



INTERN RAPPORT.

DATO: 17.12.1984

RAPPORT NR: 1542

KARTBLAD 1833 IV

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SAKSBEARBEIDER

Ragnar Hagen

A/S BIDJOVAGGE GRUBER

RAPPORT VEDRØRENDE:

Diamond drilling, area 56 and 57
Kautokeino. Joint venture Gulf/Sydvaranger.

FORDELING
OSLO:

RESYMÉ:

Follow up areas no 56 and 57 from the 1980
NGU geophysical helicopter survey are
situated 7 km south east of the Bidjovagge
Mine. They were tested in 1984 by 5 diamond
drill holes, totalling 463 m.

A new zone of Bidjovagge type copper - gold
mineralization was discovered. The best
intersection is 2,0 m with 1,62% Cu and 1,36
ppm Au.

Area 56 and 57 have been tied together and
extended by supplementary ground geophysics.
The area has got a potential for economic
mineralization and further diamond drilling
is recommended.

KIRKENES:

ANDRE:

KOMMENTAR:

INTRODUCTION

Follow up area no 56 and 57 are situated around 7 km east south-east of the Bidjovagge Mine (Fig. 1), in the central parts of the Caskias greenstone group. The geophysical helicopter survey by NGU from 1980 indicated two converging EM conductors. The details of the EM anomalies were displayed by the Dighem processing of the NGU data (report no 1381). The EM interpretation map from the Dighem processing is shown in Fig. 2. The two follow up areas were placed at irregularities in the EM pattern (Fig. 2).

Geologist Jan S. Sandstad who did the regional mapping of this part of the greenstone belt recommended the area for follow up work (report no 1471). According to Sandstad the stratigraphic level of Bidjovagge may occur in an anticline in this area

GROUND SURVEYS

The original area 56 consisted of lines 200 N to 300 S in Fig. 3. Area 57 consisted of lines 1200 S to 1500 S (originally named 200 N to 100 S, see report no 1519). After the diamond drilling supplementary magnetic and slingram surveys tied the two areas together and the grid is now continuous over 2.4 km (Fig. 3). The results of the geophysical surveys will be discussed later in this report.

A detailed geological survey was also made. The area is heavily covered and no outcrops were found in the original grids. In the area of the supplementary survey there is one outcrop of meta diabase. Carbonatization and carbonate veins can be seen in the outcrop. To get more information boulder tracing of the area was carried out. To the north of line S 600 the area is dominated by two large drumlines with till thickness up to 30 m and mostly long-transported material in the till. In the southern part till thickness is only a few meters and boulders are often local rocks. No boulders of economic mineralization were found, but boulders of carbonatized meta diabase and albite felsite are good indicators of mineralization processes (Fig. 3).

In the western part of the area boulders of a pyrite rich, strongly weathered green tuff occur. The general direction of the ice-movement is from south to north. No study of local variations of the ice movement were made.

DIAMOND DRILLING

In the spring of 1984 three holes were drilled in area 57 and two holes in area 56. The total length of diamond drilling was 463.10 m. Location of drill holes are shown in Fig. 3. Drill hole sections are shown in Figs. 4 to 7. Core log reports and chemical analyses are presented in Encl. 1. Hole 56-1 was drilled to test the westernmost conductor. The drilling proved the conductor to be a steeply dipping graphite felsite (Fig. 4). The graphite felsite is associated with albite felsite and carbonate-rich rocks. The rock unit named "altered rock" in Fig. 4 is an albite-carbonate alteration of diabase. The "carbonate rock" in Fig. 4 is also more likely an alteration product than a sediment. Only weak copper mineralization occurs in graphite felsite and albite-carbonate rich rocks. The most interesting result of hole 56-1 is clearly the 2 m section of 0.97 ppm Au and 0.23% Cu in carbonate rock and altered rock. This very high gold to copper ratio is promising. The eastern limb of a possible anticline was tested with hole 56-2. The conductor is located under a drumline and the hole had to be pulled far back (Fig. 5). After 105 m of green tuffs and some albite felsite the hole intersected 20 m of graphitic schist. No mineralization was found in this hole. A sharp magnetic anomaly coinciding with the conductor (Fig. 3) must be explained with the presence of a shallow boulder with high magnetic susceptibility.

Hole 57-2 intersects two main units of graphite felsite which corresponds with the two short conductors (Figs. 3 and 6). Also in this hole the graphite felsite is associated with albite felsite and albite carbonate alterations of the diabase. A two meter intersection of 1.62% copper and 1.36 ppm Au in albite carbonate altered diabase is ore grade quality. Also promising is one meter of 0.43 ppm Au with only 39 ppm Cu in albite felsite near the bottom of the hole. 2.98

Holes 57-1 and 57-3 tests the same zone in two sections, 200 m apart (Fig. 3). The conductor is a thin unit of graphite felsite (Figs. 6 and 7). The associated units of albite felsite and albite carbonate rock contains a weak copper mineralization with minor gold.

DISCUSSION

The geology of area 56 - 57 is very similar to the geology of the Bidjovagge Mine. The mineralization is clearly a Bidjovagge type copper - gold mineralization. It is likely that J.S. Sandstad's correlations between the stratigraphic level of this new area and Bidjovagge is correct.

An anticline structure is strongly indicated by magnetics and EM (Fig. 3). The lithologies of holes 57-1, 57-3 and 56-1 are somewhat different, but this can be ascribed to lateral variation. Holes 57-1 and 57-3 are likely situated closer to a center of hydrothermal activity.

The graphite felsite and mineralization intersected by hole 57-2 is believed to be a separate stratigraphic level, not structurally connected with the units in holes 57-1 and 57-3. The conductor of lines 1700 S to 1900 S may be correlated with the units intersected by hole 57-2.

With the interpretation presented here the conductor in hole 56-1 have to be a unit above the main zone.

The weak EM anomaly to the west of the main zone is probably caused by the pyrite-rich weathered tuff that can be seen in boulders in this area.

Area 56 and 57 represent a new zone of Bidjovagge type mineralization. The five holes described in this report indicate that the zone has got a potential for economic mineralization. The most interesting area is between lines 500 S and 900 S (Fig. 3). The magnetic low along the EM conductor in this area may be caused by loss, of magnetite in the greenstone by hydrothermal alteration. A similar but smaller magnetic low is seen in association with mineralization in the area of hole 57-1 and 57-3. With reference to the short conductors with mineralization of hole 57-2, the satellite conductor of lines 700 S and 800 S is interesting. The area between lines 500 S and 900 S is further enhanced by the weak western conductor. The pyrite mineralization in the tuff may represent the last phase of a waning hydrothermal system.

The second area with a potential is the conductor of hole 56-1. In this hole the mineralization is magnetite bearing so the center of mineralization cannot be indicated by a magnetic low. The large thickness of overburden of the northern part of the grid also makes the magnetics less useful. The good gold values of hole 56-1 does however warrant further drilling towards north along this zone.

The geophysical pattern between lines 1500 S and 1800 S is complicated. Experience from Bidjovagge prove that geophysical breakes like the one between 1500 S and 1700 S are favourable for this type of mineralization. Large EM amplitudes and steeps magnetic gradients prove that the till is thin and this area can be investigated by shallow till sampling.

The helicopter data from the continuation of the two limbs of the anti-cline towards south should be studied carefully to find new areas for follow-up work.

The results from area 56 and 57 show that the exploration method of an advanced processing of the helicopter geophysics combined with good geological mapping produces the necessary data to recognize good target areas. The Max Min II slingram survey combined with a detailed magnetic ground survey supply data suitable for selecting drilling targets.

Stabekk, 17. desember 1984


Ragnar Hagen

ENC. 1.

Kjerneobservasjoner.

Borhull nr. 56-2
 Koordinator: Y 300 S
 Påsatt i høyde 455 m.
 • i retning 300⁸
 • med helning 45⁰
 Borhullets lengde 137,40 m

Profil X
125 E

Boret meter	Bergart	Kjerne- mangel	Skifrihet	Bergart prøve
0-36.30	Jordboring			
36.30-43.80	Meta-tuff. Finkornig, grønn, diffus lagning Mt-rik. 40.25-40.35: Massiv, middelsk. Mt-py-karb.sone Inneh. spredte tynne karb.årer Siste 2 m: Spredte py-porfyroblaster.		43.50: 40 ⁰	
43.80-47.50	Albittfels, grønn-grå, uren. fink. Spredte albitt-karb.årer, litt py.		47.25: 60 ⁰	
47.50-52.40	Meta-tuff. Grønn, finkornig. 5 mm-store karb.-porfyroblaster. Også karb. disseminert og i årer.			
52.40-60.85	Albittfels, grønn-grå finkornig, tildels uren. Spredte py-blaster. Mt-rik.		53.30: 45 ⁰ 57.50: 50 ⁰	
60.85-103.40	Meta-tuff. som 47.50-52.40. Lokalt felslignende. Litt py i spredte karb.- albitt-årer. Mt-rik. 91.40-91.50: Mt-py-karb. massiv, grovk. m. spor cp. Siste 2 m: Grafitt-holdige bånd.		67.10: 45 ⁰ 84.40: 50 ⁰ 97.35: 45 ⁰	
103.40-105.25	Overgangsb.a. Grafittskifer - karbonatb.a. middelsk. dels lagdelt.			
105.25-126.00	Grafittskifer, finkornig, tildels høyt gra- fittinnh. Oppknust m. glidespeil. Inneh. karb. slirer m. noe py.		106.20: 60 ⁰	
126.00-132.80	Metabasalt. Massiv middelsk. Første 2,5 m: Lys feltsp.b.a. (omv) m. py. Løvt Mt-innh.			
132.80-137.40	Karb.b.a., uren, grumsete, oppknust. Lokale soner m. tuffitt. Lokalt også fels-soner. Lite Mt.			
	Hullet avsluttet v/137.40 m.			

Kjerneobservasjoner.

Borhull nr. 57 - 1 Profil _____
 Koordinator: Y ON (1400 S) X 175 W (25E)
 Plass i høyde 440 m.
 • i retning 1008
 • med helning 45°
 Borhullets lengde 75,50 m

Boret meter	Bergart	Kjerne- mangel	Skifrihet	Bergart prøve
0 - 7,50	Jordboring			
7,50-14,40	Meta tuff, båndet, middelskornig, grønn. Lokale lyse partier. Litt py, særlig i årer med karb. og i lyse partier.		lagning 10,30 m: 65°	
14,40-32,20	Albittfels, finkornig, noe mørke silikater, lokalt båndet med tuff. Spredte karb.årer med py. Mt-rik 14,40-19.00. Foldestrukturer 25-26 m. Lokalt oppknust og forvitret.		lagning 16,40 m: 45°	
32,20-37,90	Albittfels, svakt grafittholdig. Tett, finkornig. Mm -store lyse spetter. Inneholder spredte karb. årer.		33,20 m: 75°	
37,90-39,00	Albittfels som 14,40-32,20. Inneholder spor av cp. Lokalt mt.			
39,00-39,60	Grafittfels. Høyt C-innhold. Oppknust 39,00-39,10. Massiv py og spor cp.			
39,60-42,00	Albittfels. Tett, finkornig. Tynne py -årer i tett nettverk. 41,70-42,00: Cp -mineralisering m/karb.			
42,00-63,00	Metadiabas, omvandlet. Lys middelsk., massiv feltspat, biotitt amfibol b.a. Py-rik. Py + spor cp i karb.årer til 46,00. Mt -holdig fra 47,50. Økende mt, og mindre omv. fra 50 m. Gradvis overgang til:			
63,00-75,50	Metabasalt. Mørk grønn, massiv middels-finkornig. Mt -rik. Spredte årer med py og karb.			
	Avsluttet 75,50 m.			

Ragnar Hagen

Kjerneobservasjoner.

Borhull nr. 57-2 Profil _____
 Koordinator: Y 0 N (1400S) X 65 W (135E)
 Plassert i høyde 425 m.
 • i retning 100^g
 • med helning 45^o
 Borhullets lengde 99.35 m

Boret meter	Bergart	Kjerne- mangel	Skifrihet	Bergart prøve
0- 7.50	Jordboring			
7.50-21.60	Albittbergart (leucodiabas), massiv fin- middelskornig, lys, urene soner m. mørke sili- kater. Inneh. py + mt, tildels massive slirer m. mt.			
21.60-35.00	Metadiabas, massiv, middelsk. mt-rik, dels mt i slirer. Inneh. karbonat-årer.			
35.00-38.60	Metadiabas, omvandlet. Lys, finkornig. Inneh. py og spor cp.			
38.60-40.00	Albittfels, tett finkornig, brun. Lokalt m. lavt innh. av grafitt. Inneh. noe cp. Svært lite mt.			
40.00-58.90	Grafittfels, finkornig, middels grafittinnh. Soner m. albittfels med litt py ved: 41.60-42.00 43.95-45.05 45.75-46.50 50 -55: Knusesone m. veksling mellom al- bittfels og grafittfels, tildels massiv py v/52-53 m. Lavt grafittinnh. 55-58.90 m.		40.60: 60 ^o 47.45: 70 ^o	
58.90-73.00	Albittfels, brun, tett. inneh. litt py. Oppknust, lokalt rødlig farge.		71.60: 45 ^o	
73.00-87.90	Grafittfels, finkornig, tildels høyt grafitt- innh., litt py. Oppknust.			
87.90-97.50	Albittfels, brunlig, finkornig. Gradvis overgang fra grafittfels. Inneh. litt py		88.90: 40 ^o	
97.50-99.35	Grønnstein, massiv middelskornig mt-rik. Hullet avsluttet v/99.35 m. 09.07.84 Ragnar Hagen			

Kjerneobservasjoner.

Borhull nr. 57-3
 Koordinator: Y 200 N (1200 S) Profil X 175 W (0)
 Påsatt i høyde 440 m.
 • i retning 100^B
 • med helning 45^O
 Borhullets lengde 47.40 m

Boret meter	Bergart	Kjerne- mangel	Skifrihet	Bergart prøve
0-12.00	Jordboring			
12.00-30.15	Meta-tuff., finkorning, grønn, Mt-rik. Uklar lagning. Spredte karb.årer m. py og mt samt spor cp. Økende innh. av karb.årer ca.26 m		16.70: 60 ^O	
30.15-30.85	Albittfels, finkorning, grå m. karb. og litt py.			
30.85-35.00	Grafittfels, oppknust, litt py.			
35.00-47.40	Albittfels, grå-brun uren, finkornig. 35-36: py-rik 36-38: spor cp. Lokalt en diffus lagning.		37.40: 50 ^O	
	Hullet avsluttet v/47.40 m p.g.a. ras.			
	09.07.84			
	Ragnar Hagen			

LEGEND

Allochthonous rocks

6 Nalgamas and Tierta Nappes (Late Precambrian)

Autochthonous rocks

5 Invidal Group (Late Precambrian)

Precambrian rocks

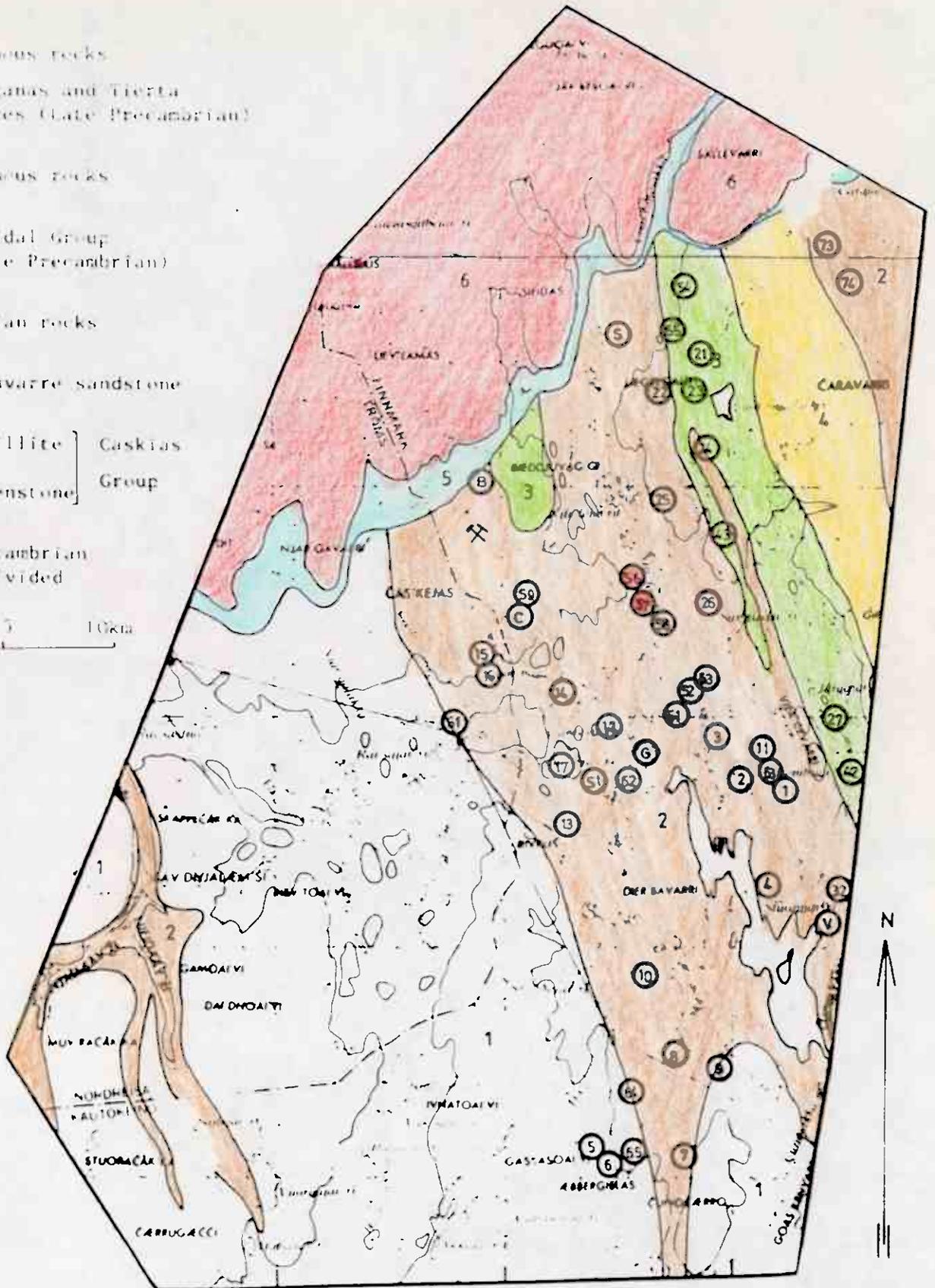
4 Caravarre sandstone

3 Argillite } Caskias Group

2 Greenstone } Group

1 Precambrian undivided

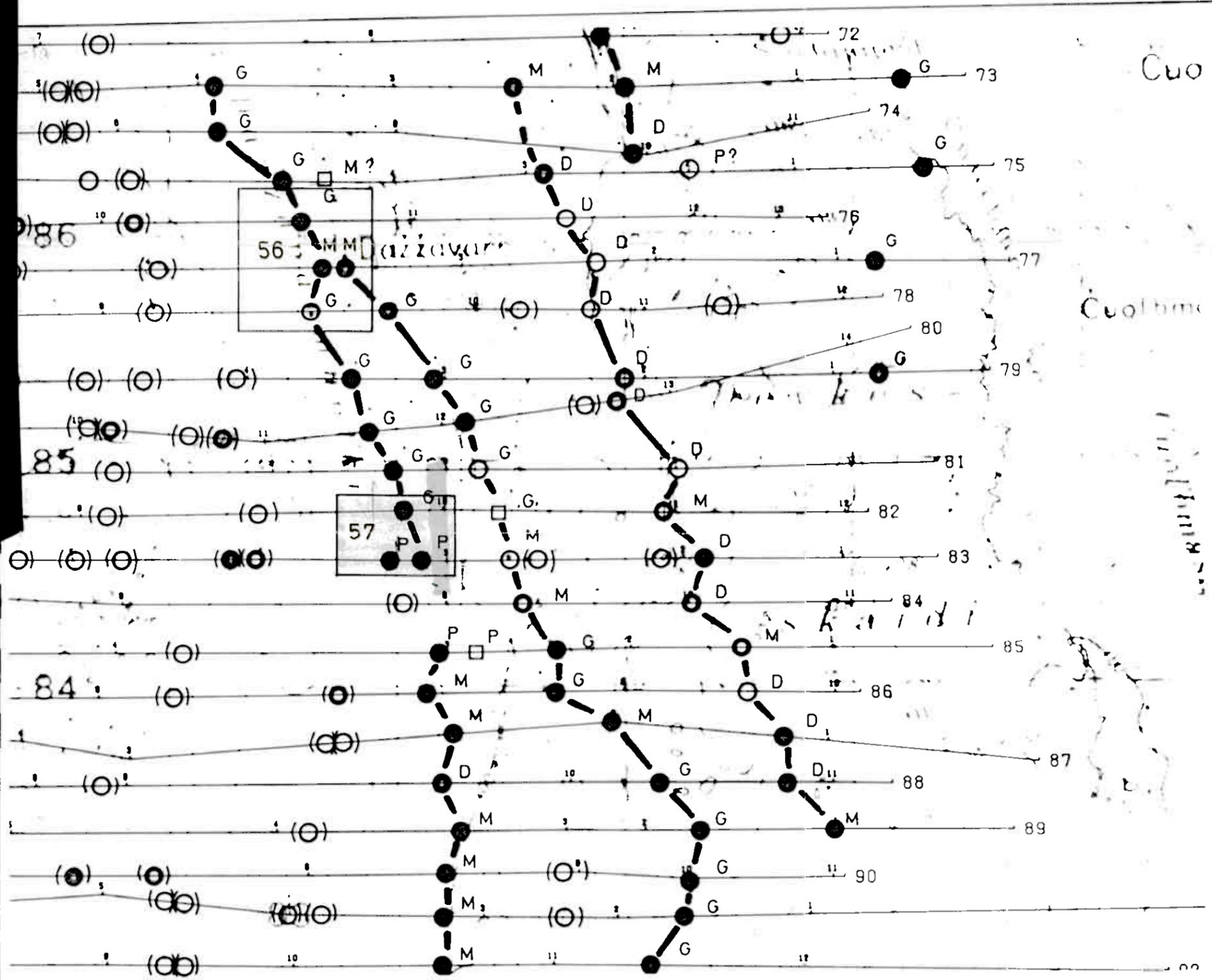
0 5 10 km



① Follow-up area.

Joint venture Norwegian Gulf - A/S Sydvaranger	Scale 1:250 000
	Trace
PROSPEKTERING A/S	Fig 1.

FIG. 2.

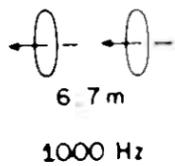


LEGEND

EM anomalies are graded as to the probability that they reflect bedrock conductors. There are four grades as follows:

Symbol	Probability Grade	Probability Rating
●	4	> 90%
◐	3	75-90%
◑	2	60-75%
○	1	40-60%

Vertical coaxial coils
 Coil separation
 Frequency

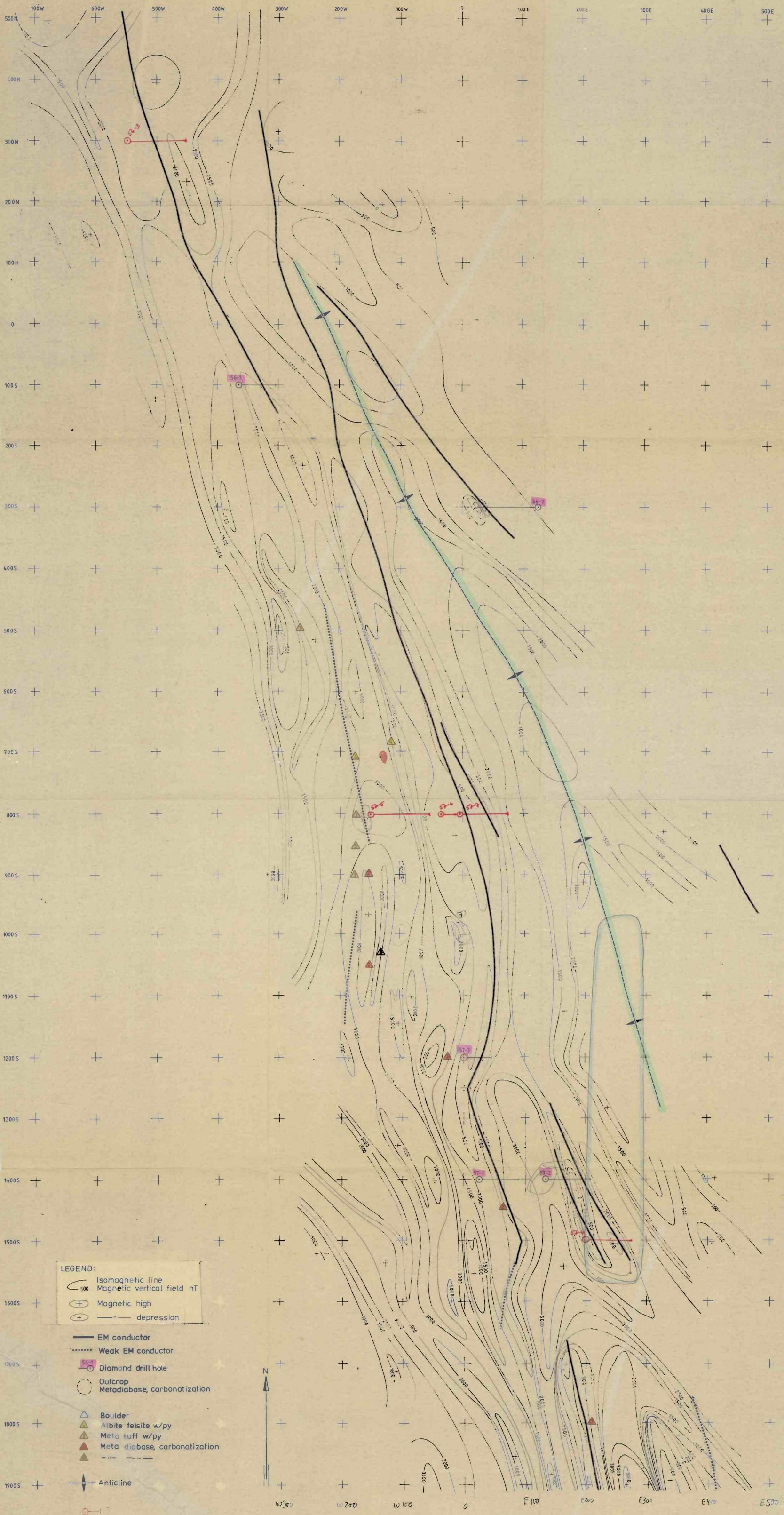


EM interpretation

- G - Good conductor ($R/I > 2$)
- M - Medium conductor ($1 < R/I < 2$)
- D - Poor conductor ($R/I < 1$)
- P - Quality of conductor undefined due to magnetic polarization.
- - Anomaly not recognized by Dighem's processing
- (○) - Anomaly caused by magnetic polarization or by conductive overburden.
- ⊗ - Anomaly caused by noise.
- ? - Interpretation uncertain.
- - Conductor axis.
- - Conductor axis, uncertain.
- ← - Positioning error.

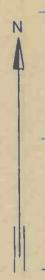
AREA 56, 57 Helicopter EM	M
	1:20000
	Målt:
	Tegn: RH 12/64
Trace:	
PROSPEKTERING A/S	Fig. 2

1-53



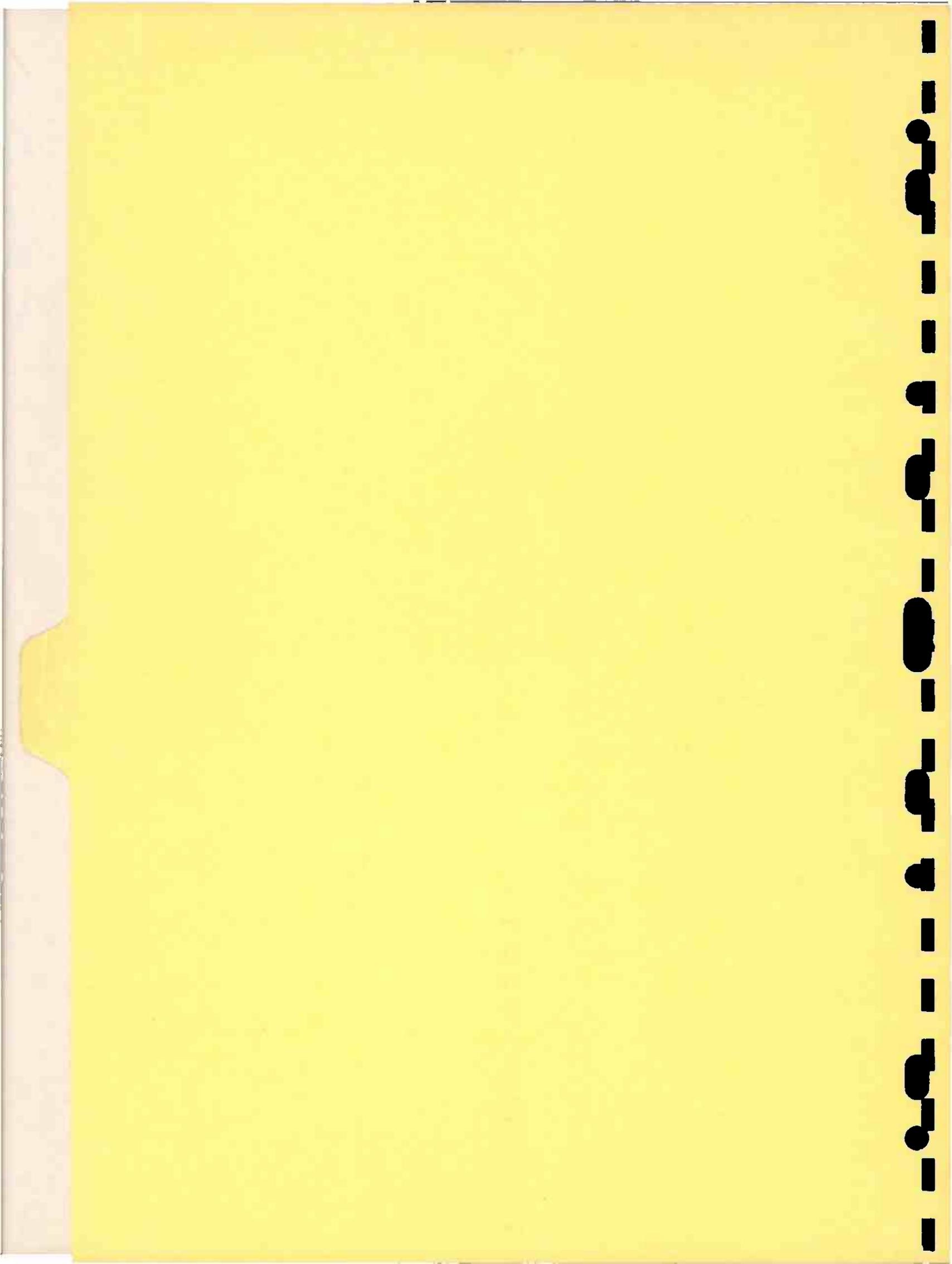
LEGEND:
 -500 Isomagnetic line
 Magnetic vertical field nT
 (+) Magnetic high
 (-) depression

— EM conductor
 Weak EM conductor
 (56-1) Diamond drill hole
 (O) Outcrop
 Metadiabase, carbonatization
 △ Boulder
 △ Albite felsite w/py
 △ Meta tuff w/py
 △ Meta diabase, carbonatization
 - - - Anticline



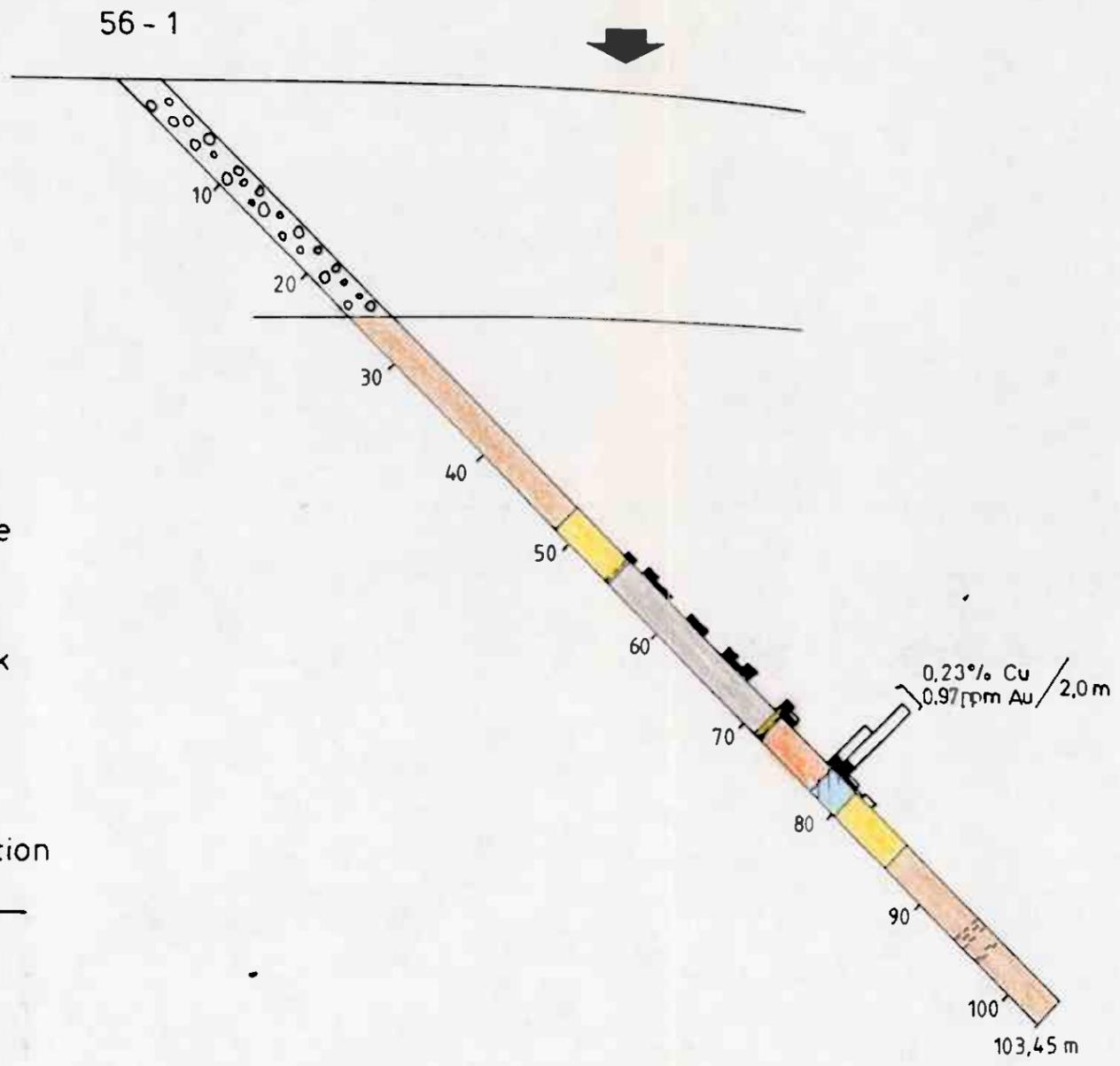
AREA 56, 57. Geophysics Geology Diamond drilling	M 1:2500
MAH	
Tegn-RH 12/84	
Trace RH 12/84	
PROSPEKTERING A/S	Fig. 3.

4-1-11



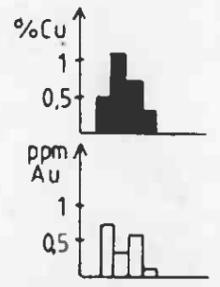
400W 375E 350W 325W 300W 275W 250W

470
460
450
440
430
420
410
400



LEGEND:

- Graphite felsite
- Altered rock
- Carbonate rock
- Albite felsite
- Meta tuff
- Cp - mineralization
- Py - " " "



EM-conductor

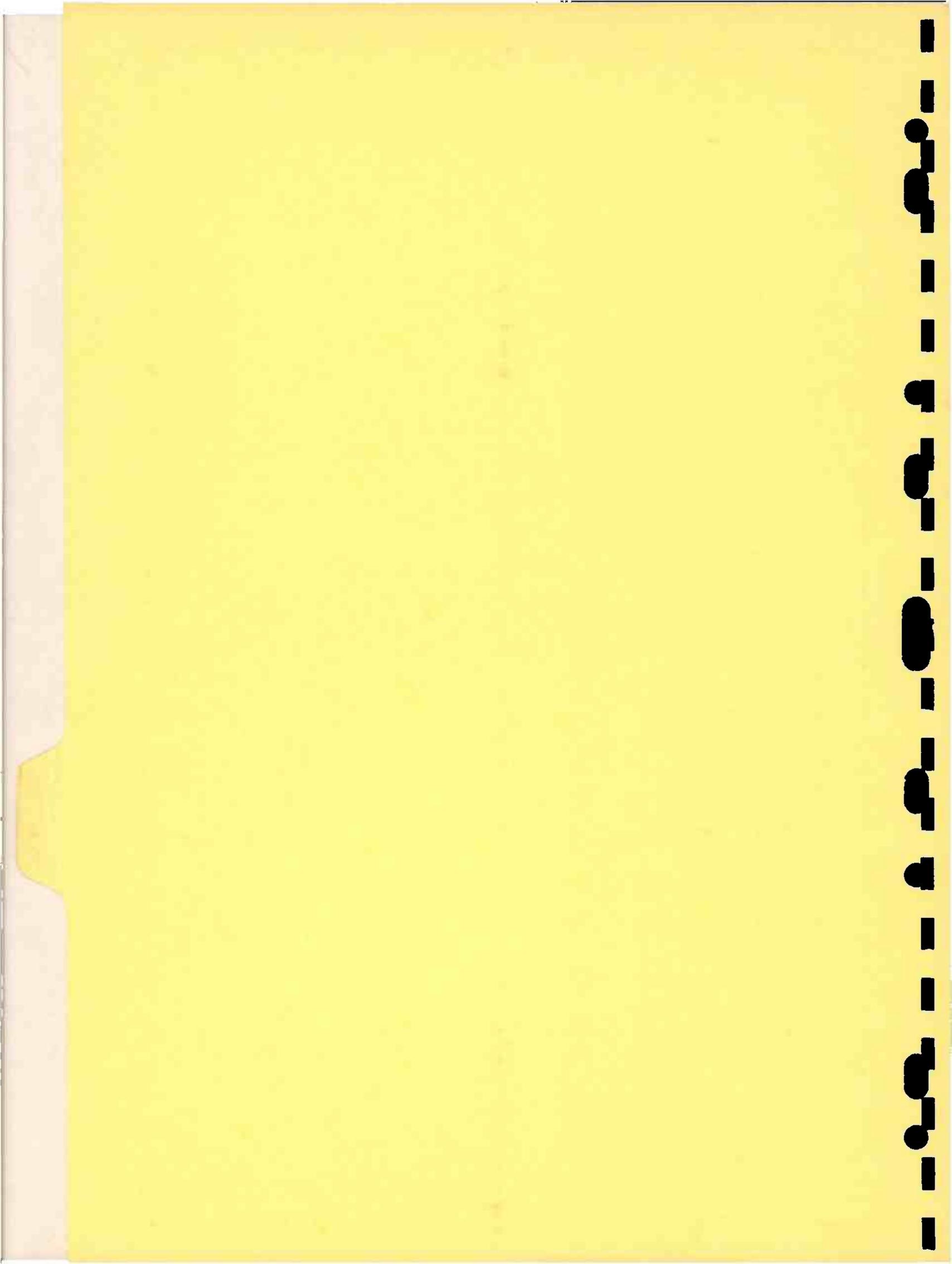
Core angles:



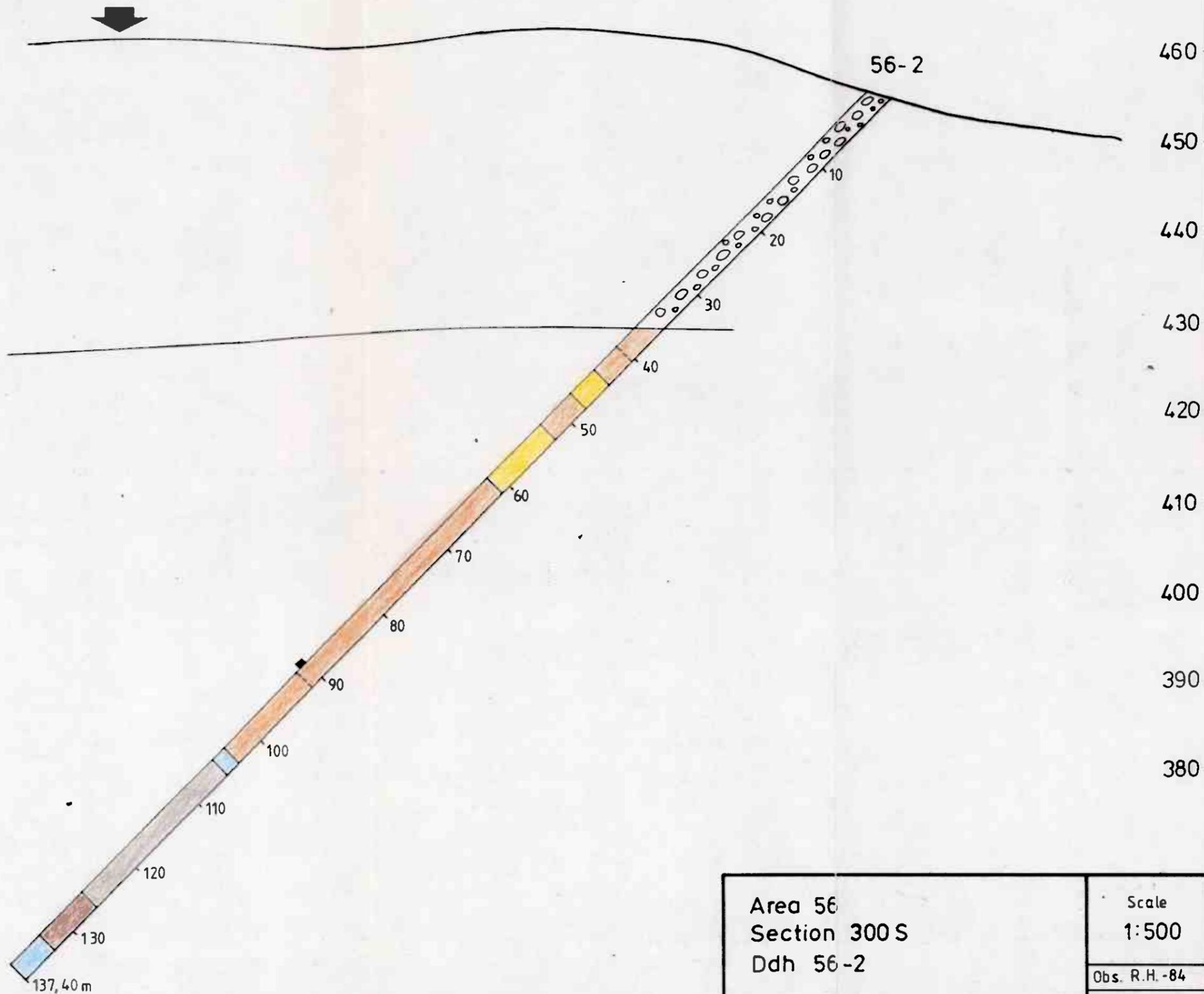
Area 56 Section 100S Ddh 56-1	Scale
	1:500
	Obs. R.H.-84
PROSPEKTERING A/S	Draw. R.H.-84
	Trace: H.B.-84
	Fig. 4

0,23% Cu
0,97 ppm Au / 2,0 m

103,45 m

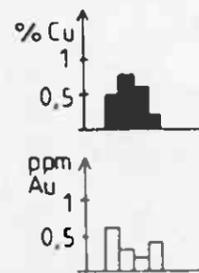


0 25E 50E 75E 100E 125E 150E



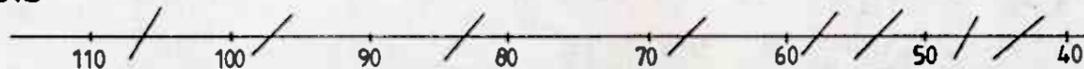
LEGEND:

- Albite felsite
- Meta tuff
- Graphitic schist
- Meta basalt
- Carbonate rock
- Py - mineralization



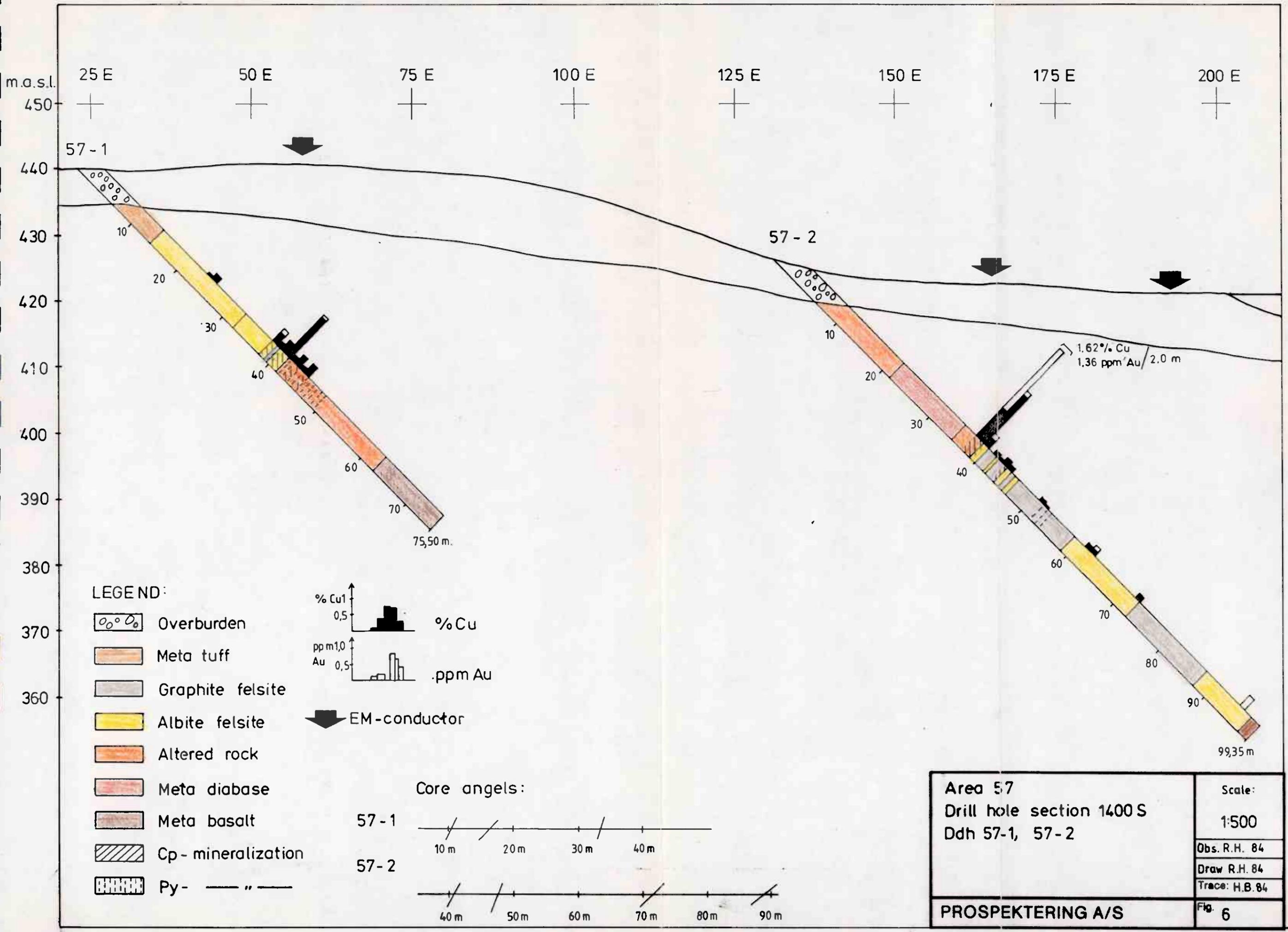
EM-conductor

Core angles:

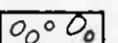
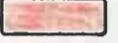


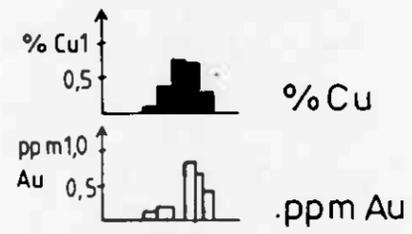
Area 56 Section 300 S Ddh 56-2	Scale 1:500
	Obs. R.H.-84
	Draw. R.H.-84
Trace: H.B.-84	
PROSPEKTERING A/S	Fig. 5

FIG. 6



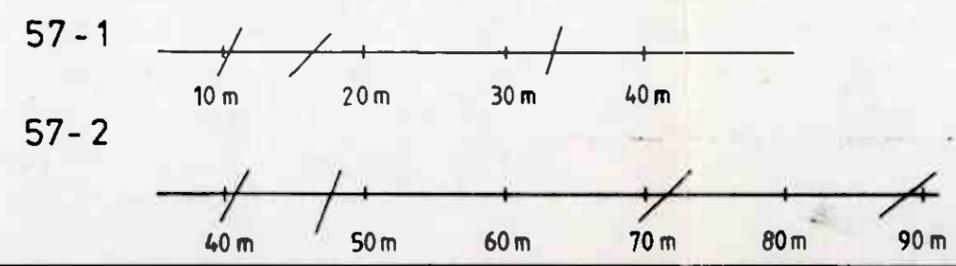
LEGEND:

-  Overburden
-  Meta tuff
-  Graphite felsite
-  Albite felsite
-  Altered rock
-  Meta diabase
-  Meta basalt
-  Cp-mineralization
-  Py- " "



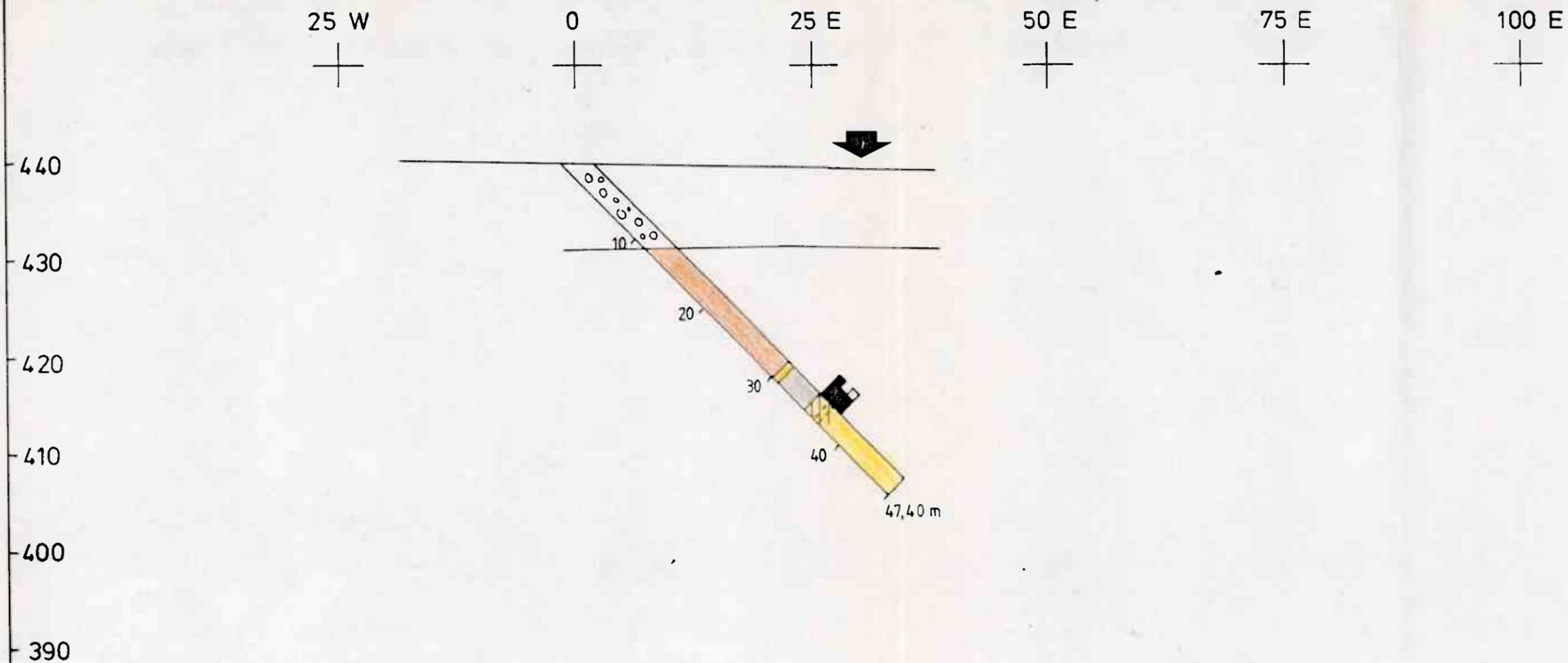
EM-conductor

Core angles:

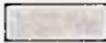


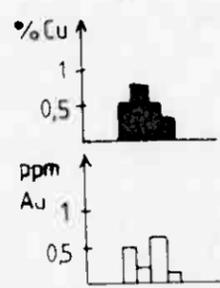
Area 57 Drill hole section 1400 S Ddh 57-1, 57-2	Scale:
	1:500
	Obs. R.H. 84
	Draw R.H. 84
	Trace: H.B. 84
PROSPEKTERING A/S	Fig. 6

FIG. 7.

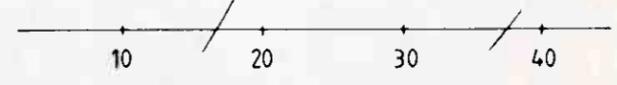


LEGEND:

-  Meta tuff
-  Graphite felsite
-  Albite felsite
-  Cp - mineralization
-  Py - " " "



Core angles:



Area 57 Section 1200 S Ddh 57-3	Scale 1:500
	Obs. R.H.-84
	Draw. R.H.-84 Trace: H.B.-84
PROSPEKTERING A/S	Fig. 7