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Rapportarkivet

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Kommer fra ..arkiv	**Ekstern rapport nr**	**Oversendt fra**	**Fortrolig pga**	**Fortrolig fra dato:**
Falconbridge	Sul 141-7-71			

Tittel

Evje Iveland Project.
Induced polarization survey, Kjettevann grid, vinter 1971

Forfatter	Dato	Bedrift
F Nixon	1971	Sulfidmalm A/S

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Iveland	Aust-Agder	Østlandske	15114 15123	Mandal

Fagområde	Dokument type	Forekomster
Geofysikk geologi	Rapport	Kjettevann (Mølland)
Råstofftype	**Emneord**	
Malm/metall	Ni Cu	

Sammendrag

Med geologisk blottningskart fra gridet som ligger på østbredden av Kjettevann (357 moh).

Mangler:
Metallfaktor kart, transparent magnetisk kart, borhull lok. kart, EM fra kjettevann 1968, IP-kart bilag 9-25.

A / S S U L F I D M A L M

EVJE-IVELAND PROJECT

INDUCED POLARIZATION
SURVEY - KJETTEVANN
GRID - WINTER 1971.

F. NIXON

1) SUMMARY OF PREVIOUS WORK

Nickel showings have been known in the Kjettevann area for many years. The known mineralized zone is situated near the eastern shore of Kjettevann and lies in a basic/ultrabasic phase near the contact of a norite complex. The geology is complex and the mineralization is erratically distributed. The zone has been traced by surface prospecting and diamond drilling over a strike length of almost 300 m in a NS/S direction. The average width of the zone is approximately 50 m.

Previous work on the propterty has consisted of the following:

Between 1957 and 1958 by Raffineringsverket A/S, Evje:

a) Magnetometer survey

b) Minor blasting of 2 small pits and some trenching plus the sinking of an exploration shaft to a depth of 20 m. A 50 m long drift ran in a NW direction from the bottom of this shaft.

c) Diamond drilling of 16 holes with a total length of 890,89 m.

The same company carried out the following exploration work in 1957-58:

D) "Electric" survey along the eastern shore of the lake.

e) Drilling of two holes.

Sulfidmalm began investigations here in 1967 and the following work has been carried out:

f) Regional mapping by the writer in 1967.

g) An E.M. survey was carried out by a Sulfidmalm crew on land in 1967 and on the frozen lake in 1968. Both gave negative results.

h) Detailed mapping was carried out by E. Overwien and the writer in 1968.

i) In 1967 and 1968 R. Sand carried out a geochemical investigation around the old workings at Kjettevann.

j) In 1969 Sulfidmalm carried out a magnetometer (Crasius "Mini-mag") survey over the known zone, and also a soil sampling survey to the south of the known mineralized zone.

k) In 1969 4 holes with a total length of 634.88 m were drilled by Sulfidmalm.

l) In 1970 8 holes were drilled to a combined length of 1811,06m.

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For more details the reader is referred to the following reports:

"Mineralization catalogue of showings in Evje-Iveland district", by Sulfidmalm geologists.

"Report on drilling at Kjettevann 1969" by F. Nixon and

"Report on drilling at Kjettevann 1970" by F. Nixon.

2) WORK CARRIED OUT

The I.P. survey was carried out using a McPhar Variable Frequency Unit (Model P 660) with operating frequencies of 0.3 and 5 cps. McPhar supplied one operator (A.W. Wood), Sulfidmalm being responsible for supplying the rest of the four man crew. The grid lines were chained by local help hired by Sulfidmalm. The project was co-ordinated and supervised by the writer.

Interpretation of the results has been undertaken by D.B. Sutherland, Chief Geophysicist, Falconbridge Nickel Mines Ltd.

The following profiles were run:

Line	Dipole separation	E/W extension	Total length
120 S	50 m	300 E - 250 W	550 m
60 S	50 m	300 E - 300 W	600 m
20 N	50 m	300 E - 300 W	600 m
80 N	25 m	150 E - 175 W	325 m
115 N	50 m	300 E - 300 W	600 m
140 N	100 m	300 E - 430 W	730 m
200 N	50 m	300 E - 300 W	600 m
200 N	25 m	150 E - 175 W	325 m
240 N	25 m	150 E - 175 W	325 m
300 N	50 m	300 E - 300 W	600 m
350 N	25 m	200 E - 125 W	325 m
400 N	50 m	450 E - 300 W	750 m
500 N	50 m	450 E - 300 W	750 m
600 N	50 m	450 E - 300 W	750 m
700 N	50 m	450 E - 250 W	700 m
800 N	50 m	400 E - 200 W	600 m
900 N	50 m	450 E - 250 W	700 m
1000N	50 m	450 E - 250 W	750 m
		Total line distance	10.600 m

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A magnetometer survey was carried out by L. Nesvoll of Sulfidmalm using a McPhar M 700 Fluxgate magnetometer. The mag. survey was run in the same grid lines as the I.P. with fill in lines so that the maximum distance between profiles was 50 m. A total of 15.5 profile-kms were measured with approx. 1300 readings.

3) RESULTS

The anomalies discovered have been divided into 3 classes. Class 1 - anomalies being the strongest and most interesting anomalies, class 3 being the weakest.

In the following table the anomalies are numbered and their location and class given.

LIST OF ANOMALIES - KJETTEVANN GRID

No.	Line	Dipoles	E/W co-ordinates	Class
1	120 S	50 m	25 W - 75 W	3
2	80 S	50 m	0 - 50 W	3
3	20 N	50 m	10 W - 40 W	1
			40 W - 75 W	2
			10 W - 25 E	2
4	80 N	25 m	25 W - 50 W	1
5	115 N	50 m	0 - 40 W	1
			40 W - 75 W	2
6	140 N	100 m	0 - 100 W	1
7	200 N	50 m	0 - 50 W	1
			50 W - 140 W	3
8	200 N	25 m	30 W - 70 W	1
			15 W - 30 W	2
			70 W - 85 W	2
9	240 N	25 m	25 W - 75 W	2

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No.	Line	Dipoles	E/W co-ordinates	Class
10	240 N	25 m	0 - 25 E	2
11	300 N	50 m	25 E - 75 E 75 E - 125 E	2 3
12	350 N	25 m	10 E - 10 W	2
13.	350 N	25 m	40 E - 110 E	3
14	400 N	50 m	50 W - 0 0 - 100 E	2 3
15.	500 N	50 m	50 W - 0 0 - 75 E	2 3
16	600 N	50 m	0 - 100 W	3
17	900 N	50 m	250 E - 300 E	3
18	1000N	50 m	250 E - 290 E	3

The magnetic data is presented as an isoanomaly map in scale 1 : 1.000.

4) INTERPRETATION

D. B. Sutherland's verbal and written comments to the writer have been incorporated into this section.

The I.P. survey has outlined the known zone of sulphide mineralisation. No other geophysical method used on this property has succeeded in doing this previously.

The area of basic and ultrabasic rocks that have been outlined by drilling and surface mapping, seem to be characterized by broad areas of moderate frequency effects with values ranging from 3-8 percent. It is interesting to note that this F.E. zone seems to extend beyond the drilled zone to as far as line 600 N.

The metal factor values for the area are quite low and without the close geological control that we have in this area, the anomalies might be considered to be of minor importance. Metal factor values in the order of 10 to 20 units appear to correlate closely with the known zone of sulphide mineralization from

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line 0/0 to at least as far north as line 200 N, and possibly a continuation of this zone is reflected by similar metal factor values from 200 N to 400 N.

Contoured n=1 metal factor values for the 50 metre spreads show highs occuring over the known mineralization, but also show an offsett zone to the east between 200 N and 400 N and an area of good closures between 400 N and 500 N, this latter area being in strike continuation of the main zone.

The high metal values are all associated with distinct resistivity lows.

The anomalies in the known mineralized zone (anomalies 3 - 9) all appear to represent near vertical sources that are shallow and have a low to moderate metallic content and are about 50 m wide. The zone was outlined quite well by the 50 m dipoles used for the initial survey.

The magnetic survey shows that the area over the known mineralization is characterized by a zone of low readings in the range 0 - 500 gamma except for an isolated area on the west side of the base line between 0 and 50 N, where values are in the order of 1000 - 2000 gamma and also on line 240 co-incident with anomaly 9, where values are in the 1000 gamma range.

This main anomaly zone is situated over the area where basic and ultrabasic rock types outcrop. It is with these rocks that the mineralization is dominantly associated. North of line 200 N surface outcrops are different in character and barren gabbro types dominate , however, a drill hole on line 260 N intersected mineralized meta ultrabasics at depths.

There is some evidence that a NW/SE trending fault runs just north of line 200 and the offset I.P. anomalies migh reflect this. There are also fault indications on the mag. map and the contoured n=1 resistivities.

A short description of the anomalies in the known mineralized zone follows:

Anomaly 3 A definite class 1 anomaly, indicating a shallow source with a concentrated core and weaker metallic content on the flanks.

Anomaly 4 Again a strong shallow anomaly. Probably about 25 m wide. With the 25 m dipoles used, one would have expected higher metal factor values and it is a little surprising that this did not occur.

Anomaly 5 Again a fairly strong response.

Anomaly 6 This 100 m dipoles anomaly indicates a shallow source.

Anomaly 7 Reflects a definite shallow source on the east of a broad weak zone.

Anomaly 8 (Anomaly 7 on 25 m dipoles) shows a complex source 25-50 m wide. There now seems to be some depth to the top. A definite increase in metal factor values.

Anomaly 9 A moderate shallow source. Is associated with higher magnetic values than the above mentioned anomalies, and lies in the supposed fault zone.

To the south of line 0/0 there are indications that a narrow zone of the known mineralization may continue south. The anomalies are quite weak and unfortunately located at a depth of more than 25 m and cannot be detailed easily with shorter dipoles. These two anomalies (No. 1 and 2) fall partly within magnetic highs.

As mentioned above I.P. anomalies continue to the north of line 200 N and may represent a continuation of the known mineralized zone. The I.P. results, however, are generally different in character from those in the main zone.

Anomaly 10 (offsett anomaly on line 240 N) suggests a narrow shallow zone that could possibly have high metallic content. Hematite and magnetite are known to occur in this area, and the mag values are locally as high as + 700 gamma.

Anomaly 11 (also offsett to the east of the baseline) indicates a moderate source at depth on the edge of a broad weak source of low metallic content. Depth to the top is greater than 25 metre. The magnetic values over the anomaly range from + 200 gamma to + 600 gamma. Rock outcrop on surface gives no indication of sulphides.

Anomaly 12 This is a single station high (M.F. 18 on N=4) and may reflect a better source at depth. It needs some detail to confirm it existence.

Anomaly 13 Reflects a broad source of low metallic content. High resistivities. Magnetic values are fairly high + 1000 gamma to + 2000 gamma. Magnetite is seen in outcrop, so this anomaly probably indicates magnetite dissemination occuring over a width of approximately 100 m.

Anomaly 14 Indicates a bread, weak shallow source with some improvement to the west. (from 0 - 80W). This better part is associated with fairly low resistivities, whereas the weaker part to the east is associated with much higher resistivities and also higher frequency effects. There is also a marked magnetic gradient between the two anomaly parts, the westerly being associated with values in the range + 400 gamma to + 700 gamma, whereas the easterly portion has values over + 1000 gamma.

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It is suggested that the easterly portion is due to disseminated magnetite, whereas the westerly is possibly due to some sulphide source.

Anomaly 15 Gives the same general pattern as anomaly 14, but weaker and is probably due to the same causes.

Anomaly 16 Suggests a weak, broad, shallow source. Low resistivities might suggest a fairly basic rock type. Mag. values vary from + 300 gamma to -500 gamma. Suggests a rock type with minor amounts of metallics rather than an important source containing sulphide mineralization.

To the north of this anomaly the effects become very feeble and no anomalies can be defined except No. 17 and 18 which lie far to the east.

These anomalies between line 200 N and line 600 are considered to be important. Anomalies 10 and 11 indicate some concentrated source, and anomalies 12 and the westerly portions of 14 and 15 seem to indicate a sulphide source. The contoured M.F. maps give interesting closures in this area and the anomalies are partly associated with magnetic lows. Mineralized ultrabasics encountered in a drill hole on line 260 N have not been closed to the north, so it would appear that there is a good chance for additional mineralization in this area.

Anomalies 17 and 18 Weak, shallow, indications that will be checked up on the ground.

RECOMMENDATIONS

The best anomaly zone i.e. from 0 - 260N has already been drilled by Sulfidmalm on the basis of geology. The 100 m dipoles profile on line 140 N suggest that the mineralization does not have great extensions at depth. At present no further work is recommended on this zone.

On the basis of the geological, drilling, magnetic and I.P. evidence no further work is recommended to the south of the main zone.

As mentioned above there is a strong chance for additional mineralization between 200 N and 500 N, and it is recommended that this zone be investigated further by soil sampling and diamond drilling. The best sulphide intersections for Ni were obtained in the northern end of the main zone in meta ultrabasics and the possibility that these rocks extent north should be checked out even though the anomalies are not so well defined as to the south.

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It is also possible that there may be some depth to some of the anomalies in this northern zone.

Anomalies 17 and 18 should be checked on the ground by surface examination and soil sampling.

ENCLOSURES

Fargekode mangler

1) Plan map showing geology and topography in the grid area, the I.P. anomalies are plotted and numbered. Scale 1:5000.

2) Transparent overlay of contours of Metal Factor values for n=1 on 50 m spreads 1:5000.

3) Transparent overlay of contours of Metal Factor values for n = 2 on 50 m spreads 1:5000.

4) Transparent overlay of contours of apparent resistivity for n = 1 on 50 m spreads. 1:5000.

5) Transparent overlay of magnetic anomalies. 1:5000.

6) Magnetic anomaly map. 1:1000.

7) Electromagnetic map from Kjettevann 1968. 1:1000.

8) Map showing location of drill holes. 1:1000

9-25 Individual I.P. plots with anomalies marked and numbered.

2/6-71
PH/jr

A/S SULFIDMALM

L E G E N D

Pegmatite

Basic - Ultrabasic Phases of Gabbro Complex

Gabbro/Meta Gabbro

Amphibolite/Massive Amphibolite

Hornblende Gneiss

Dioritic Gneiss

Coarse HB Dioritic Rock

Granitic Gneiss

po pyrrhotite

py pyrite

pn pentlandite

cp chalcopyrite

mt magnetite

s sulphides

old mine working

prospect pit

foliation

joint

lineation

migmatitic

I.P. anomalies 50 m spread

I.P. anomalies 25 m spread

I.P. anomalies 100 m spread

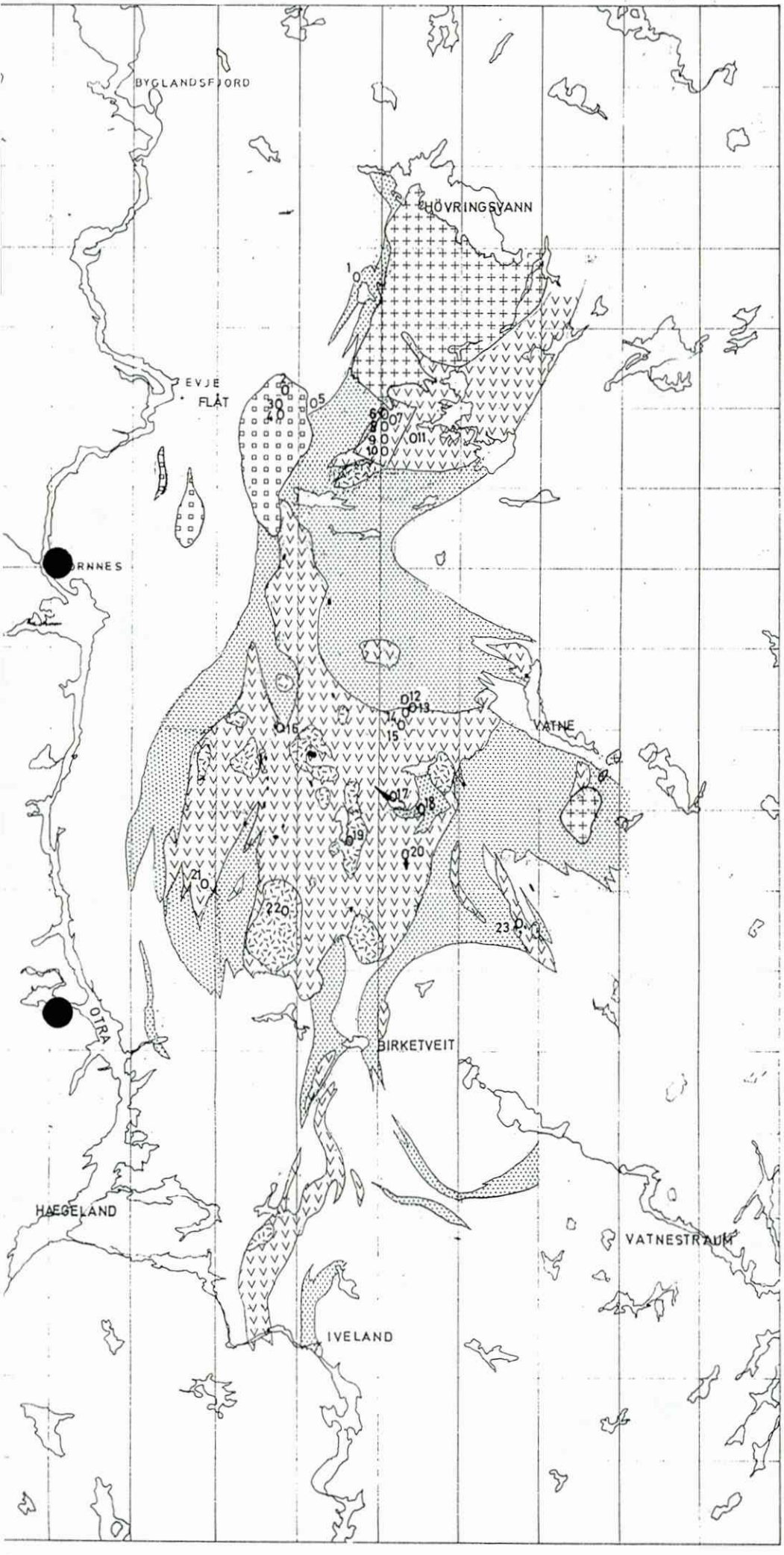
Class 1

" 2

" 3

8/7-71

FN/hm



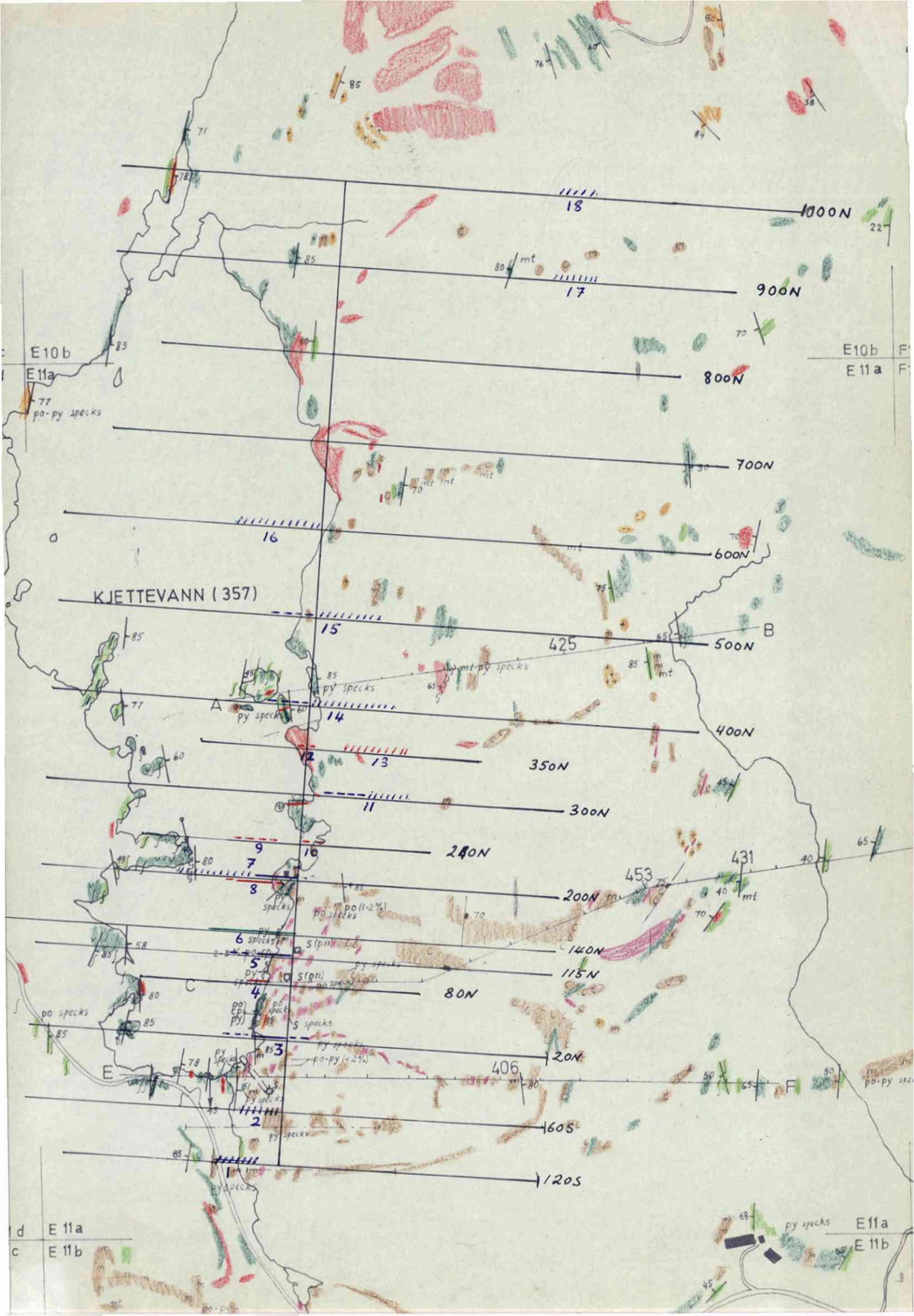
EVJE-IVELAND ARE

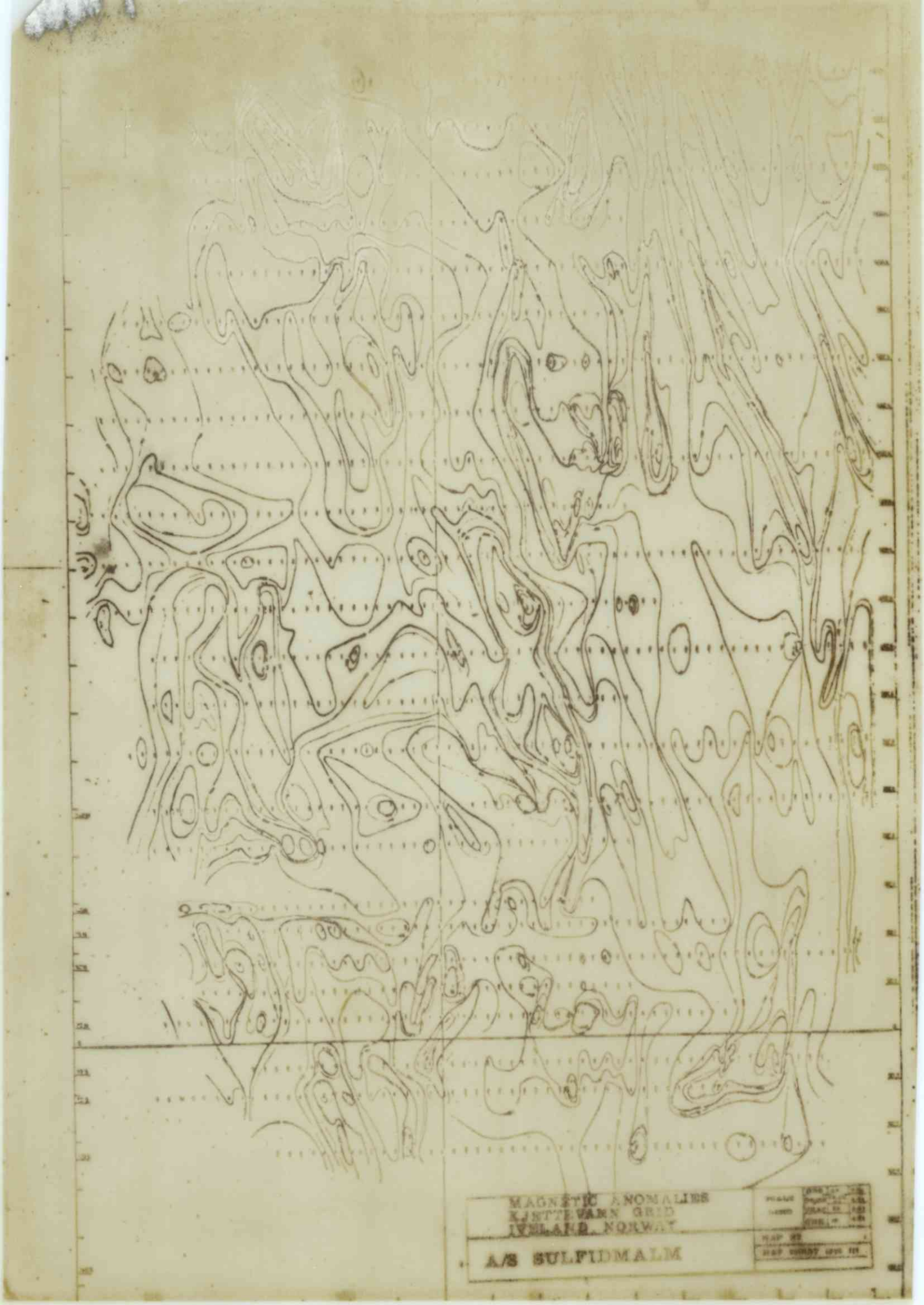
- GRANITIC AND DIORITIC GNEISS
- AMPHIBOLITE FOLIATED AND MASSI
- HORNBLENDE GNEISS
- GABBRO
- HORNBLENDE DIORITE
- ULTRABASIC
- GRANITE

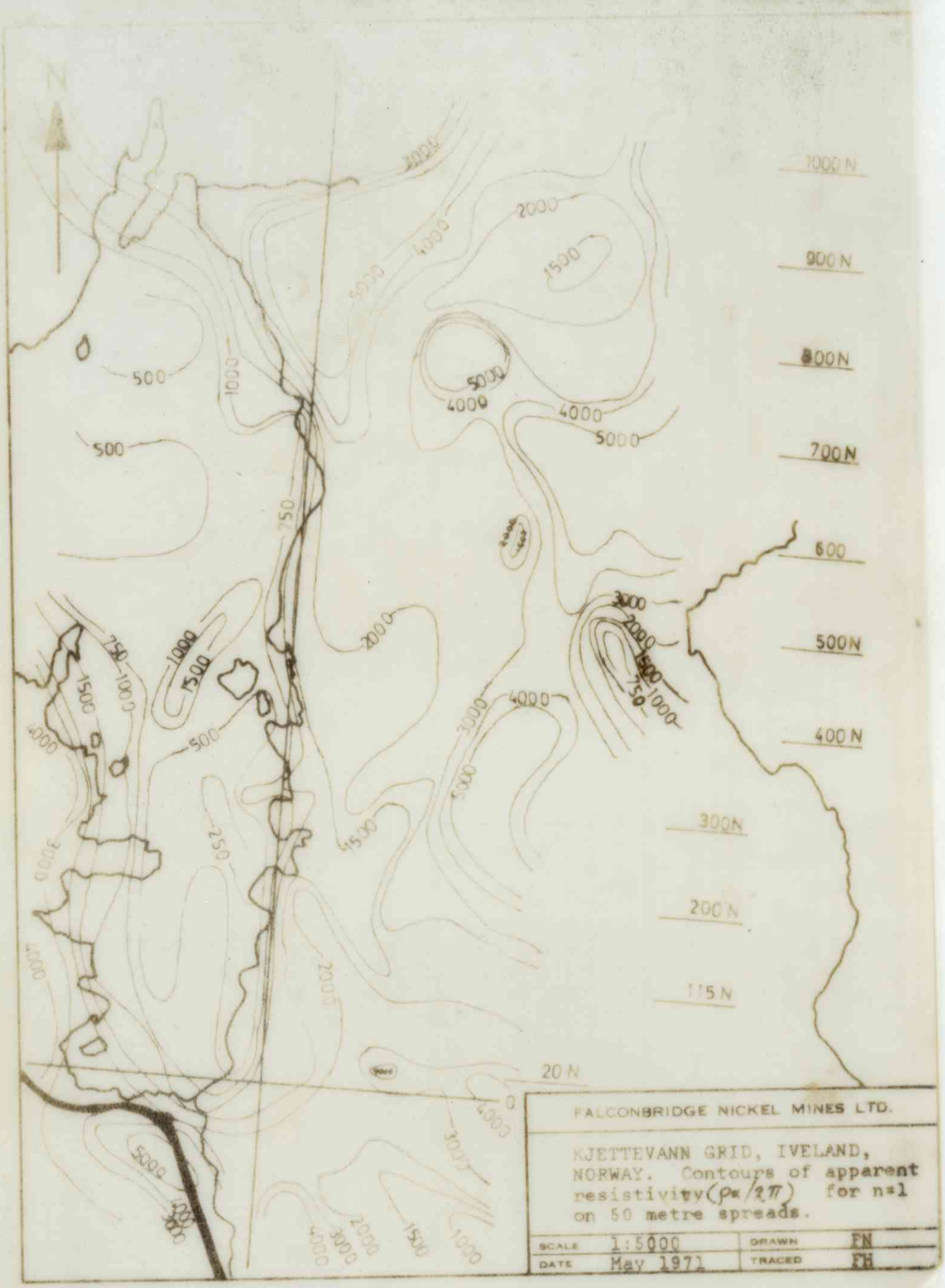
1 st. AAR[illegible]AU PROSPECT
2 FLATERYGD "
3 FLÅT MINE
4 MYKLEÅSEN PROSPECT
5 STABBESTEN "
6 HESTÅSEN "
7 LANGTJERN "
8 LOMTJERN "
9 GULREGN "
10 BYTTINGSMYR "
11 VIKSTÖL "
12 N. PAASCHE "
13 S. PAASCHE "
14 BEKKEN "
15 ORREKNAPPEN "
16 LITJERN "
17 KLEPPTJERN "
18 EPTEVASSMYR "
19 MÖLLAND (Kjetlevann)
20 HAALAND "
21 LANDAAS "
22 SKRIPELAND "
23 ELSHAUGEN

AAVITSLANDSHEIA GRID AREA

0 1 2 3 4 5KM


KJETTEVANN (357)
1000N
900N
800N
700N
600N
500N
400N
350N
300N
240N
200N
140N
115N
80N
20N
60S
120S
E10b
E11a
E11b
E10b F
E11a F
E11a
E11b
A
B
C
E
F
425
453
431
406
po-py specks
py specks
mt-py specks
po specks
S specks
po (1-2%)
po-py (<2%)
S(pn)

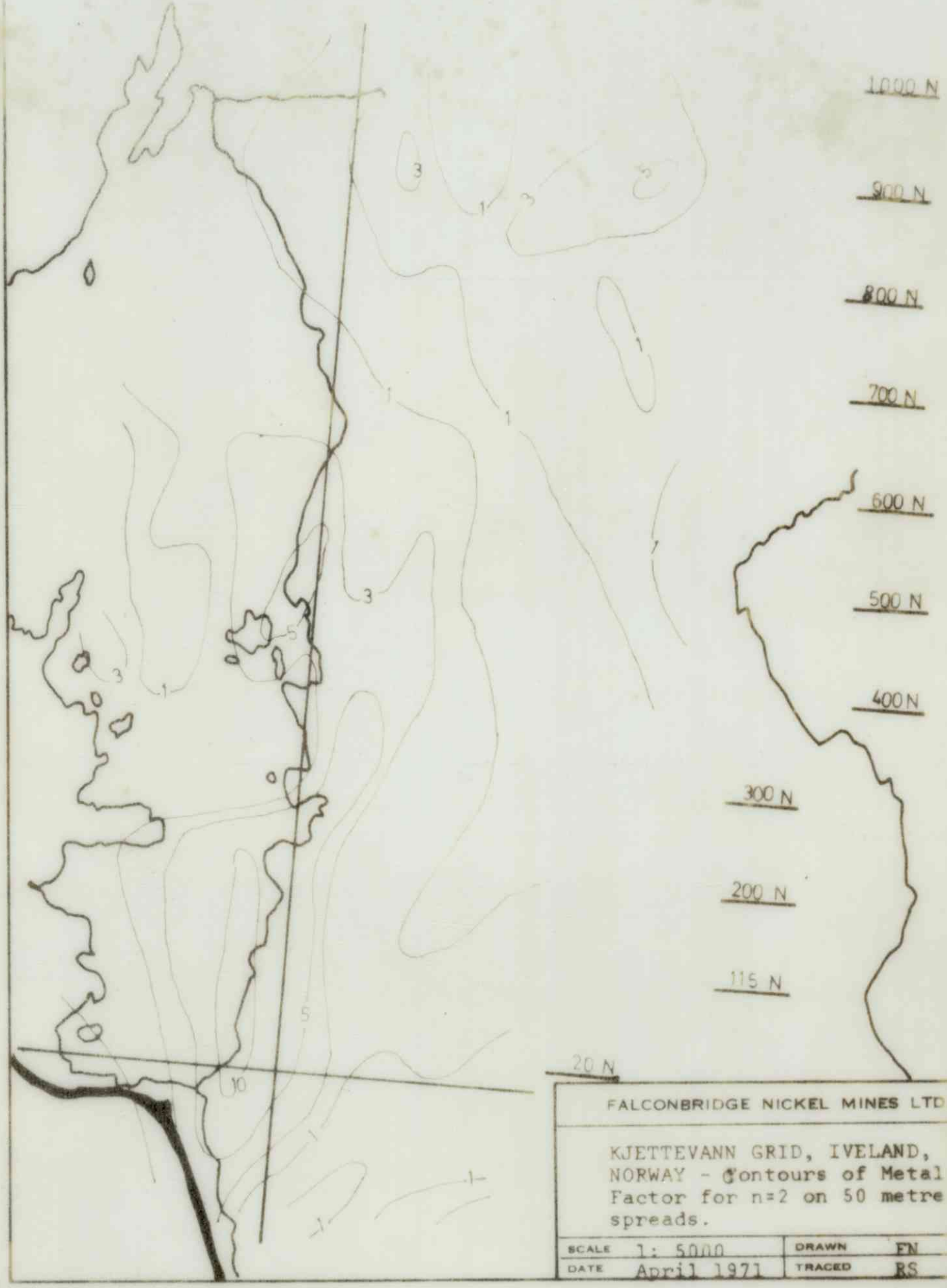

MAGNETIC ANOMALIES
KJETTEVANN GRID
IVELAND NORWAY
A/S SULFIDMALM



FALCONBRIDGE NICKEL MINES LTD.

KJETTEVANN GRID, IVELAND, NORWAY. Contours of apparent resistivity ($\rho_a/2\pi$) for n=1 on 50 metre spreads.

SCALE	1:5000	DRAWN	FN
DATE	May 1971	TRACED	FH



FALCONBRIDGE NICKEL MINES LTD.

KJETTEVANN GRID, IVELAND, NORWAY - Contours of Metal Factor for n=2 on 50 metre spreads.

SCALE	1: 5000	DRAWN	FN
DATE	April 1971	TRACED	RS