REPORT ON THE SURFICIAL GEOLOGY OF UPPER CHALEUR BAY MAPPED USING MS26B ECHOSOUNDER DATA FROM THE CANADIAN HYDROGRAPHIC SERVICE

SUBMITTED TO:

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SUMMARY

Surficial sediment texture has been mapped in the Upper Bay of Chaleur using MS26B echosounder data collected by the Canadian Hydrographic Service in 1964. Four types of bottom sediment, I, II, IIa and III, interpreted as sandy silt, mud, sandy mud and sand, are distinguished on the basis of reflector characteristics. Sediment is generally distributed with the coarsest material in shallow water and the finer material deposited in deeper areas.

A submerged and partially buried river channel has been traced from the mouth of the Restigouche River eastward to the margin of the map area. Apparent scouring indicates strong bottom currents in the section of channel between profiles E1-E2 and J1-J2. Sediment distribution also indicates stronger bottom currents north of the channel than to the south. Thus, areas favourable for dumping of dredged material would be southwest of the channel, over Type IIa sediment, or in the eastern portion of the map area, over Type II sediment.

SECTION 1

INTRODUCTION

The purpose of this project has been to map surficial sediment texture of inshore areas using existing Canadian Hydrographic Service data. Ten areas of interest were suggested by Don Bezanson and described in the Geomarine proposal. Figure 1 is a page-size sketch of the interest areas and Figures 2-11 show each area in detail. Upper Chaleur Bay, from Belledune to Dalhousie was chosen for mapping, based on priority ratings by the client, and availability of data. The area actually mapped, ~680 sq. km., is larger than Area 1 of the proposal and corresponds to CHS Field Sheet #4042.

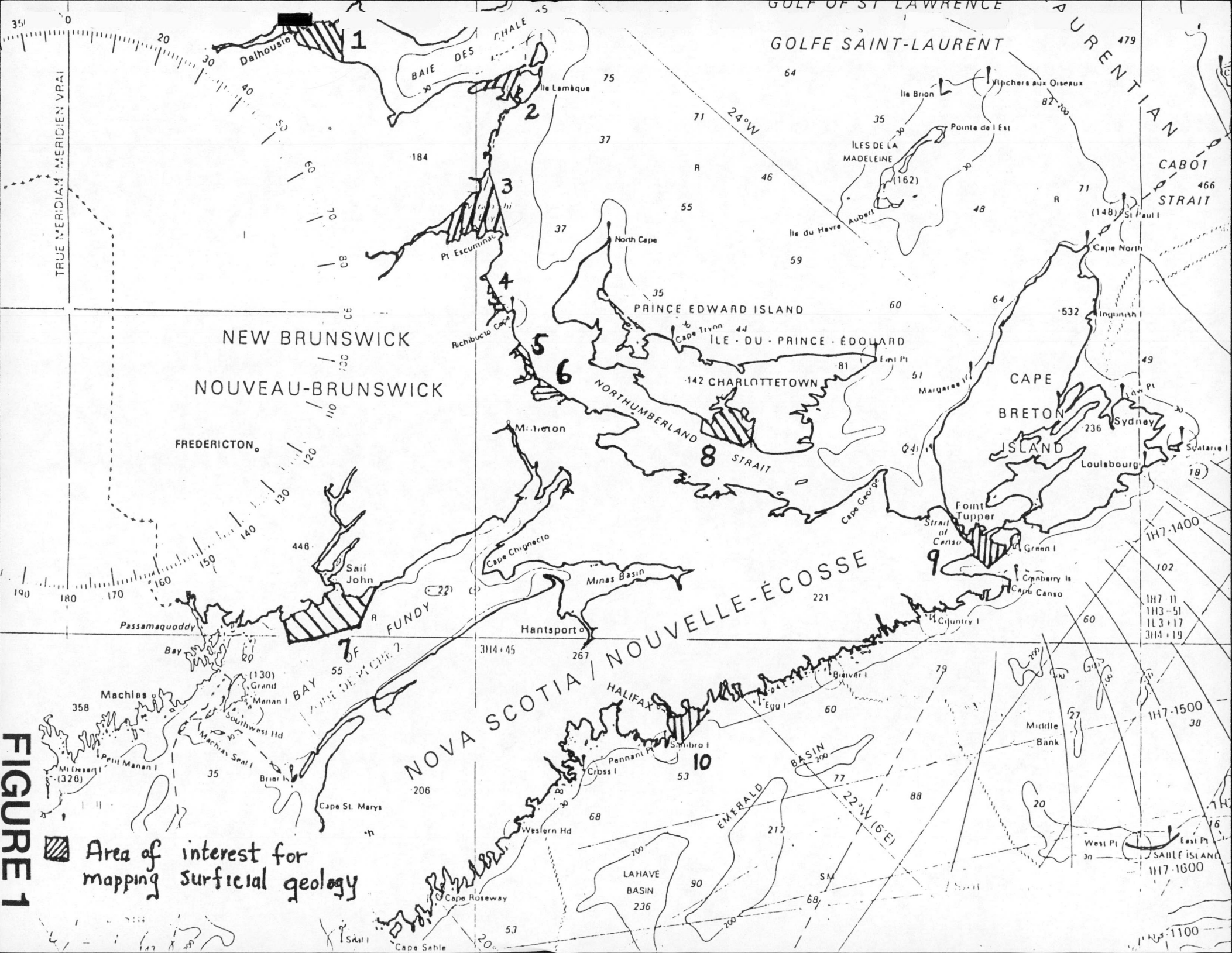
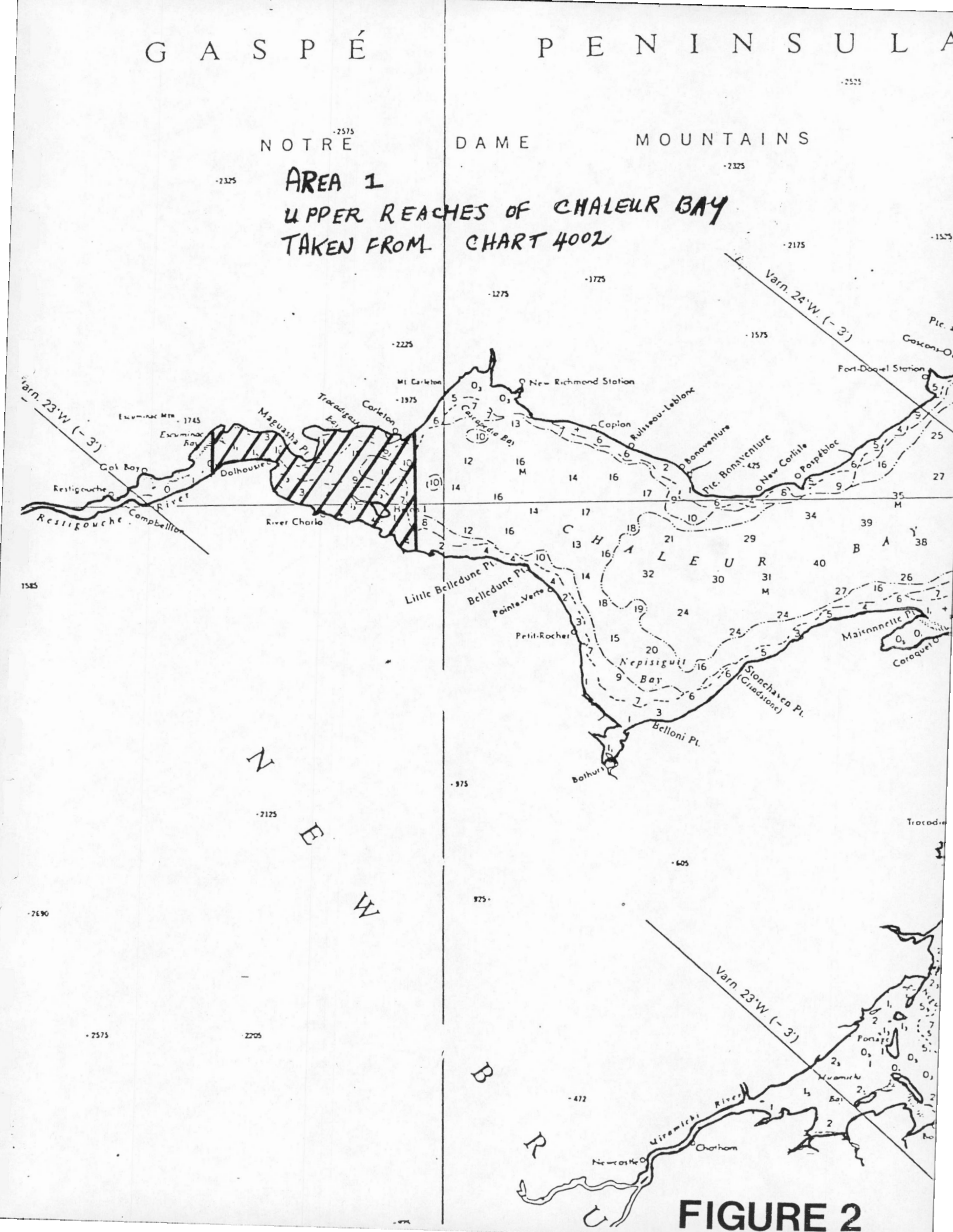


FIGURE 1

Area of interest for mapping surficial geology


GASPÉ PENINSULA
NOTRE DAME MOUNTAINS
AREA 1
UPPER REACHES OF CHALEUR BAY
TAKEN FROM CHART 4002
Varn. 24°W. (-3°)
Varn. 23°W. (-3°)
Varn. 23°W. (-3°)
Mt Carleton
New Richmond Station
Carleton
Maguasha Pt.
Dalhousie
Restigouche
Campbellton
River Charlo
Petit-Rocher
Little Belledune Pt.
Belledune Pt.
Pointe-Verte
Nepisiguit Bay
Bathurst
Belloni Pt.
Stonehaven Pt. (Crudstone)
Caraquet
Miramichi River
Chatham
Newcastle
CHALEUR BAY
NEW BRUNSWICK
FIGURE 2

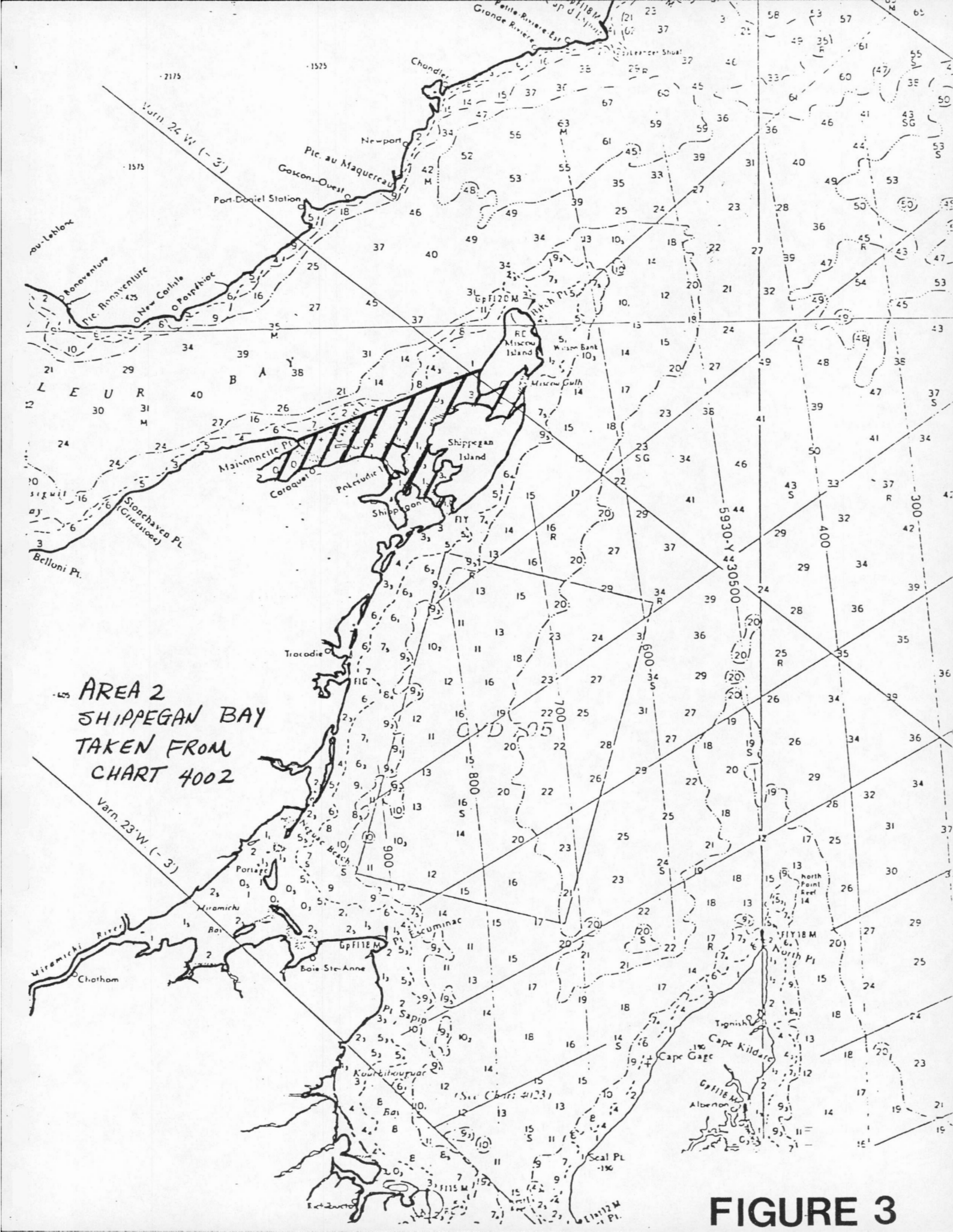

AREA 2
SHIPPEGAN BAY
TAKEN FROM
CHART 4002
Varn. 24° W. (- 3')
Varn. 23° W. (- 3')
Petite Rivière Est
Grande Rivière
Chandler
Newport
Pte. au Maquereau
Gascons-Ouest
Port-Daniel Station
Pte. Bonaventure
New Carlisle
Paspébiac
Pte. Bonaventure
Miscou Island
Miscou Bank
Miscou Gulch
Shippegan Island
Maisonnette Pt.
Caraquet
Petitcodiac I.
Shippegan
Stonehaven Pt.
(Grindstone)
Belloni Pt.
Trocadie
Portage
Miramichi
Miramichi River
Chatham
Baie Ste-Anne
Escuminac
Pt. Sapin
Kouchibouguac
Tignish
Cape Kildare
Cape Gage
Albermarle
Seal Pt.
North Pt.
North Point Reef
5930-Y
30500
600
700
800
900
300
400
BAY
LEUR

FIGURE 3

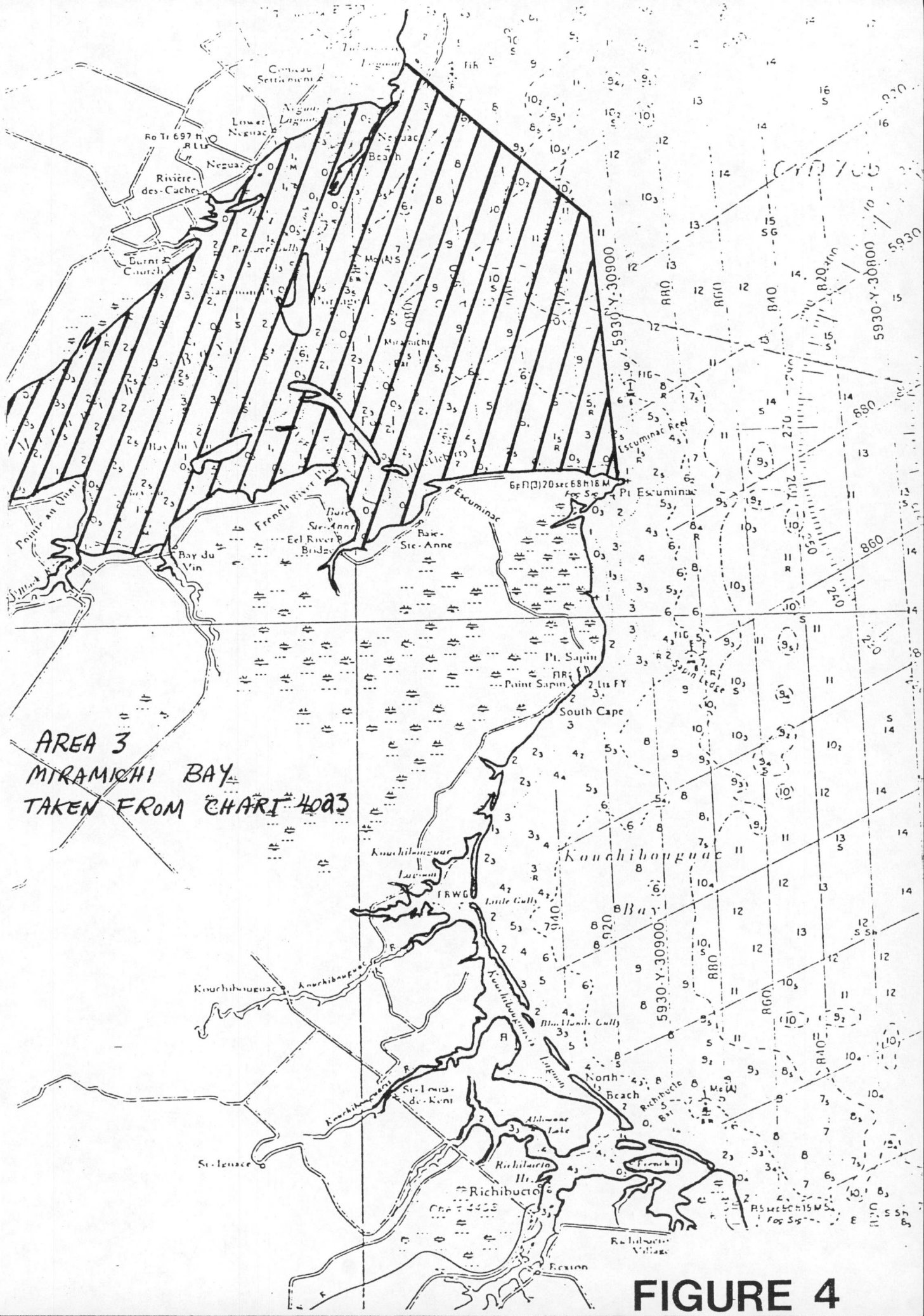

AREA 3
MIRAMICHI BAY
TAKEN FROM CHART 4093
Pt. Escuminac
Escuminac
Bay du Vin
Eel River Bridge
Pt. Sapin
Point Sapin
South Cape
Kouchibouguac
Bay
North Beach
Richibucto
Richibucto Village
Escuminac Reef
5930-Y-30900
5930-Y-30800

FIGURE 4

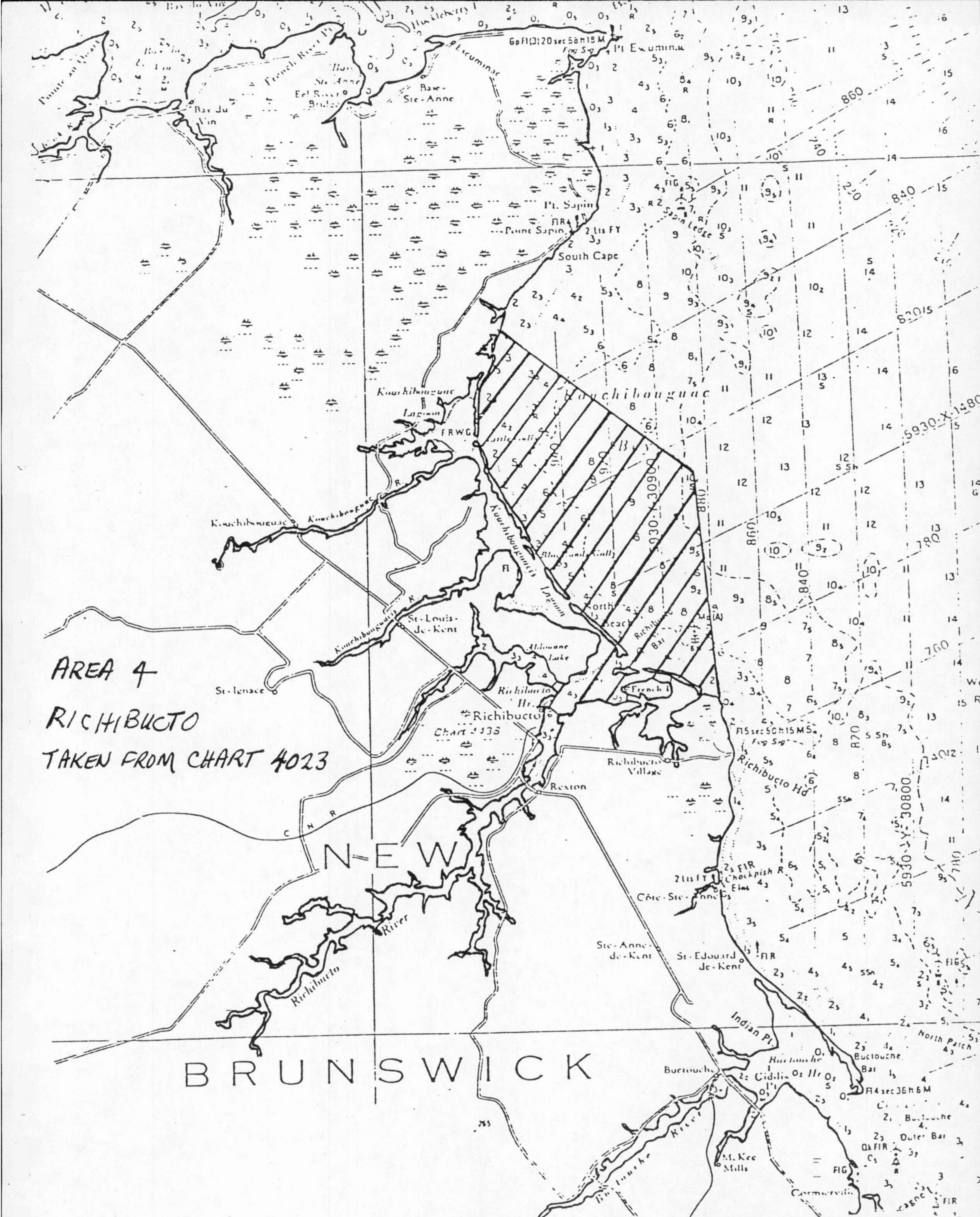
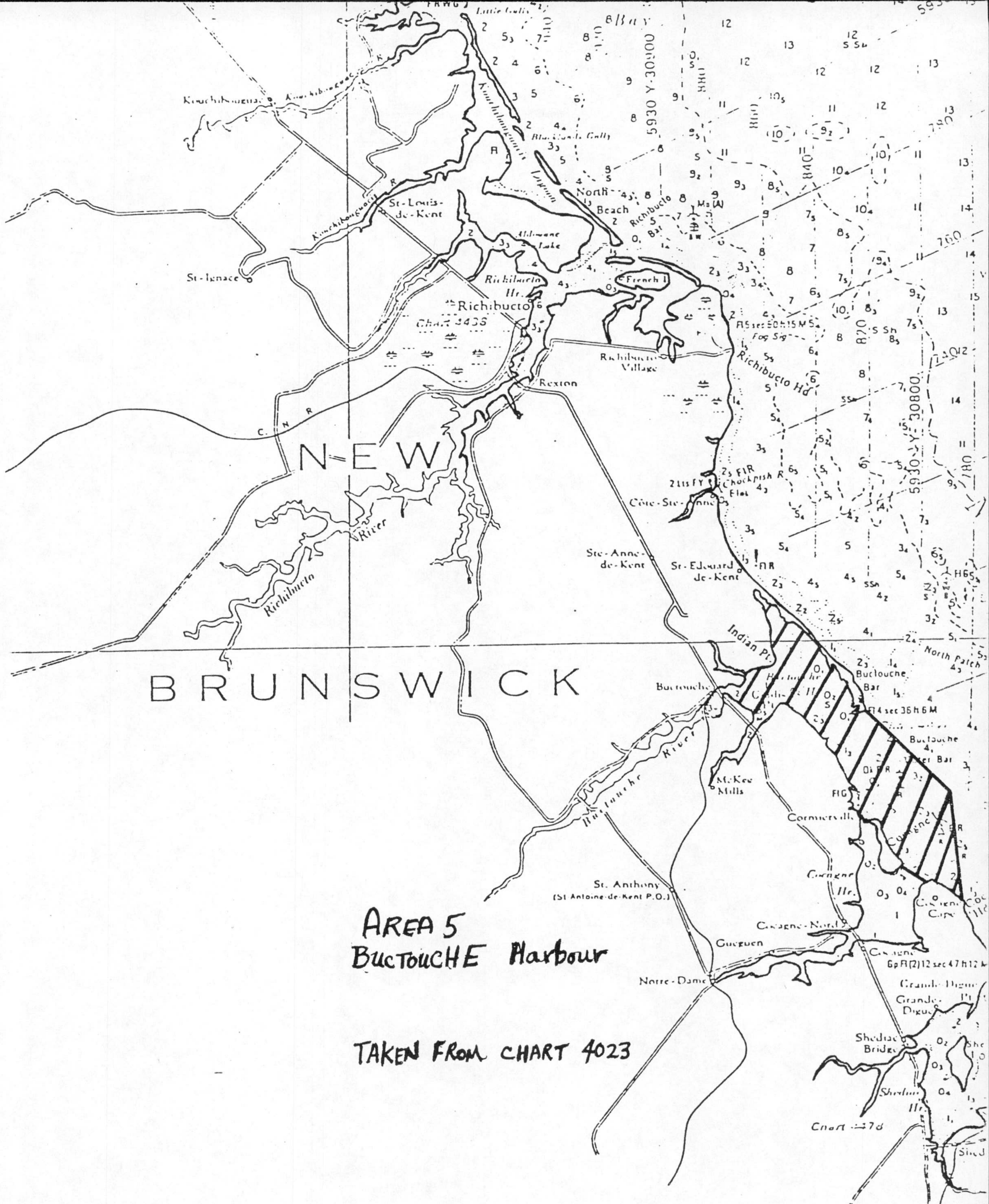

AREA 4
RICHIBUCTO
TAKEN FROM CHART 4023
Pt Escuminac
Escuminac
Baie Ste-Anne
Eel River Bridge
Bay du Vin
Pt. Sapin
Point Sapin
Sapin Ledge
South Cape
Kouchibouguac Lagoon
Kouchibouguac Bay
Kouchibouguac
Kouchibouguacis Lagoon
Black Lands Gully
St-Louis-de-Kent
Aldouane Lake
Richibucto Hr.
Richibucto
North Beach
Richibucto Bar
French I.
Richibucto Village
Richibucto Hd
St-Ignace
Rexton
Chart 4435
C N R
NEW BRUNSWICK
Richibucto River
Chockpish R.
Côte-Ste-Anne
Ste-Anne-de-Kent
St-Edouard de-Kent
Indian Pt.
Buctouche
Buctouche Bar
Buctouche Outer Bar
North Patch
Buctouche River
McKee Mills
Cormierville
5930-X-14800
5930-Y-30900
5930-Y-30800

FIGURE 5



AREA 5
BUCTOUCHE Harbour

TAKEN FROM CHART 4023

FIGURE 6

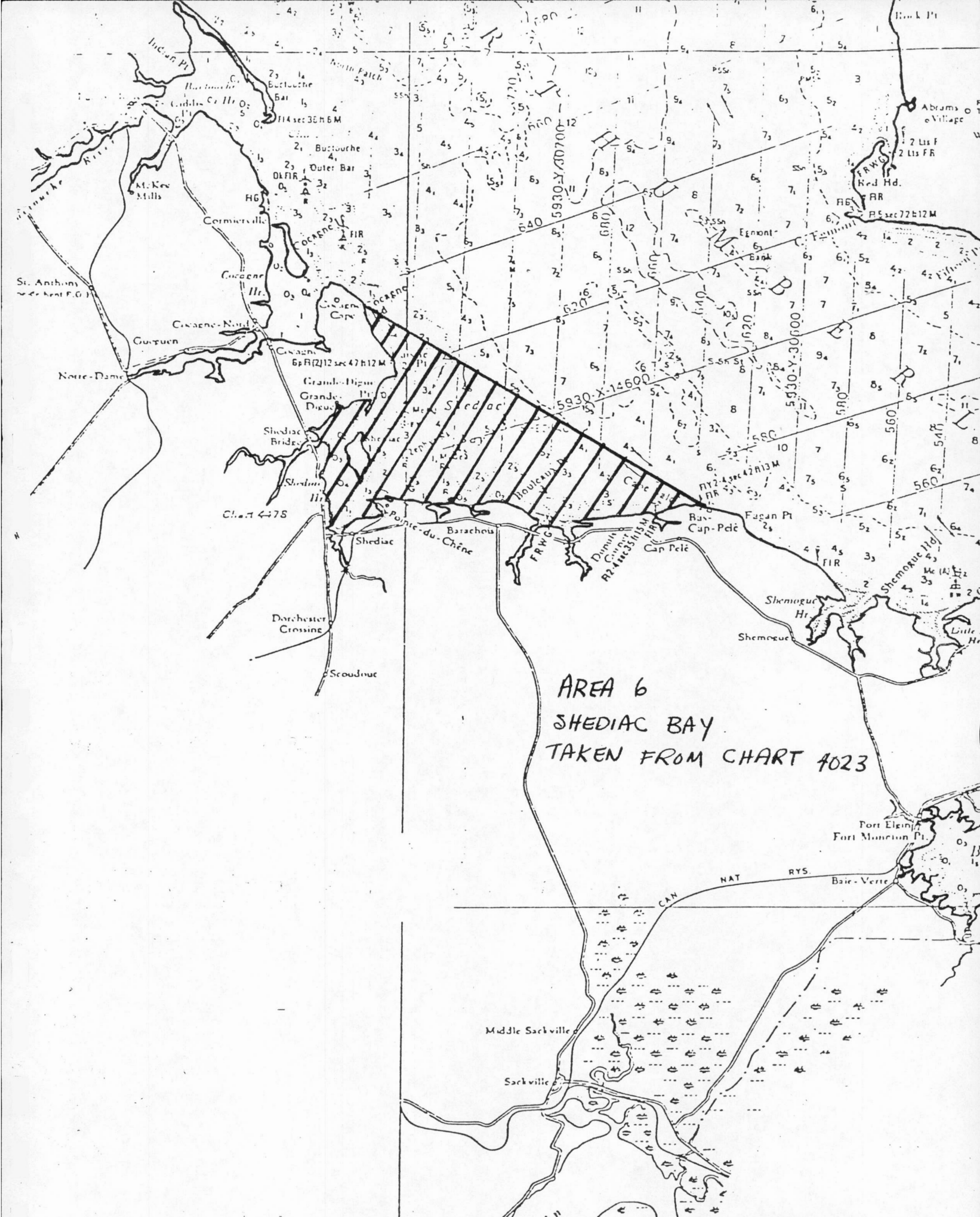

AREA 6
SHEDIAC BAY
TAKEN FROM CHART 4023
Shediac
Cocagne
Cormierville
Cocagne-Nord
Notre-Dame
St. Anthony
Grande-Digue
Shediac Bridge
Pointe-du-Chêne
Barachois
Cap Pelé
Bas-Cap-Pelé
Fagan Pt
Shemogue Hr
Shemogue
Dorchester Crossing
Scoudouc
Egmont Bay
Red Hd.
Abrams Village
Port Elgin
Fort Moncton Pt.
Baie-Verte
Middle Sackville
Sackville
CAN NAT RYS.
McKee Mills
Buctouche
Outer Bar
Chart 4475
5930-X-14600
5930-Y-30600
5930-Y-30700
Basin

FIGURE 7

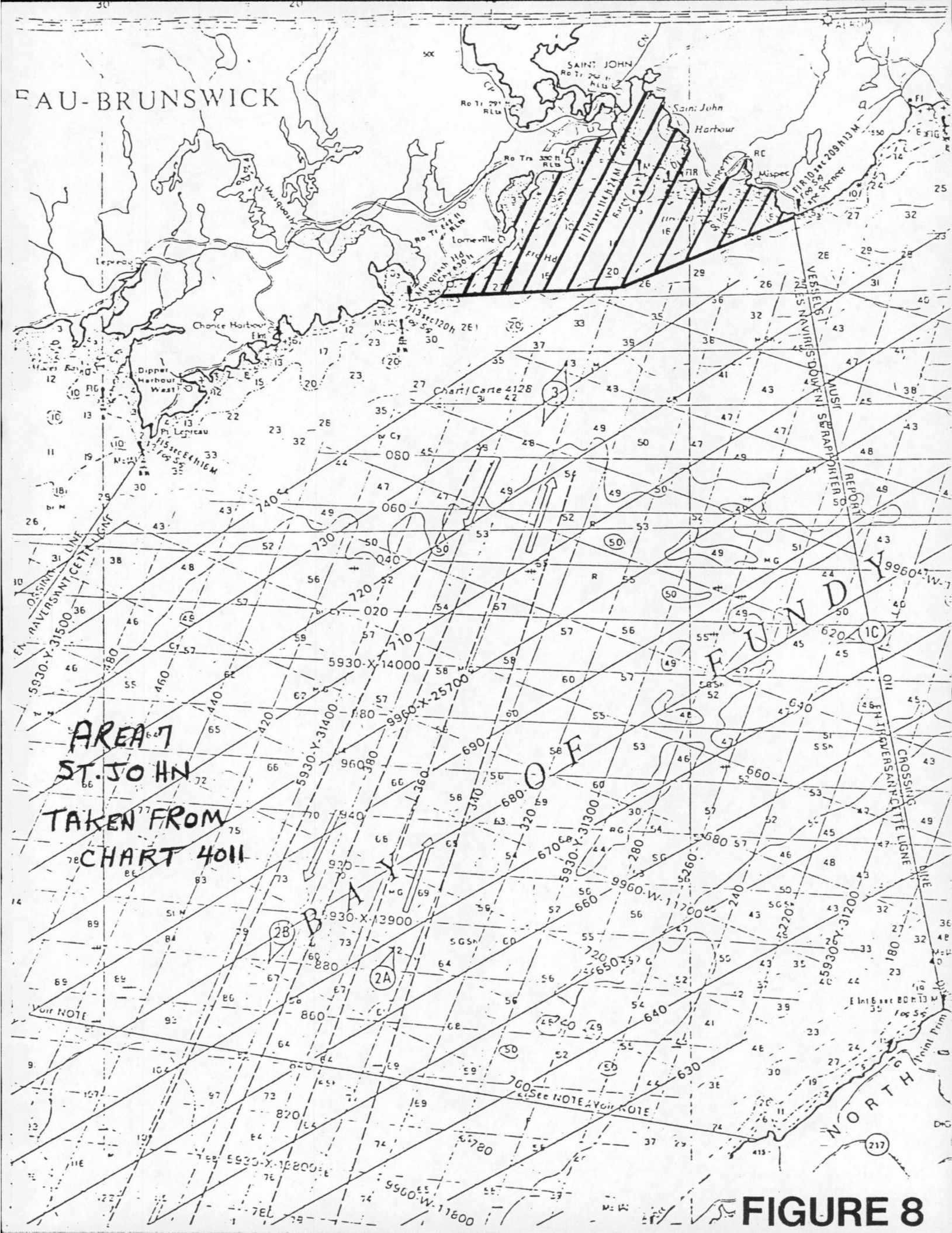

AREA 7
ST. JOHN
TAKEN FROM
CHART 4011
BAY OF FUNDY
SAINT JOHN
Saint John Harbour
Chance Harbour
Dipper Harbour West
Pt. Lepreau
Lorneville
Mispec
CROSSING
NORTH

FIGURE 8

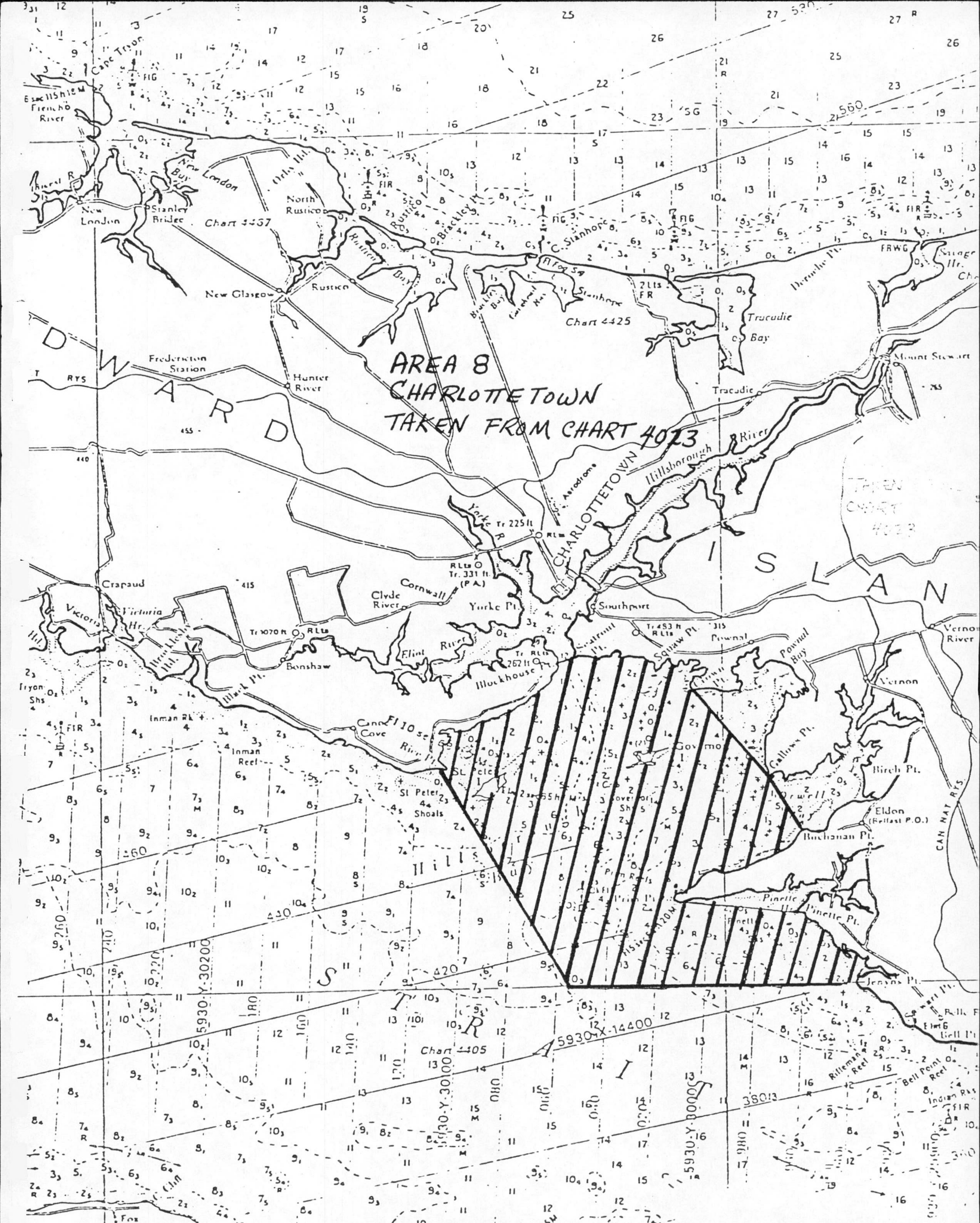

AREA 8
CHARLOTTETOWN
TAKEN FROM CHART 4023
CHARLOTTETOWN
Chart 4457
Chart 4425
Chart 4405
New London
New London Bay
Stanley Bridge
North Rustico
Rustico
New Glasgow
Rustico Bay
Brackley Pt.
C. Stanhope
Stanhope
Tracadie Bay
Tracadie
Mount Stewart
Hillsborough River
Fredericton Station
Hunter River
Aerodrome
Yorke R.
Crapaud
Victoria
Clyde River
Cornwall
Yorke Pt.
Southport
Pownal
Pownal Bay
Bonshaw
Blockhouse Pt.
Canoe Cove
St Peter Shoals
Governors Sh.
Gallows Pt.
Birch Pt.
Eldon
(Belfast P.O.)
Buchanan Pt.
Orwell
Pinette Pt.
Jenyns Pt.
Vernon
Vernon River
Inman Reef
Inman Rk
Hills
Rifleman Reef
Bell Point Reef
Fox Harbour
East Patch
5930-X-14400
5930-Y-30200
5930-Y-30000
5930-Y-8000
CAN NAT RYS

FIGURE 9

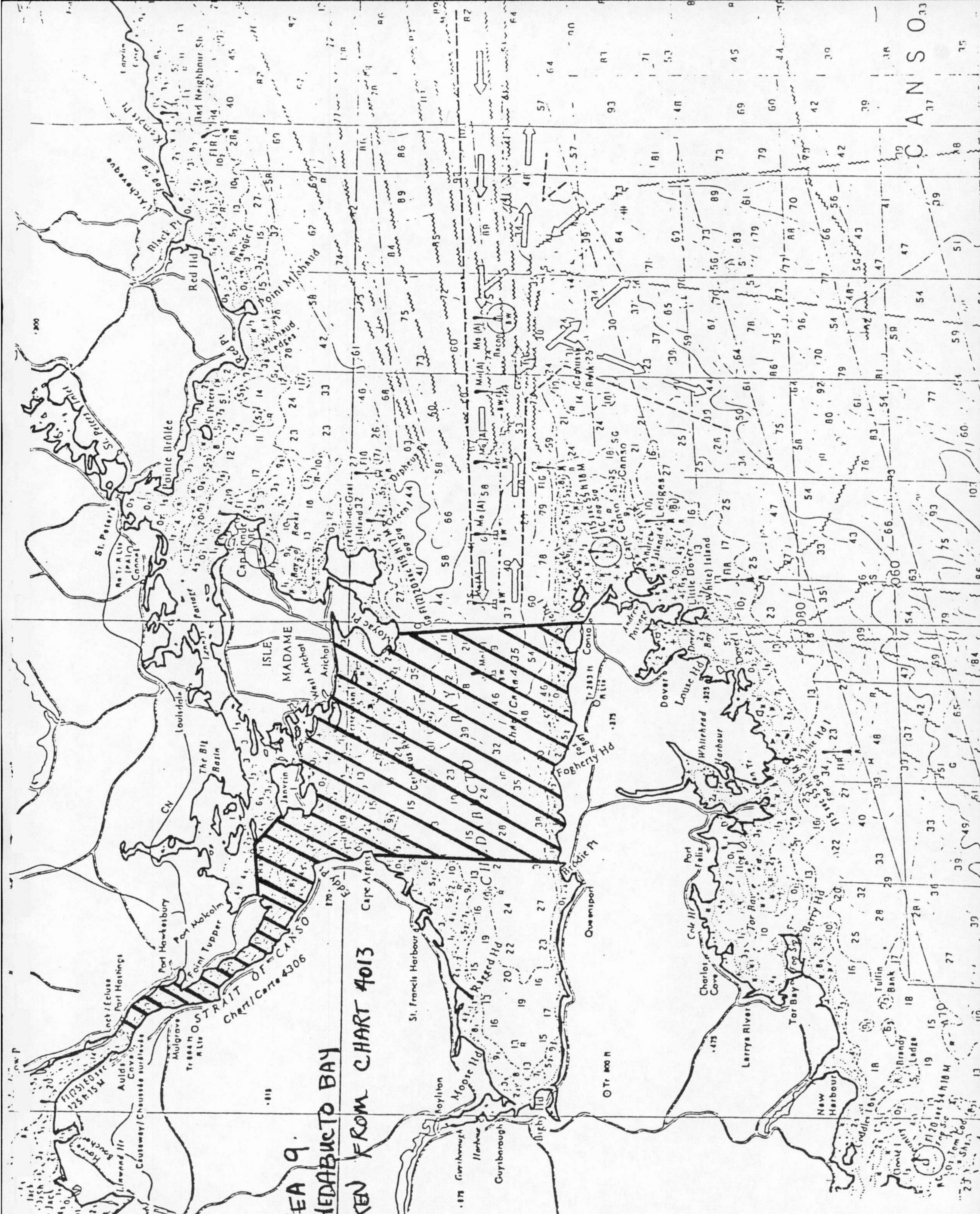

AREA 9
CHEDABUCTO BAY
TAKEN FROM CHART 4013
STRAIT OF CANSO
Chart/Carte 4306
ISLE MADAME
CHEDABUCTO BAY
CANSO

FIGURE 10

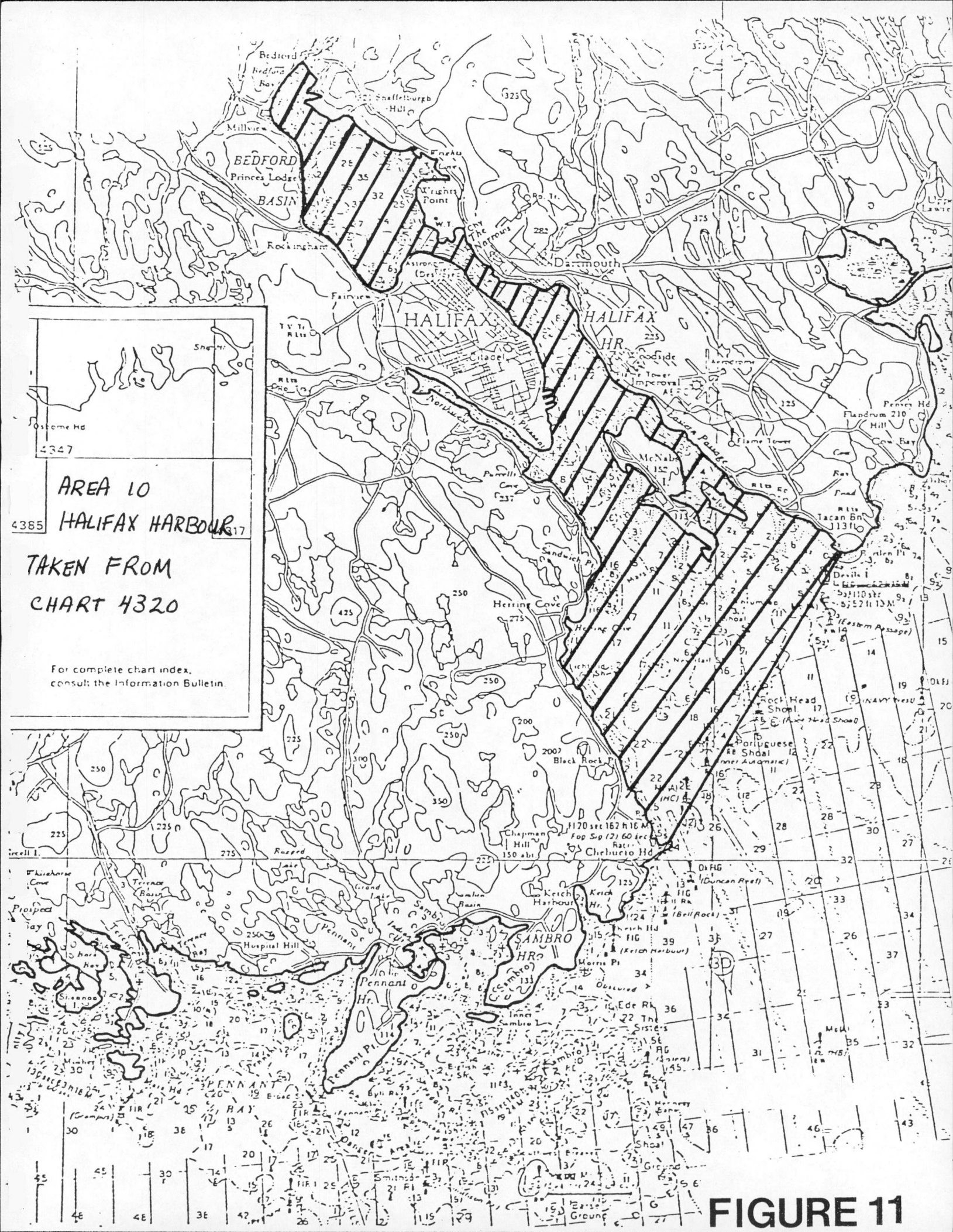

AREA 10
HALIFAX HARBOUR
TAKEN FROM
CHART 4320
For complete chart index, consult the Information Bulletin.
4347
4385
4317
BEDFORD
Princes Lodge
BASIN
HALIFAX
HR
Dartmouth
Citadel
Herring Cove
Chebucto Hd
Hospital Hill
Pennant Hr.
SAMBRO
HR
PENNANT
BAY
Prospect
Bay

FIGURE 11

SECTION 2

THE DATA

The data, collected in 1964 by the Canadian Hydrographic Service, is composed of four boatboard track plots and 32 rolls of MS26B profiles. Approximately 1800 line-km. of data, at a line spacing of ~300 metres, provides very detailed coverage of the area. All the available data has been used in compiling the sediment texture map.

Table 1 lists the sounding rolls by date, vessel and fix numbers.

TABLE 1

Echosounder Data from the Map Area Listed by Roll

Vessel	Date	Fix Numbers
KUNGO	September 19, 1964	1-139
KUNGO	September 22, 1964	1-180
KUNGO	October 7, 1964	1- 27
KUNGO	October 8, 1964	1- 27
WIDGEON	September 14, 1964	1-155
WIDGEON	September 15, 1964	1- 6
WIDGEON	September 17, 1964	1-141
WIDGEON	September 18, 1964	1- 70
WIDGEON	September 19, 1964	1-140
WIDGEON	September 22, 1964	1-124
WIDGEON	October 7, 1964	1- 50
WIDGEON	October 8, 1964	1-147
WIDGEON	October 15, 1964	1- 40
METELA	August 31, 1964	1- 45
METELA	September 14, 1964	1- 98
METELA	September 15, 1964	1- 12
METELA	September 17, 1964	1-163
METELA	September 18, 1964	1- 53
METELA	September 19, 1964	1-102
METELA	September 22, 1964	1- 82
METELA	October 6, 1964	1- 66
METELA	October 7, 1964	1- 48
METELA	October 8, 1964	1-125
KAPUSKASING	August 27, 1964	1-183
KAPUSKASING	August 28, 1964	1-136
KAPUSKASING	August 29, 1964	1-142
KAPUSKASING	August 30, 1964	1- 18
KAPUSKASING	September 2, 1964	1- 32
KAPUSKASING	September 10, 1964	1-123
KAPUSKASING	September 12, 1964	1-131
KAPUSKASING	September 13, 1964	1-139
MALARD	September 18, 1964	1- 39

SECTION 3

INTERPRETATION METHODS

Echosounder data has been used in the past to map surficial sediment texture (L. H. King, 1967). Several parameters must be taken into consideration when interpreting MS26B records:

(1) the spread of the bottom return in time;

(2) the amplitude of the return, or the darkness of the bottom trace;

and

(3) the transparency of the sediment to sound (or the degree of sub-bottom penetration).

For example, sand is a hard, non-transparent medium which returns sound with very little penetration or scattering. Thus, pure sand allows no sub-bottom penetration and shows on a sounding record as a thin, dark line.

Conversely, clay, an almost transparent medium, shows a weak line at the bottom, underlain by a light area and allows good penetration to the underlying layers.

Silt tends to scatter acoustic energy and lies between clay and sand in degree of transparency. Thus, silt produces a broad, grey return which may be lighter or darker depending on the amount of clay or sand included. Transparency to sound, in the case of silt, is largely a function of the thickness of the layer and is reduced by the inclusion of sand.

With these concepts in mind, four bottom sediment types were delineated in the Upper Chaleur area, I, II, IIa and III.

Type I has been mapped over areas showing a broad, strong bottom return, usually with no sub-bottom penetration. The sediment is assumed to be predominantly silt with varying amounts of sand and clay. Boundaries with Type IIa are often gradational and the two are probably opposite ends of a sandy-silt to clayey-silt spectrum.

Type IIa sediment allows penetration to depths of 15-20 feet and is characterized by a moderately strong bottom return. The weaker return and higher transparency of Type IIa, as compared to Type I sediment, is indicative of a lower sand content.

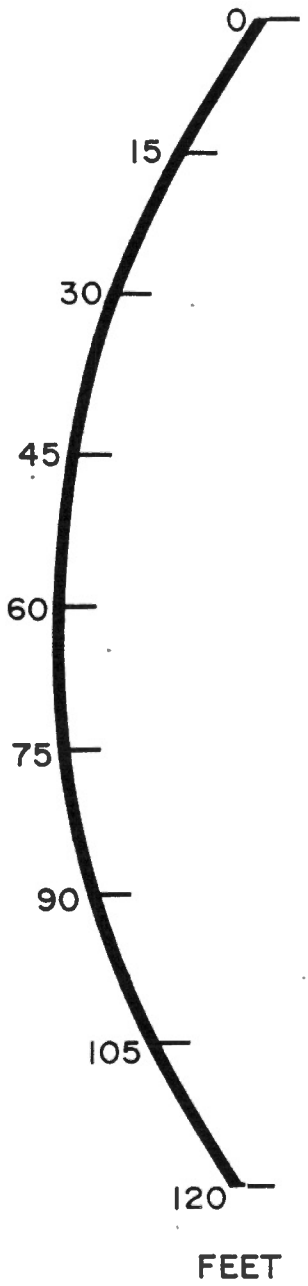
Type II has been mapped over areas showing a weak bottom return with good penetration to underlying layers.

A wide bottom return indicates a fairly high silt content, while the transparency is characteristic of clay-type sediments.

Type III areas are characterized by a very thin bottom return and no penetration. The bottom trace usually appears patchy, probably as a result of scattering due to surface irregularities and/or the presence of gravel. Type III sediments can be tied into observed occurrences of sand and gravel recorded on the field sheets. Table 2 summarizes the classification system. Figure 12 is a depth scale for the profiles.

TABLE 2

Type	Description of Reflector	Interpretation
I	Broad, strong bottom return usually without penetration to underlying layers	Predominantly silt with lesser amounts of sand and clay (sandy silt)
IIa	Moderately strong bottom return with penetration to underlying reflectors	Silt and clay with lesser amounts of sand (sandy mud)
II	Weak bottom return with good penetration to underlying reflectors	Silt and clay in sub-equal amounts (mud)
III	Narrow bottom return, usually patchy, with no penetration to underlying layers.	Predominantly sand with some gravel and possibly silt (sand)



DEPTH SCALE (IN FEET) FOR THE MS26B ECHO-SOUNDER PROFILES

FIGURE 12

SECTION 4

RESULTS

The final surficial sediment map and 19 echosounder profiles, listed in Table 3, are included with the report. The map shows the coarsest material, Type III, distributed in the shallower areas around the margins of the bay. The finest sediment, Type II appears at depths greater than ~20 metres, with Types I and IIa arranged between the two extremes. The textural classification often corresponds to stratigraphic boundaries, with Type II overlying Type IIa (see profiles I1-I2 and J1-J2) which, in turn, can be seen on some profiles, overlying Type I sediment (see profiles C1-C2 and D1-D2).

A submerged river channel, indicated by the dashed line, has been traced through the map area and can be seen on many of the profiles. Depth of the channel in exposed sections varies from 20-35 feet, with a width of 750-1000 metres. Infilling with Type II sediment (see Profile L1-L2) has occurred in the deepest areas, while the section of channel closest to the mouth of the Restigouche River shows a sill of Type IIa (Profile C1-C2) sediment, probably river-borne in origin. Compare this to Profiles A1-A2 and B1-B2 which show no infilling of fine sediment.

Between these two sections, the channel is lined with coarser material, mapped as Type I, and appears to be scoured. Profile H1-H2 is a prime example. Sediment distribution generally indicates stronger currents north of the channel, which have laid down coarser material in smaller quantity than that found south of the channel (see Profile J1-J2).

Sediment distribution suggests the strongest bottom currents north of the channel and between lines E1-E2 and J1-J2. Thus, the sill at the mouth of the Restigouche River may be

partially due to incoming currents. The most favourable areas for dumping of dredged materials would be south and west of the channel over a Type IIa bottom or much further east in the areas bottomed by Type II material.

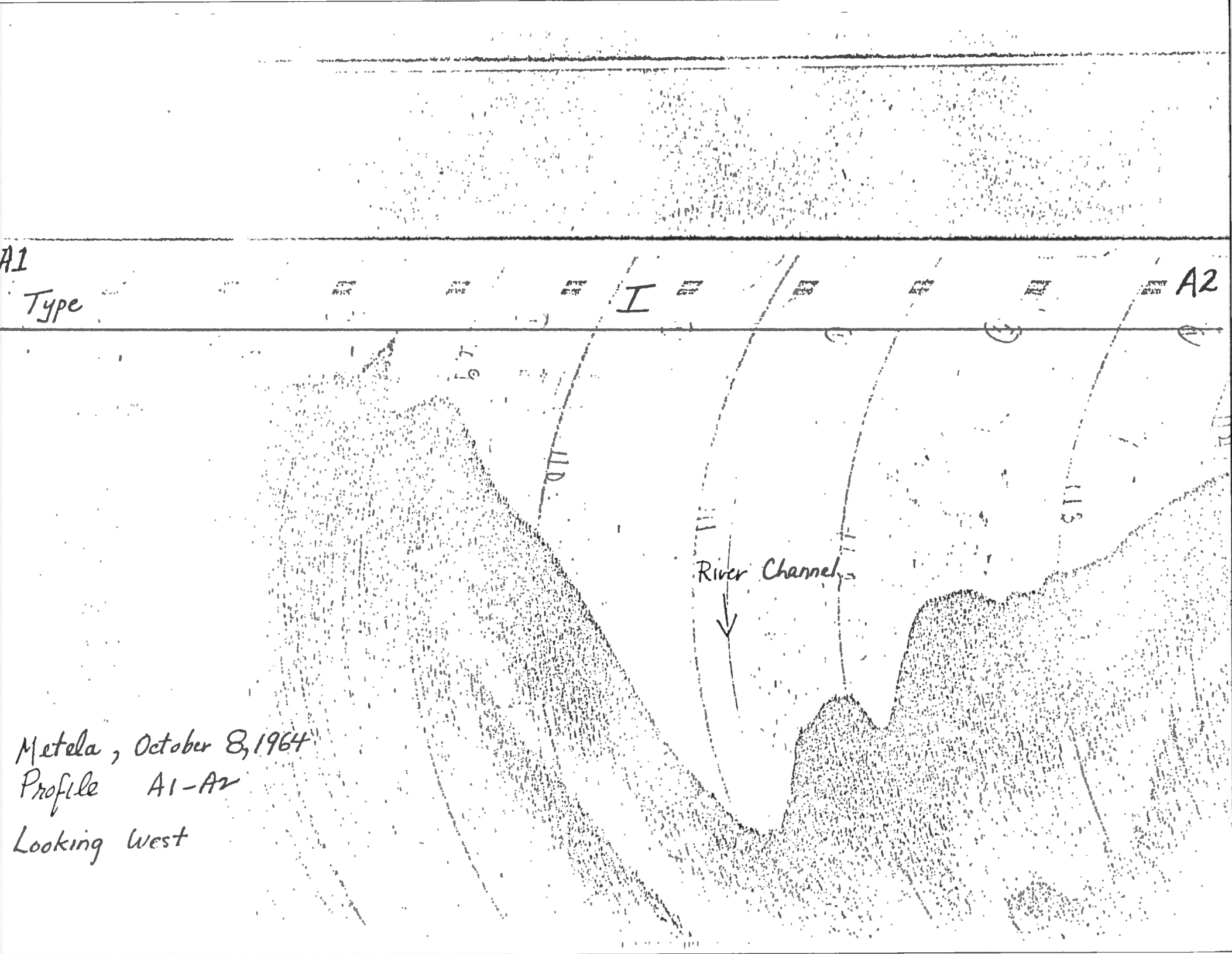
TABLE 3

Listing of Echosounder Profiles

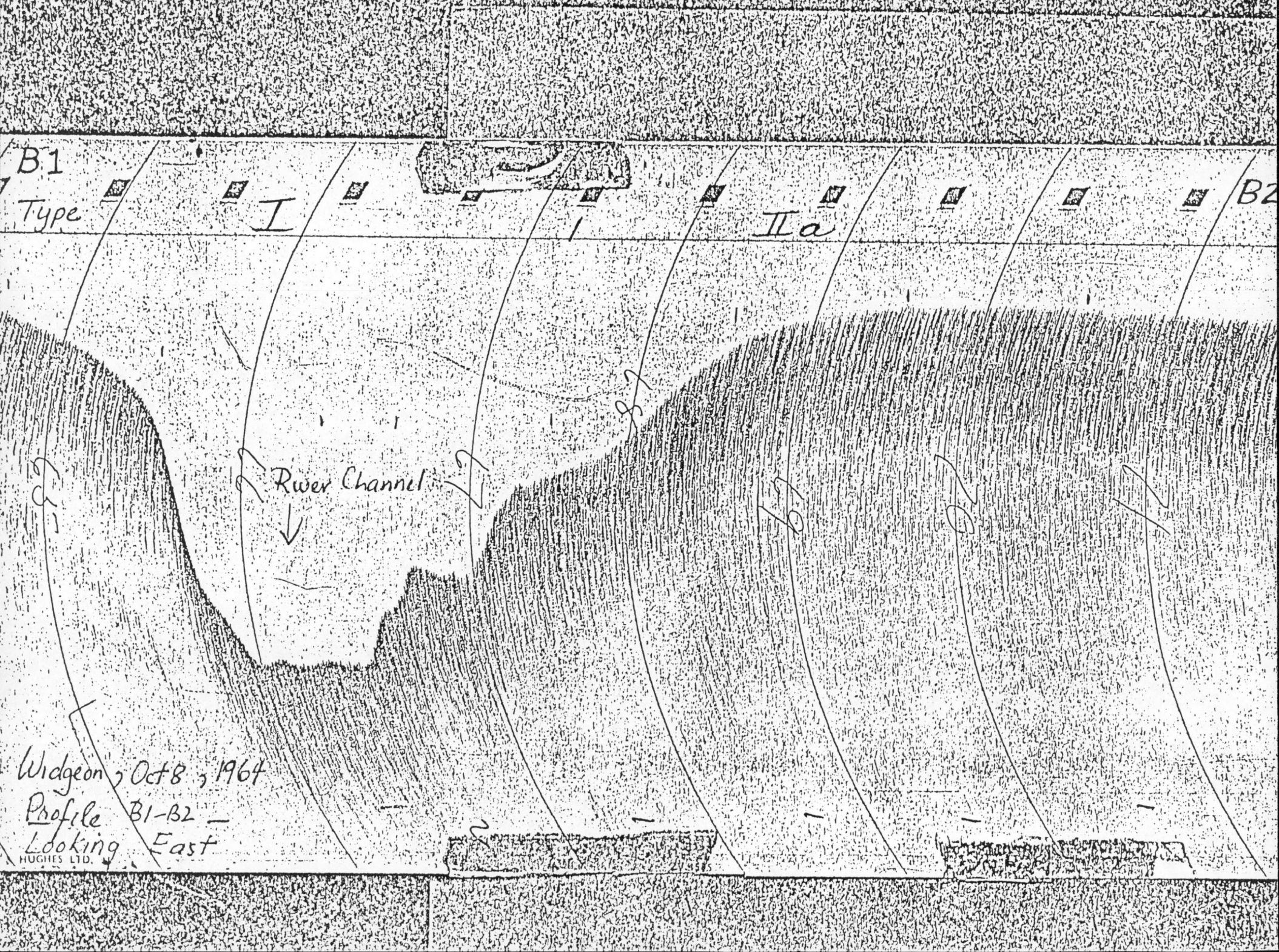
Vessel	Date	Fix Nos.	Profile
METELA	October 8, 1964	107-114	A1-A2
WIDGEON	October 8, 1964	65- 71	B1-B2
WIDGEON	October 8, 1964	1- 10	C1-C2
KUNGO	September 19, 1964	1- 8	D1-D2
KUNGO	September 19, 1964	39- 47	E1-E2
KUNGO	September 19, 1964	111-119	F1-F2
KUNGO	October 8, 1964	5- 9	G1-G2
KAPUSKASING	September 10, 1964	92-104	H1-H2
WIDGEON	September 22, 1964	1- 9	I1-I2
KAPUSKASING	September 10, 1964	41- 48	J1-J2
METELA	September 17, 1964	17- 24	K1-K2
KAPUSKASING	August 28, 1964	94-105	L1-L2
KAPUSKASING	August 27, 1964	117-130	M1-M2
KAPUSKASING	September 12, 1964	5- 16	N1-N2
KAPUSKASING	September 12, 1964	18- 30	P1-P2
METELA	August 31, 1964	16- 20	Q1-Q2
WIDGEON	September 14, 1964	48- 54	R1-R2
KAPUSKASING	September 13, 1964	68- 79	S1-S2
KAPUSKASING	September 10, 1964	111-120	T1-T2

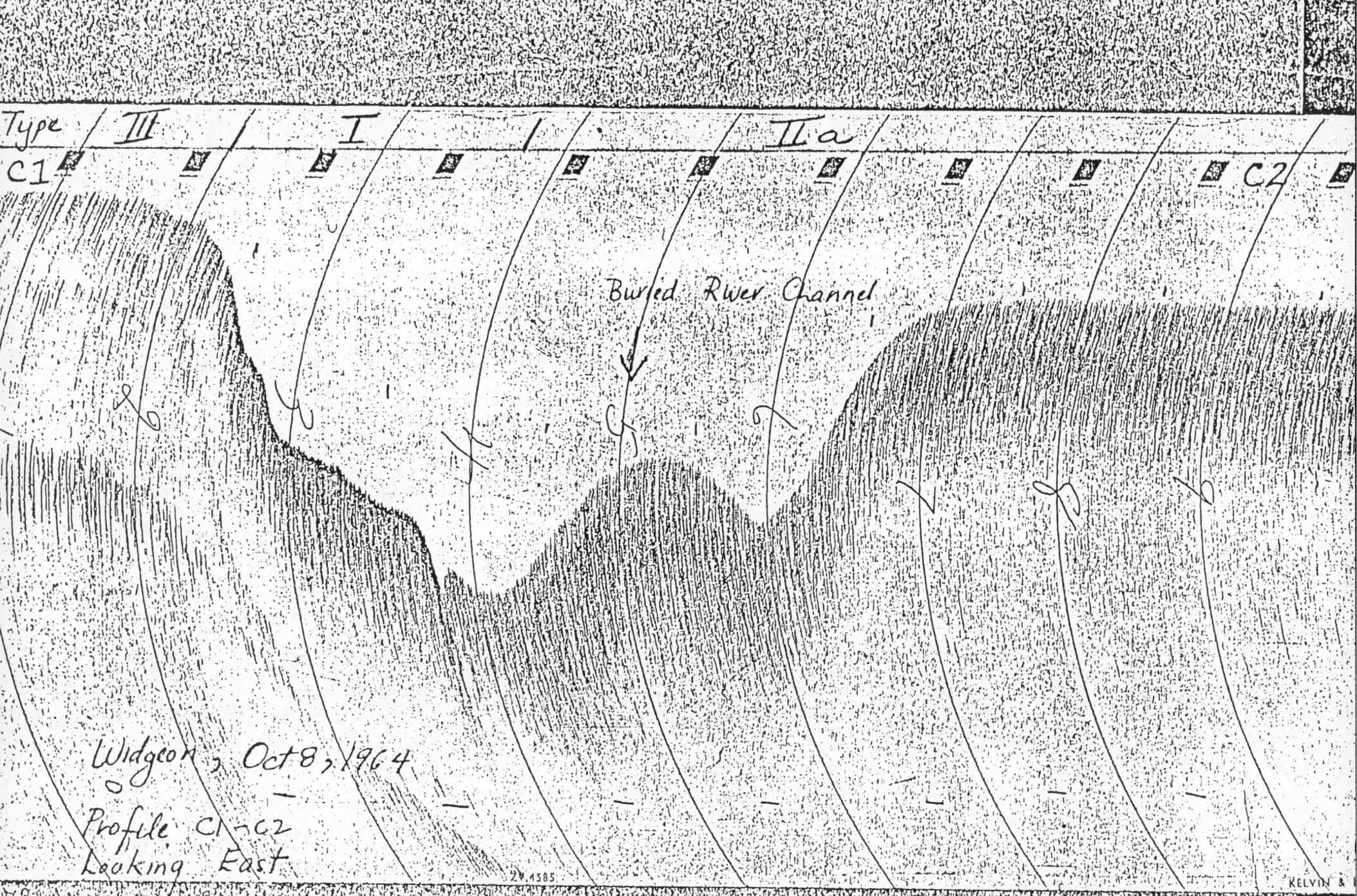
REFERENCES

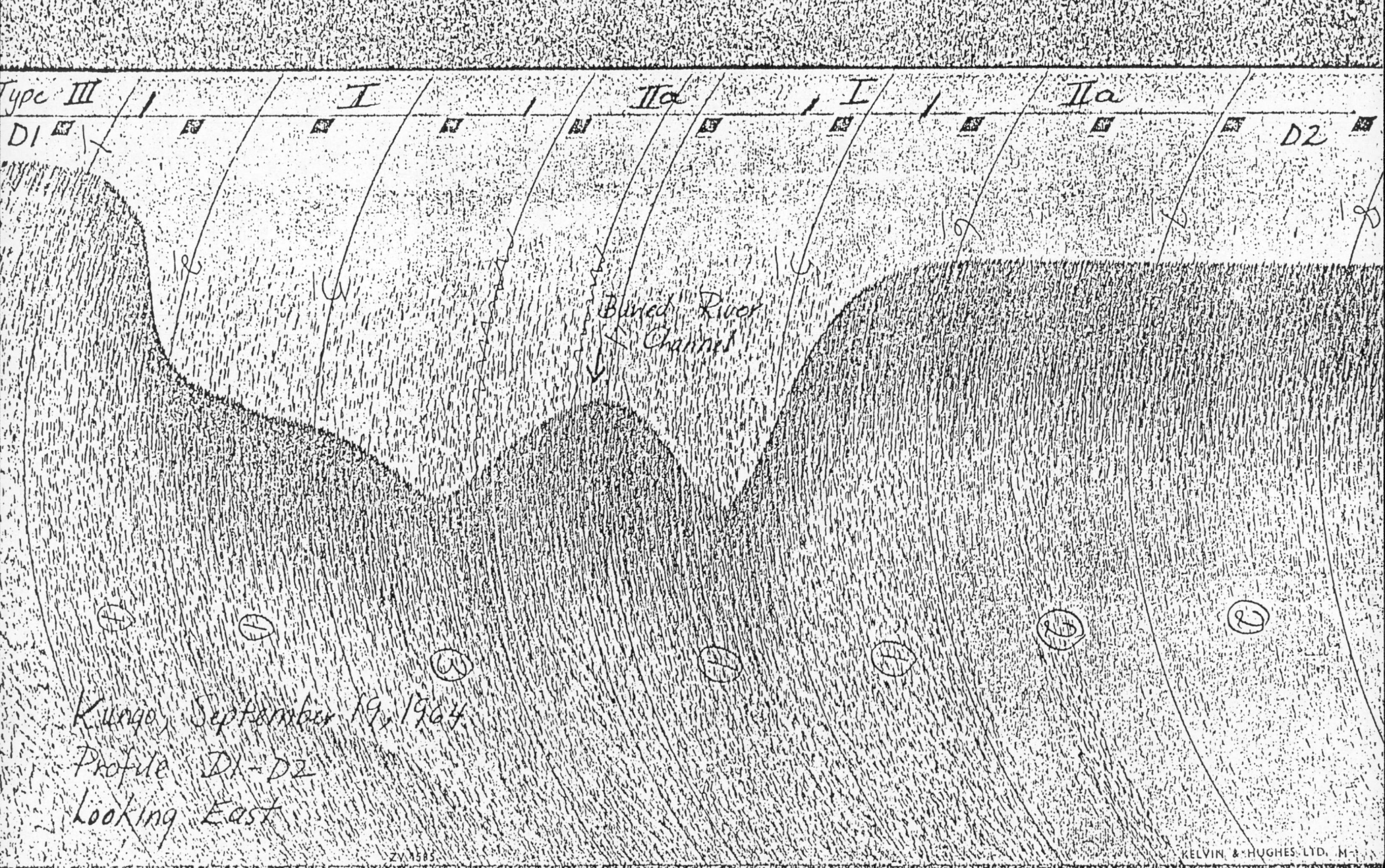
King, L. H., 1967. Use of a Conventional Echosounder and Textural Analyses in Delineating Sedimentary Facies: Scotian Shelf in Canadian Journal of Earth Sciences, Volume 4, No. 4.

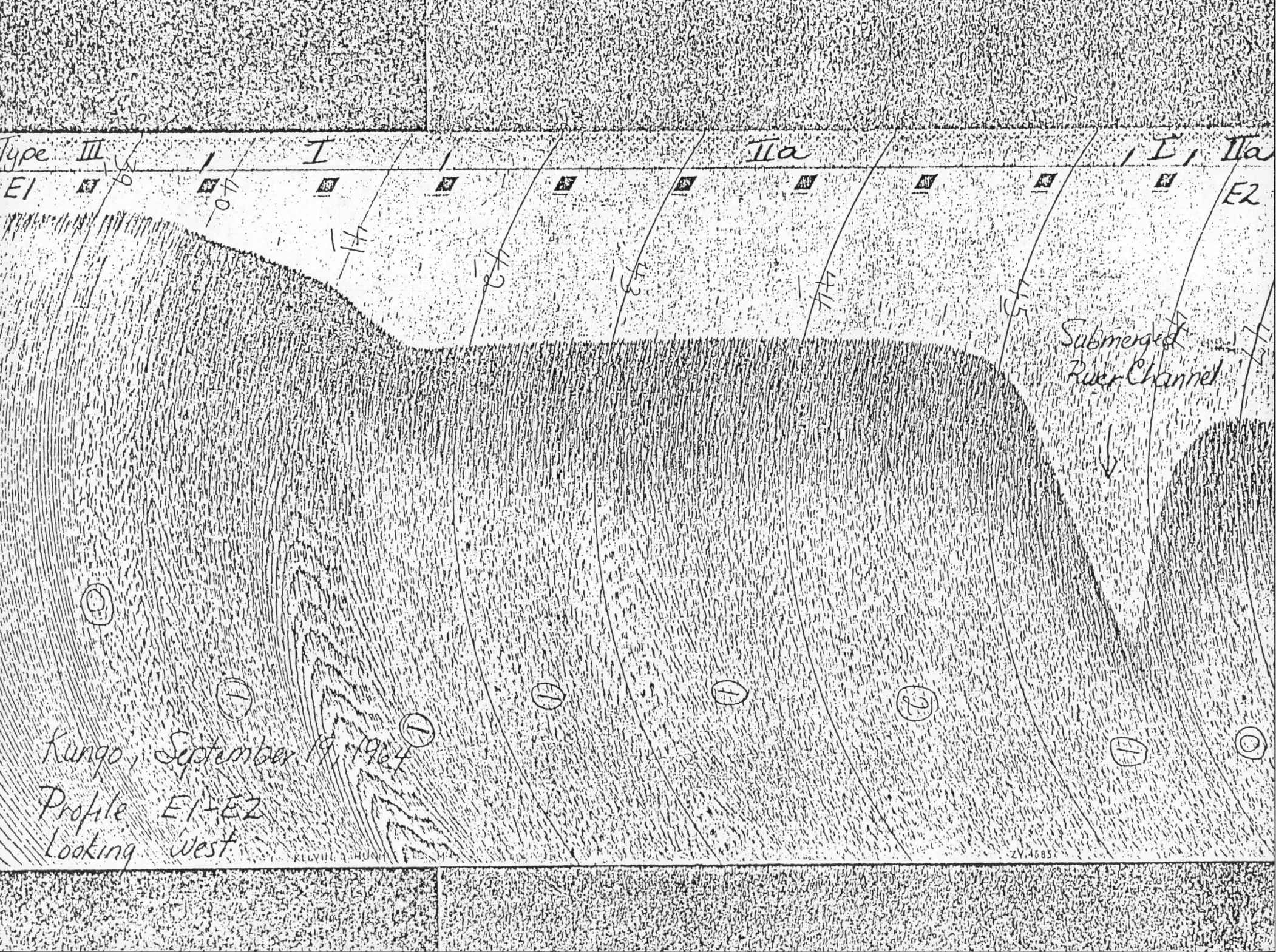


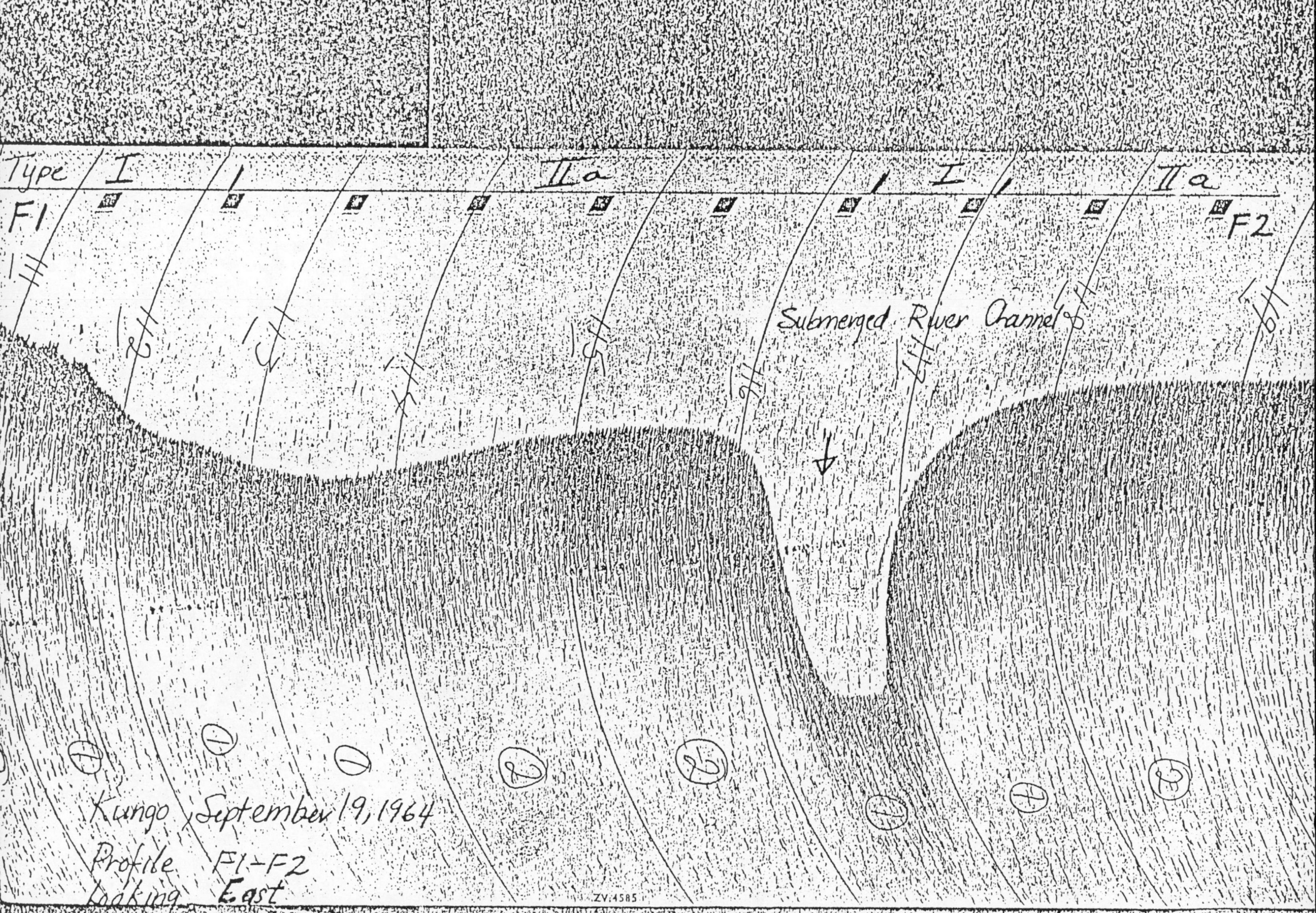
Metela, October 8, 1964
Profile A1-A2
Looking West

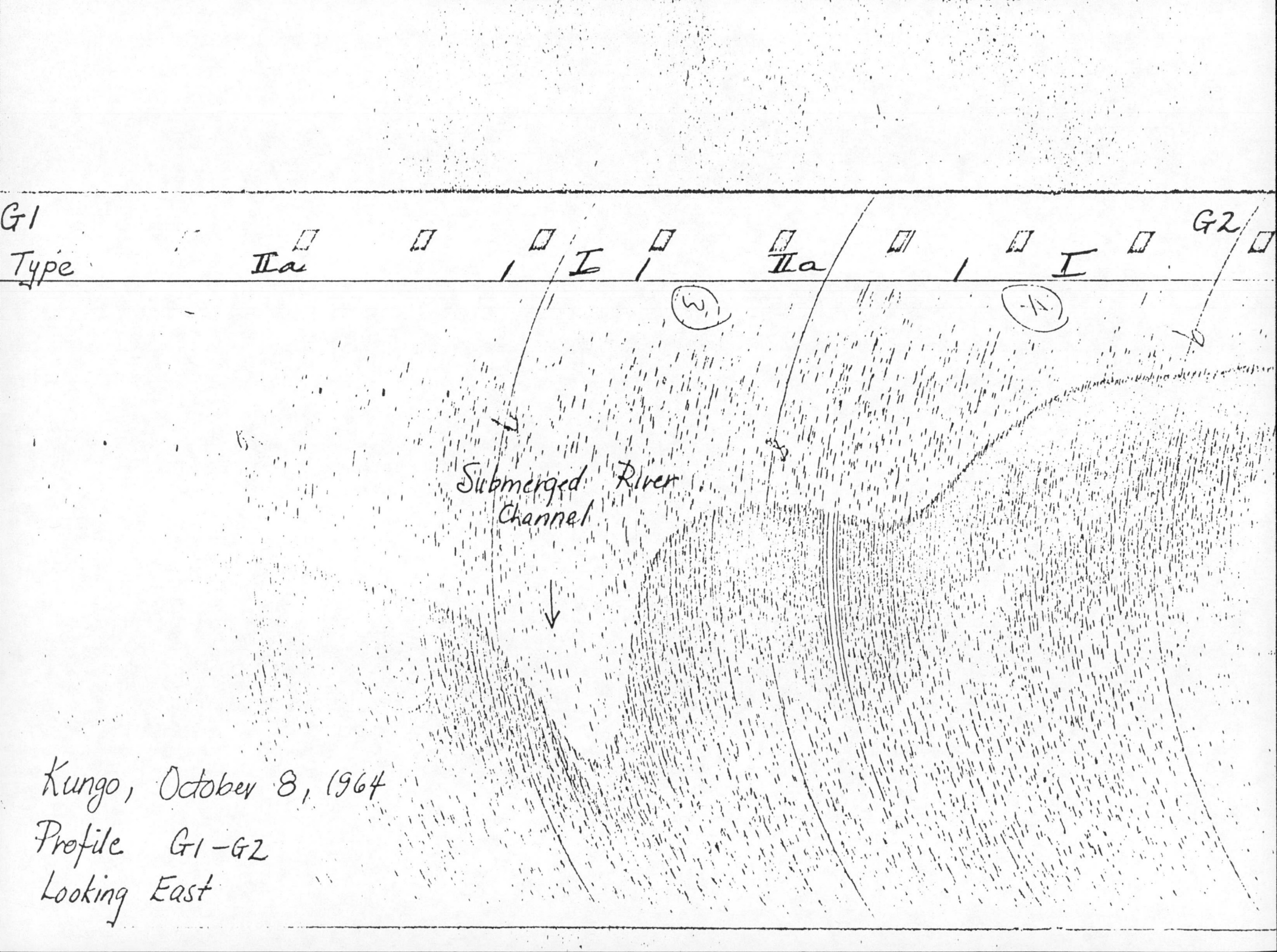

B1
Type
I
IIa
B2
River Channel
Widgeon, Oct 8, 1964
Profile B1-B2
Looking East
HUGHES LTD.


Type III
I
II a
C1
C2
Buried River Channel
Widgeon, Oct 8, 1964
Profile C1-C2
Looking East
24.1585
KELVIN &

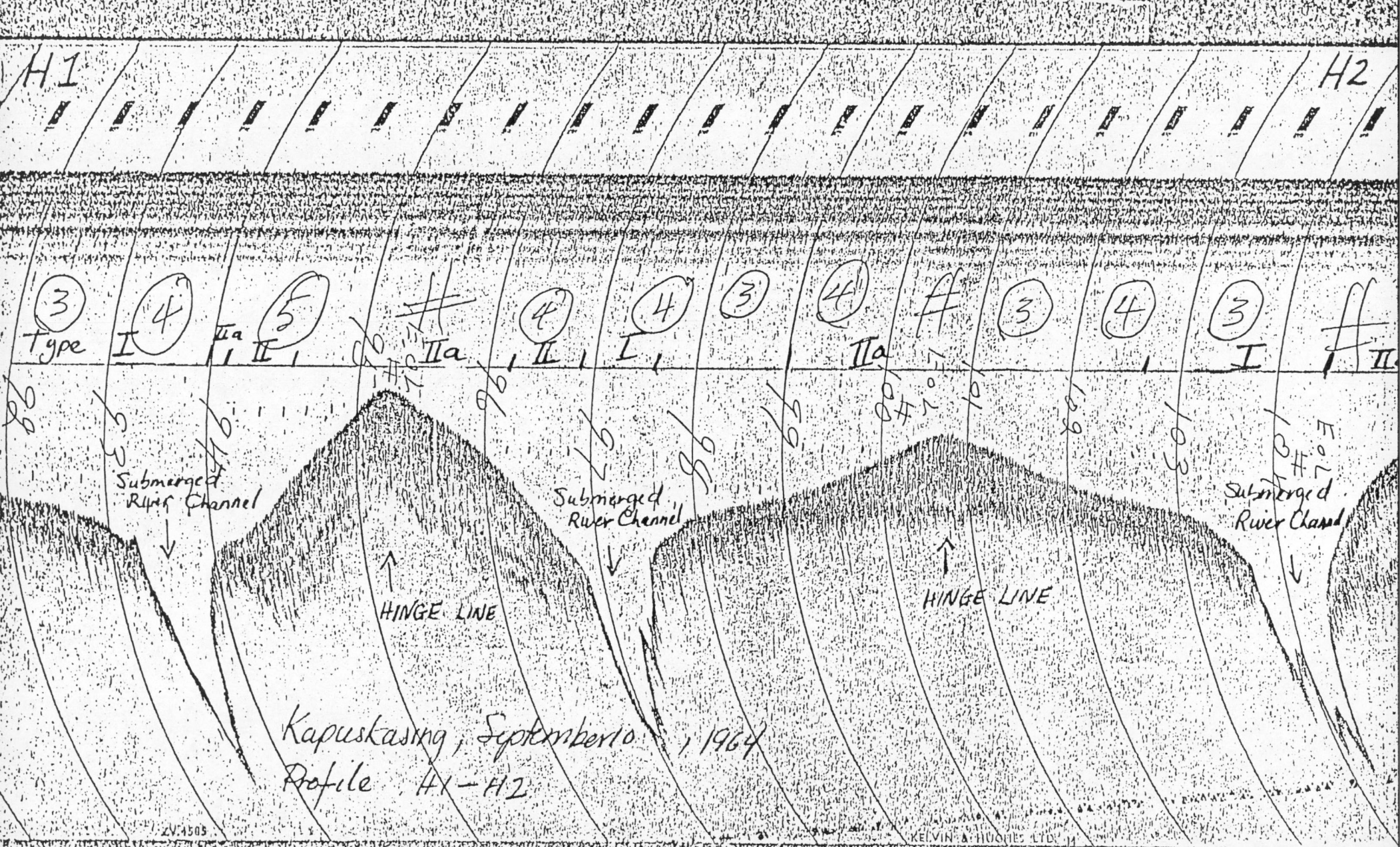

Type III
I
IIa
I
IIa
D1
D2
Buried River Channel
Kunga, September 19, 1964
Profile D1 - D2
Looking East
ZV 585
KELVIN & HUGHES LTD.

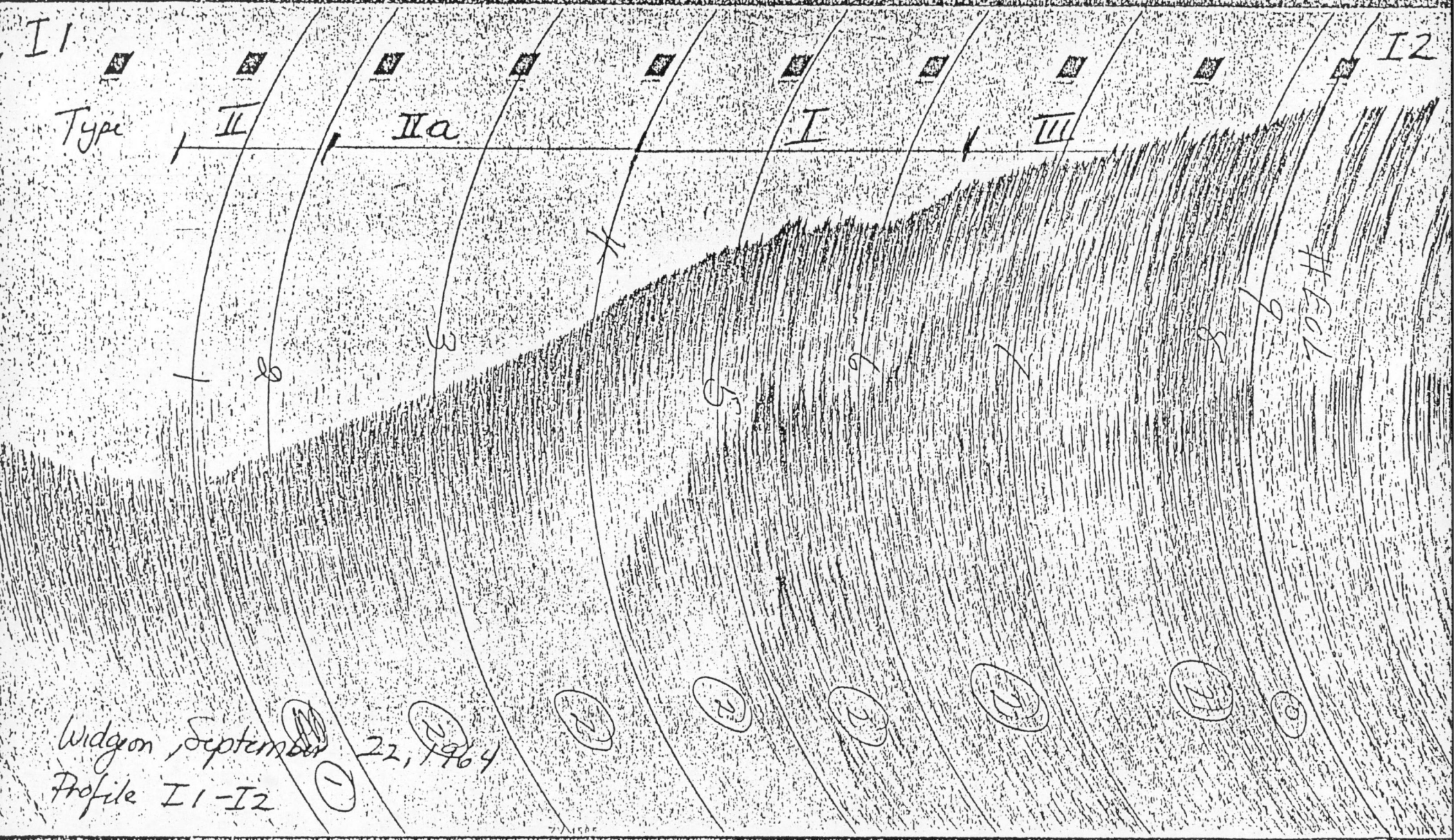

Type III
I
IIa
I, IIa
E1
E2
Submerged River Channel
Kungo, September 19, 1964
Profile E1-E2
Looking West

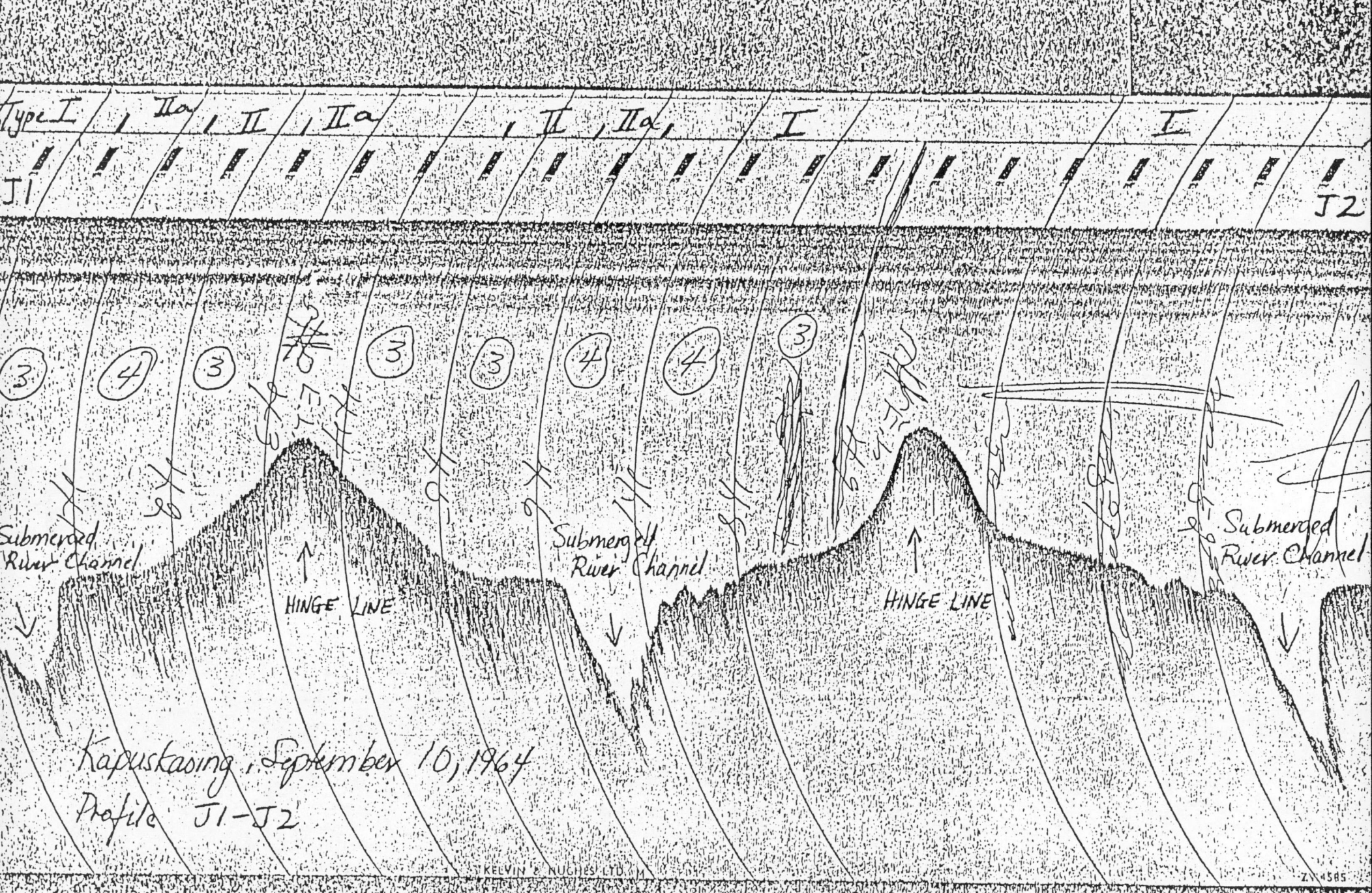

Type I
I
IIa
I
IIa
F1
F2
Submerged River Channel
Kungo
September 19, 1964
Profile
F1-F2
looking
East
ZV-4585

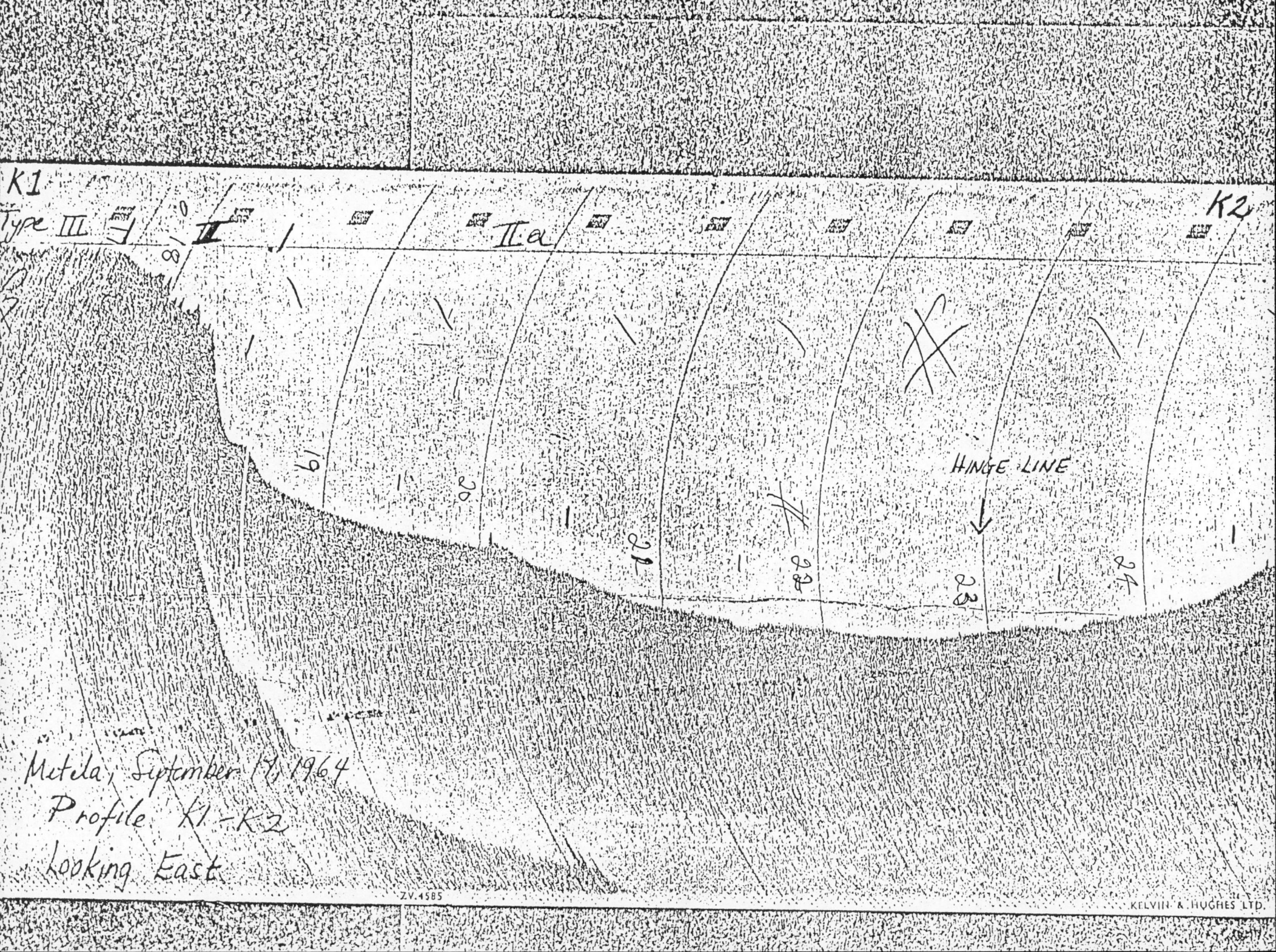


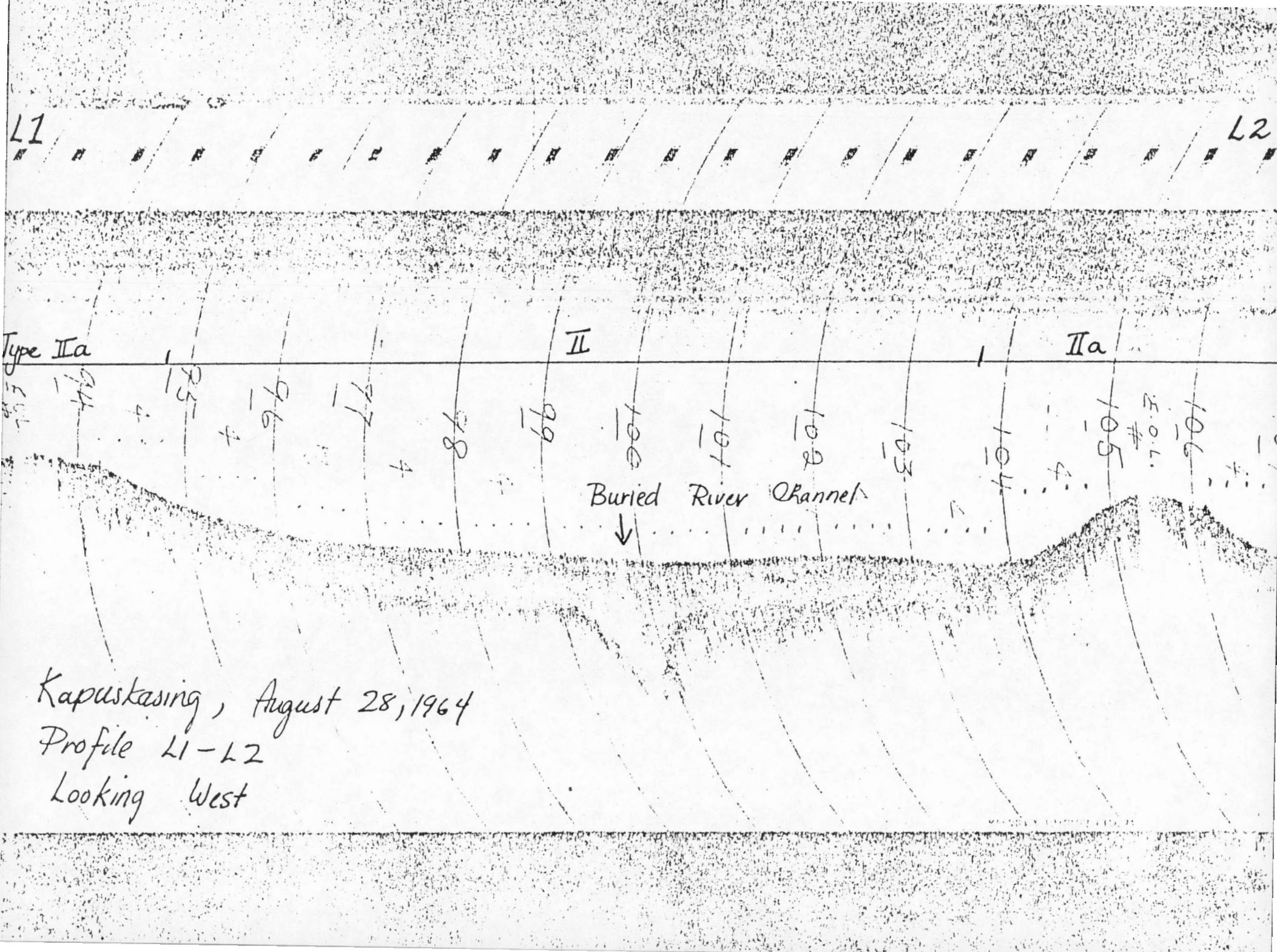
Kungo, October 8, 1964
Profile G1–G2
Looking East


H1
H2
Type
Submerged River Channel
HINGE LINE
Submerged River Channel
HINGE LINE
Submerged River Channel
Kapuskasing, September 10, 1964
Profile H1 – H2
KELVIN & HUGHES LTD

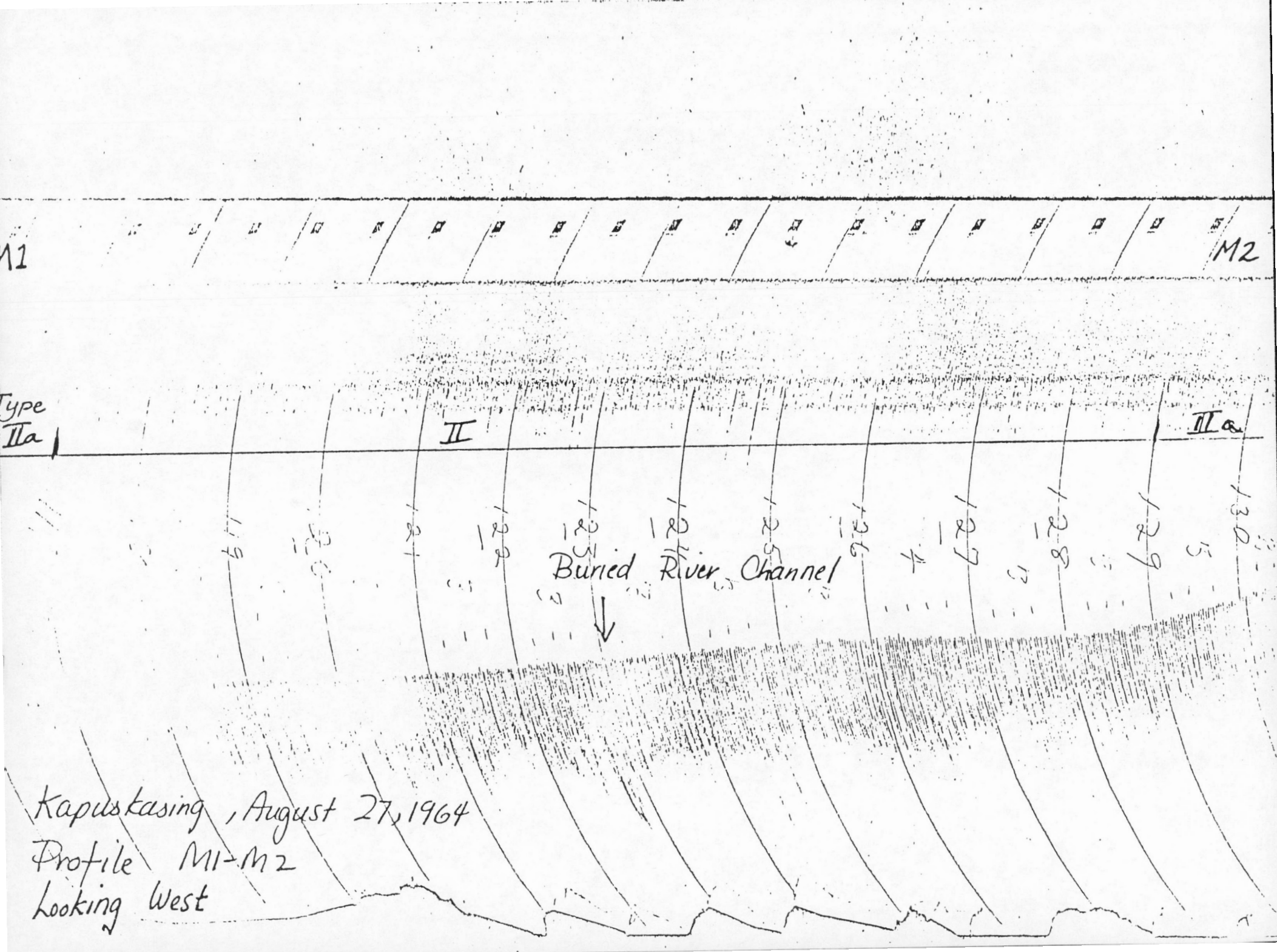

I1
I2
Type
II
IIa
I
III
Widgon, September 22, 1964
Profile I1-I2

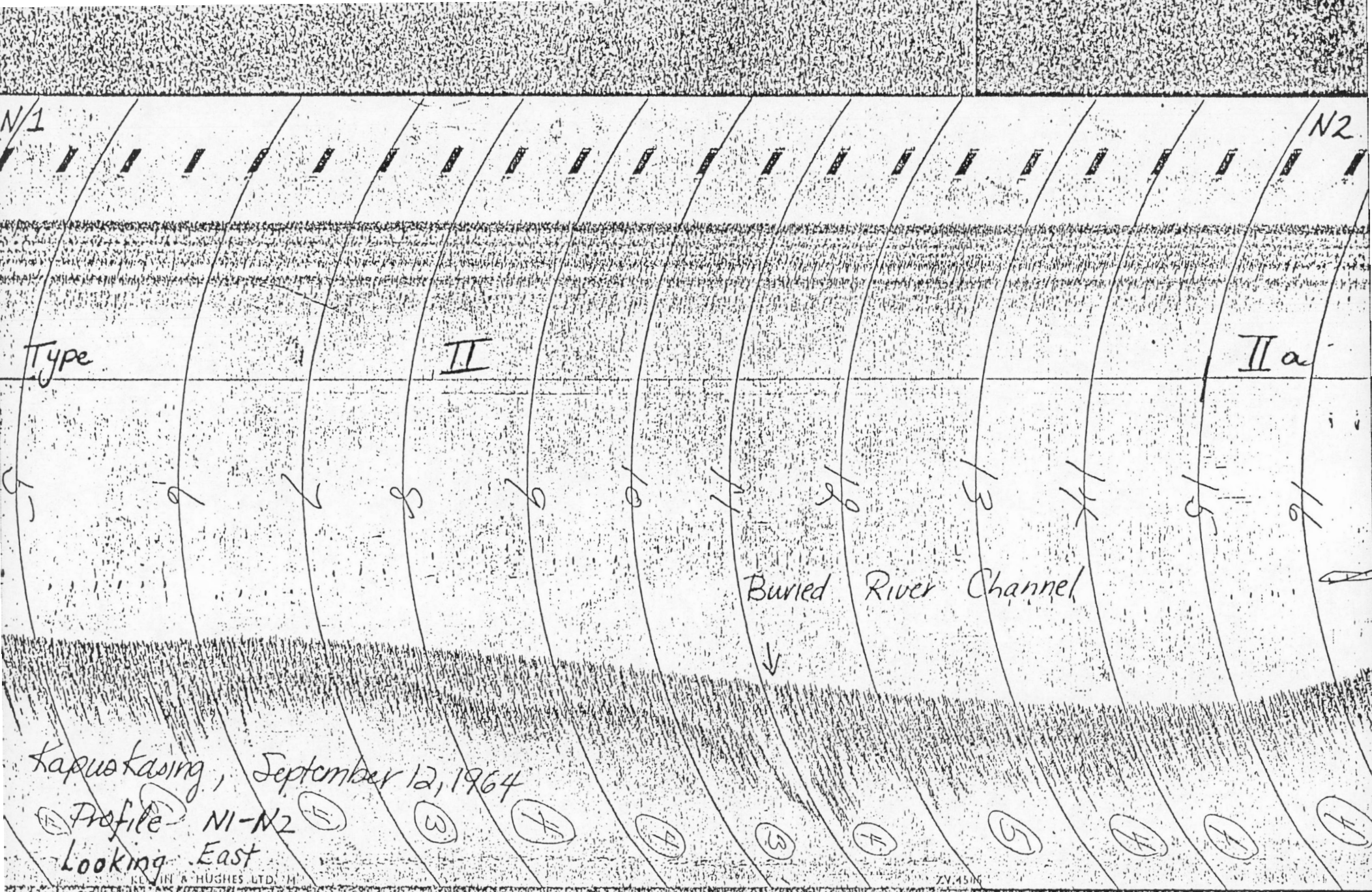

Type I
IIa
II
IIa
II
IIa
I
I
J1
J2
3
4
3
3
3
4
4
3
Submerged River Channel
HINGE LINE
Submerged River Channel
HINGE LINE
Submerged River Channel
Kapuskasing, September 10, 1964
Profile J1-J2
KELVIN & HUGHES LTD.
Z.V.4585

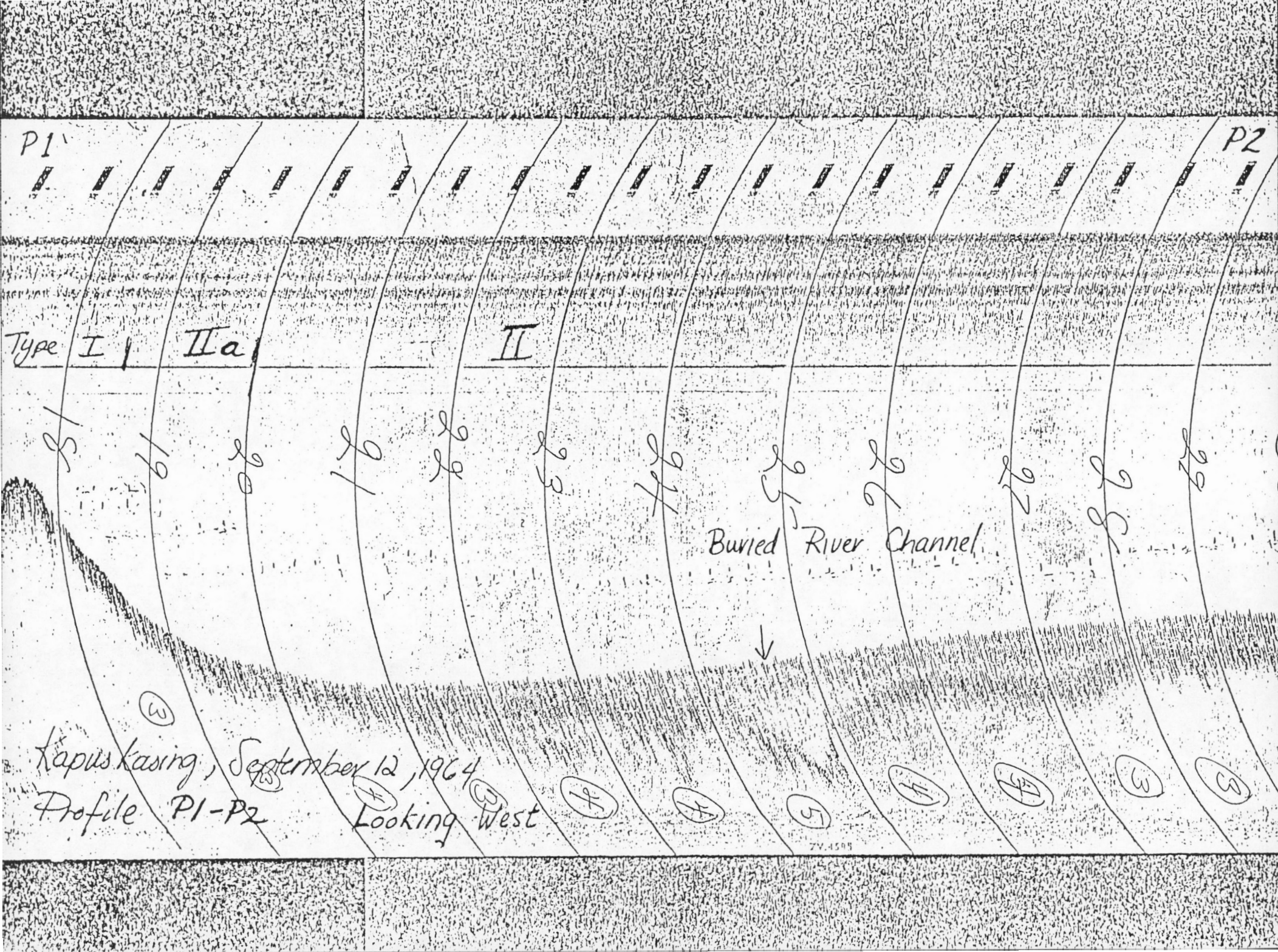

K1
K2
Type III
III
II
IIa
HINGE LINE
Matala, September 17, 1964
Profile K1-K2
Looking East
ZV.4585
KELVIN & HUGHES LTD.

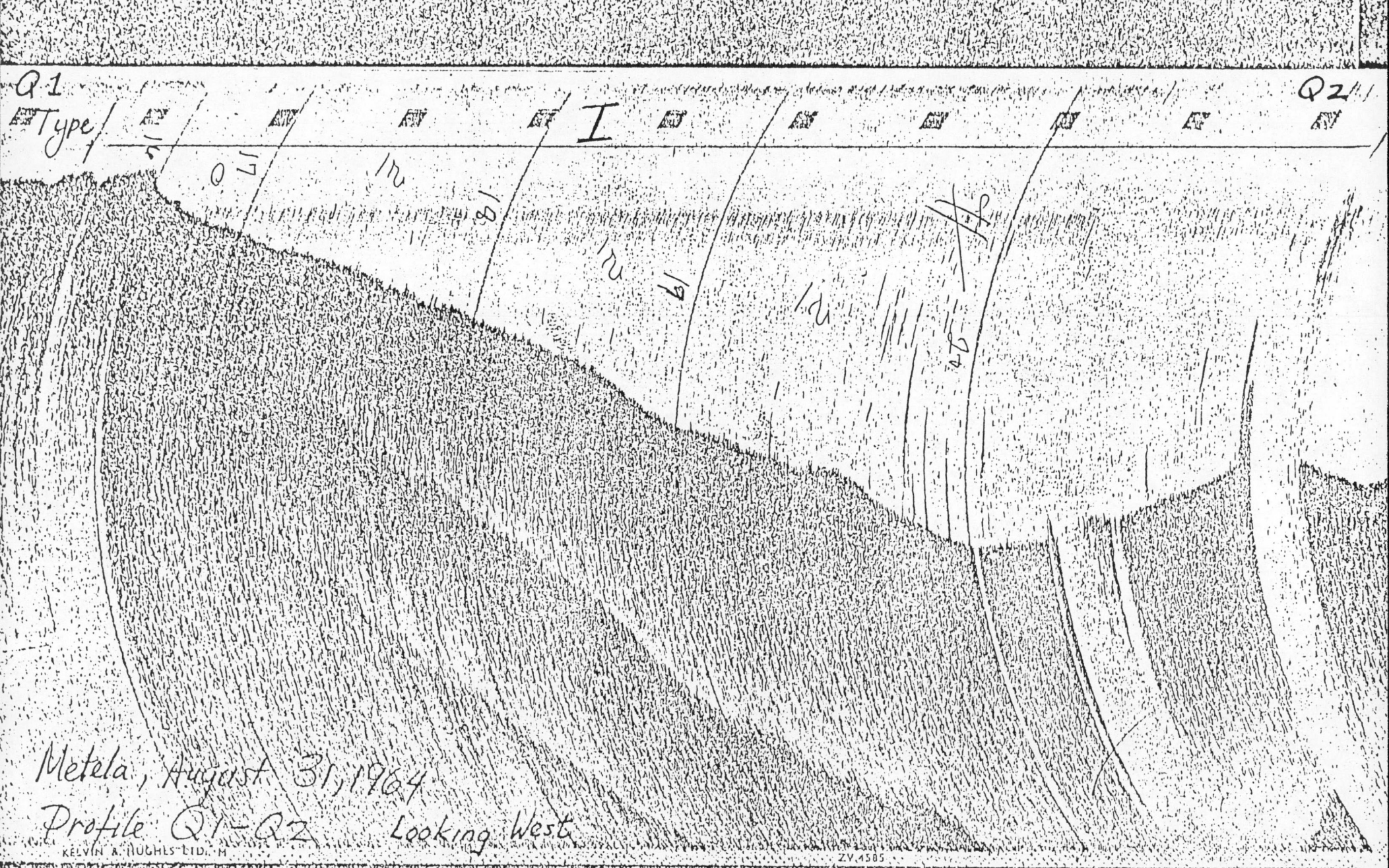


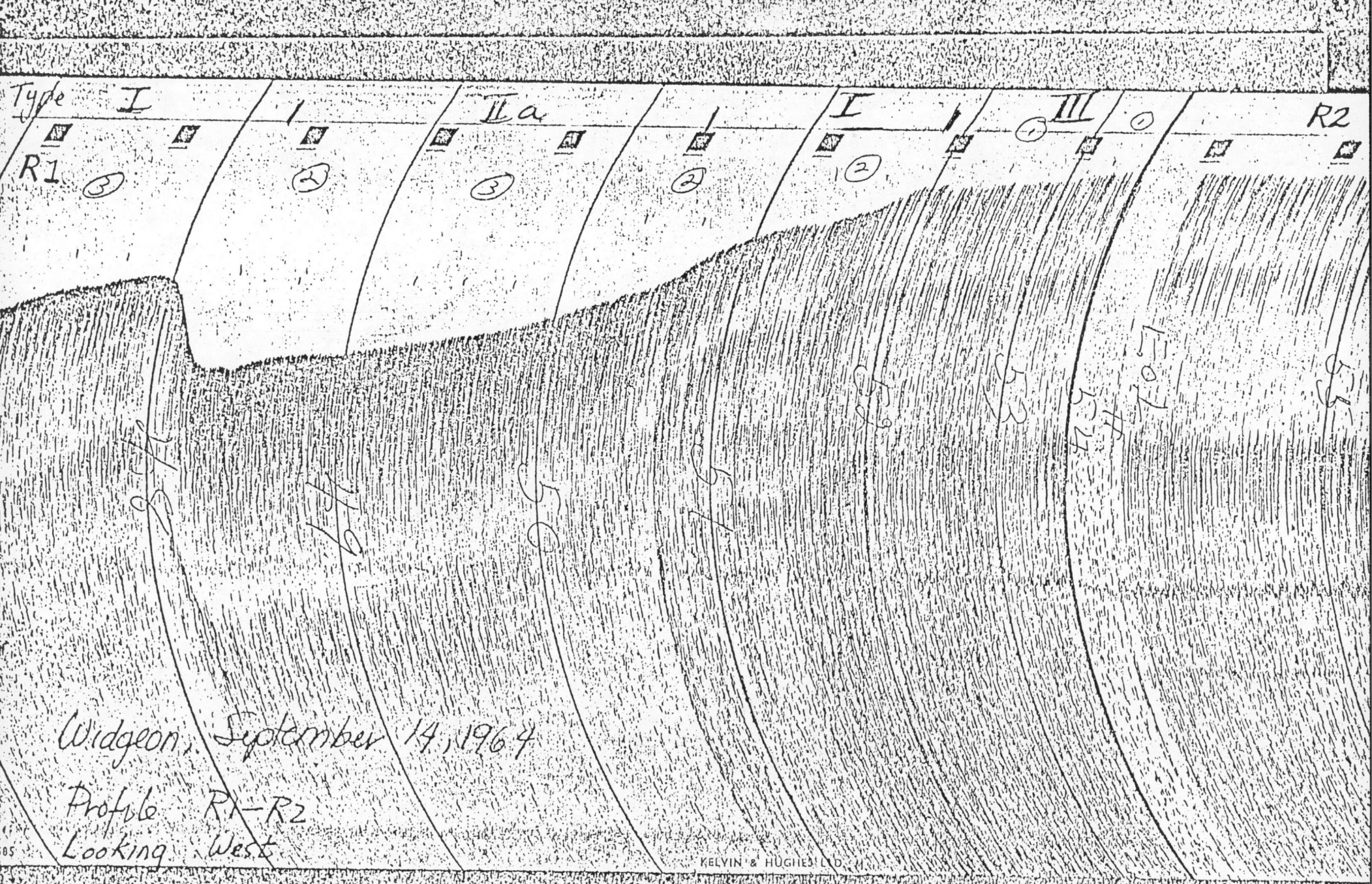
Kapuskasing, August 28, 1964
Profile L1 – L2
Looking West

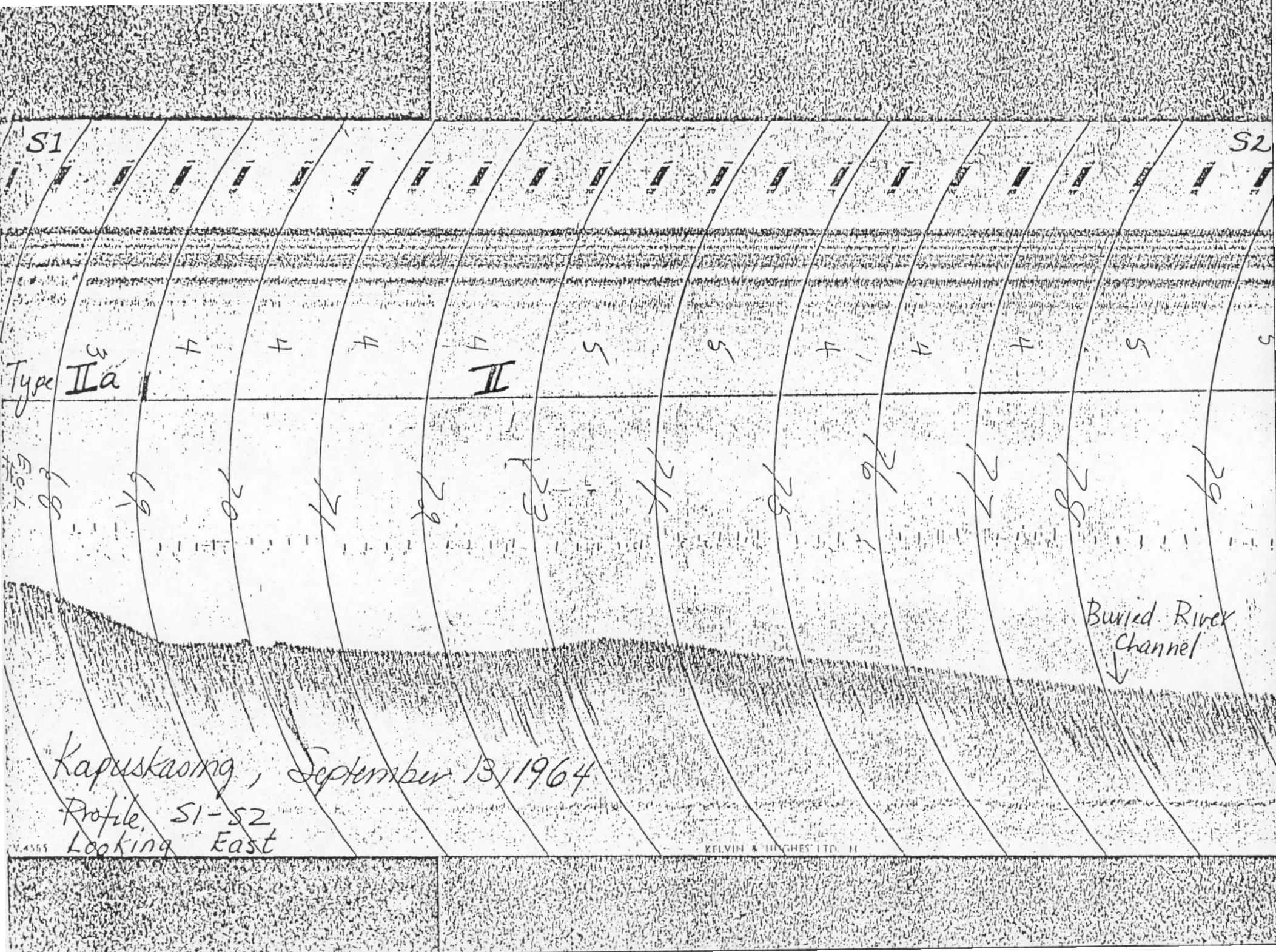

M1
M2
Type IIa
II
IIa
Buried River Channel
Kapuskasing, August 27, 1964
Profile M1-M2
Looking West

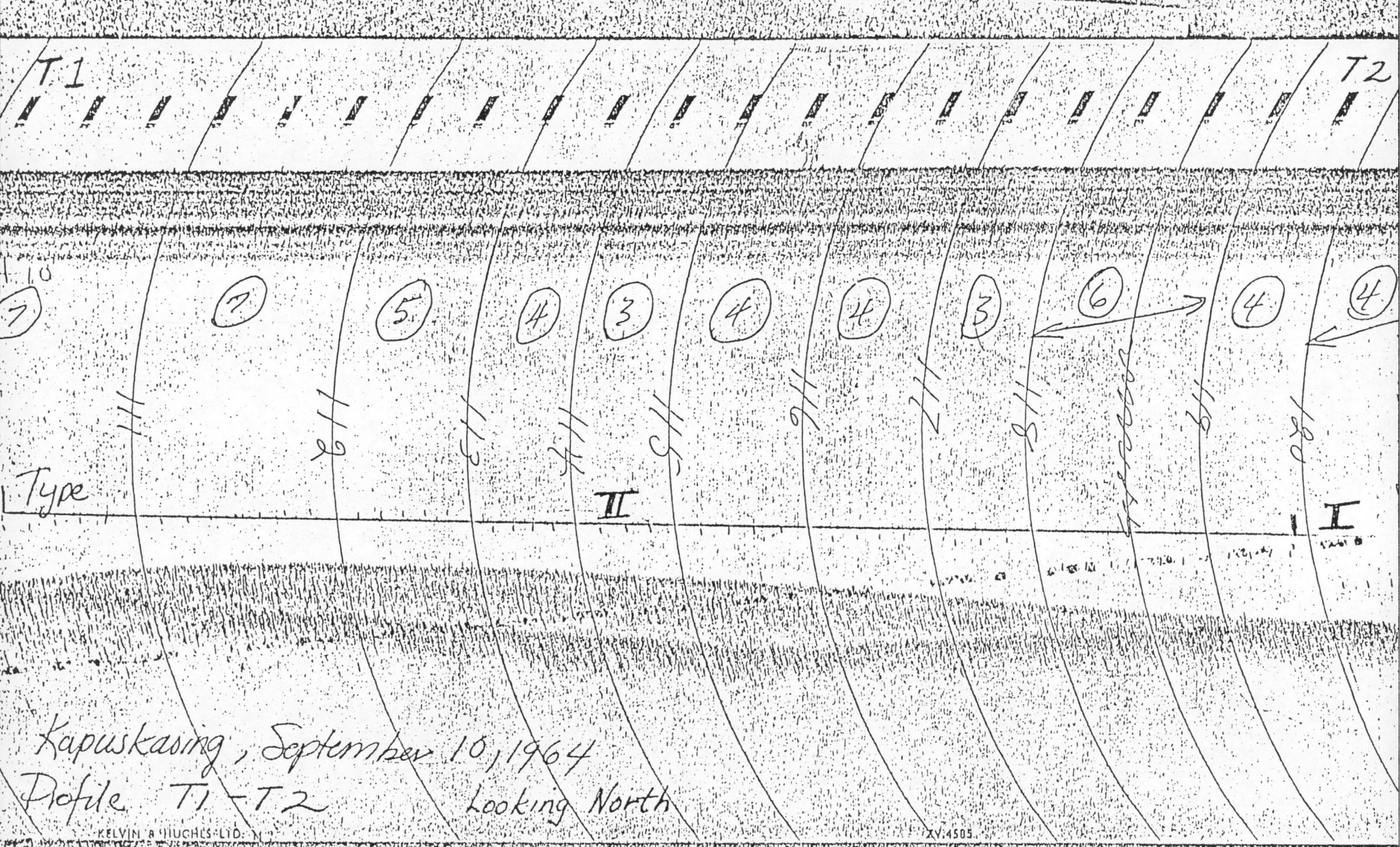

N1
N2
Type
II
IIa
Buried River Channel
Kapuskasing, September 12, 1964
Profile N1-N2
Looking East
KLEIN & HUGHES LTD.


P1
P2
Type I
IIa
II
Buried River Channel
Kapuskasing, September 12, 1964
Profile P1-P2
Looking West


Q1
Type
I
Q2
Metela, August 31, 1964
Profile Q1-Q2 Looking West
KELVIN & HUGHES LTD. M
ZV 4585


Type I
IIa
I
III
R1
R2
Widgeon, September 14, 1964
Profile R1–R2
Looking West
KELVIN & HUGHES LTD.


S1
S2
Type IIa
II
Buried River Channel
Kapuskasing, September 13, 1964
Profile S1-S2
Looking East
KELVIN & HUGHES LTD.



Kapuskasing, September 10, 1964

Profile T1 - T2 Looking North

KELVIN & HUGHES LTD.

XV.4505