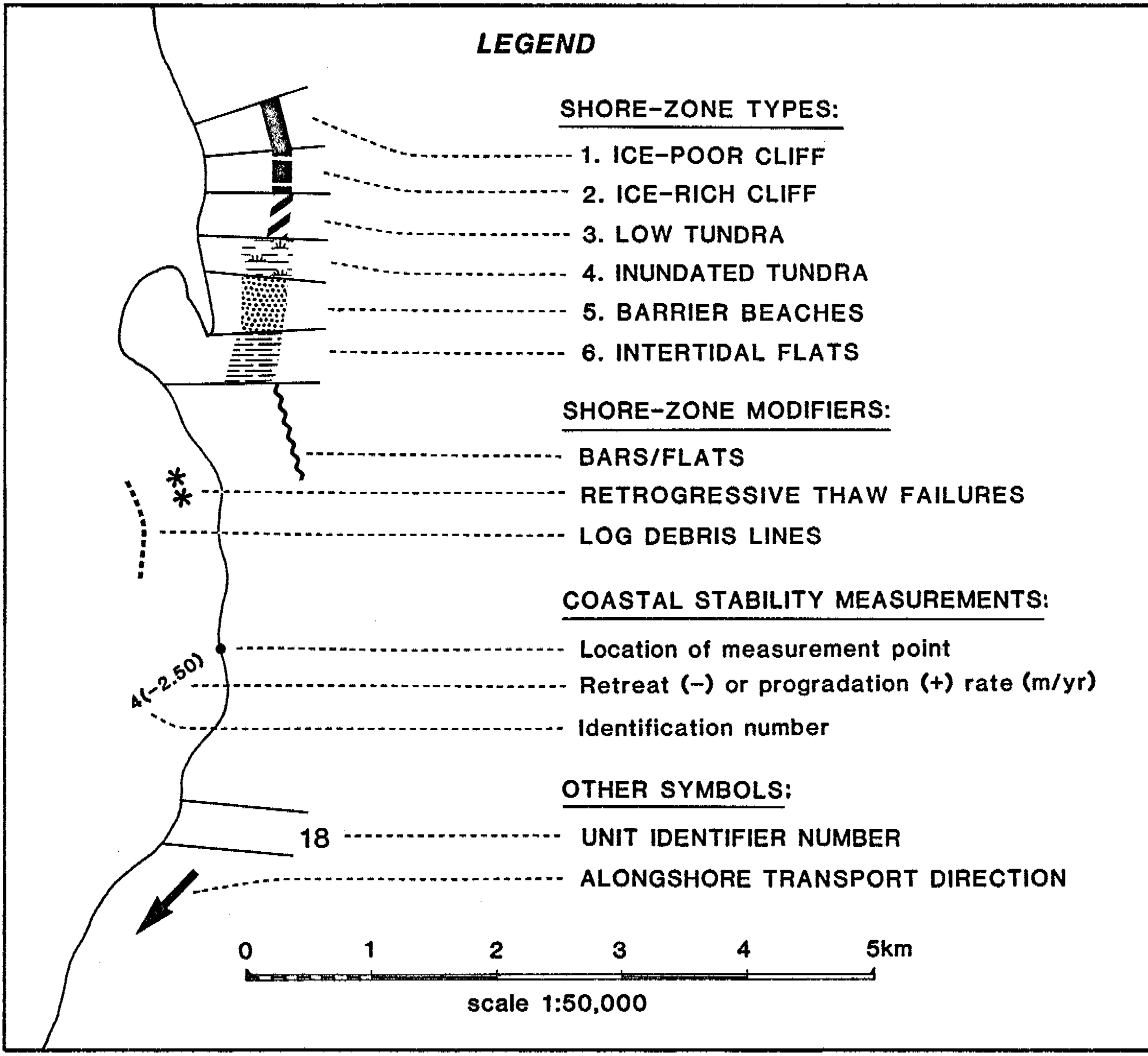
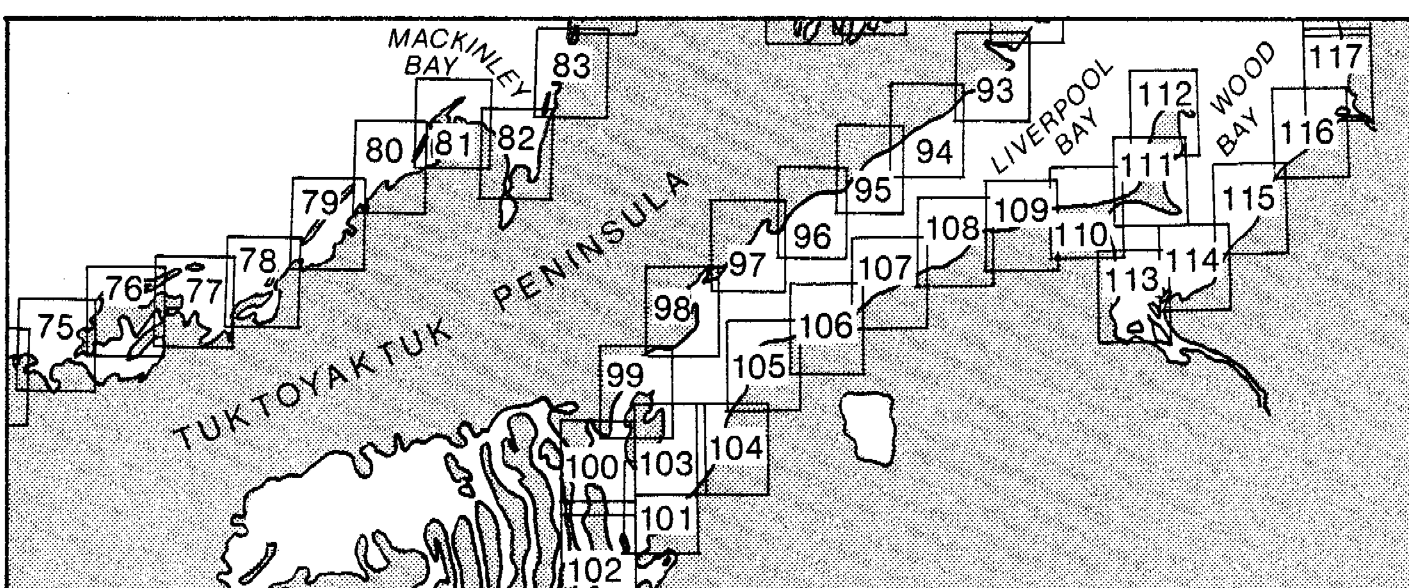
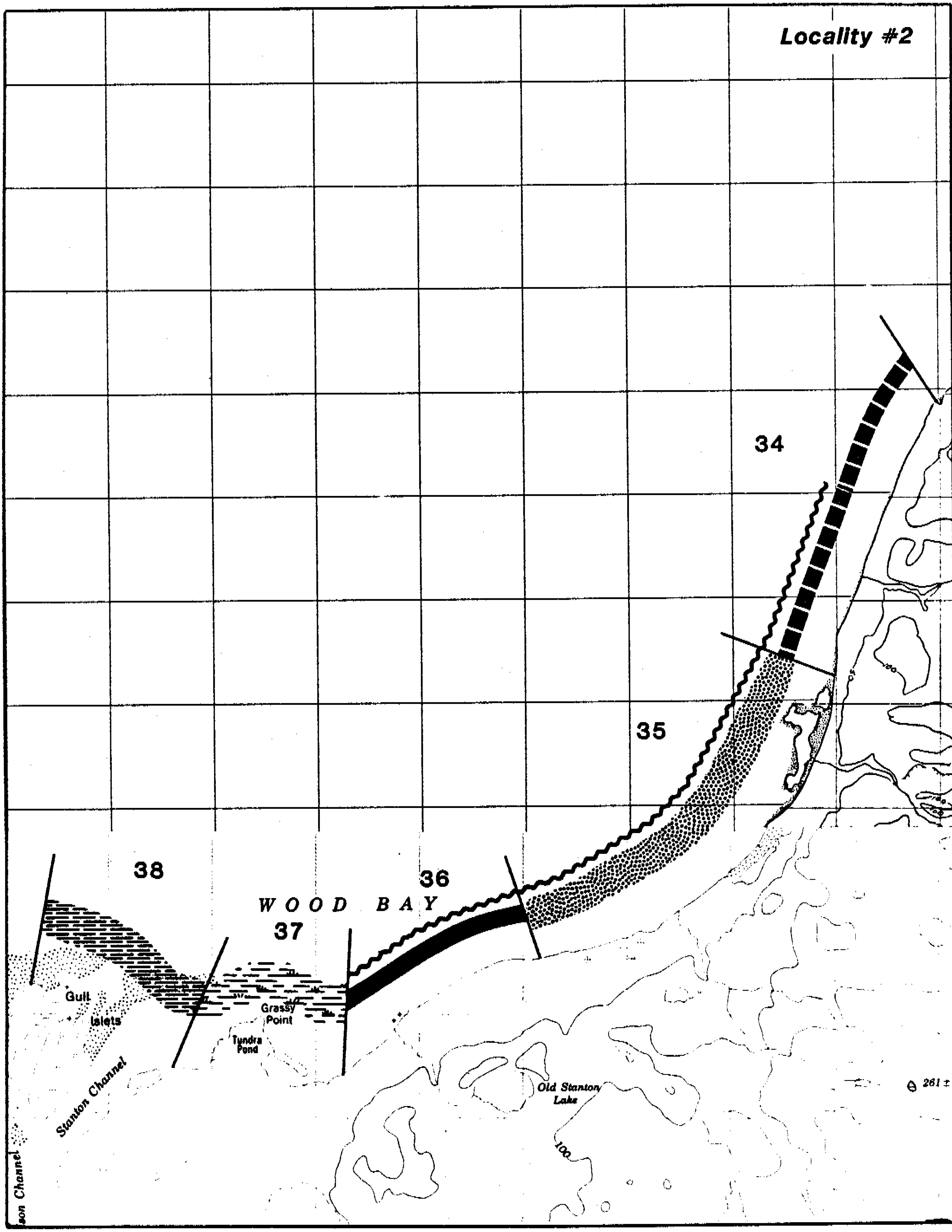
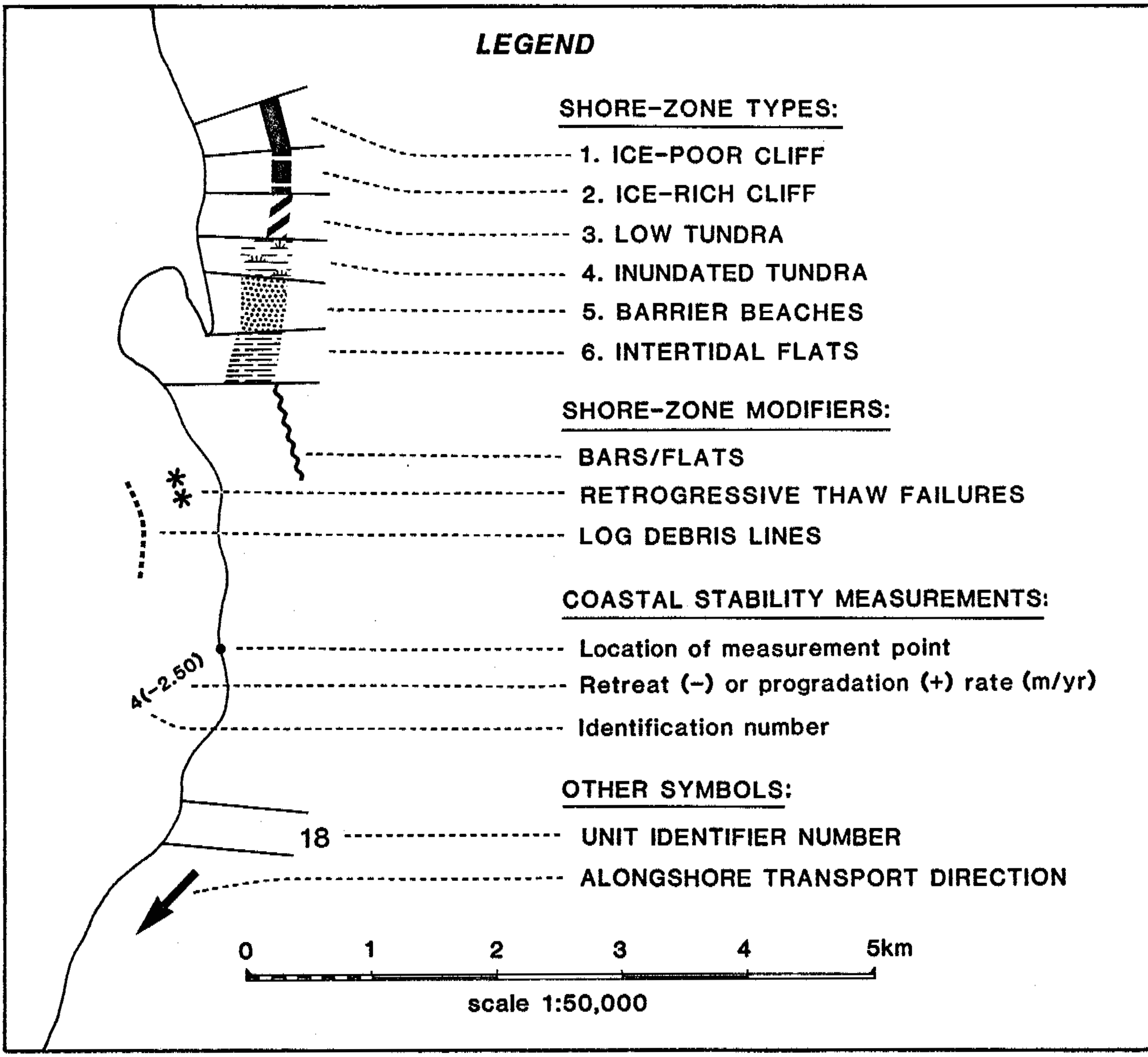
39
40
Brant Island
Nicholson Channel
Jaeger Island
Cold Island
Flat Island
Fox Den Channel
Flat Island
Juncus Island
Stuck Channel
FOX DEN ISLAND
Tundra Ponds
Triangle Island
Tundra Ponds

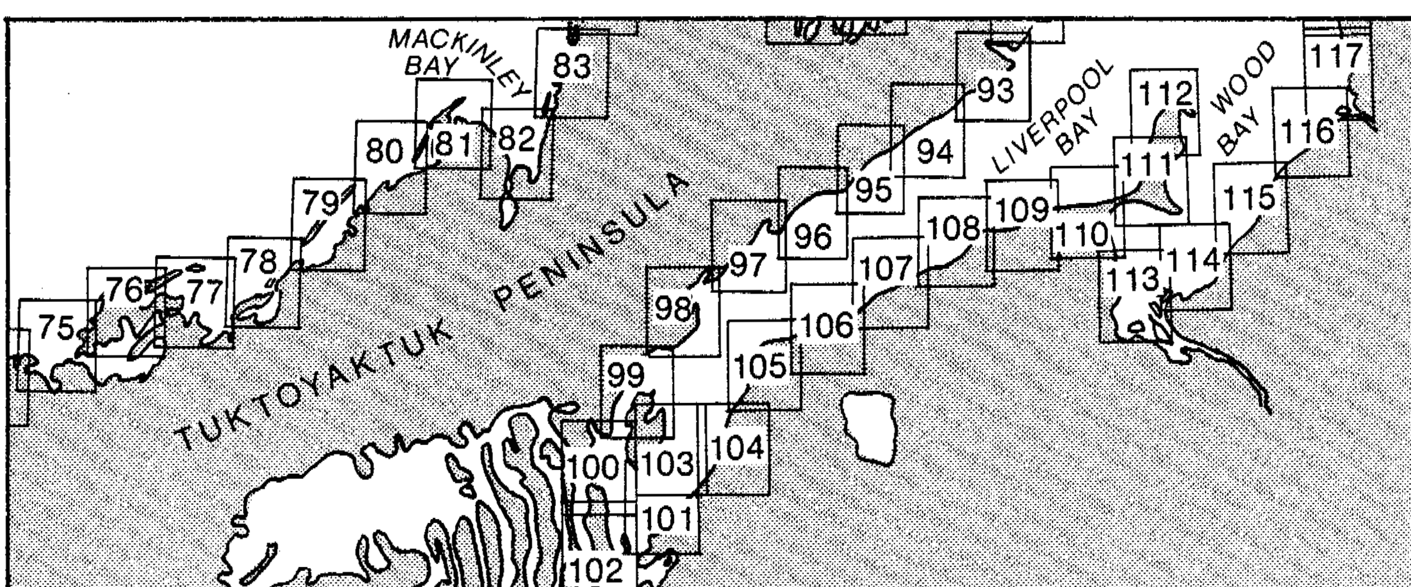

LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75 76 77 78 79 80 81 82 83
93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110
111 112 113 114 115 116 117



Locality #2
34
35
36
37
38
W O O D B A Y
Gull
Islets
Grassy
Point
Tundra
Pond
Stanton Channel
Old Stanton
Lake
100
261 ±
son Channel


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
76
77
78
79
80
81
82
83
93
94
95
96
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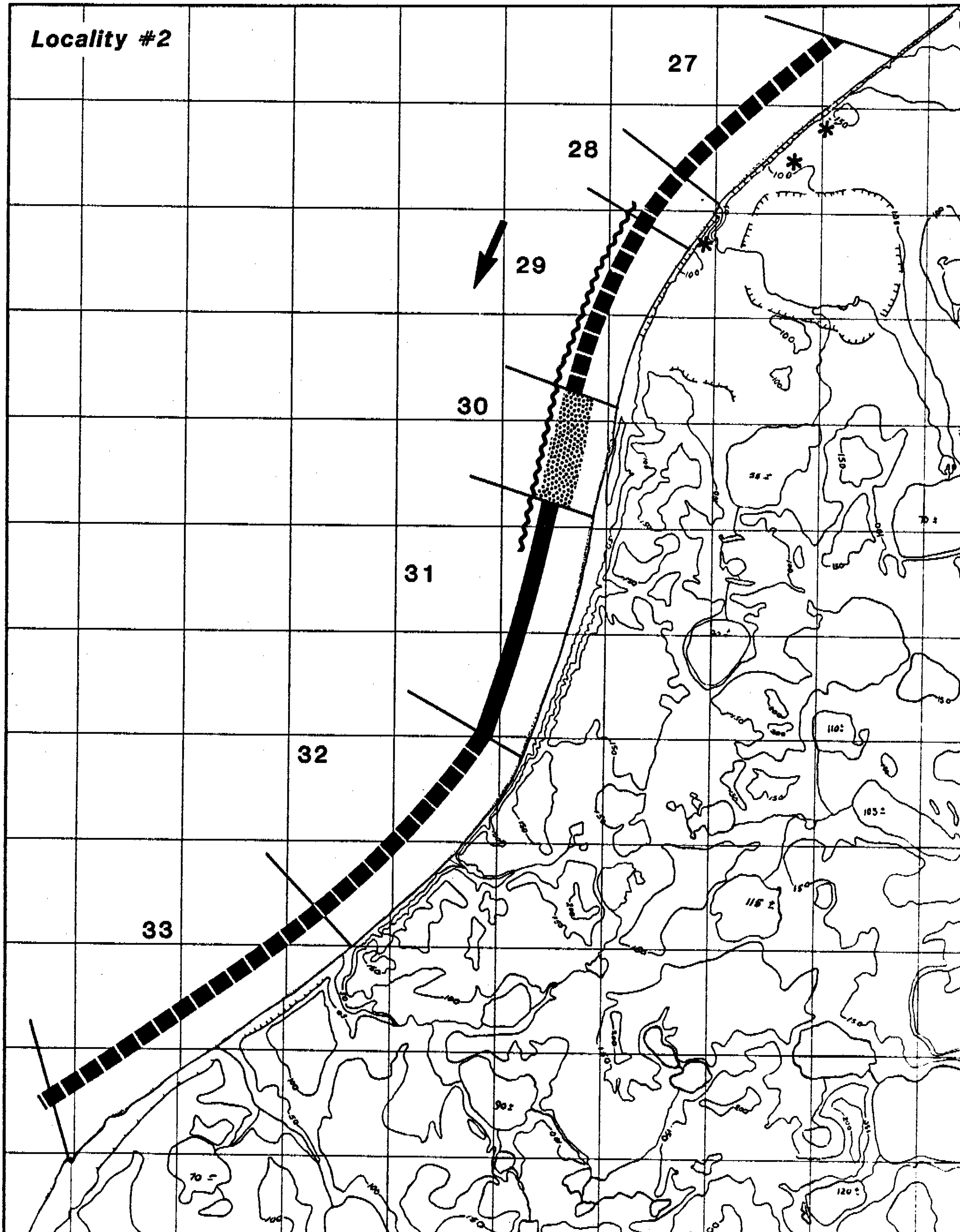
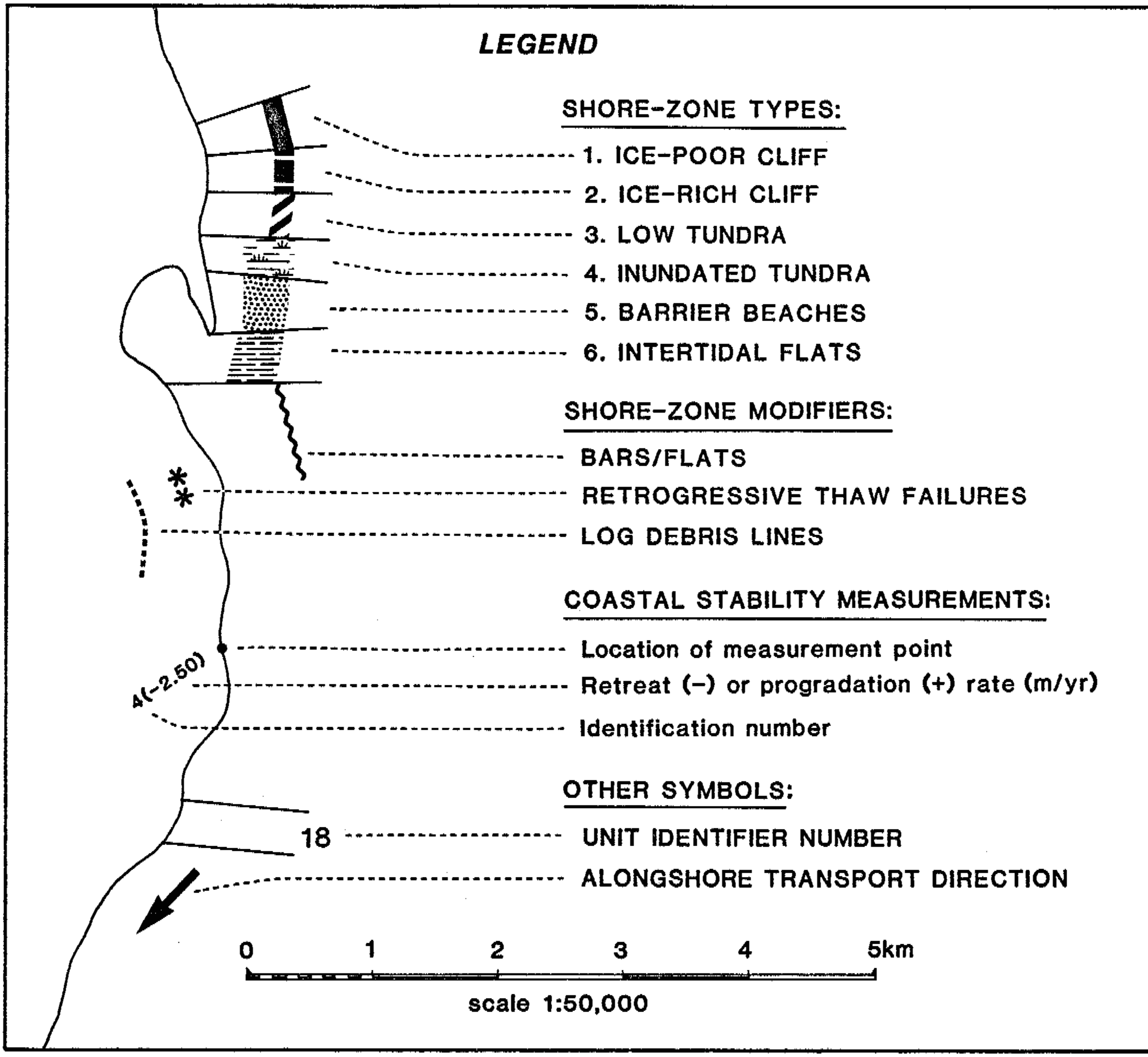
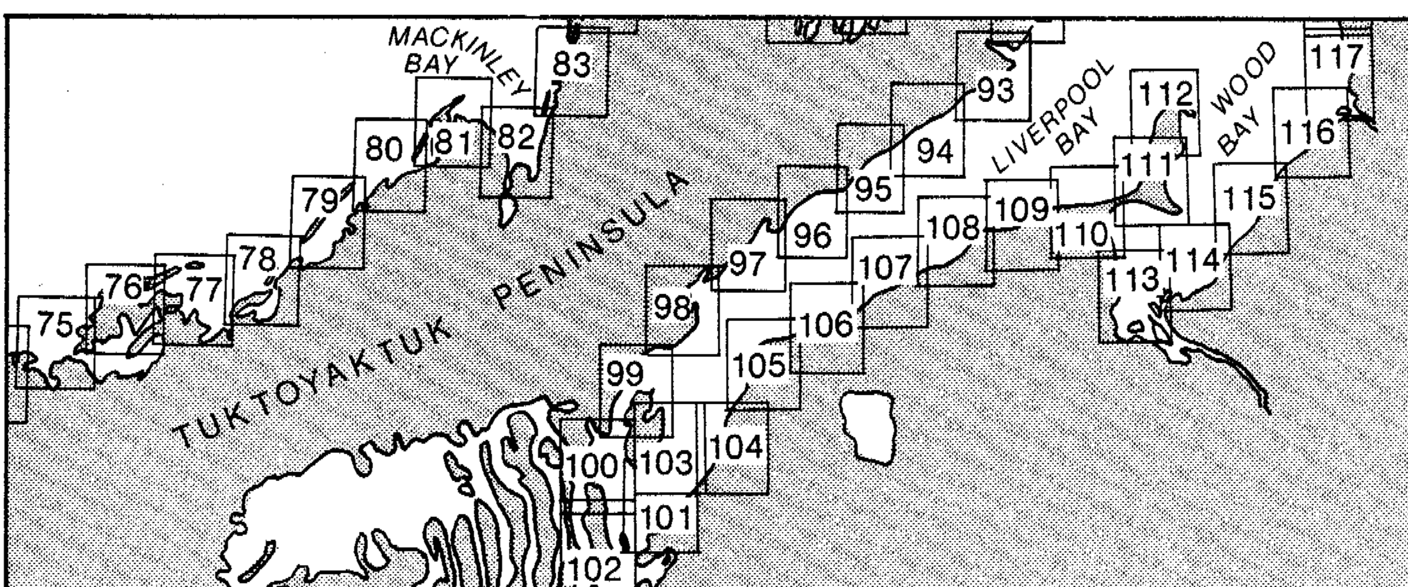
116
117



Locality #2
27
28
29
30
31
32
33


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
76
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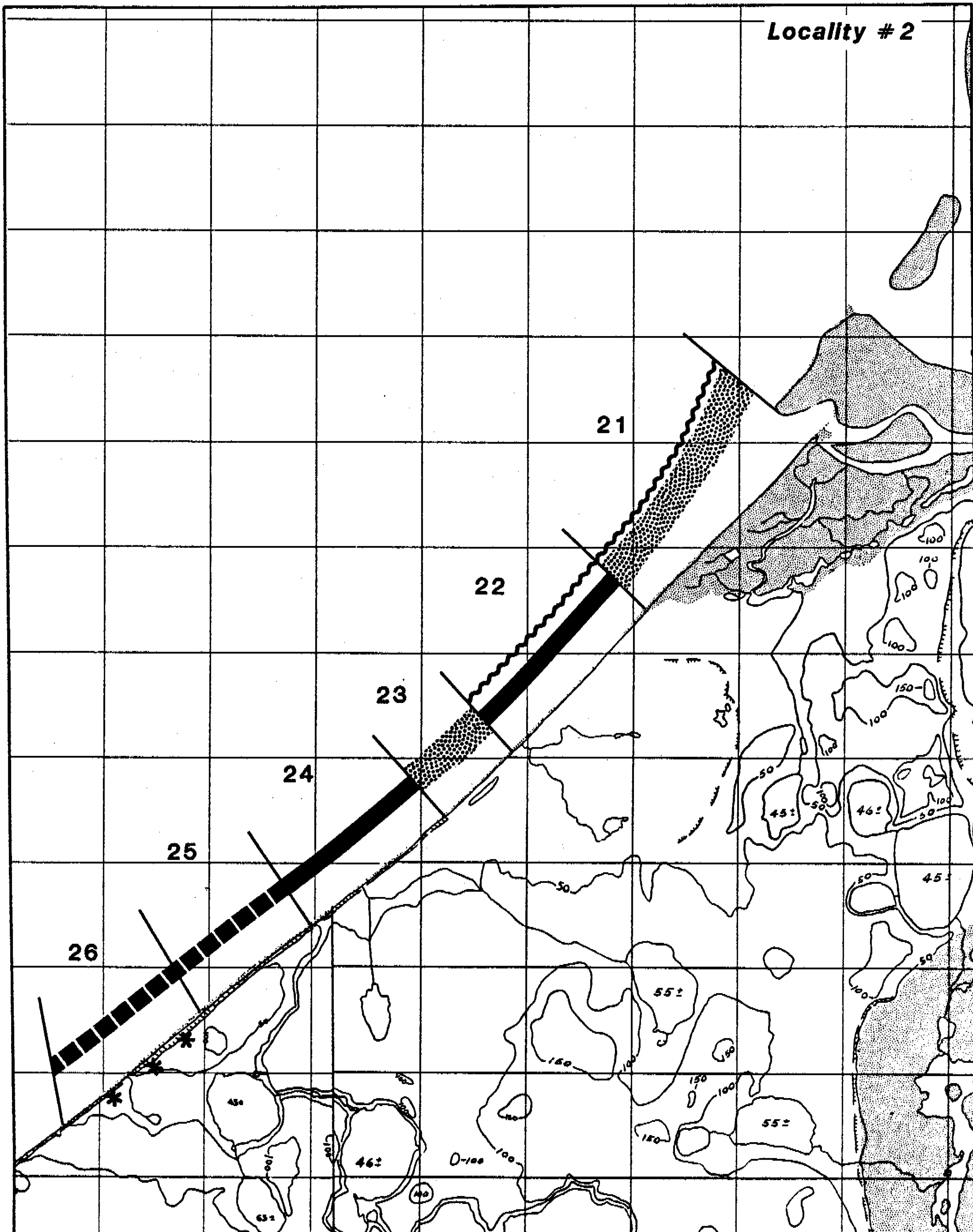
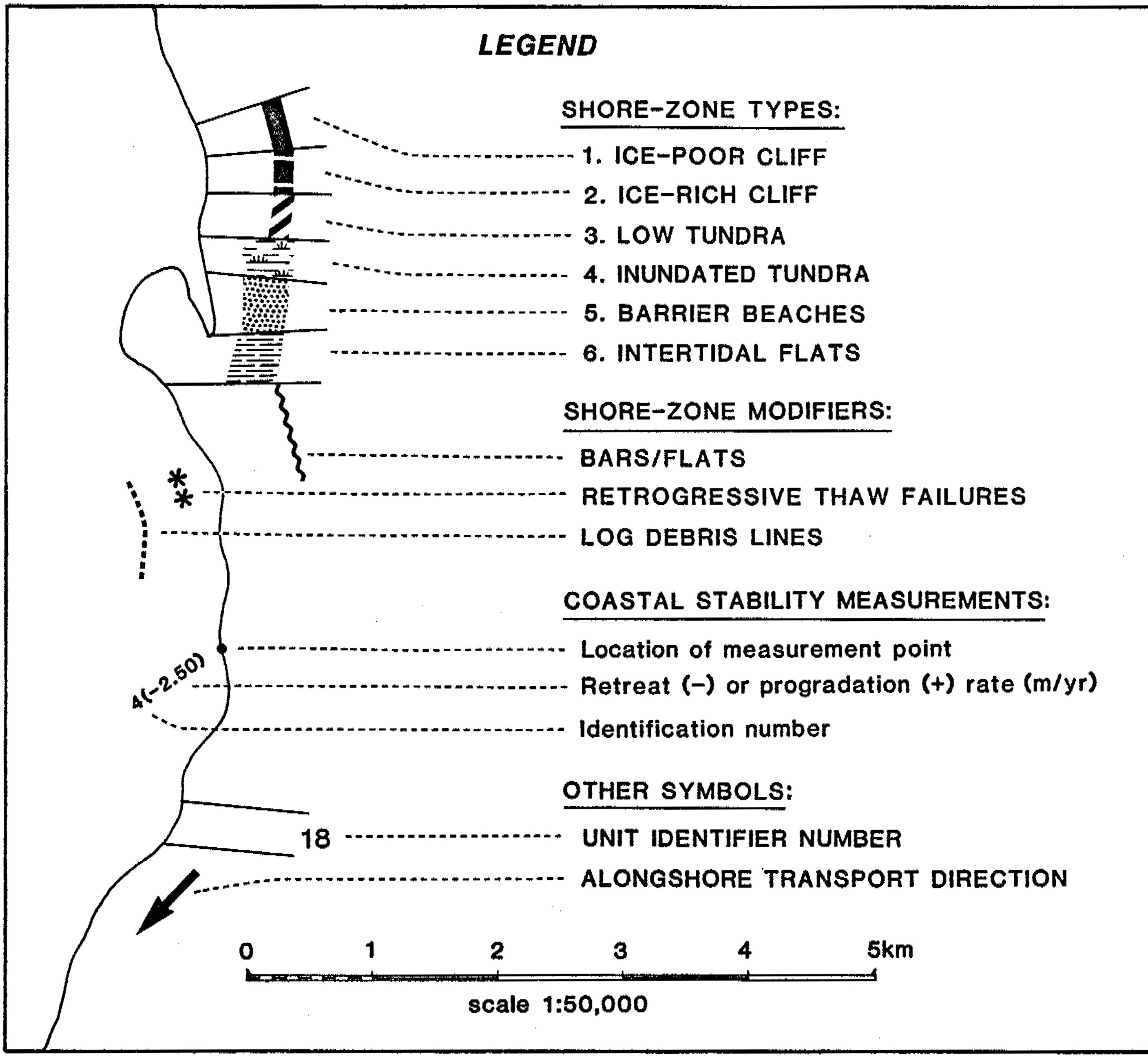

Locality # 2
21
22
23
24
25
26
100
150
50
45±
46±
55±
150
63±
0-100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
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BARS/FLATS
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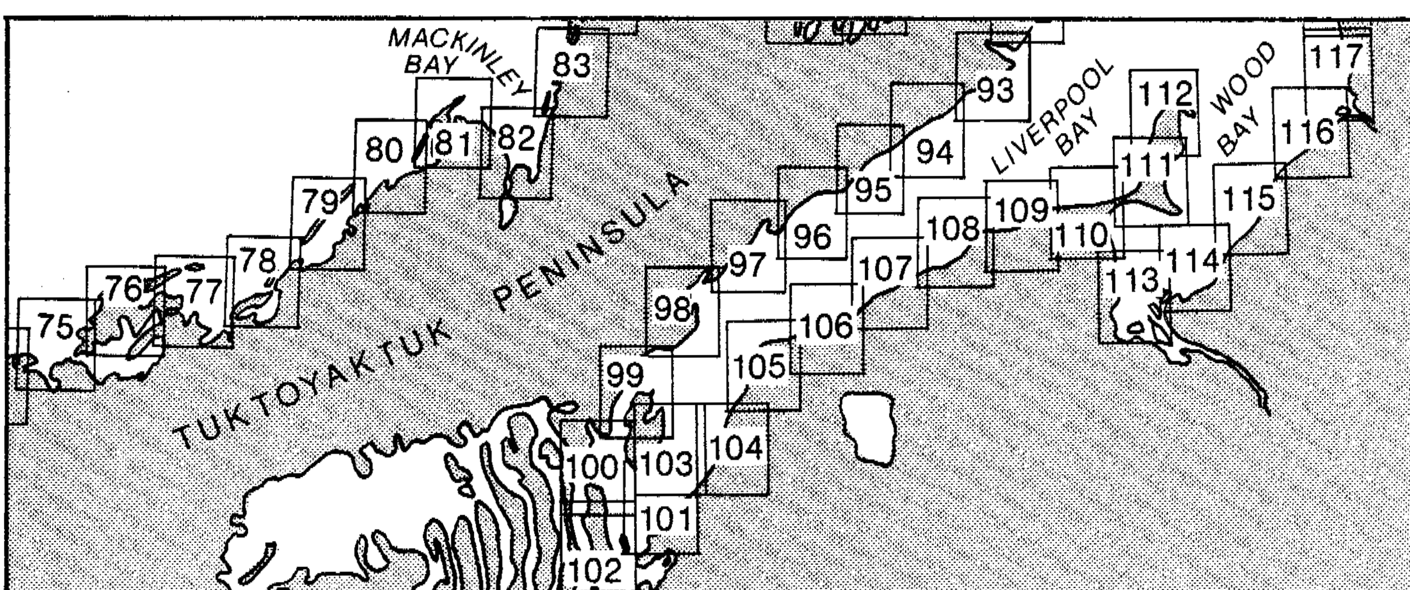
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


MACKINLEY BAY
LIVERPOOL BAY
WOOD BAY
TUKTOYAKTUK PENINSULA
75
76
77
78
79
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81
82
83
93
94
95
96
97
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103
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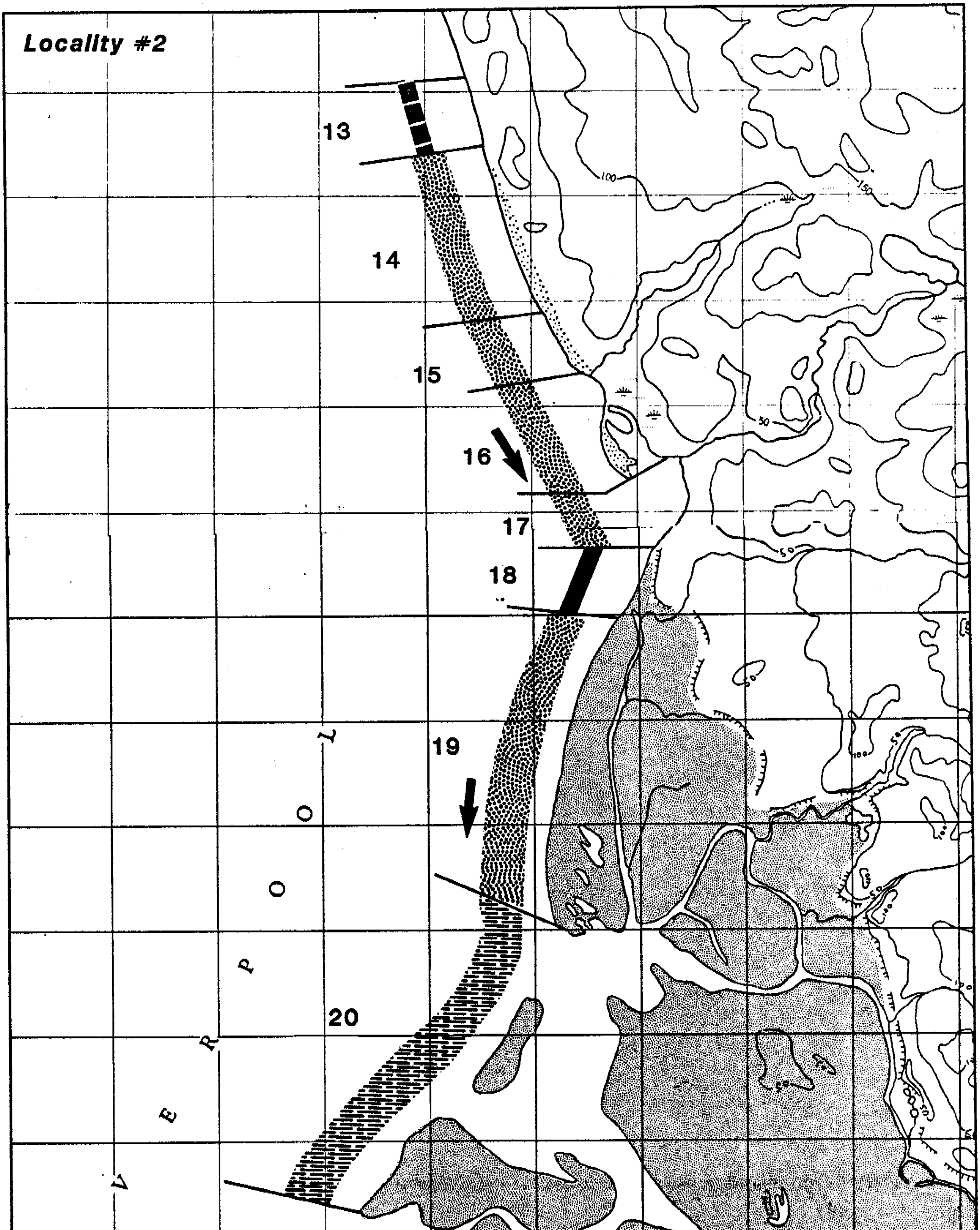
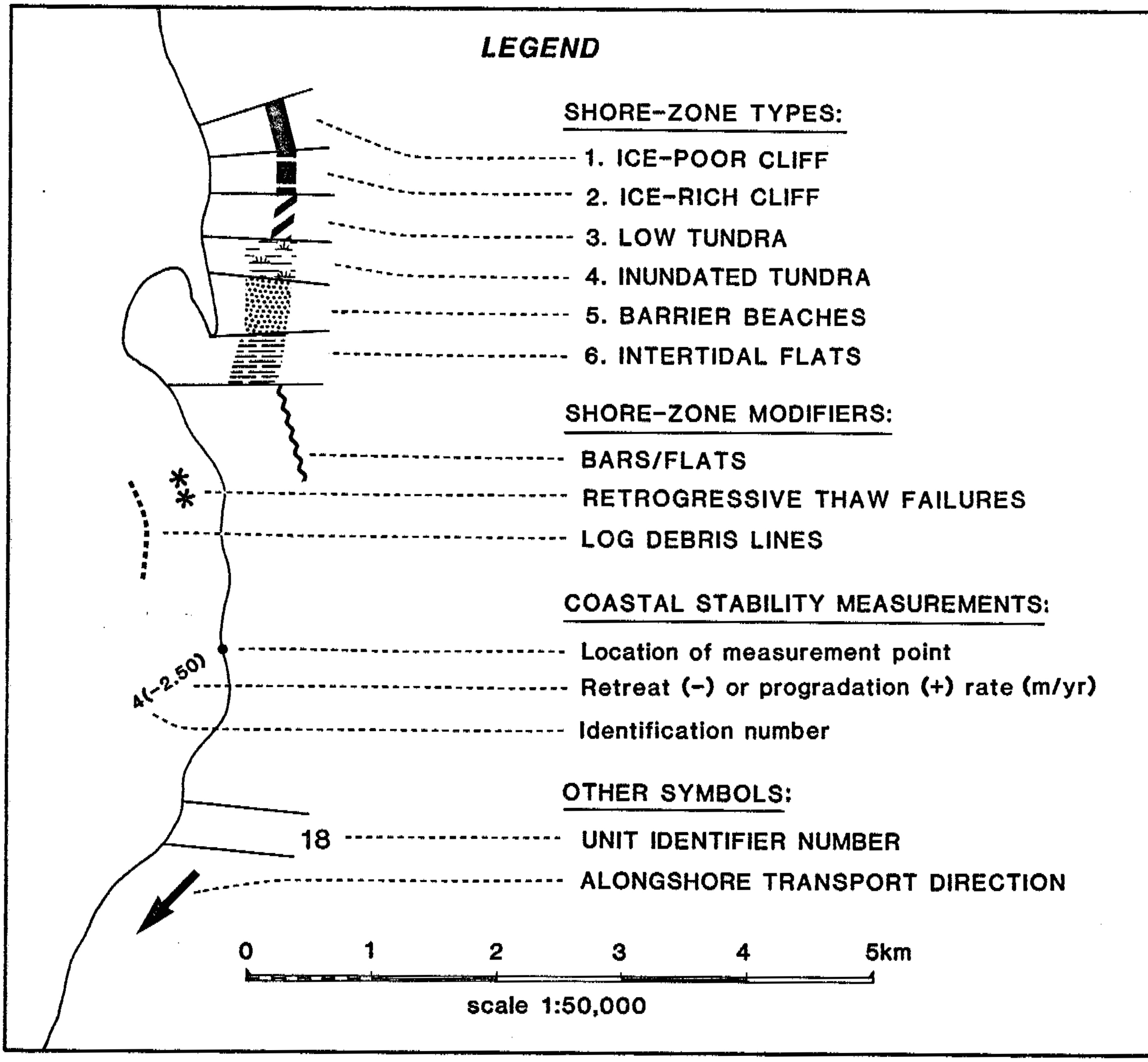
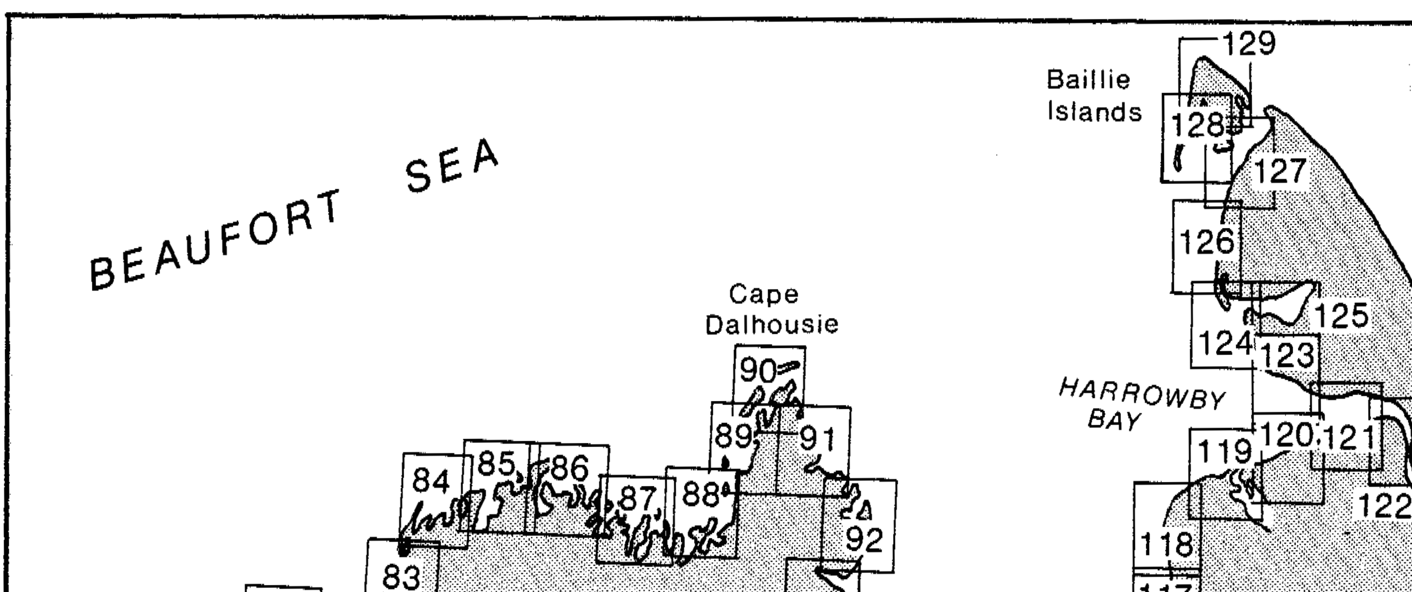
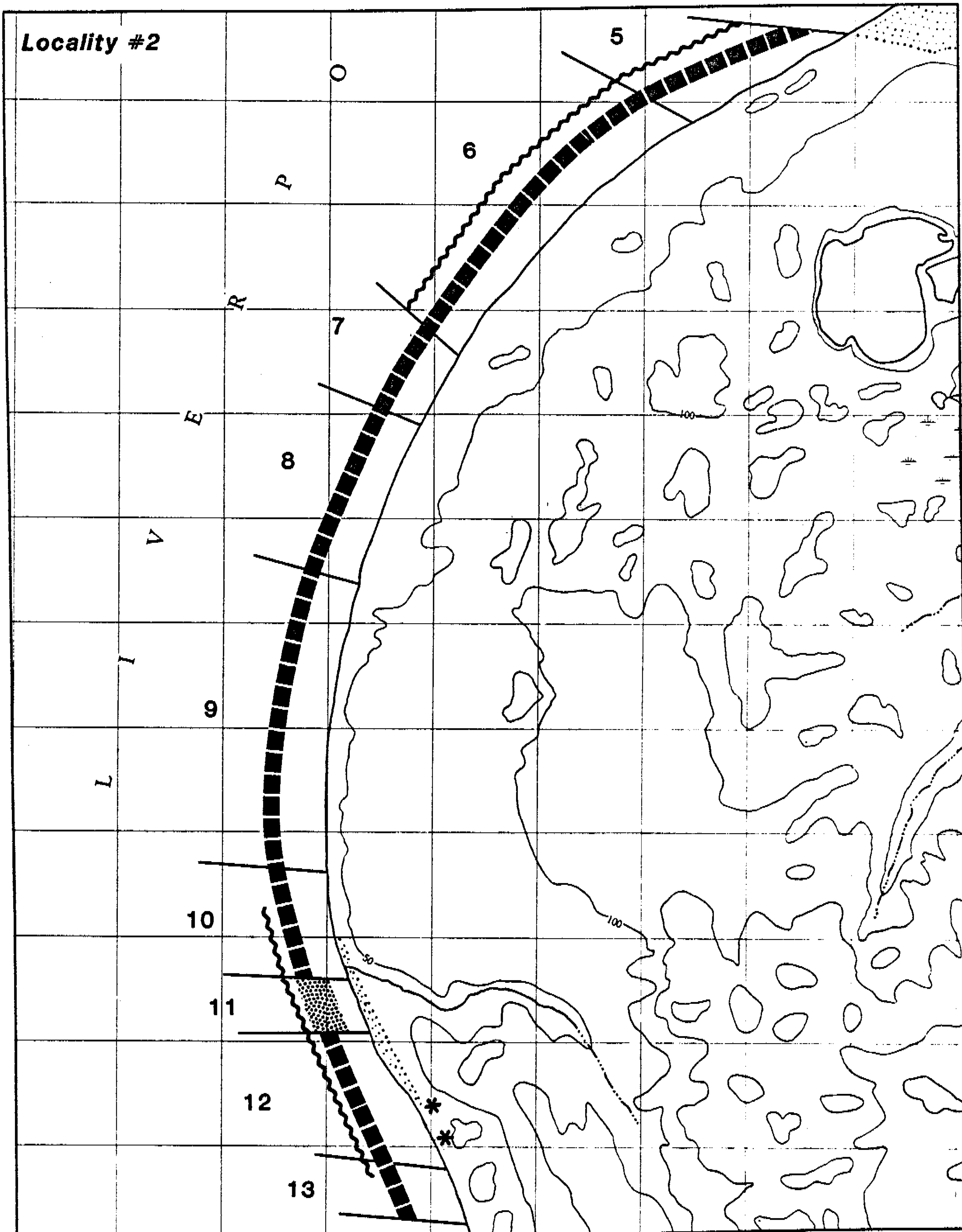
116
117



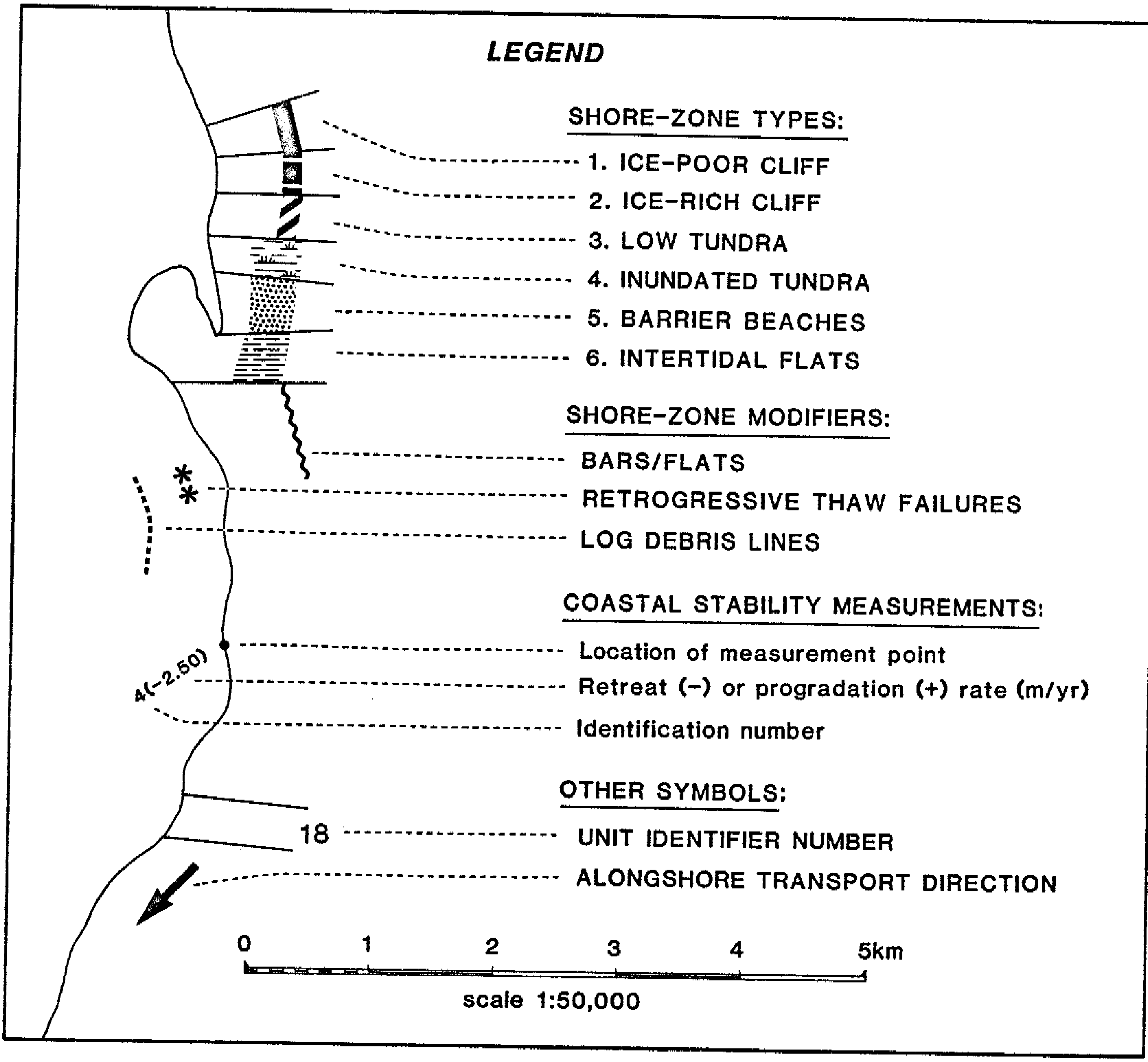
Locality #2
13
14
15
16
17
18
19
20
100
150
50
V E R P O O L


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
83
84
85
86
87
88
89
90
91
92
117
118
119
120
121
122
123
124
125
126
127
128
129



Locality #2
LIVERPOOL
5
6
7
8
9
10
11
12
13
100
100
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
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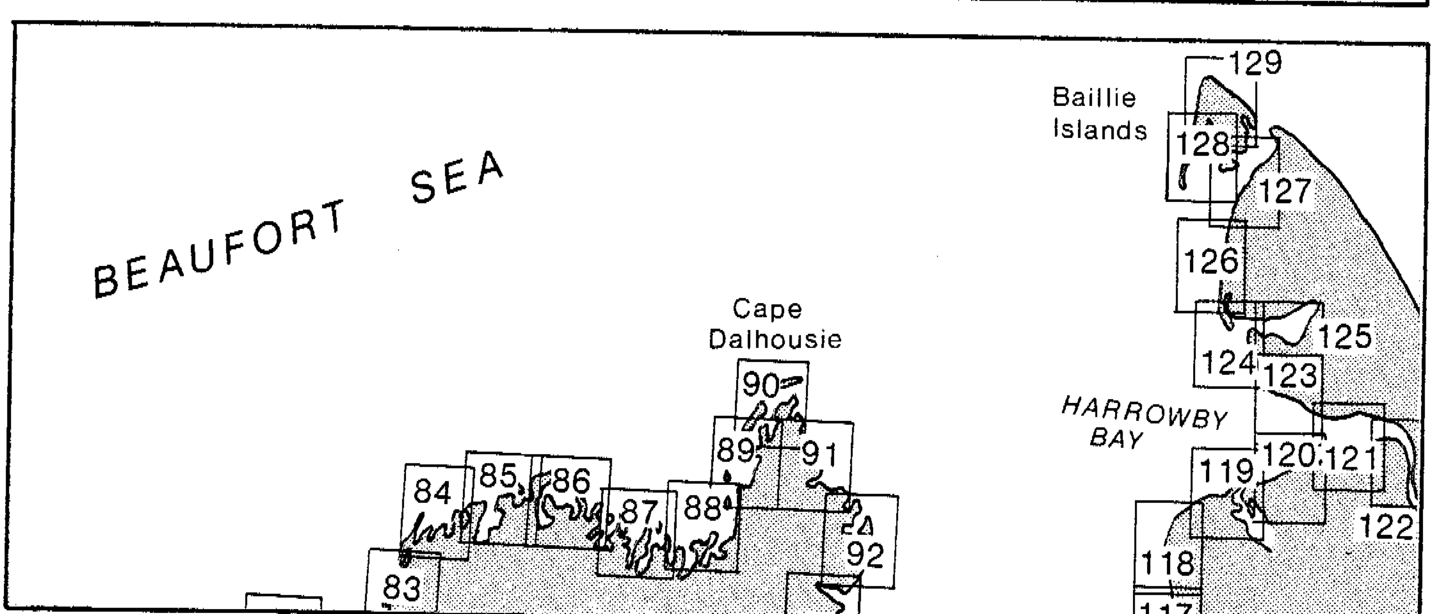
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
127
126
125
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122
121
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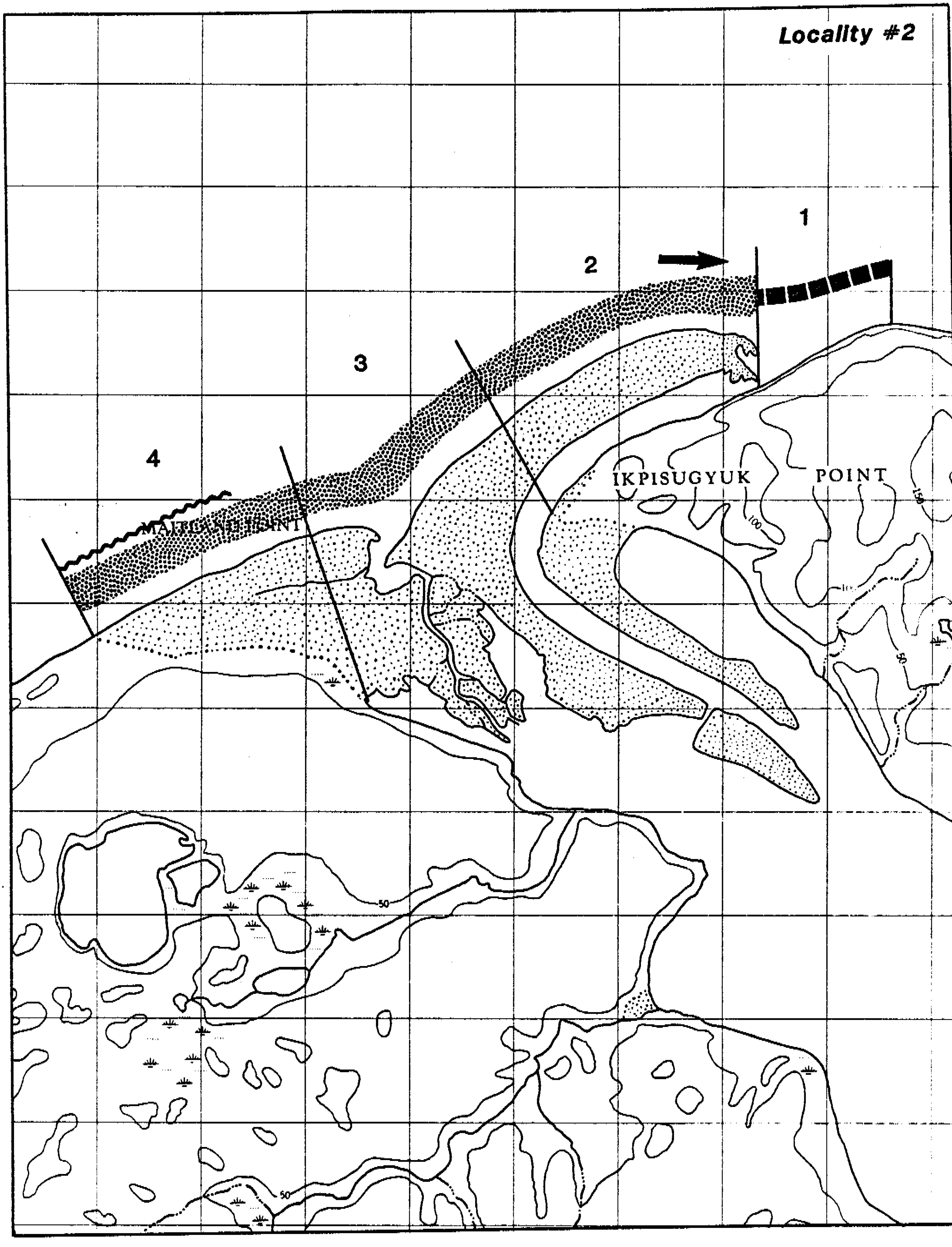
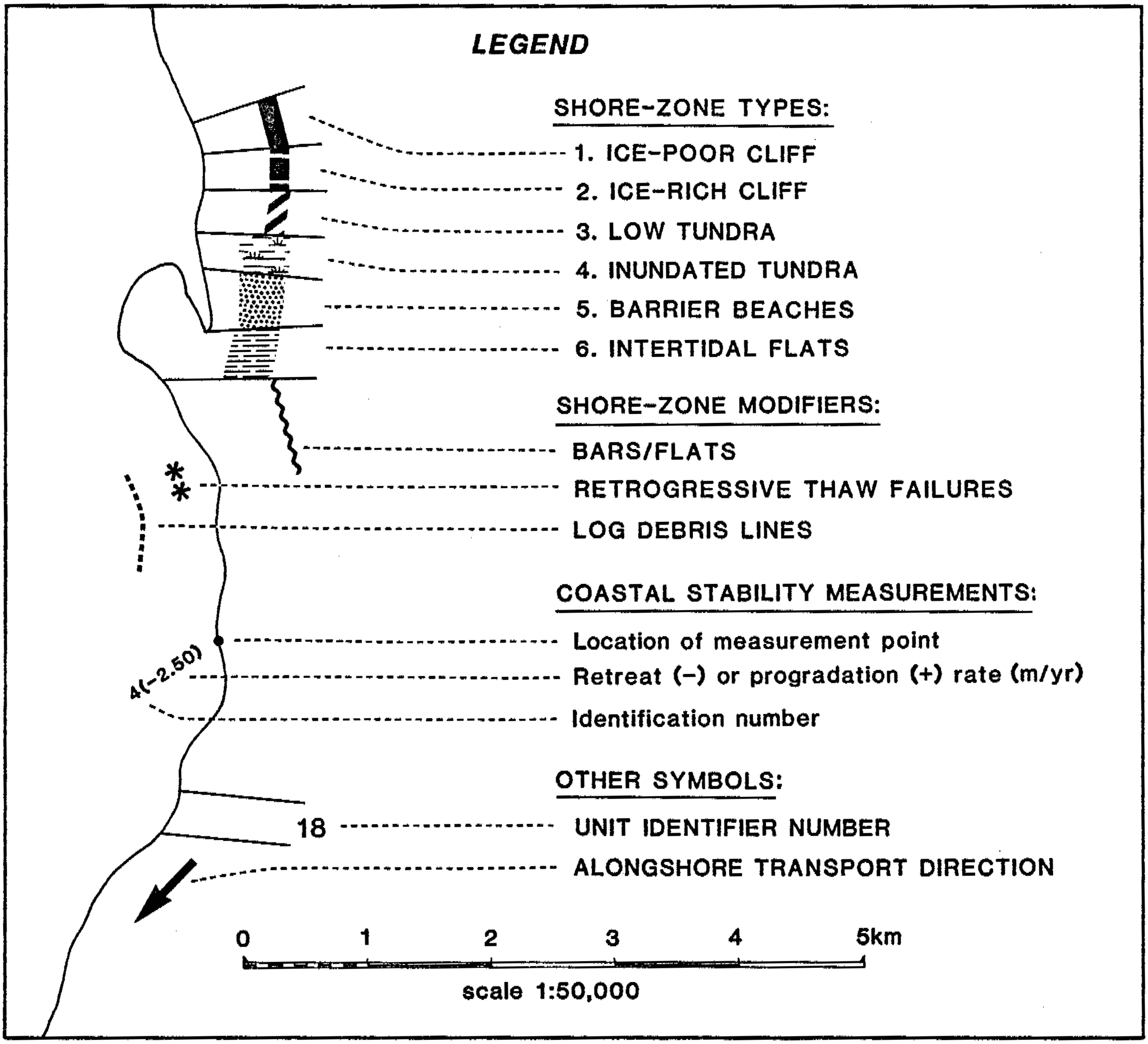
87
86
85
84
83


Locality #2
1
2
3
4
IKPISUGYUK POINT
MAITLAND POINT
100
150
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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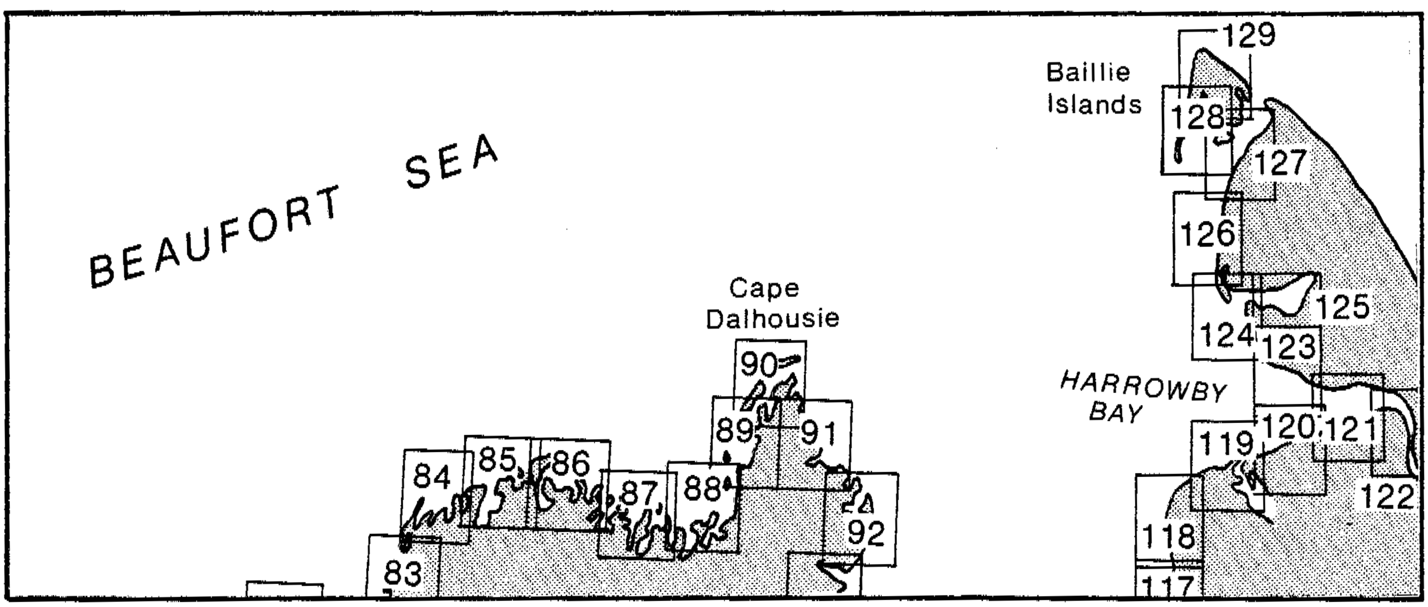
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (−) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
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125
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92
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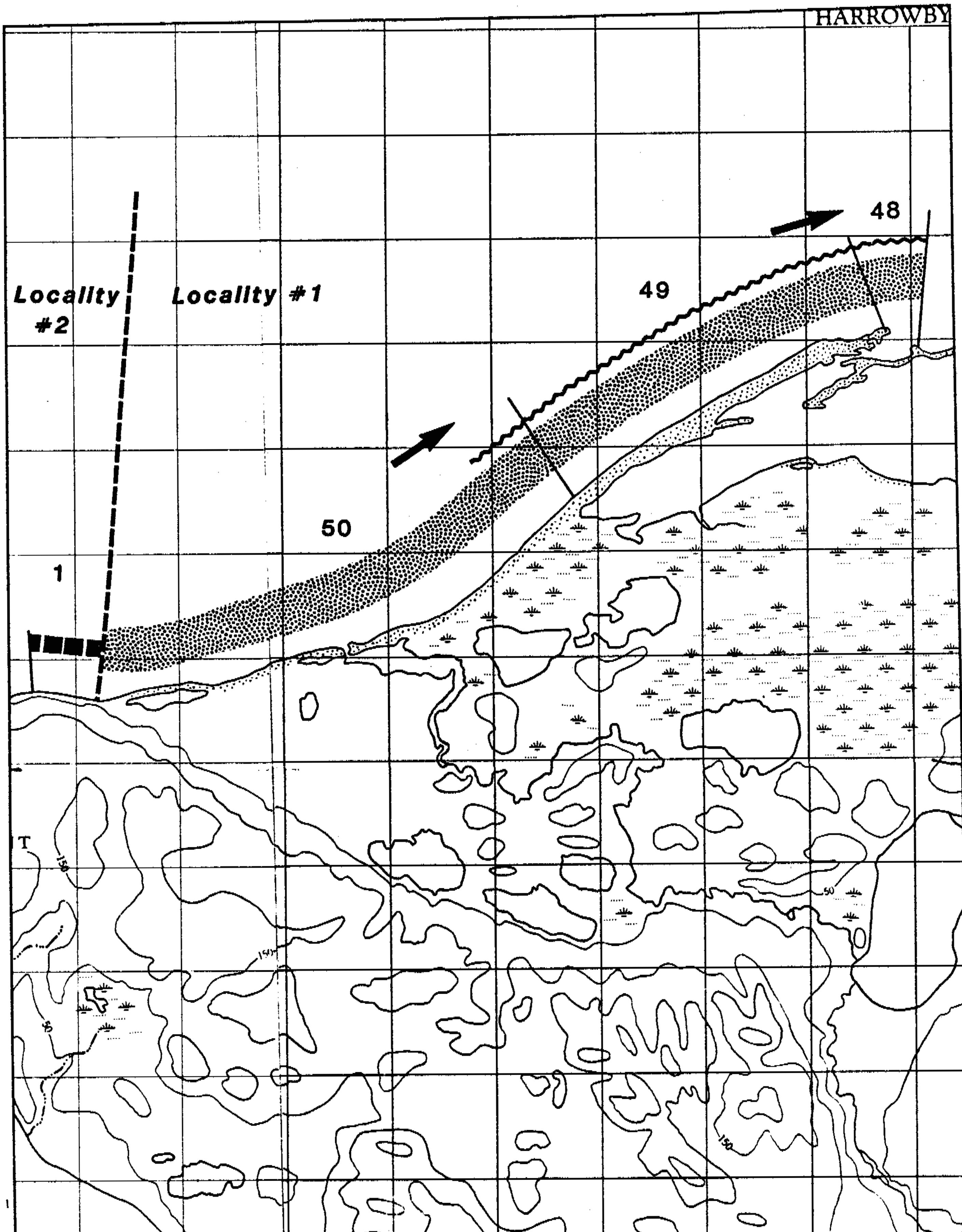
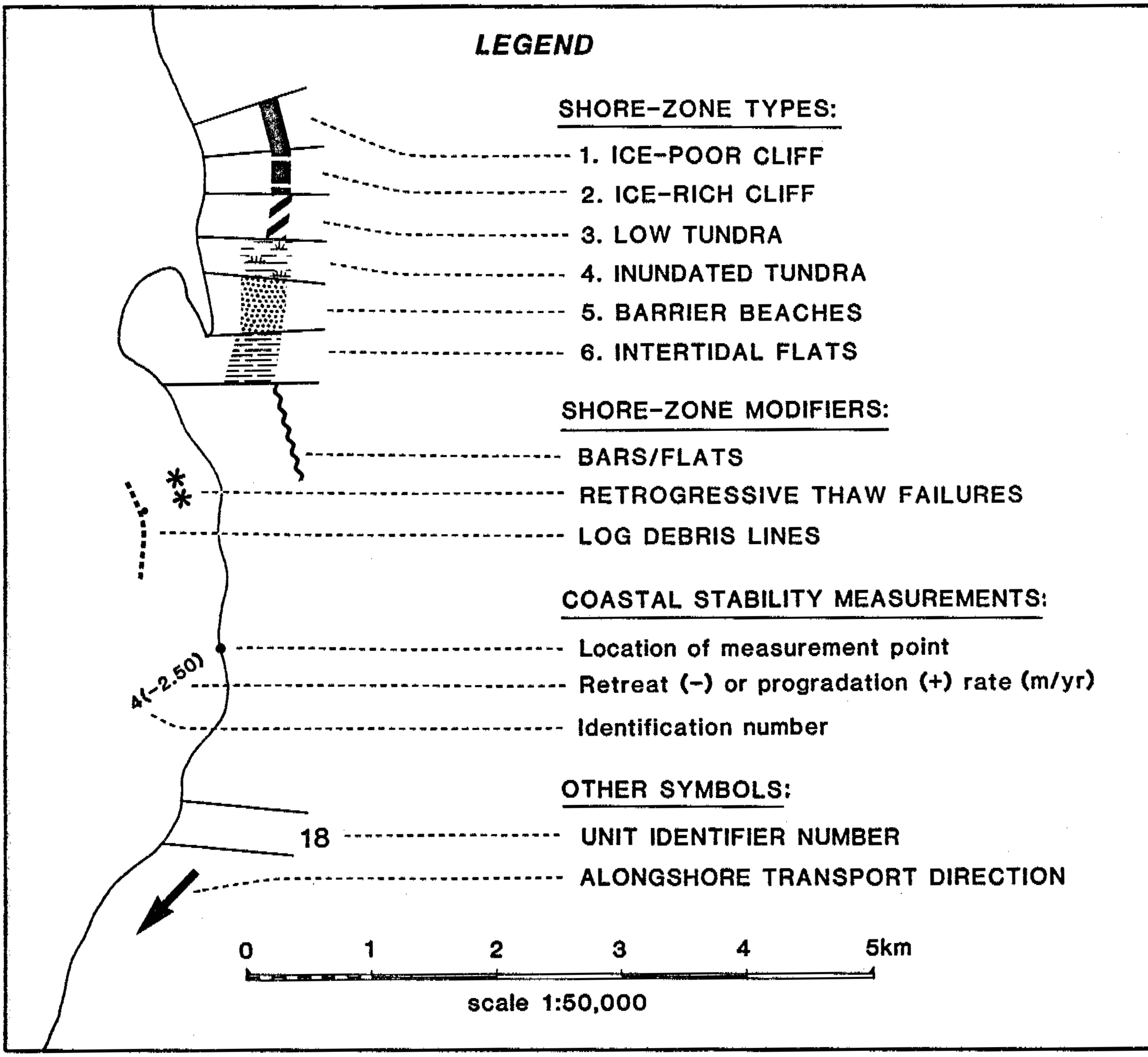
87
86
85
84
83


HARROWBY
48
Locality
#2
Locality #1
49
50
1
T
150
150
50
50
150


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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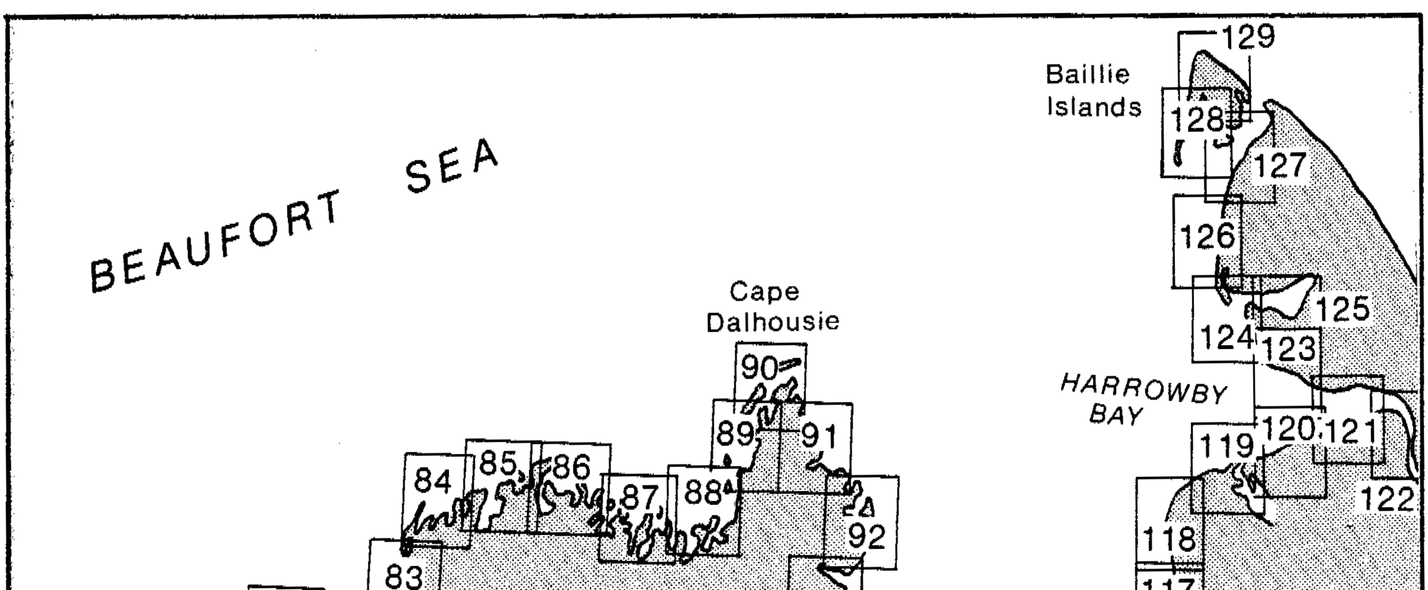
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
127
126
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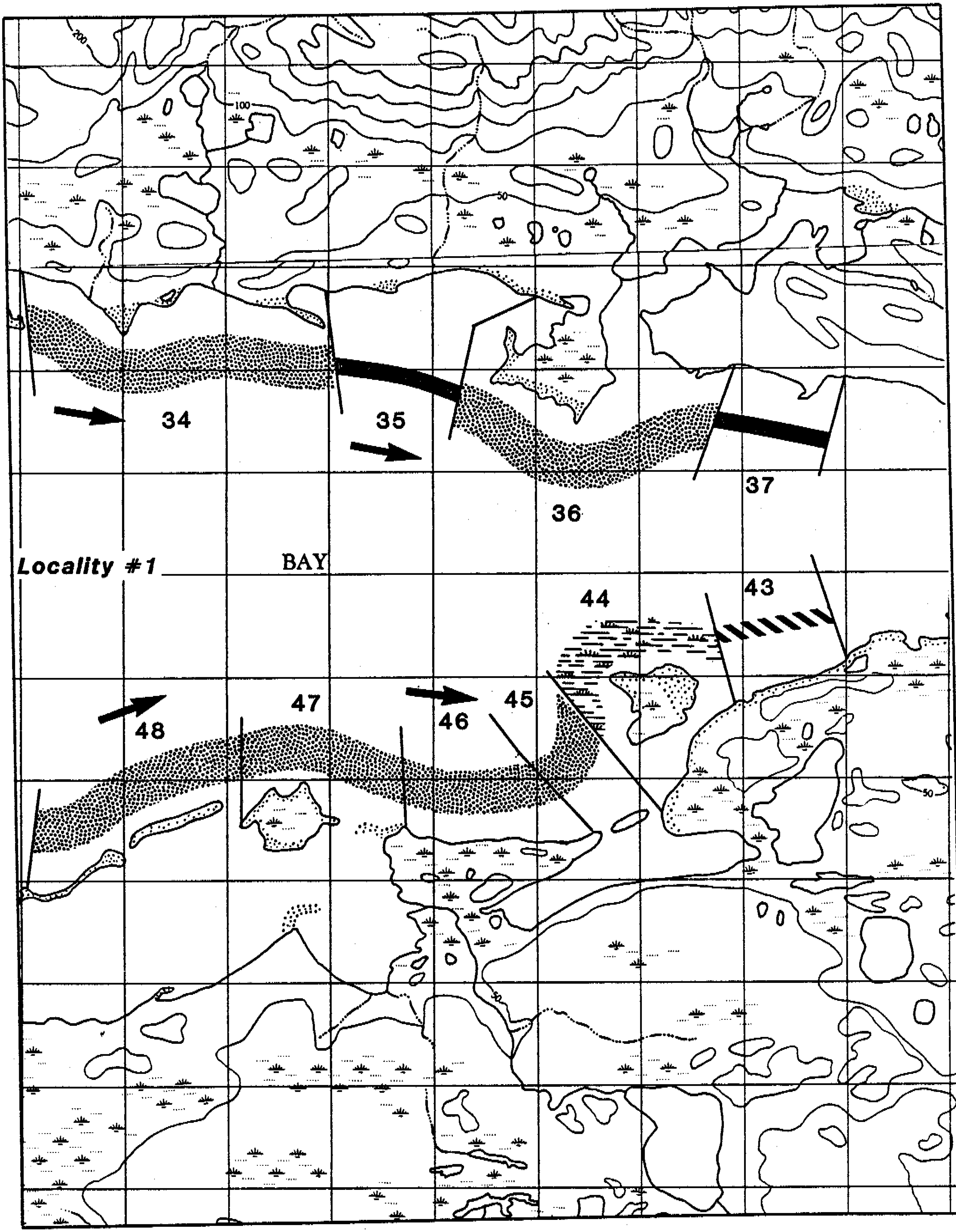
86
85
84
83


200
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50
34
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36
37
Locality #1
BAY
44
43
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48
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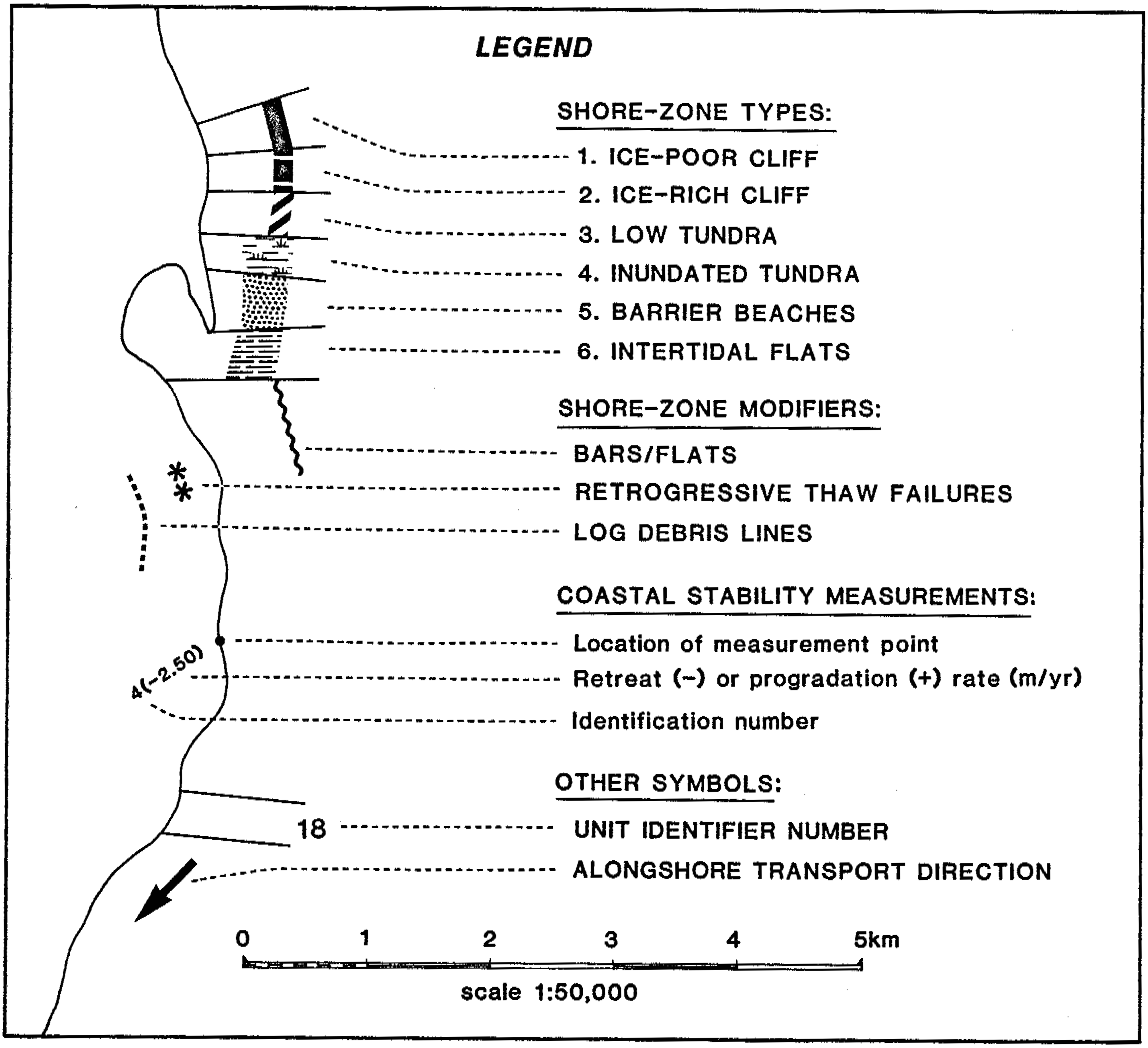
50
50


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
4(-2.50)
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
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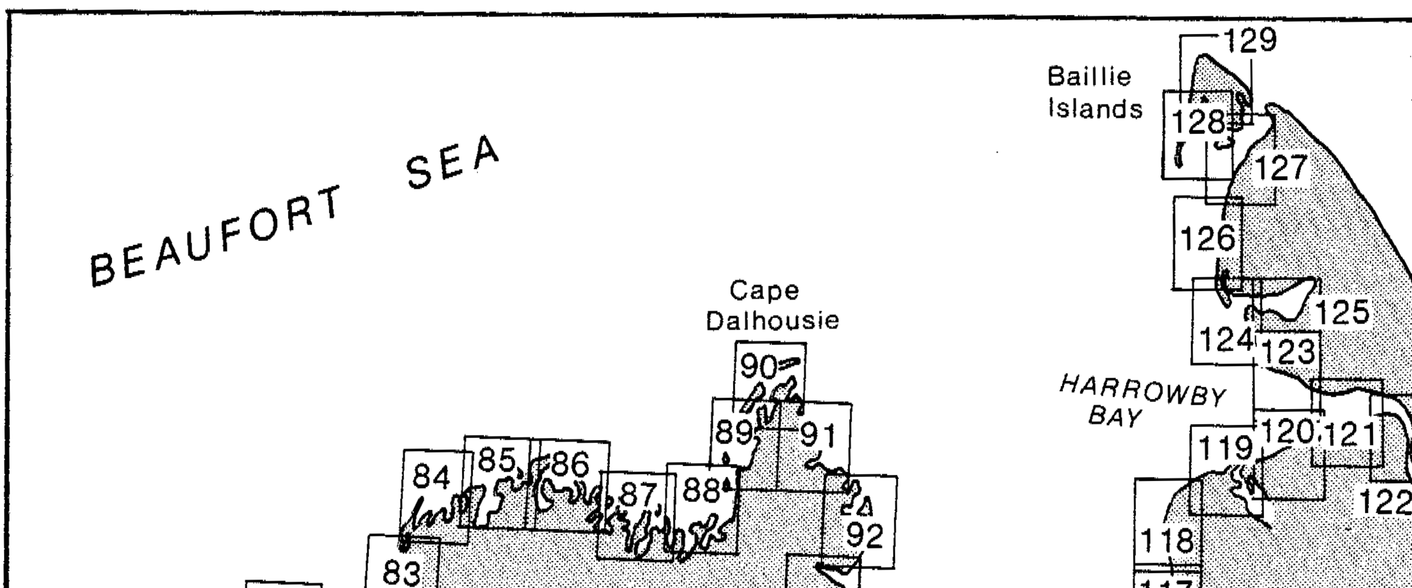
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
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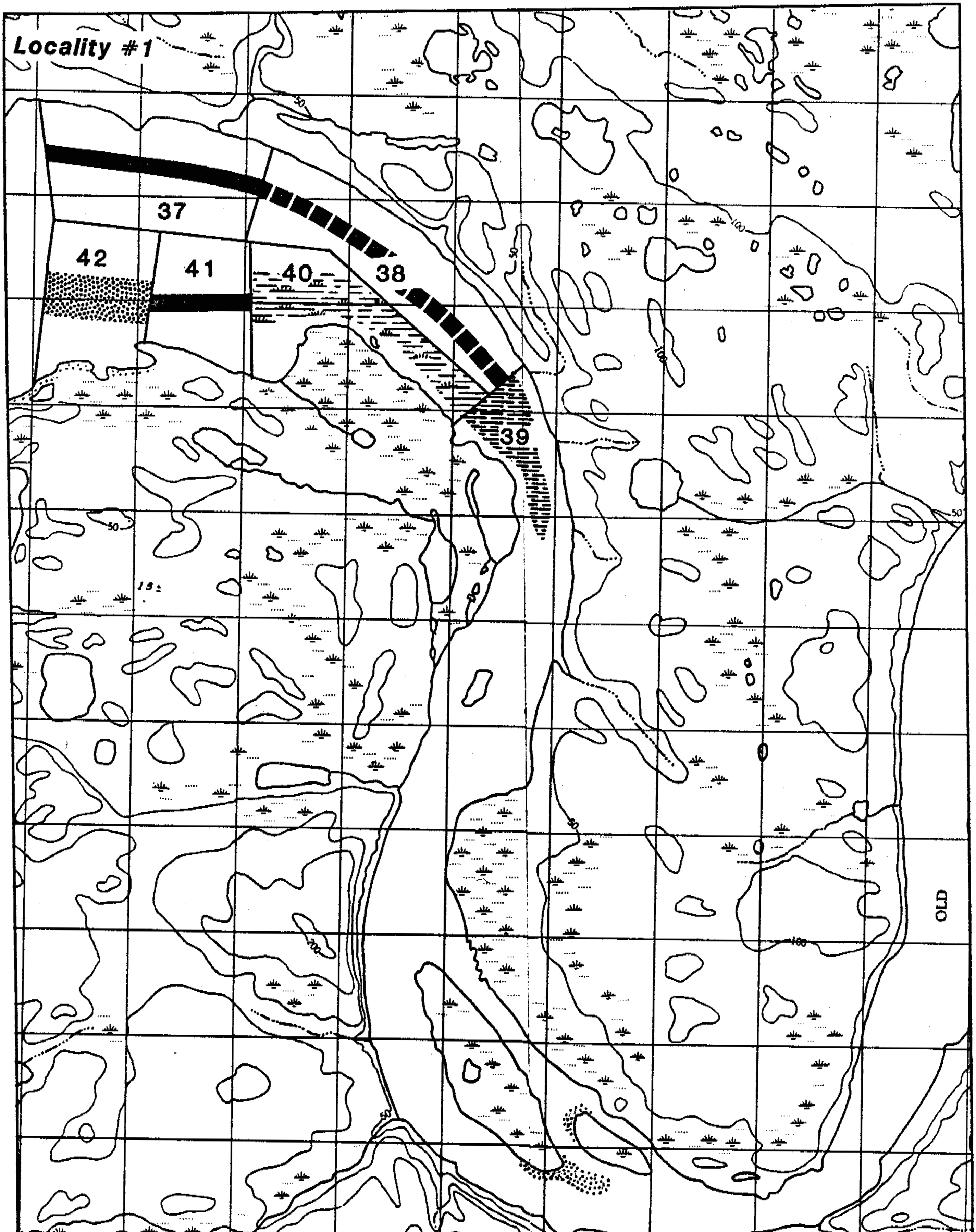
84
83


Locality #1
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100
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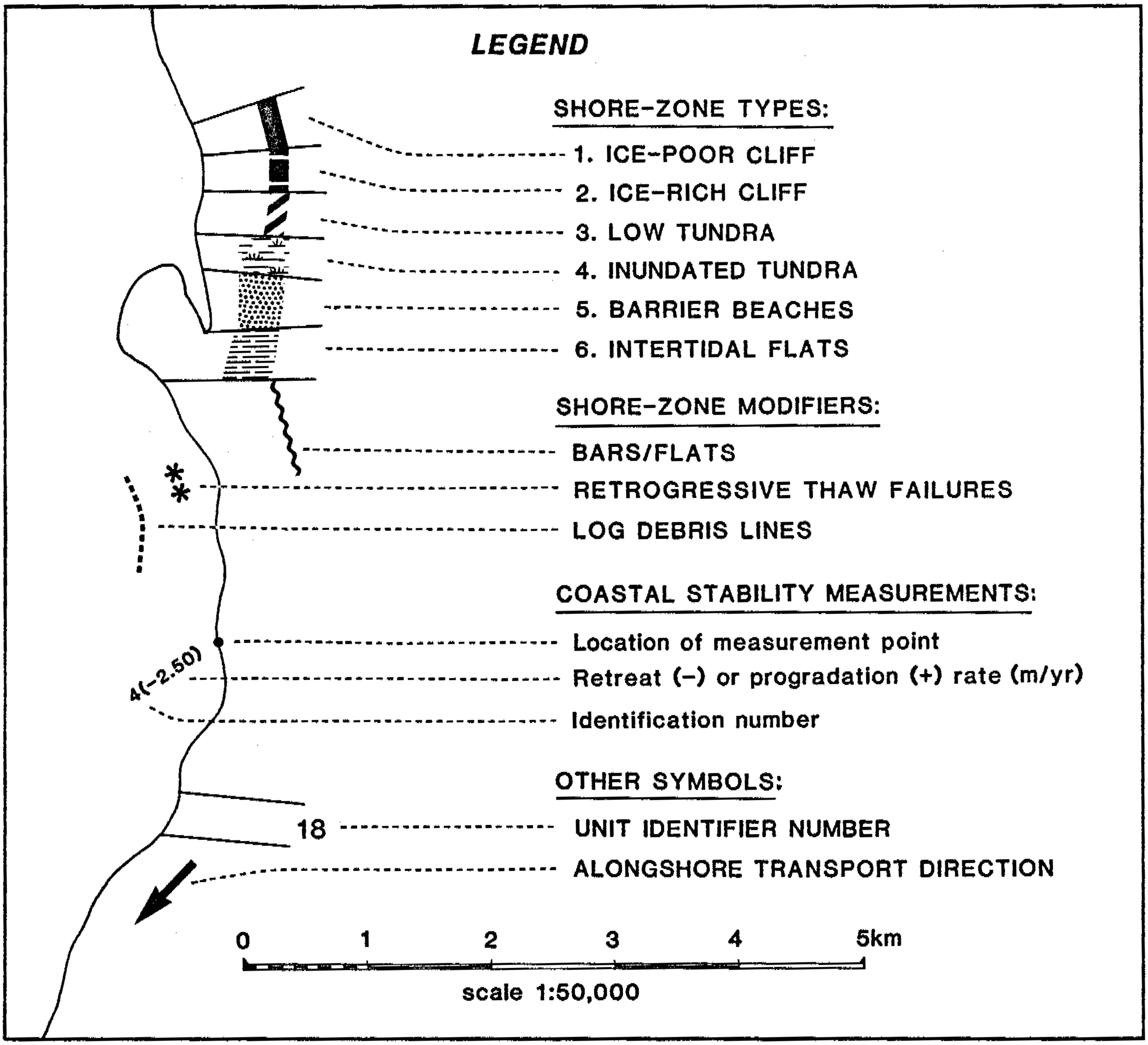
100
50
15
50
200
100
50
50
OLD


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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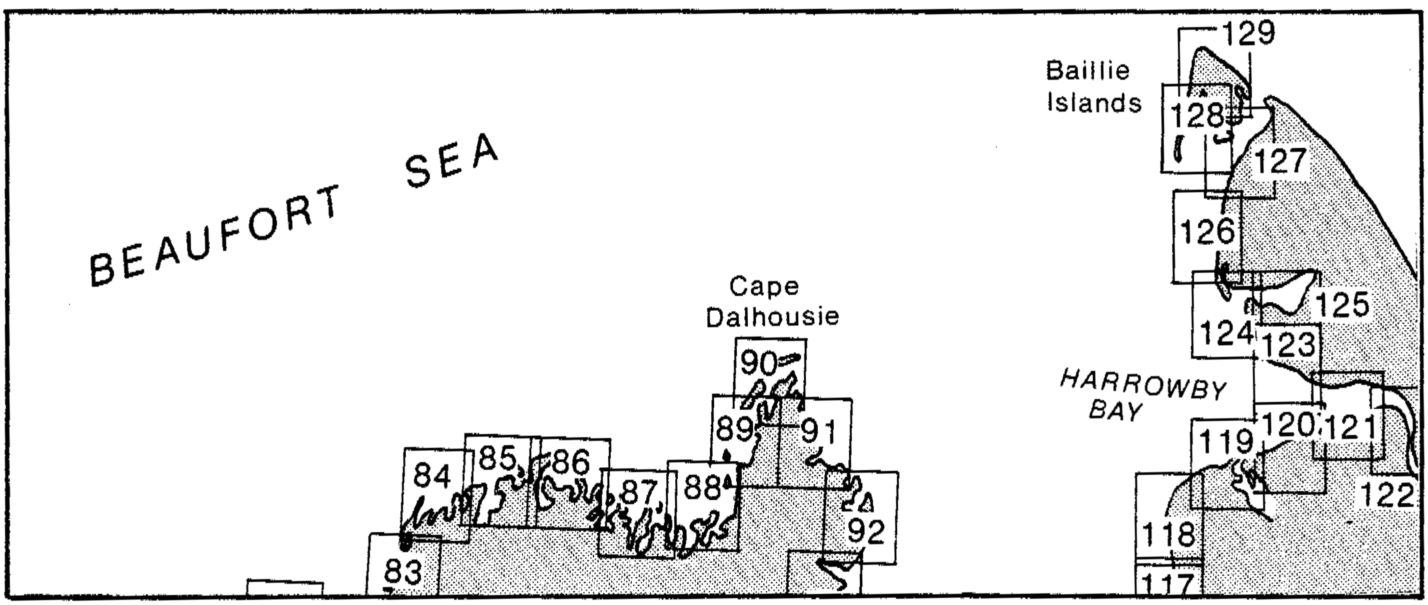
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (–) or progradation (+) rate (m/yr)
Identification number
4(–2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
83
84
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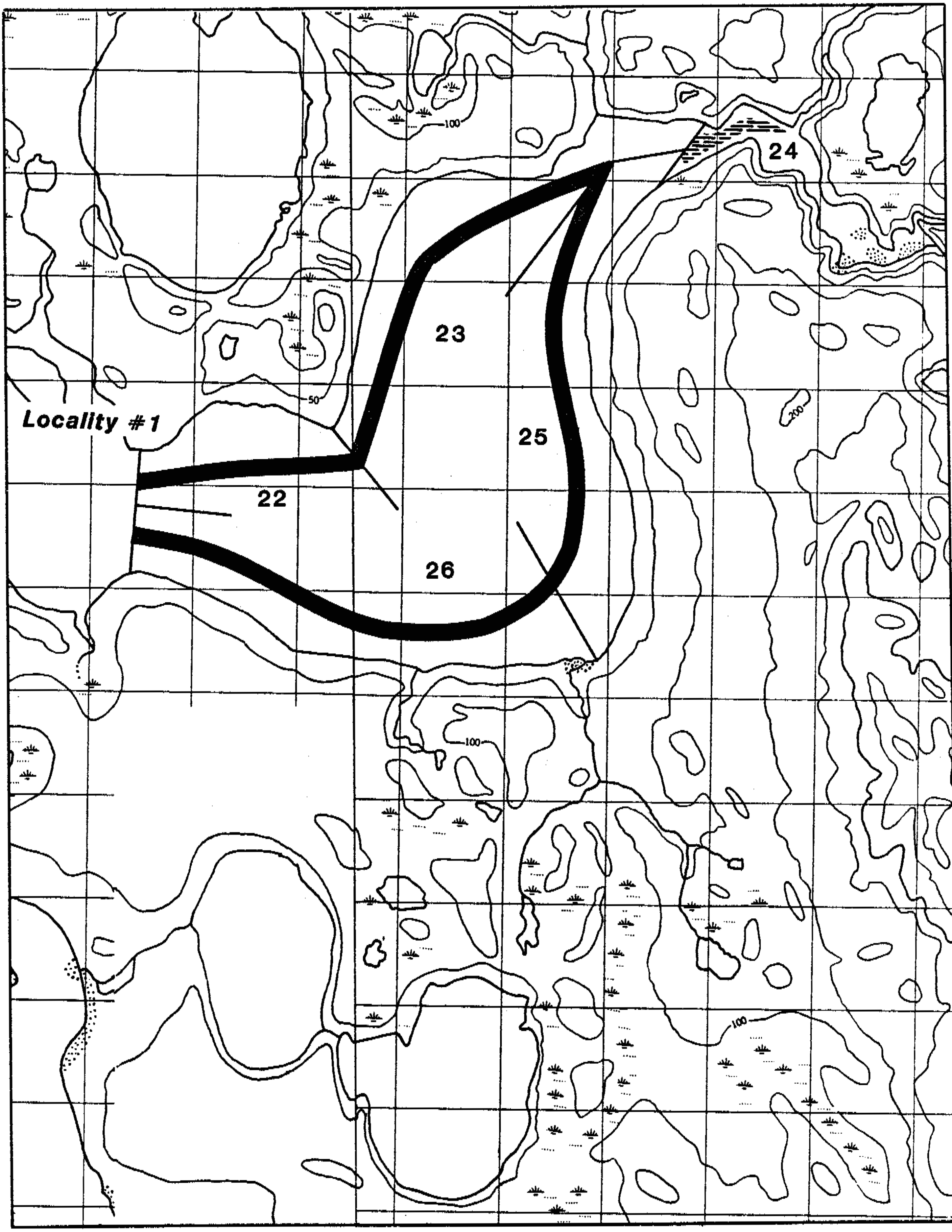
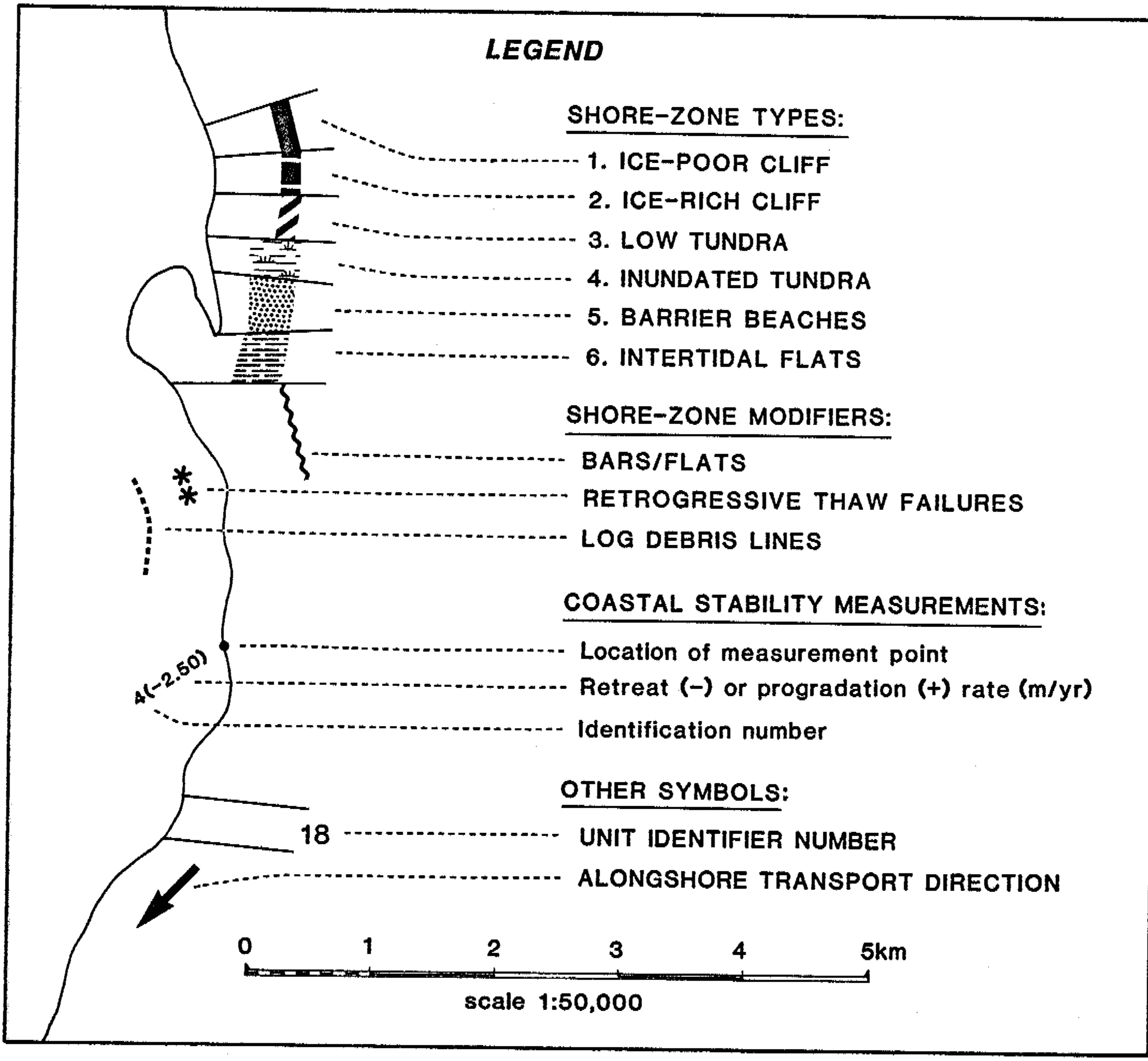
126
127
128
129



Locality #1
22
23
24
25
26
50
100
200



LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
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3. LOW TUNDRA
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4(-2.50)
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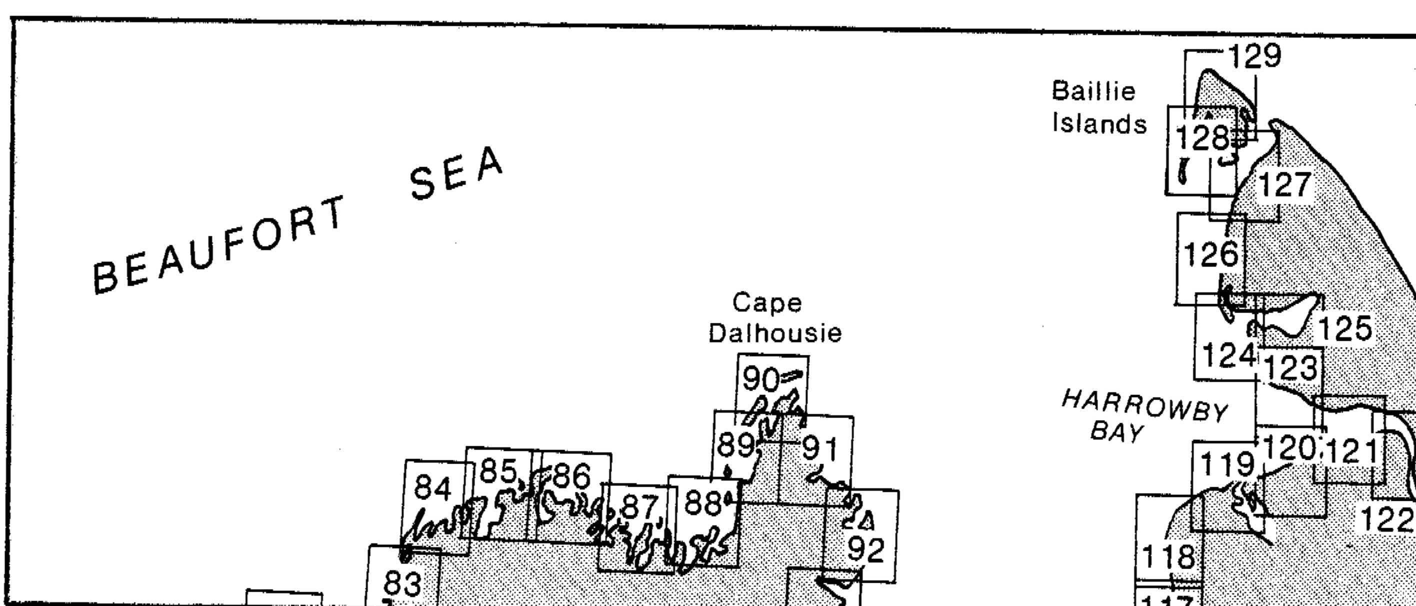
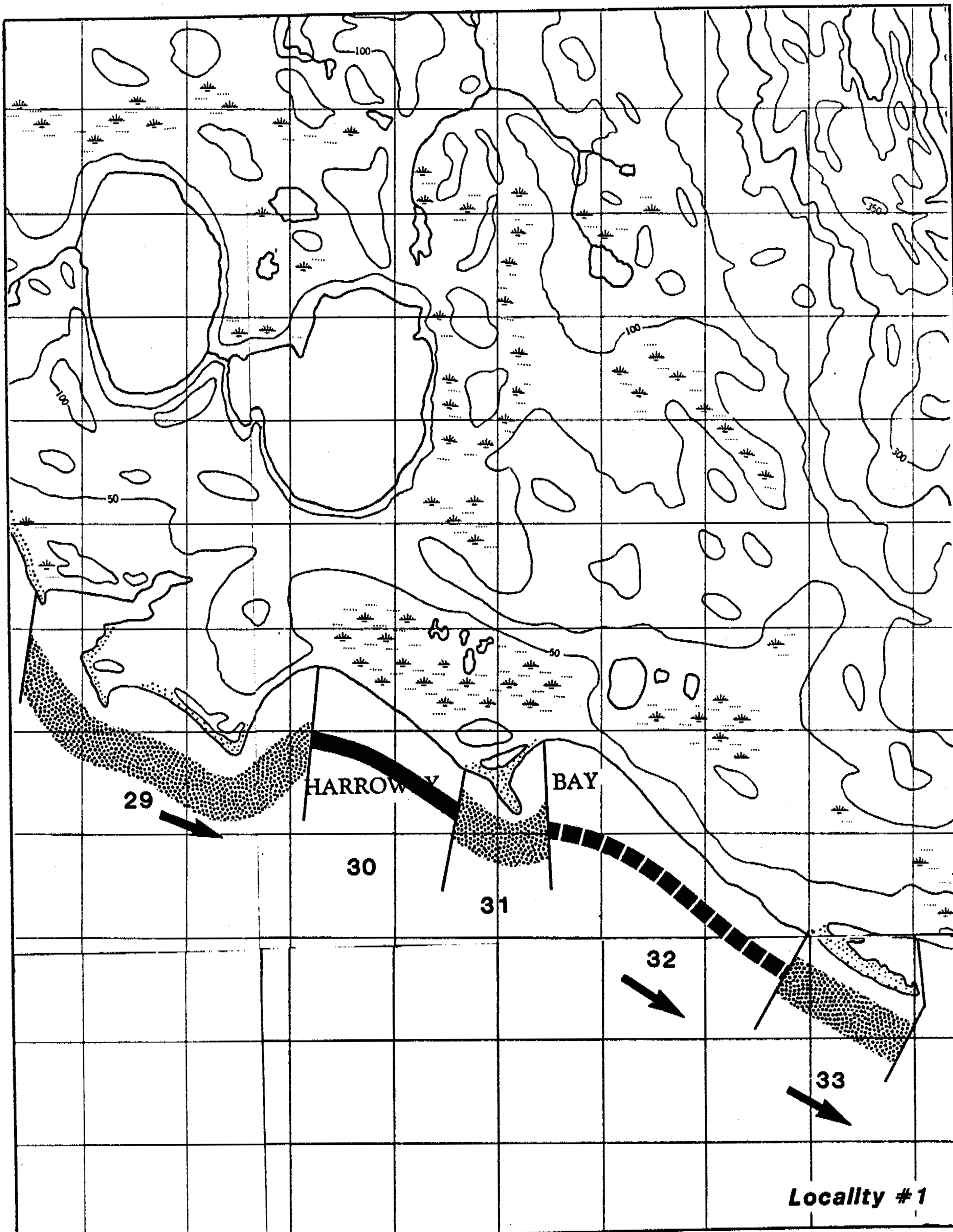
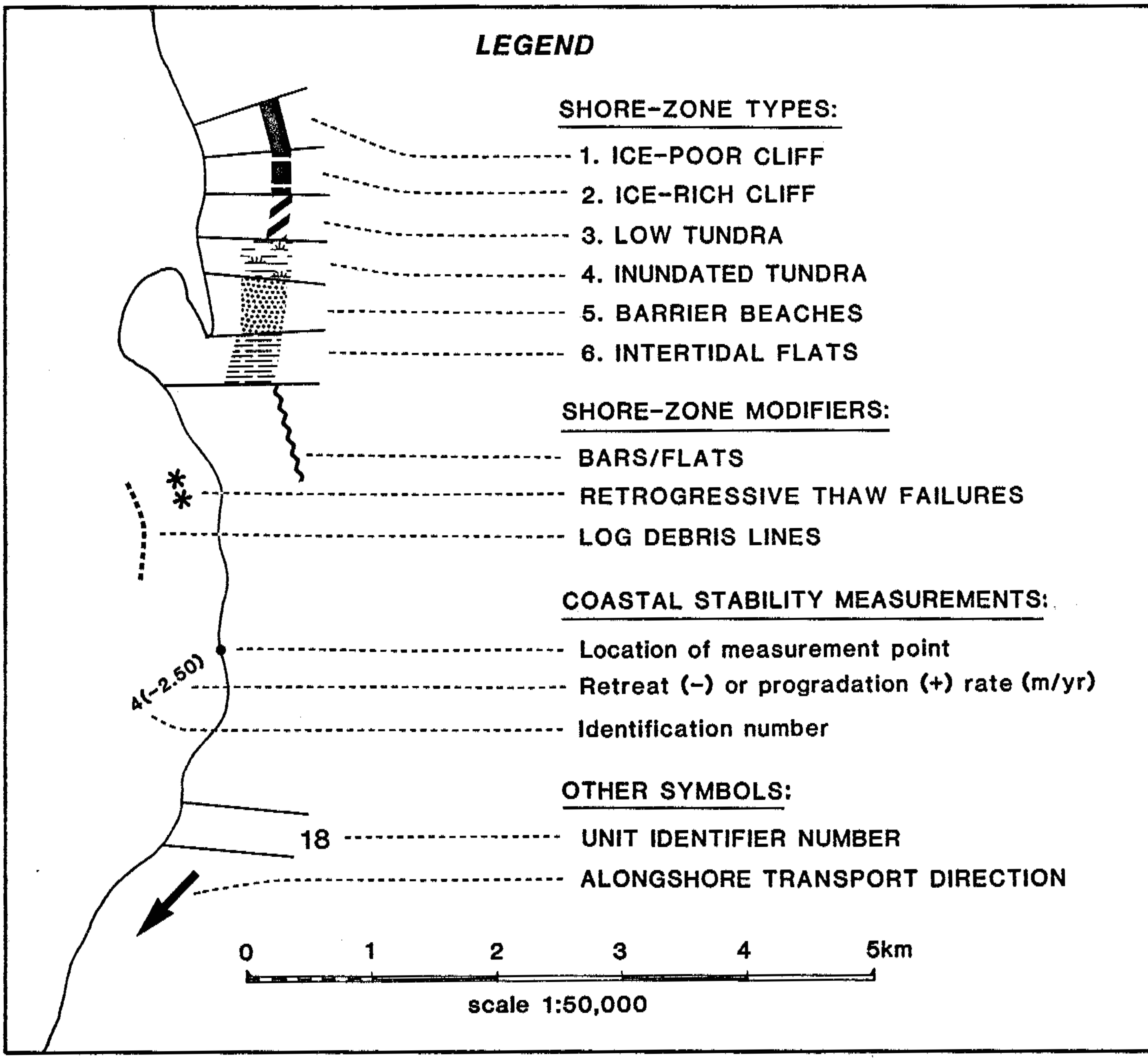
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000



BEAUFORT SEA
Cape Dalhousie
Baillie Islands
HARROWBY BAY
83 84 85 86 87 88 89 90 91 92
117 118 119 120 121 122 123 124 125 126 127 128 129


100
350
100
100
300
50
50
HARROW Y
BAY
29
30
31
32
33
Locality #1


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
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BARS/FLATS
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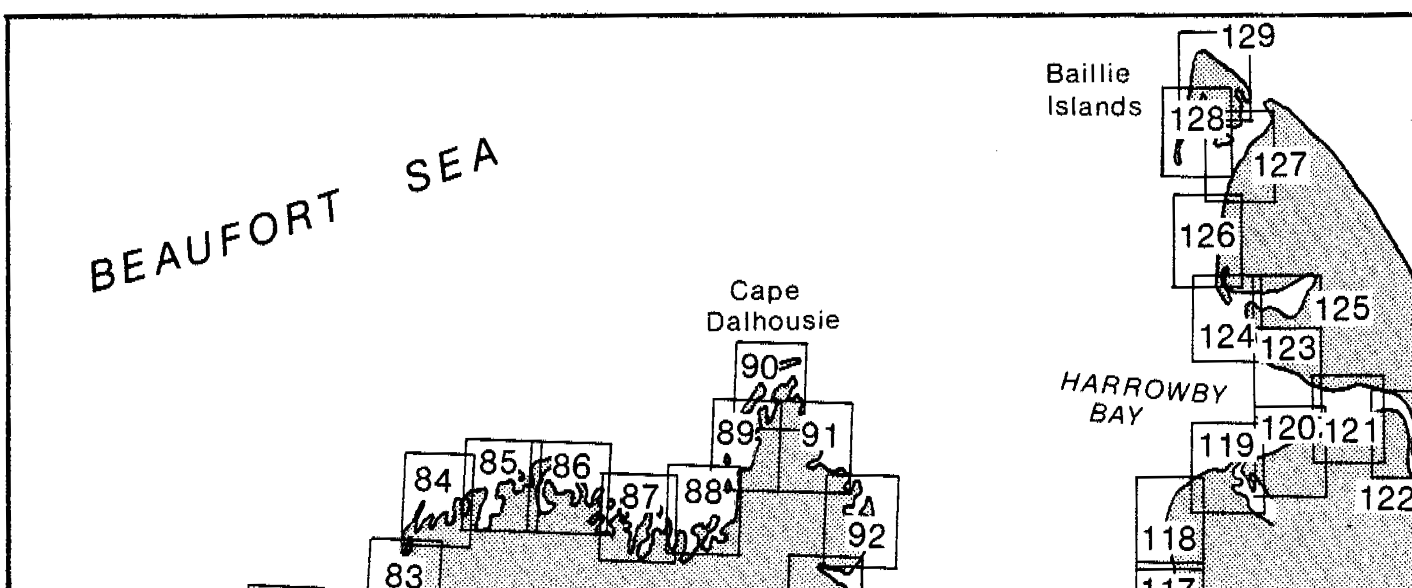
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
129
128
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126
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122
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91
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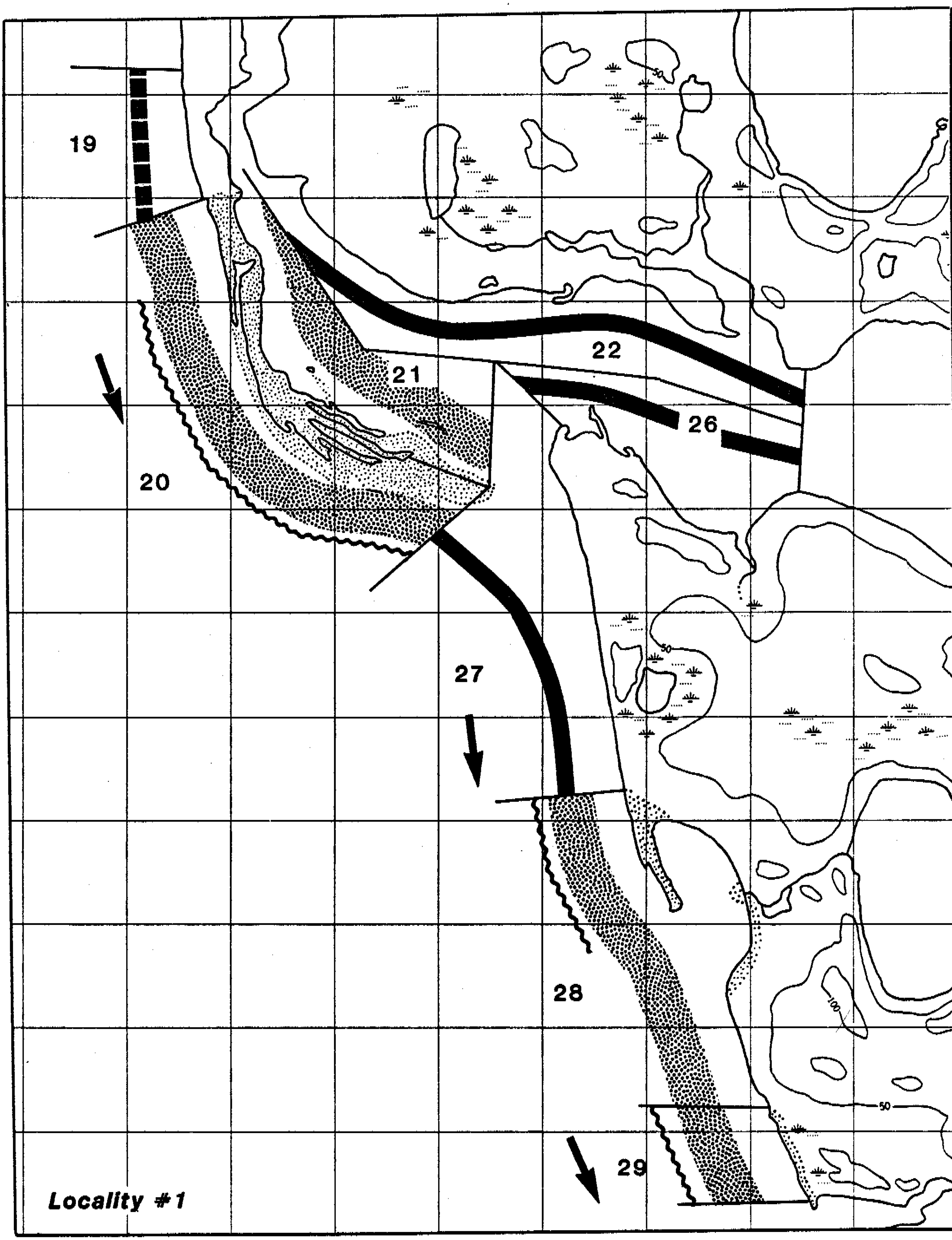
83
92


19
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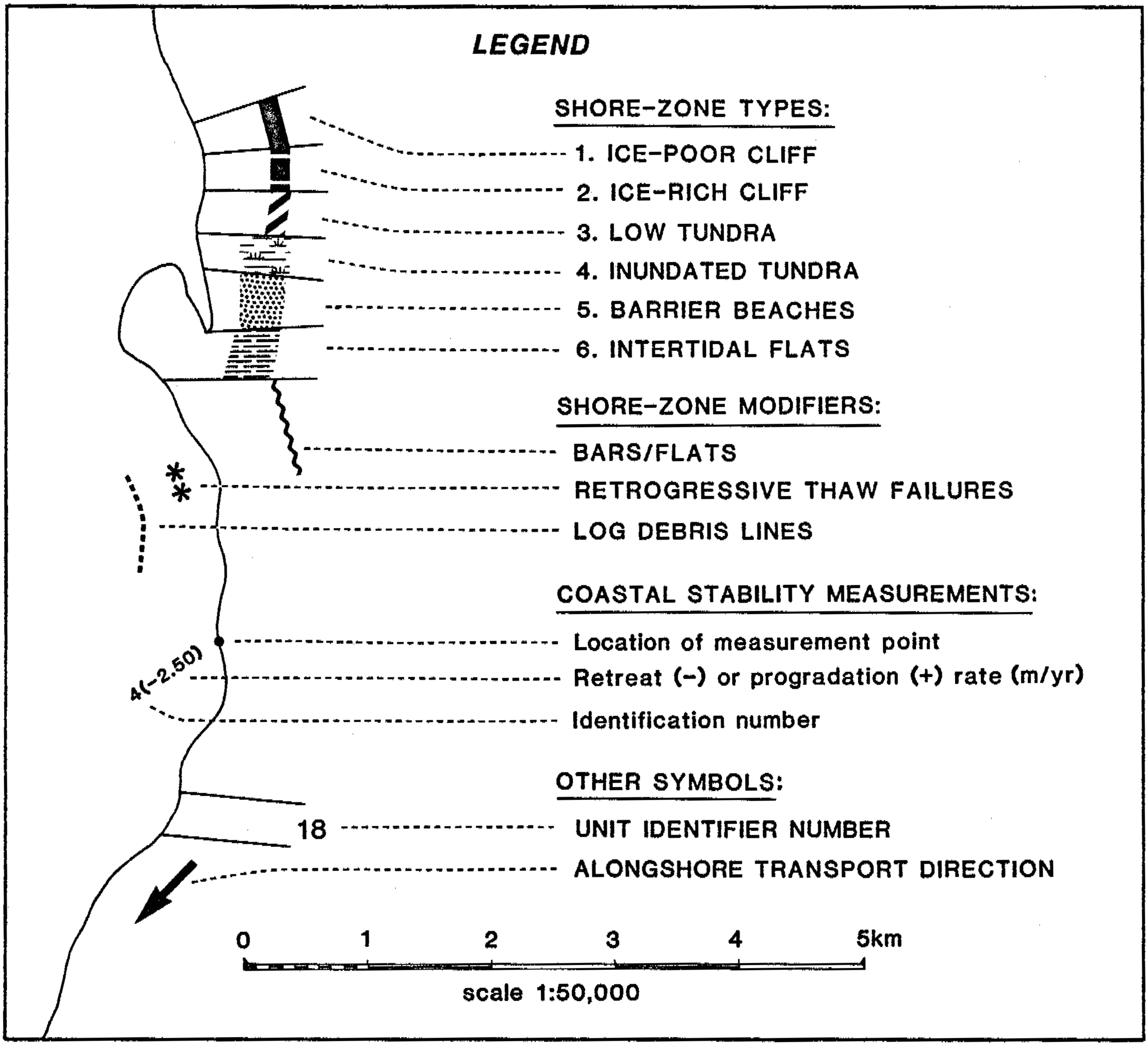
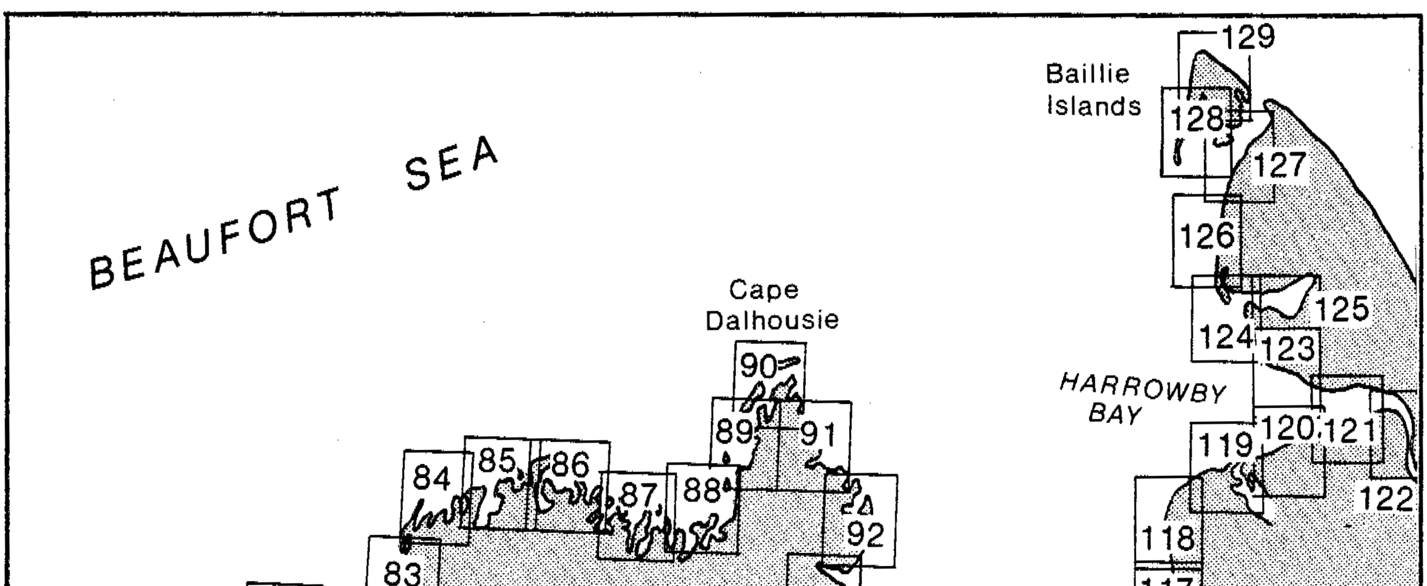
21
22
26
27
28
29
50
100
Locality #1


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (-) or progradation (+) rate (m/yr)
Identification number
4(-2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0
1
2
3
4
5km
scale 1:50,000


BEAUFORT SEA
Cape Dalhousie
Baillie Islands
HARROWBY BAY
83
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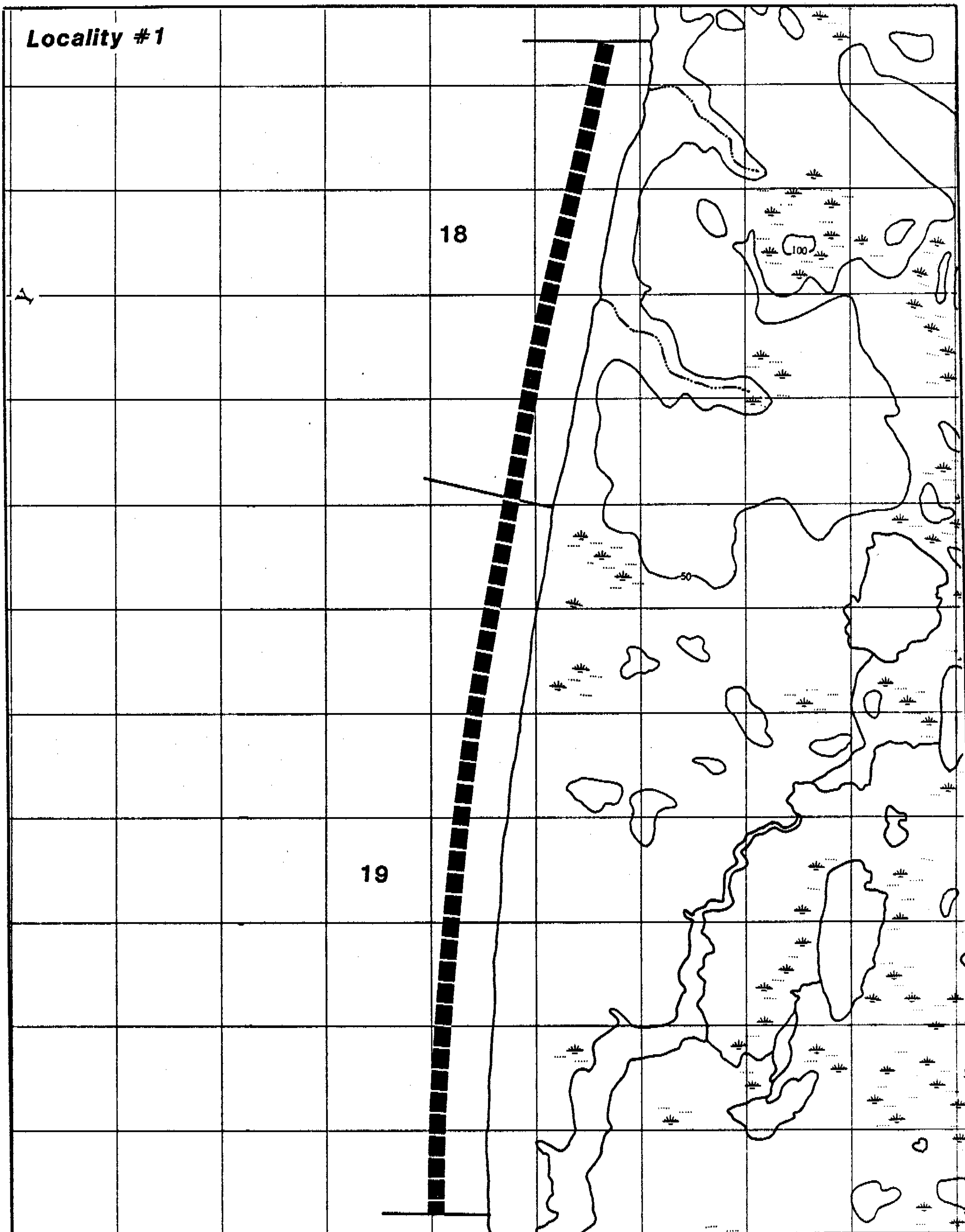
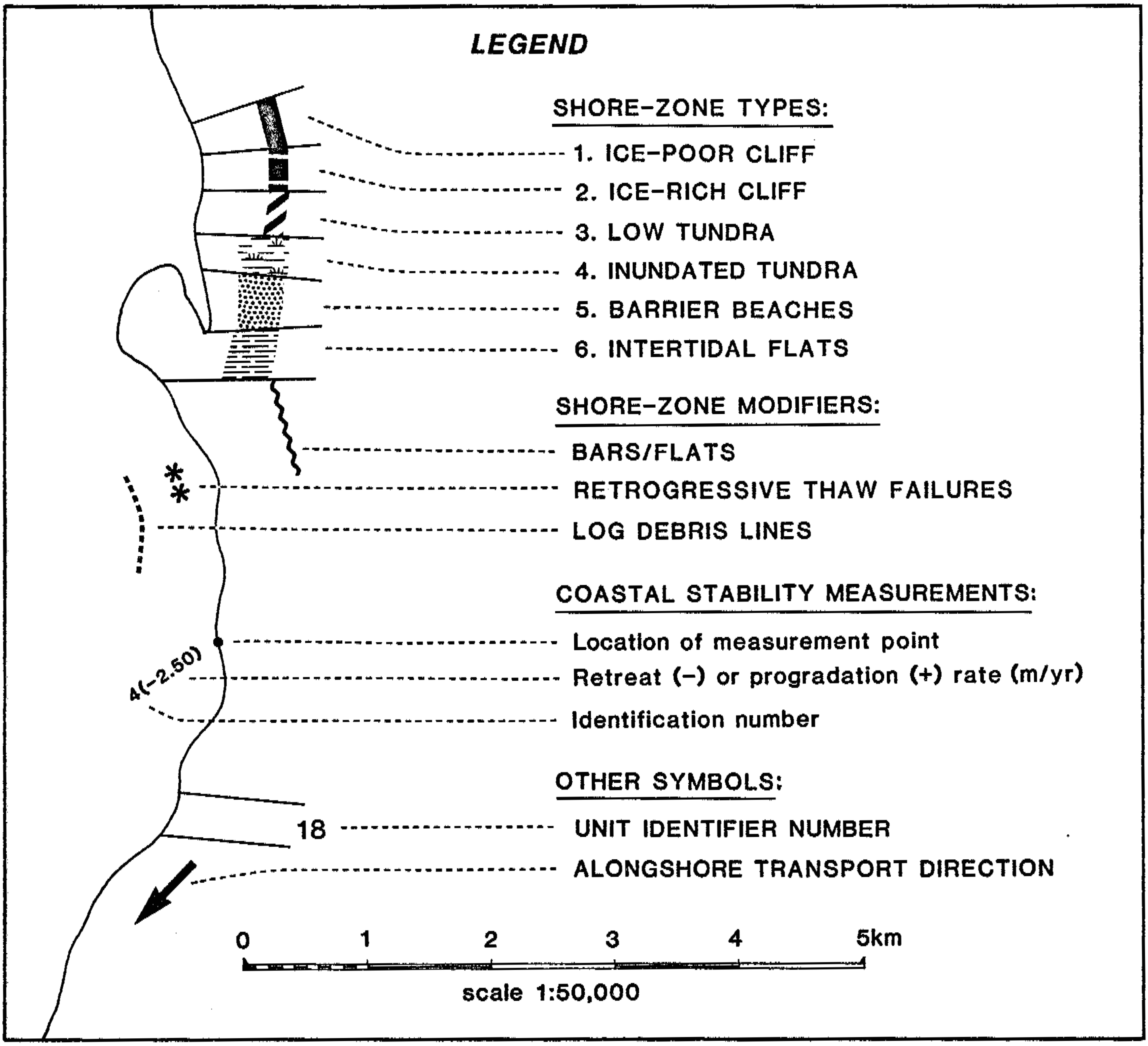
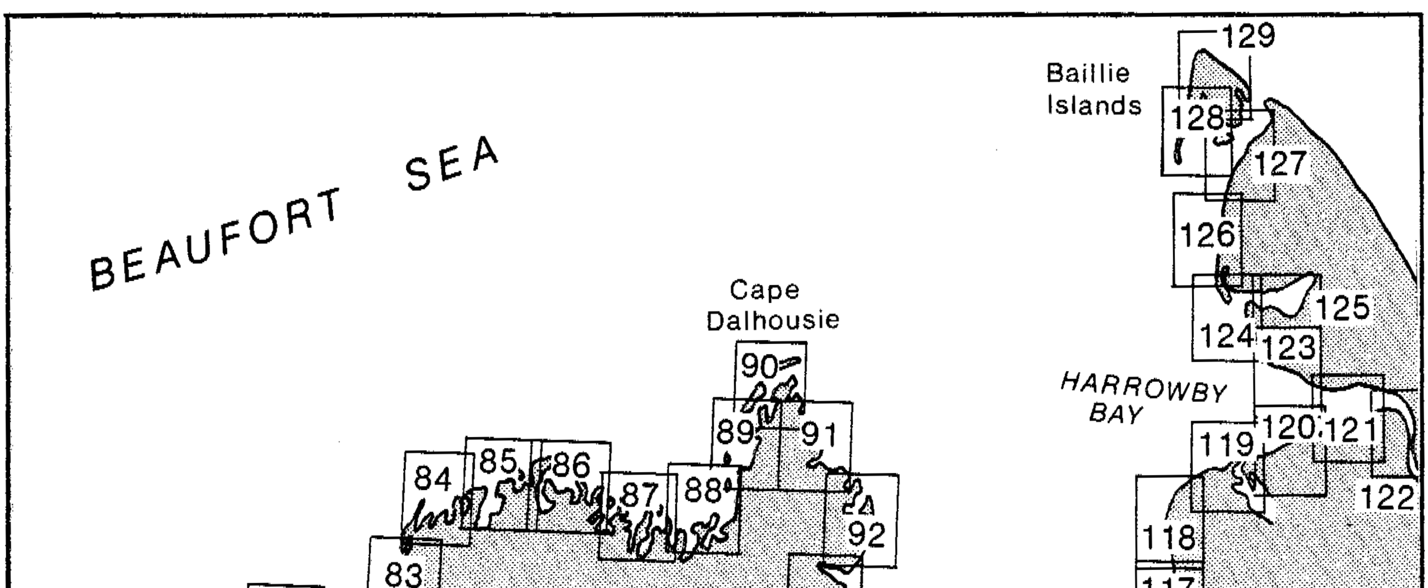

Locality #1
18
100
50
19


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (−) or progradation (+) rate (m/yr)
Identification number
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
83
84
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125
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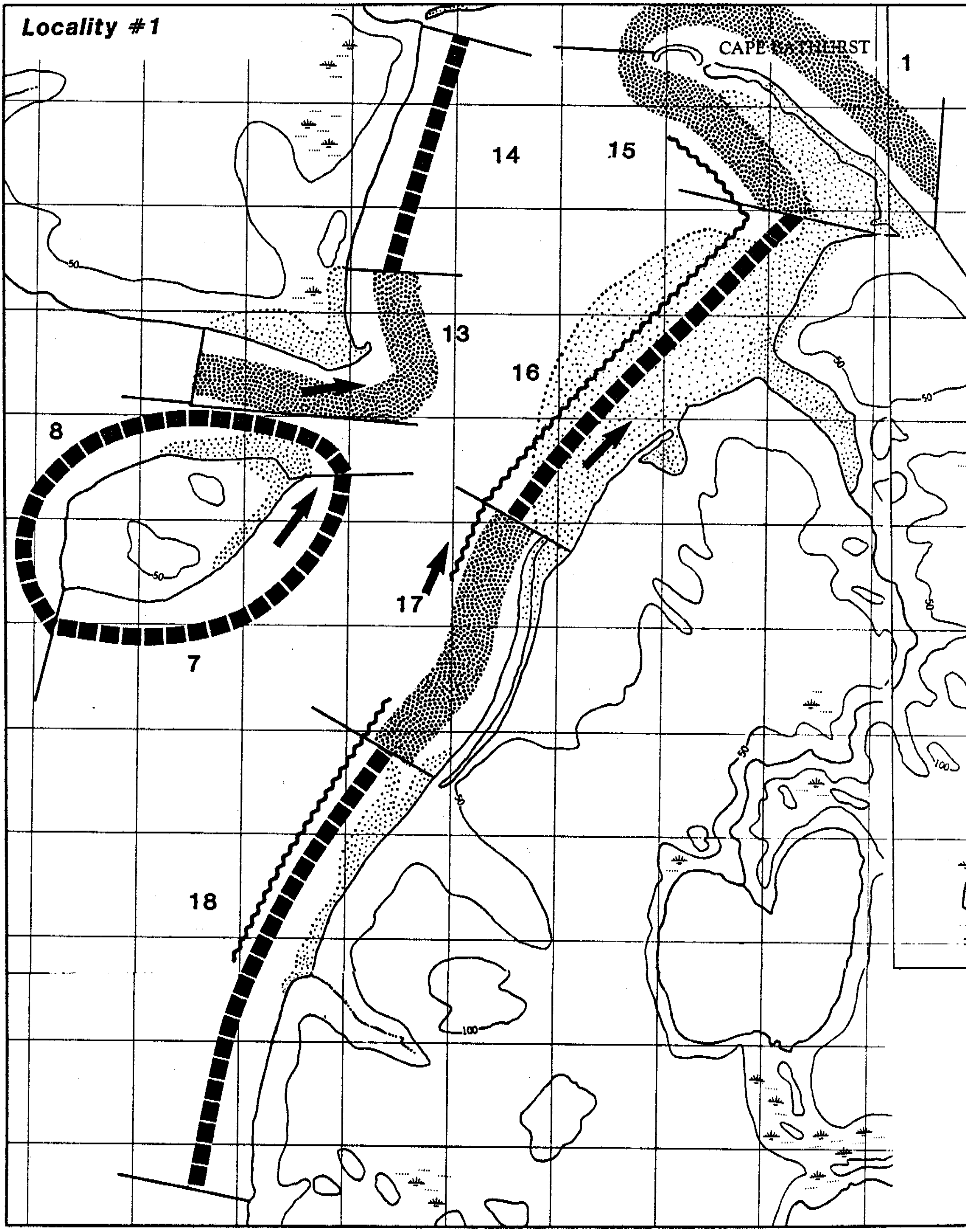
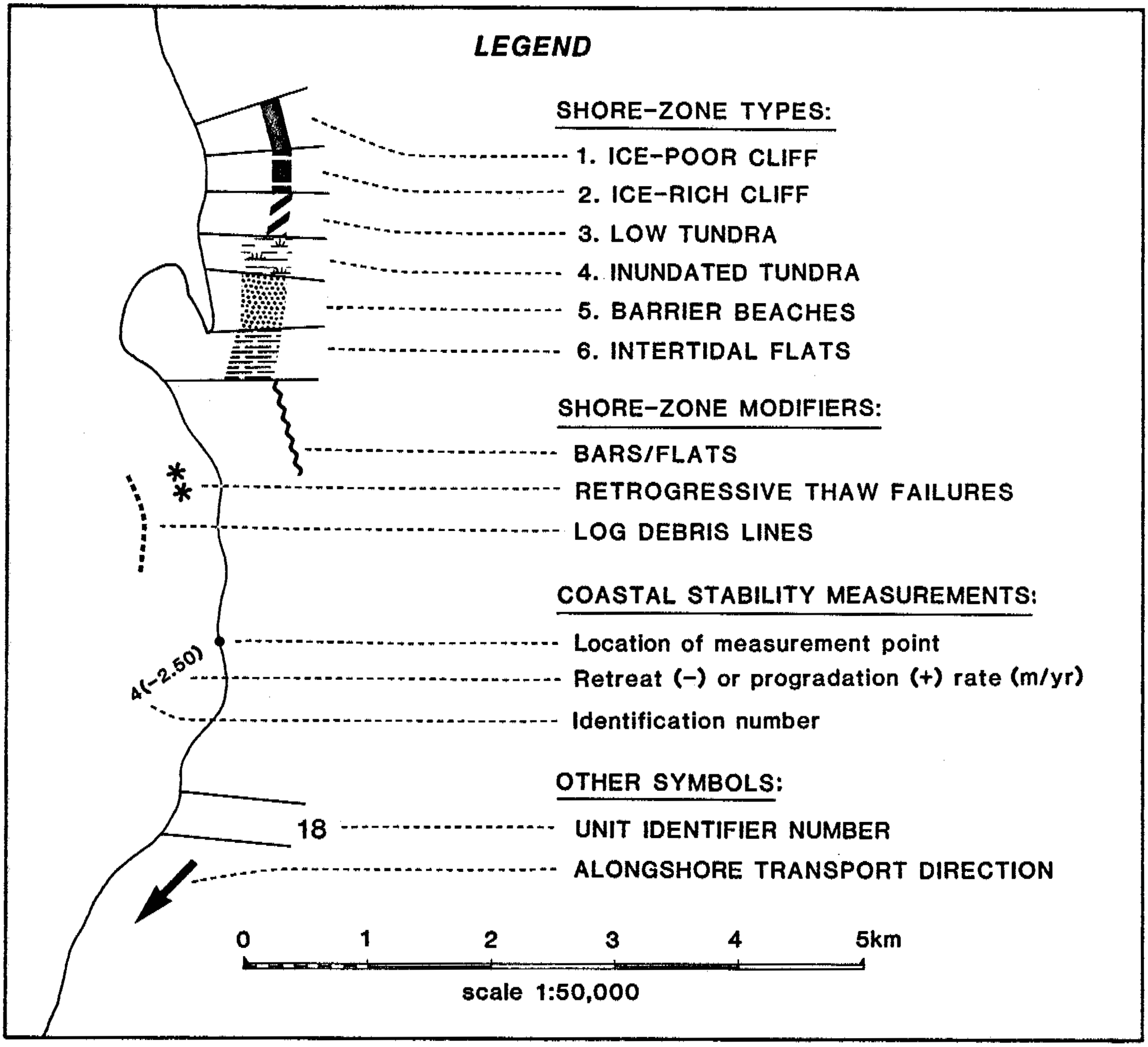
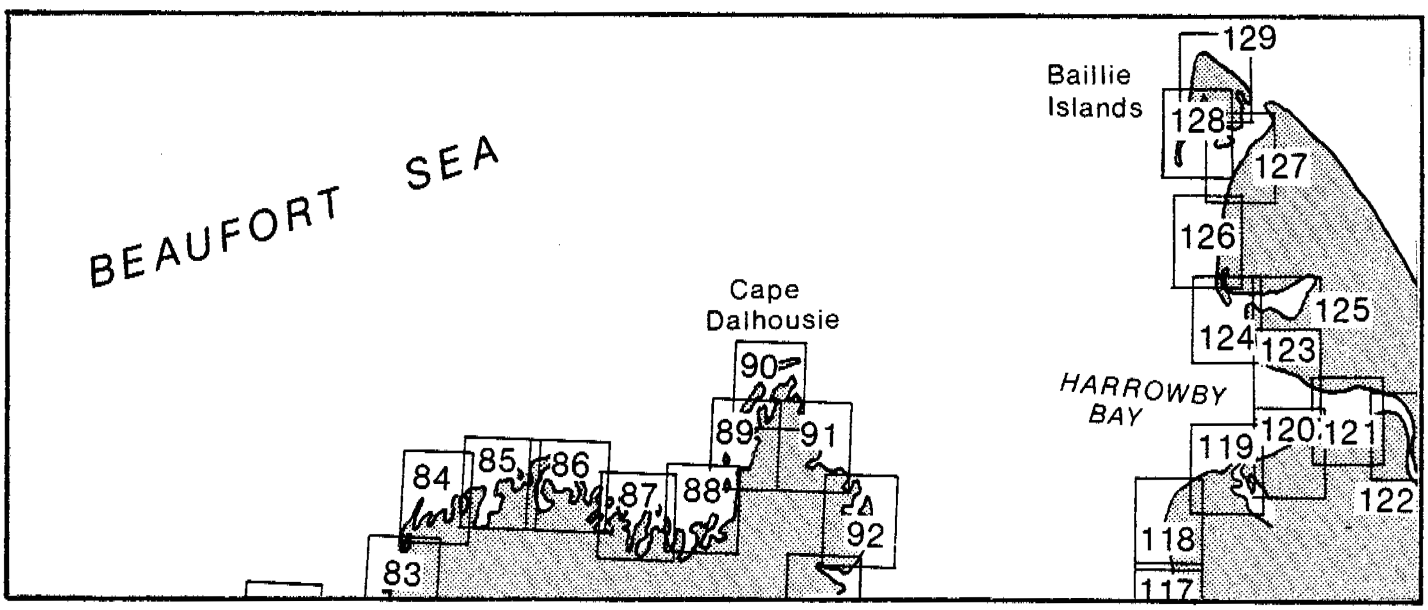
127
128
129


Locality #1
CAPE BATHURST
1
14
15
13
16
8
17
7
18
50
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
5. BARRIER BEACHES
6. INTERTIDAL FLATS
SHORE-ZONE MODIFIERS:
BARS/FLATS
RETROGRESSIVE THAW FAILURES
LOG DEBRIS LINES
COASTAL STABILITY MEASUREMENTS:
Location of measurement point
Retreat (−) or progradation (+) rate (m/yr)
Identification number
4(−2.50)
OTHER SYMBOLS:
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
Cape Dalhousie
HARROWBY BAY
83
84
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92
117
118
119
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121
122
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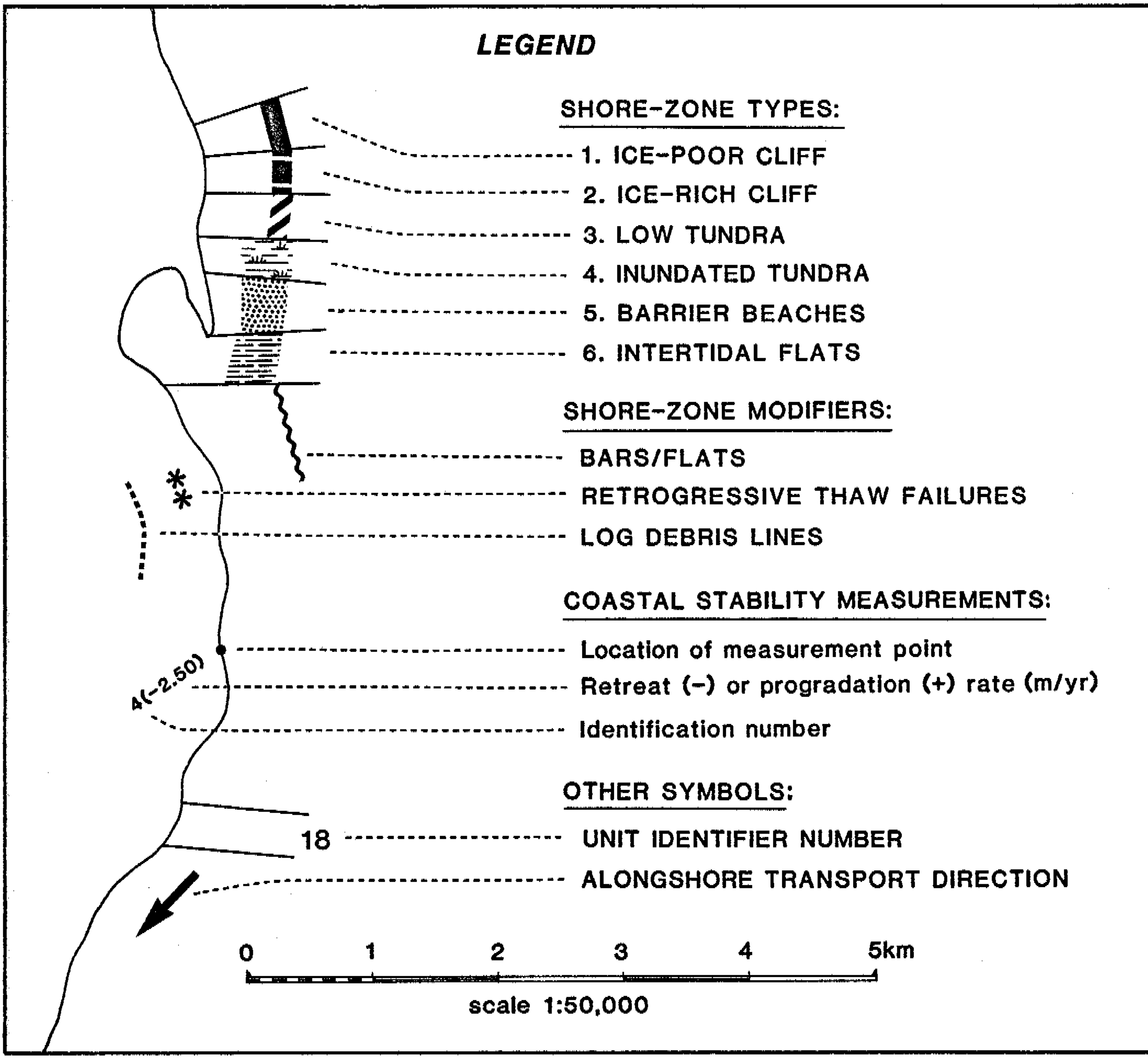
124
125
126
127
128
129


Locality #1
ISLAND
3
10
11
9
12
6
5
4
50
100


LEGEND
SHORE-ZONE TYPES:
1. ICE-POOR CLIFF
2. ICE-RICH CLIFF
3. LOW TUNDRA
4. INUNDATED TUNDRA
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COASTAL STABILITY MEASUREMENTS:
Location of measurement point
4(-2.50)
Retreat (–) or progradation (+) rate (m/yr)
Identification number
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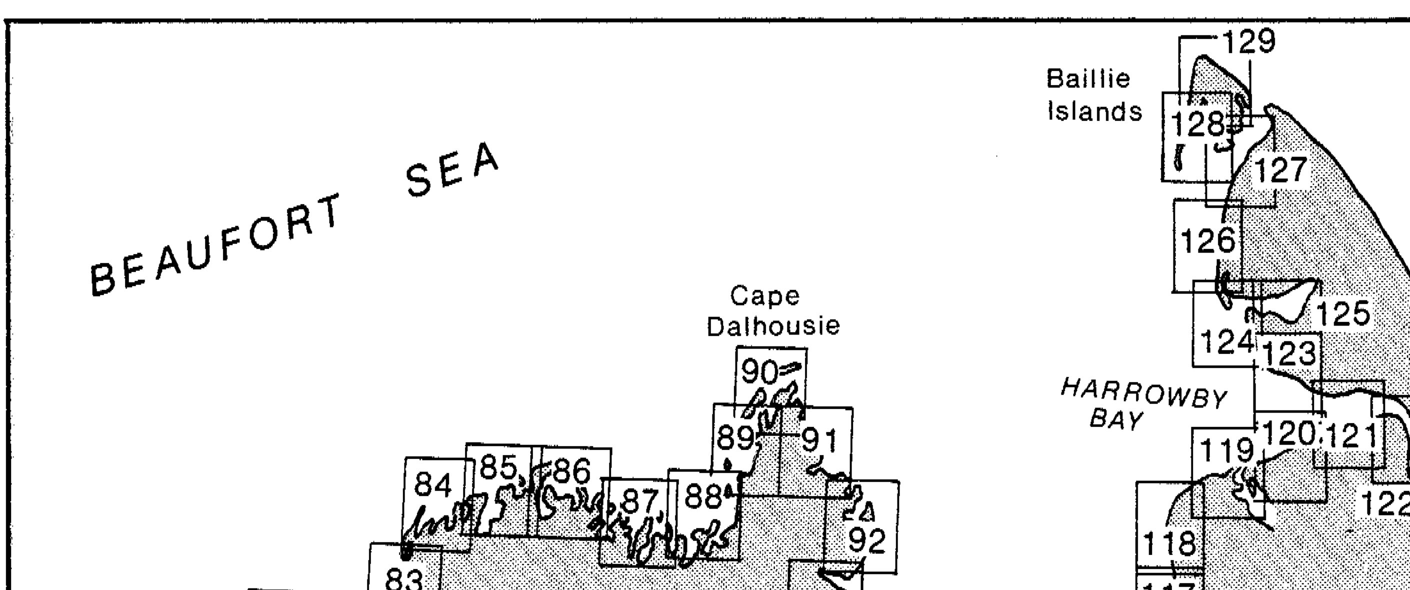
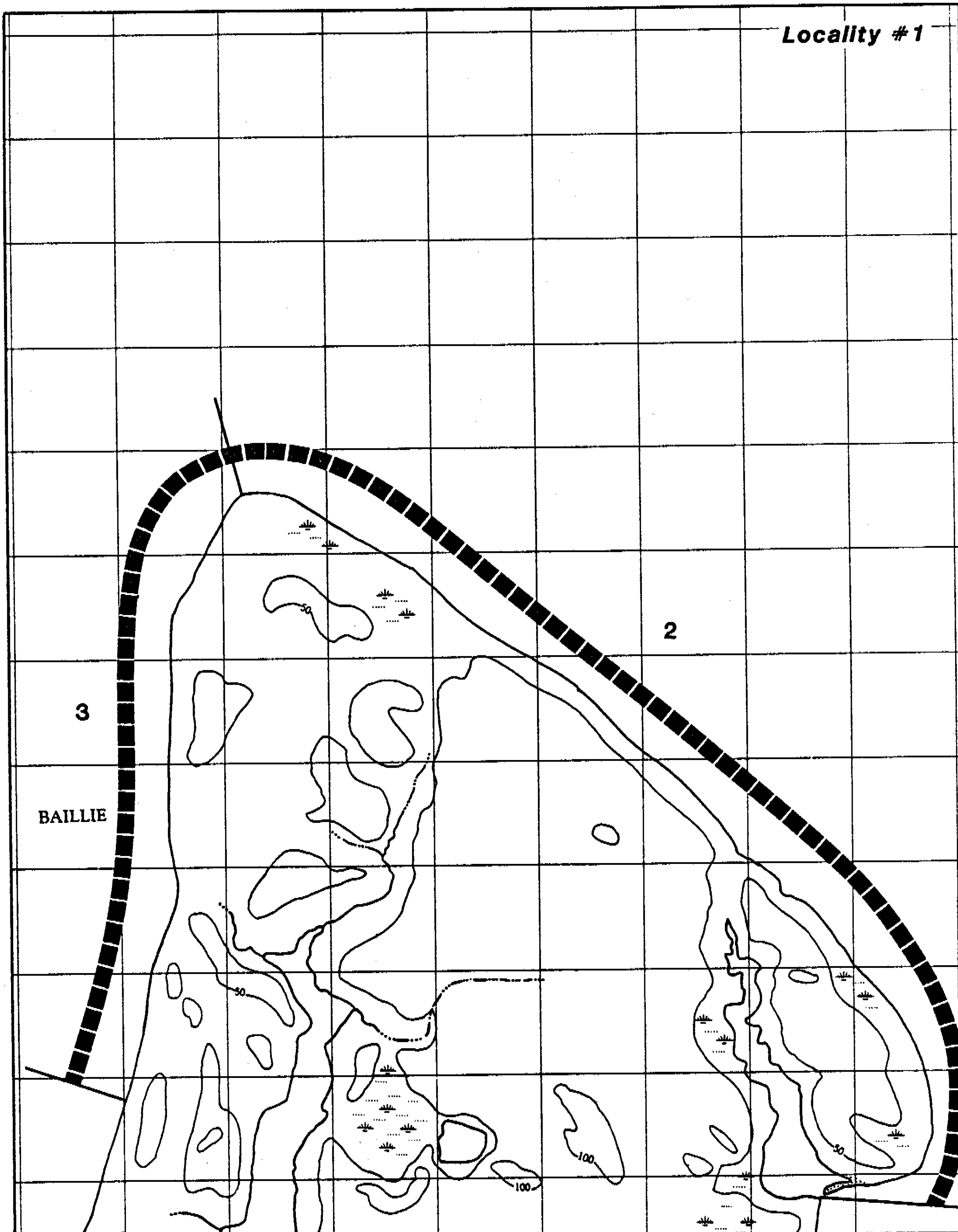
18
UNIT IDENTIFIER NUMBER
ALONGSHORE TRANSPORT DIRECTION
0 1 2 3 4 5km
scale 1:50,000


BEAUFORT SEA
Baillie Islands
129
128
127
126
125
124
123
HARROWBY BAY
119
120
121
122
118
117
Cape Dalhousie
90
89
91
84
85
86
87
88
92
83


Locality #1
2
3
BAILLIE
50
50
50
100
100
50