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FOR FALCONBRIDGE NIKKELVERK A/S
A/S SULFIDMALM

GEOLOGICAL, GEOPHYSICAL AND DIAMOND DRILLING INVESTIGATIONS IN THE ESPEDALEN BASIC COMPLEX 1974.

PROJECT NO. 905 15

JOINT VENTURE
NORSK HYDRO A/S - A/S SULFIDMALM

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Inneholder bilagene
1 - 12
20, 22
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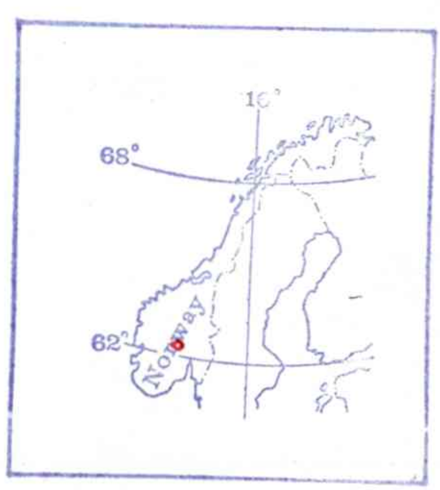

BV 1217

Report No. 344/74/15

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INTRODUCTION

This report deals with work carried out in 1974 as part of a continuing project to assess the nickel potential of the Espedalen area.
The project is a joint venture between Norsk Hydro A/S and A/S Sulfidmalm.
All operations in 74 have been carried out by Sulfidmalm.

PREVIOUS WORK

The reader is referred to the following reports:

32.64.15	Report from a geological and geophysical survey in Espedalen, Oppland. E. Overwien.
127.71.15	Mise-a-la-masse potential measurements, Espedalen August 1971. A. Sindre
128.71.15	A geochemical orientation study in the Espedalen area. R.B. Band
129.71.15	Photogeology of the Espedalen area. L. Lucarelli
187.72.15	Summary of field work in the Espedalen area August 72. B.H. Wilson
191.72.15	Andreasberg Mine Espedalen. B.H. Wilson
192.72.15	The Nicoline Mine Espedalen. B.H. Wilson
193.72.15	Statsråd Stang Mine Espedalen. B.H. Wilson
229.72.15	Field work in Espedalen 1972. M.J. Ryan
236.72.15	Geochemical till sampling in Espedalen, T.H. Tan, J.B. Gammon
238.72.15	Ground geophysical surveys over the Andreasberg and Megrund areas Espedalen. Norsk Hydro A/S
264.73.15	Soil geochemistry in Megrundtjern area Espedalen. R. Hovland
265.73.15	Prospecting work in the Grasgardli area Espedalen. R. Hovland
269.73.15	A summary of the geology, nickel potential and exploration in the Espedalen area. F. Nixon.

The latter report gives a resume of all previous work.

WORK CARRIED OUT

1. Regional V.L.F. and magnetic ground survey covering the basic complex on the west side of Espedalsvann.
2. Detailed follow up of regional anomalies with geology, geophysics, sampling and winkie drilling.
3. Some detailed work on selected areas on the east side of the lake i.e. Stang, Jorstad, Evans, Stubberud area.
4. Flotation tests on ore from Jorstad and Grasgardli.
5. Claim staking.

RESULTS

A regional V.L.F. and magnetic ground survey was carried out on the west side of the lake from Vassend to Grasgardli. The survey was carried out under winter conditions. Profile spacing was 250 m (100 m at Grasgardli) with 25 m between each observation point. 50 profilkms covered with 250 m spacing and 15 profilkms with 100 m spacing.

Instruments used were CRONE EM16 VLF unit and McPHAR M700 fluxgate magnetometer. Results are presented on enclosures 1 - 7.
Enclosure 1 shows the Fraser contoured V.L.F. data from the entire area. Enclosures 2 - 7 show mag and V.L.F. data for the 3 grid areas Vesle, Nordgardseter and Grasgardli. As will be seen from the maps the area is dominated by linear V.L.F. and magnetic anomalies with a NW/SE strike and often a considerable extent. There is a good correlation between magnetics and V.L.F. measurements.

On the basis of the initial regional survey carried out in March, certain areas were picked out for detailed follow up work. This will be described below.

GEOLOGY

INTRODUCTION

Geological mapping has been carried out in a number of detailed grid areas. Usually the amount of outcrop has been very limited and only in the Megrundstjern - Grasgardli area are the outcrops sufficient to give a detailed geological picture, - thus this account of the geology is mainly based on the observations around this Megrundstjern - Grasgardli area.

REVIEW OF THE GEOLOGY

The area in question is part of the Espedalen thrust sheet and is considered as being genetically related to the Jotun nappe structure which occupies the central massif of the Norwegian Caledonides.

The anorthosite-suite rocks of the area have long been considered as being genetically related as part of a complex magmatic differentiation which has been obscured by tectonic transformations. The present field work suggests an alternative interpretation of the Espedalen rocks, essentially based on observations which indicate that the sulphides were introduced with younger intrusions of norite-pyroxenite into pre-existing anorthosites - anorthosite gneisses and pyroxene gneisses.

ROCK UNITS IN THE AREA

The rocks of the Espedalen thrust sheet can be divided into two large groups: precambrian crystalline rocks, essentially of the anorthosite kindred and eocambrian sediments. Both groups are allochthonous, resting on autotochnous cambro-ordovician schists.

The dominant crystalline rock type is anorthosite and anorthosite norite - in the Megrundtjern - Grasgardli area replaced by pyroxene gneisses. Norite - pyroxenites are less frequently present. Thin layers of garnet bearing acid gneisses are also present.

FIELD DESCRIPTIONS OF THE MAIN ROCK TYPES

ANORTHOSITES AND GNEISSES

These vary with increasing mafic content from pure anorthosite - through anorthosite gneiss to pyroxene gneiss. These are the only rocks that seem to have an orientational fabric - either a strong linear or planer fabric, essentially due to elongated feldspars and/or mafic aggregates.
Migmatitic structures can often be found in these rocks, and they can also be seen to be silicified.

Magnetite and pyrite are fairly common in this rock group and locally pyrrhotite and chalcopyrite can be seen often in association with silicification. Small patches of quartz rich garnet biotite gneisses are found in places.

THE MAGMATIC SUITE

On the western side of Espedalsvann a considerable amount of the area is made up of non foliated mafic rocks, often showing typical igneous textures. These are norite and pyroxenite.

NORITE - LEUCONORITE

The norite - leuconorite suite rocks are eugranular subophitic, medium to coarse grained rocks with varying amounts of felsic minerals. The colour index varies from 30 - 70. The transition between the two types seems gradational and the spatial distribution between the two types is complicated and apparently arbitrary.

A very coarse grained leuconorite is often found in the vicinity of pyroxenite. This coarse grained leuconorite is found (Megrundstjern and Grasgardli) to contain higher amounts of disseminated sulphides than the remaining norite-leuconorites, in which oxides often dominate among opaque phases.

The borders of norite-leuconorite against gneisses are in general sharp and well defined. In places xenoliths of pyroxene gneiss have been found in norite thus indicating a relative time-relationship between the two.

The border towards pyroxenite is also well defined, although gradational on a mesoscopic scale and with a very lobate and irregular course. Nodules of pyroxenite with completely gradational transition are found in norite and vice versa.

However, most borders in the area show strong shearing and mylonitization.

PYROXENITE

Pyroxenite is a general term used to cover all utramafic rocks in the area, however, in several localities olivine or its serpentinized equivalents have been recognized and here peridotite is a more correct term.

Pyroxene and amphibole constitute more than 90% of the silicates in this rock. Orientational fabric is generally absent, however, locally the rock shows a plane-parallel cleavage with a parting of several cm. This direction can be shown to be parallel to strong shear planes within the rock sequence, and parallel to the thrusting and mylonitization associated with the overlying Valdres Sparagmite. Additionally, zones of local shear are often encountered in the pyroxenites.

Sulphides are essentially found as disseminated grains or aggregates of pyrrhotite and chalcopyrite. The former dominates with po/cp ratios usually being greater than 5. The content of sulphides varies from nil to 20% and is locally much higher. Distribution is often remarkably even on the mesoscopic scale.

The borders of the pyroxenite are often strongly sheared.

SCHISTS

ARGILLITE SCHIST

Structurally on top of the crystalline rocks and occasionally also within the sequence, rocks of likely sedimentary origin are found. The presence of well preserved sedimentary structures, such as crossbedding, lamination and slump structures confirm this.

The rock appears as a very fine grained, greenish schist and it possesses a strong schistosity despite the presence of primary structures.

The borders are sharp against gneisses and norite and the absence of mylonites along this boundary indicates that the argillite schists might have been deposited as early Eocambrian sediments.

The structurally upper boundary of the argillite schist is, however, tectonic in character, as here a very finegrained, massive mylonite borders the schist against the Valdres sparagmite on top.
Pyrite is frequently observed in the argillite schists as very small single grains, and locally as secondary joint precipitations.

VALDRES SPARAGMITE

Valdres sparagmite occurs in the area as a medium grained schistose meta-greywacke.

At several places the rock shows complex-folding. No sulphides have been observed in the Valdres sparagmite.

TECTONICS

Again structural interpretation is made difficult by lack of outcrop over the entire area. In the northern part of the area the structural trends seem to be greatly affected by thrusting tectonics.

Figs. 1 and 2 show some plotted structural observations.

The fact that the constructed fold axes of the pyroxene gneiss are parallel to the lineations, which are the intersections between foliation and later schistosity is presumably a co-incidence, because the later schistosity is parallel to one of the limbs of the fold (fig. 1).

The strong maximum density of poles of shear planes are more randomly distributed, and this agrees well with observations in the field, suggesting that the shearing is often local in character. (fig. 2).

Faulting and jointing are also dominant in the area, varying from small cracks to pseudotachylite-cemented fault zones. The orientation is apparently random but an east-west orientation seems to dominate.

MINERALIZATIONS

MINERALOGY

The following is based on field observations.

Both sulphides and oxides are abundant in selected areas although Fe sulphides are the commonest. The sulphides in order of decreasing abundance are pyrrhotite, chalcopyrite, and pyrite, pyrrhotite generally constituting more than 60% of the sulphides present in a sample . Most po-bearing samples in norite-pyroxenite have been treated with dimethylglyoxime with a positive result. Po-bearing samples from anorthosite and pyroxene gneiss have failed this test.

Magnetite and ilmenite are the common oxides. The most important mineral assemblages would thus seem to be:

1. Po + Cp + Pn ± Mt
2. Po + Cp + Py + Pn ± Mt
3. Po + Cp + Py + Mt
4. Py + Mt
5. Mt + Il ± Py

SULPHIDES

Assemblages 1 and 2 are associated with pyroxenite and to a lesser degree, with norite.

Assemblage 3 is found in silicified anorthosite and pyroxene gneisses.

Assemblages 4 and 5 are found in all rock types.

The sulphide bearing rocks show a strong variation in content of sulphides, and in the pyroxenite there is observed a gradiontal transition between barren rock and massive ore.

Most commonly pyrrhotite and chalcopyrite seem to be disseminated in pyroxenite in amounts from 2 - 5%.

In some localities there seems to be a weak indication of a progressive increase of sulphide content towards the base of the pyroxenite.

TEXTURE

The disseminated mineralization is usually found either as spherical drops of Po-Cp aggregates or as irregular shaped, interstitial grains, often remarkably evenly distributed in the rocks. As the sulphide content increases the irregular grains begin to have mutual contacts and thus produces a network in which small rounded grains of pyroxene are isolated: -
as at Melgard and Grasgardli upper showing.

TYPES

Three tentative mineralization types are put forward on the basis of field observations.

1. Normal mineralization disseminated sulphides usually of low grade order 0 - 10%. In this type po is completely dominant constituting more than 80% of the sulphides present. Examples are common throughout the area.

2. Shearing mineralization
   a) A mineralization which has been relocated by shearing to occupy positions within foreign rocks.
   b) Sulphide cemented breccia/shearing zones in pyroxenites. This type is generally of higher grade order, as the redistributed ore often is massive in character. Chalcopyrite is also more frequent. Examples are found at Melgard-Grasgardli and Vesle 2.

3. "Footwall mineralization"

   This is recognized as heavy disseminated and partly interlocking mineralization in norite overlain by a mineralized pyroxenite.
   It is usually of high grade and seems to be significantly richer in chalcopyrite, locally constituting 40 - 50% of the sulphides and apparently related to shearing in the rocks as the ore shows stringers which result in a weak foliation and occasionally follow cracks and joints. Megrundstjern and Grasgardli show examples of this type.

OXIDES

In a large amount of norite, Po - Cp are absent and oxides are the dominant opaque phase, locally 10 - 20%. These minerals are only found as homogeneously disseminated grains.

SECONDARY SULPHIDES

A considerable amount of secondary mineralizations occur in the area. Often pyrite, but also chalcopyrite and pyrrhotite are found as precipitates on joint surfaces or simply as crack fillings. These mineralizations are very local in character.

DETAILED INVESTIGATIONS ON WEST SIDE OF LAKE

1) MELGARD GRID

GEOPHYSICS

A two line anomaly picked up on the regional survey was detailed already during the winter season due to favourable weather and accessibility. The anomaly was detailed with 25 m profile spacings and 10 m observation spacing. A 400 m long anomaly was outlined with excellent correlation between magnetics and V.L.F.
In its southern part the anomaly has a NW/SE orientation and in its northern part a more N/S orientation, the break occurring around o/o. Both the mag and V.L.F. show this same trend. The magnetic anomaly at the orientation break is represented by a substantial dipole.
Enclosures 8 and 9 show the V.L.F. and magnetic detailed surveys.

GEOLOGY

The surface geology is shown on enclosure 10. The area is heavily covered by overburden and only small outcrops of anorthosite, fine gr. amphibole schist and one norite outcrop were found. The anomaly trend was, however, marked by a slight depression in the topography and near this depression several mineralized ultrabasic blocks were found. These were considered to be of local origin. Assays on two of the blocks gave the following results:

Sample No.	Location	Ni %	Cu %	S %
44.15.74	175 S/25 E	0.96	0.38	5.4
514.15.74	125 S/20 E	0.48	0.18	2.8

On the basis of these results it was decided to test the anomaly with the Winkie drill.
Drill hole 1 was collared at 100 S/25 E and drilled 45° W. The hole was drilled in anorthosite down to 17.75 m and then passed into a sheared serpentinized ultrabasic which continued down to 33.00 m. From 33.00 to the end of the hole at 36.30 the rock was dominantly a fine gr. amphibolite gneiss.
The ultrabasic was well mineralized near both the hanging and foot walls with up to 20 - 30% sulphides over 0.5 m. The rest of the section was evenly mineralized with 2 - 5% sulphides. The dominant sulphide was pyrrhotite with minor chalcopyrite. The fine grained amphibolite contained some pyrite.

Assay results are given below.

Sample No.	Distance	Meters	Ni %	Cu %	S %
100.15.74	17.75 - 18.75	1.0	0.92	0.20	3.8
101.15.74	18.75 - 20.15	1.35	0.66	0.17	2.1
102.15.74	20.15 - 21.85	1.70	0.24	0.16	0.90
103.15.74	21.85 - 23.25	1.40	0.42	0.22	1.9
104.15.74	23.25 - 26.25	3.0	0.32	0.28	1.4
105.15.74	26.25 - 28.65	2.40	0.28	0.22	1.3
106.15.74	28.65 - 29.50	0.85	0.43	0.15	1.7
107.15.74	29.50 - 30.50	1.0	1.20	0.22	5.2
108.15.74	30.50 - 31.50	1.0	0.18	< 0.05	0.76
109.15.74	31.50 - 33.00	1.50	0.14	< 0.05	0.38
110.15.74	33.00 - 36.00	3.00	0.09	< 0.05	0.60

This gives an average of the entire ultrabasic zone of.

Ni	Cu	S	
0.42	0.19	1.7 m	over 15.25 m

or cutting off the weaker assays from 31.50.

Ni	Cu	S	
0.47	0.21	1.95	over 12.75 m

Enclosure 11 shows a graphical log of this hole.

Drill hole 2 was collared at 25 S/35 E and drilled 45° W and intersected ultrabasic from 20.80 - 34 m with a faulted in "xenolith" of amphibole gneiss between 25.45 and 26.80. The rest of the hole was drilled in anorthosite. The ultrabasic was sheared both in the hanging and footwalls but contained only minor sulphides except between 27 and 31.50 m where the sulphide content increases to 2 - 5 %.

Assay results are given below, and enclosure 12 shows a graphical log of the hole.

Sample No.	Distance	Meters	Ni %	Cu %	S %
111.15.74	20.80 - 21.10	0.30	0.05	< 0.05	0.16
112.15.74	21.10 - 22.10	1.0	0.10	< 0.05	0.20
113.15.74	22.10 - 23.10	1.0	0.09	< 0.05	0.21
114.15.74	23.10 - 24.10	1.0	0.09	< 0.05	0.22
115.15.74	24.10 - 25.10	1.0	0.12	< 0.05	0.26
116.15.74	25.10 - 26.10	1.0	< 0.05	< 0.05	0.21
117.15.74	26.10 - 27.20	1.10	0.10	< 0.05	0.40
118.15.74	27.20 - 28.45	1.25	0.29	0.08	1.5
119.15.74	28.45 - 30.00	1.55	0.40	0.09	1.8
120.15.74	30.00 - 31.60	1.60	0.24	0.06	0.80
121.15.74	31.60 - 33.10	1.50	0.11	0.10	0.34
122.15.74	33.10 - 34.50	1.40	0.06	< 0.05	0.18

For the entire section this gives an average of

Ni	Cu	S	
0.16	0.06	0.6	over 13.70 m

A richer section from 27.20 - 31.60 averages

Ni	Cu	S	
0.31	0.07	1.45	over 4.40 m

CONCLUSIONS AND RECOMMENDATIONS

Hole 1 gave promising results which were, however, somewhat marred by the fairly negative results obtained with hole 2. It is interesting to note that hole 2 was put down at the orientation break in the anomaly and was drilled through the negative portion of the magnetic dipole.

Despite the poor results of hole 2 the good intersection in hole 1 warrants further work to be carried out on this 400 m long anomaly. Further drilling is recommended.

2. VESLE 2 GRID

GEOPHYSICS

The regional geophysics located a 5 line (1000 m) long anomaly near the shore of Espedalsvann below the old Vesle prospect. This was given the name Vesle 2.

Detailed follow up V.L.F. and Mag. were carried out with 50 m profile separation.

The results are shown on enclosures 13 and 14. The detailed work breaks the regional anomaly down and implies some possible faulting. Again a good correlation was found between the magnetics and V.L.F.

GEOLOGY

Mapping was hindered again by lack of outcrop. Enclosure 15 shows the results. It will be seen that a large ultrabasic body exists in the eastern part of the grid this has an offshoot at 500 - 600 N.
A smaller ultrabasic body was also identified in the south-westerly corner of the grid. Both mineralized blocks and outcrops were found. Two mineralized ultrabasic blocks considered to be local and found near a strong V.L.F. anomaly (150 N/50 W) gave the following results:

Sample No.	Ni	Cu	S
502	0.65	0.29	2.10
503	0.86	0.14	2.0

Further, mineralized outcrops were noted on the ultrabasic offshoot 500 N/200 W. Sampling gave the following results:

Sample No.	Type	Ni	Cu	S
40 B	chip 2 m	0.70	0.10	2.3
505	chip 1.7 m	0.94	0.28	3.1

Unfortunately these outcrops are covered by claim point taken out by A. Klyphaugen.

CONCLUSIONS

Again the correlation between geology and geophysics is good. The general V.L.F. anomaly seems to indicate the ultrabasic/norite zone whereas the higher V.L.F. values and mag highs pick out the mineralized sections. We have the possibility of a 4 - 500 m mineralized zone running in a E-W direction from 600 N/400 W to 100 N/0 - this being indicated by mineralized outcrops and blocks which give interesting nickel and copper values.

The V.L.F. mag anomaly at 700 N/100 W is not exposed and may well represent a similar mineralized zone.

Both mag and V.L.F. indicate E-W running faults between 500 - 600 N.

Short Winkie holes could be used to test the extent of the known zone and the possibility of mineralization at 700 N/100 W.

3. VESLE 13

This represents the same type of situation as found at Vesle 2. A long regional anomaly has been followed up with 50 m profile spacing detailed V.L.F. and mag. measurements and geological mapping.

GEOPHYSICS

Two distinct anomaly zones are evident, with a good V.L.F. and mag. correlation. A break in the western V.L.F. anomaly may indicate faulting. Enclosures 16 and 17 show the detailed investigations.

GEOLOGY

Geological mapping and prospecting was hindered by extreme scarcity of outcrops. (see enclosure 18). In the entire grid only 4 outcrops of norite/pyroxenite were found.

Within the outcrop of the eastern anomaly one outcrop of norite was found containing 1% pyrrhotite, a block was also found containing ca. 5% sulphides, this was assayed and gave the following reault.

Sample No.	Ni	Cu	S
259	0.12	0.16	2.7

In the vicinity of the western anomaly one small outcrop and 5 blocks of pyroxenite were found, four of the blocks were mineralized and the best was assayed with the following result:

Sample No.	Ni	Cu	S
251	0.58	0.19	2.9

A small wedge of schist was noted at 1500 N/100 W and this seems to cause a small V.L.F. anomaly.

CONCLUSIONS

Lack of outcrop make correlation very difficult but in the light of previous experience in this area it would seem that the two anomalies represent pyroxenite/norite bodies which are at least partly mineralized.

4. NORDGARDSETER

GEOPHYSICS

A regional anomaly has been followed up with detail V.L.F. and mag. 50 m profile spacing. Enclosure 19 shows the results.
A strong linear V.L.F. anomaly 400 S/200 E has good magnetic correlation.

A smaller V.L.F. anomaly 200 N/50 E also has good mag. correlation.

GEOLOGY

Very few outcrops occur in the area, but block finds and sub-outcrops in the main anomaly area show mineralized ultrabasics and norite to be present, and it is probable that the main anomaly represents a basic/ultrabasic body.
It is recommended that this zone be drilled.

GRASGARDLI AREA

GEOPHYSICS

The area was covered by 100 m line spacing V.L.F. and mag. measurements.
A series of linear anomalies were obtained some of which fell together with known showings in the area. Enclosures 6 and 7 show these results.

GEOLOGY

The detailed geology of the Grasgardli grid is shown on enclosure 20.
Enclosure 21 shows the results of more regional investigations in the area.

Mapping has outlined two, possibly three pyroxenite bodies together with associated norite, in a series of pyroxene gneisses. The crystalline sequence is overlain by argillite schists and Valdres sparagmite.

As can be seen the V.L.F. anomalies correlate well with the field observations of mineralized ultrabasic.

The lower pyroxenite zone (200 S - 375 E) is a mineralized unit that outcrops for almost 50 m in a stream bed. It is not exposed in strike direction being covered by glacial till.

The stream outcrop was sampled with the following result:

Sample No.	Distance	Ni %	Cu %	S %
1508.1	grab	0.50	0.28	4.76
15.08.2	grab	0.57	0.04	0.89
2073.15.74	400 E - 376 E	0.24	0.03	0.43
2072.15.74	376 E - 369 E	0.38	0.02	0.53
2067.15.74	369.E - 362 E	0.40	0.02	0.38
2069.15.74	362 E - 357 E	0.26	0.01	0.25

The chip samples represent chips over available outcrop and not continuous channel samples.

The central pyroxenite unit at Grasgardli (50 S - 150 E) is of limited outcrop but the V.L.F. anomaly suggests that it might extend beneath the marsh and moraine covered part to the immediate south and west of the exposed part. This showing gives good examples of the footwall mineralization where leuconorite in the footwall is well mineralized.

Samples returned the following results:

Sample No.	Distance	Ni %	Cu %	S 3
1508.5	grab in pyrox. top	0.44	0.03	1.38
1508.6	grab in pyrox. middle	0.38	0.05	1.03
1508.7	grab in pyrox. lower	0.62	0.10	1.61
1508.8	grab in footwall leuconorite	0.80	0.10	1.44
2065.15.74	50 S/96-117 E	0.26	0.03	0.55
2066.15.74	50 S/117-128 E	0.47	0.07	0.88
2068.15.74	50 S/128 - 133 E	0.45	0.05	1.03
2070.15.74	50 S/133-140 E	0.37	0.06	0.78

The uppermost pyroxenite zone is for the most part barren. Two small showings have been worked here, however. A small showing at o/o is located in leuconorite. It seems to be local in character possibly representing the bottom of a denuded pyroxenite. However, the strong V.L.F. anomaly to the immediate south east of this locality might indicate a connection with the central pyroxenite.

The mineralization in the old showing is in part quite rich and grab samples collected in 1973 returned:

	Ni	Cu	S
1.	0.79	0.15	12.4
2.	0.64	0.21	9.8

A chipsample taken over the dump at this old showing gave:

Ni	Cu	S
0.38	0.34	5.8

A chip sample taken this year of the 1 metre of exposed mineralization gave:

Ni	Cu	S
0.24	0.15	2.17

The small showing (100 W/25 S) in the upper parts of the pyroxenite is extremely local and associated with sulphide remobilization in shears.

Enclosure 21 shows the southerly continuation of the Grasgardli zone. As can be seen the ultrabasic zones seem to be fairly extensive and give possibilities for good tonnage. On the other hand the assay results from this particular location are fairly low. A small flotation test carried out on the Grasgardli mineralization also gave poor results.

The low sulphur values in some of the assays suggest that some of the nickel may well be tied up with silicates and a microprobe test will be carried out to determine this.

MEGRUNDSTJERN

This area had previously been investigated with slingram and soil geochemistry, sulphides had been recorded but no proper geological mapping or sampling had taken place.

GEOPHYSICS

A V.L.F. and mag survey was carried out during the summer using 40 m line spacing in order to be able to correlate with the previous slingram survey. Several V.L.F. anomalies emerged. The central anomaly at 160 S/50 W and 600 S/150 E correlates well with the slingram results, and known mineralization (160 S/50 W). The easterly part of the anomaly (600 S/150 E) is covered.

A prominant E-W running anomaly zone was picked up by the V.L.F. but did not show on slingram.

Enclusure 22 shows the mag. and V.L.F. results. Enclosures 23 and 24 show the slingram results.

GEOLOGY

The geological mapping has shown the area to be composed mainly of norite and pyroxenite (enclosure 25).

The central V.L.F. anomaly (160 S/50 W) is associated with ultrabasic and norite that were in part well mineralized. Several sampling profiles were run across this anomaly area the results of which are shown in appendix 1. Lines 80 S, 120 S, 120 N and to some extent 240 N show some high nickel values in association with the anomaly. Several values are over 1% Ni. The continuation of the anomaly to the south east (600 S/150 E) is completely covered.

A Winkie drill was put down on the main central anomaly, and drilled vertically down to 26 m. The results which are presented graphically on enclosure 26 were extremely disappointing and do not correlate well with surface sampling.

The linear anomaly at 600 S/100 W is associated with an ultrabasic body which was also sampled with several interesting values as seen in table 1. (line 610 S).

The continuation of this anomaly towards the east is difficult to explain and seems to be associated with pyroxene gneisses.

DISCUSSIONS

The distrubition of Ni sulphides shows strong association with ultramafic rocks and to a lesser extent with noritic rocks.

The fact that some rocks possess a strong orientational fabric, whereas others show typical magmatic textures, suggests a relative time relationsship between the two.

Geophysical data from the area shows elongate anomalies parallel to the general strike of foliation, especially the V.L.F. data, which more clearly seem to correlate with the field observations, are found as roughly north-south running anomaly zones which seem to fit well the course of pyroxenite norite according to the mapping.

Sulphides have been found in many localities but in varying amounts. Of immediate interest for follow up work the Melgard anomaly, Vesle 2 anomaly, Nordgardseter anomaly and Megrundstjern anomaly present themselves as drilling targets.

Also of immediate interest is the determination of the amount of nickel present in the silicate phase compared to the sulphide phase and a program to determine this will be carried out during the winter.

INVESTIGATIONS ON THE EAST SIDE OF ESPEDALSVANN

INTRODUCTION

Some limited investigations were carried out on the east side of Espedalsvann during the field season. These were confined to the old mine areas except at Stubberud where an helicopter E.M. anomaly was investigated.

STANG

At Stang V.L.F. and Mag. measurements were carried out to relocate a slingram anomaly. Results are shown on enclosure 27.

EVANS

Here 4 chip samples were taken over the outcrop of the ore body. Fig. 3 shows the location of the samples. The results returned:

Sample No.	Distance	Ni	Cu	S
2077	4 m	1.07	0.71	6.16
2078	4 m	0.72	0.14	3.49
2079	3 m	0.61	0.18	3.10
2080	3.5 m	0.91	0.24	5.44

JORSTAD

Here geological mapping, and geophysical work were carried out to chase out the extension of a slingram anomaly that Hydro had previously drilled and which mise-a-la-masse measurements had indicated might have a continuation to the north west.

Enclosures 28, 29 and 30 show the results. As will be seen much more ultrabasic rock was located but no significant mineralization was found on surface. However, a siginificant V.L.F. anomaly was discovered and this might well represent buried mineralization.

GENERAL CONCLUSIONS

The field work in 1974 has brought to light a good deal of new information concerning the geology and mineralization of the Espedalen area.

Geophysical techniques have been used with success and it would seem that the V.L.F. method is well suited for this geological environment.

Based on the results presented above together with previous work in the area, it is recommended that drilling be carried out on the following targets:

West side	East side
1. Melgard	Stang anomaly
2. Nordgardseter	Jorstad anomaly
3. Megrundstjern	
4. Vesle 2	

7th January, 1975

FN/hg

APPENDIX 1

PROFILE 120 S

Sample	Location	Rock Type	Ni	Cu	S
1047	5 V	pyroxenite	0.44	0.09	1.0
1048	6 V	pyroxenite	0.33	0.09	0.67
1049	8 V	pyroxenite	0.44	0.08	1.5
1050	9 V	pyroxenite	0.44	0.14	1.4
1051	10 V	pyroxenite	0.58	0.12	1.8
1052	13 V	noritic-pyrox.	0.25	< 0.05	0.40
1053	23 V	noritic-pyrox.	0.31	< 0.05	0.74
1054	25 V	noritic-pyrox.	0.36	0.07	0.71
1055	28 V	pyroxenite	0.48	0.05	1.4
1056	29 V	norite	0.61	0.15	2.0
1057	32 V	norite	0.64	0.12	2.1
1119	34 V	norite	0.60	0.14	1.41
1120	36 V	pyroxenite	1.15	0.13	3.01
1121	37 V	norite	1.03	0.13	2.26
1122	39 V	norite	1.06	0.09	1.63
1123	40 V	norite	0.96	0.15	2.28
1124	41	norite	1.20	0.22	3.10
1125	68 V	pyroxenite	0.38	0.12	0.72
1126	70 V	pyroxenite	0.74	0.07	1.93
1040	78 V	pyroxenite	0.36	0.05	0.60
1041	81 V	pyroxenite	0.12	< 0.05	0.31
1042	82	pyroxenite	0.11	< 0.05	0.20
1043	84	pyroxenite	0.15	< 0.05	0.26
1044	85	pyroxenite	0.12	< 0.05	0.26
1045	104 V	norite	0.23	< 0.05	0.29
1046	138 V	norite	0.14	< 0.05	0.62
1177	143 V	norite	0.07	< 0.05	0.23

PROFILE 80 S

Sample	Location	Rock Type	Ni	Cu	S
1128	8 E	pyroxenite	0.54	0.10	1.04
1127	6 E	pyroxenite	0.81	0.04	1.97
1129	2 V	pyroxenite	0.67	0.04	1.70
1130	5 V	pyroxenite	0.29	0.30	0.54
1131	6 V	pyroxenite	1.03	0.10	2.92
1132	8 V	pyroxenite	0.50	0.03	0.54
1133	10 V	pyroxenite	0.76	0.04	1.58
1134	11 V	pyroxenite	0.60	0.06	1.27
1135	14 V	pyroxenite	0.62	0.12	1.68
1136	23 V	pyroxenite	0.90	0.11	2.22
1137	75 V	noritic-pyroxenite	0.14	0.005	0.20
1138	94 V	noritic-pyroxenite	0.26	0.02	0.39
1139	111 V	pyroxenite	0.60	0.02	0.39
140	112 V	pyroxenite	0.42	0.10	0.69
141	114 V	pyroxenite	0.39	0.09	0.69

PROFILE 360 N

Sample	Location	Rock Type	% Ni	% Cu	% S
1006 A	180 W	norite	0.14	< 0.05	0.52
1006	181 W	coarse norite	0.16	< 0.05	0.51
1005	182 W	norite	0.32	0.09	1.3
1004	184 W	norite	0.37	0.10	0.99
1003	185 W	norite	0.37	0.06	0.68
1002	186 W	norite	0.31	0.07	1.2
1001	187 W	norite	0.25	0.05	0.88
1000	188 W	norite	0.21	< 0.05	1.2

880 S

Sample	Location	Rock Type	Ni	Cu	S
1097	103 V	norite	0.06	< 0.05	0.18
1098	104 V	norite	0.06	< 0.05	0.18
1099	106 V	norite	0.07	< 0.05	0.35
1100	134 V	pyroxenite	0.11	< 0.05	0.36
1101	136 V	pyroxenite	0.10	< 0.05	0.06

800 S

Sample	Location	Rock Type	Ni	Cu	S
1102	185 V	norite	0.28	< 0.05	0.45
1103	192 V	norite	0.05	< 0.05	0.19
1104	193 V	norite	0.11	< 0.05	0.51

690 S

Sample	Location	Rock Type	Ni	Cu	S
1105	50 V	norite	0.05	< 0.05	0.13
1106	80 V	pyroxenite	0.07	0.20	0.77
1107	84 V	pyroxenite	0.07	0.27	0.77
1108	87 V	pyroxenite	0.24	0.10	0.34
1109	88 V	pyroxenite	0.30	0.12	0.45

610 S

Sample	Location	Rock Type	Ni	Cu	S
1111	112 V	pyroxenite	0.20	0.10	0.48
1112	113 V	pyroxenite	0.11	0.10	0.32
1113	114 V	norite	0.20	0.21	0.87
1114	116 V	norite	0.38	0.43	1.5
1115	118 V	norite	0.46	0.51	2.0
1116	125 V	norite	0.20	0.10	0.38

40 S

Sample	Location	Rock type	Ni	Cu	S
1142	0	norite	0.18	0.10	0.25
1143	3 E	norite	0.10	< 0.05	0.09
1144	5 E	norite	0.05	< 0.05	< 0.05
1145	7 E	pyroxenite	0.18	0.10	0.54
1146	11 E	pyroxenite	0.05	0.09	0.38
1147	15 E	norite	0.18	< 0.05	0.16
1148	17 E	norite	0.16	< 0.05	0.12
1149	23 E	pyroxenite	0.07	0.18	0.48
1150	24 E	pyroxenite	0.08	0.16	0.25
1151	25 E	pyroxenite	0.25	< 0.05	0.16
1152	1 V	pyroxenite	0.21	0.16	0.57

120 N

Sample	Location	Rock Type	Ni	Cu	S
1064	2 E	pyroxenite	0.22	< 0.05	0.69
1065	3 E	pyroxenite	0.27	0.06	0.36
1066	4 E	norite	0.14	< 0.05	0.18
1067	5 E	norite	0.15	< 0.05	0.17
1068	6 E	norite	0.20	< 0.05	0.41
1069	7 E	pyroxenite	0.25	0.05	0.51
1070	8 E	norite	0.30	< 0.05	0.62
1071	10 E	norite	0.39	0.22	0.39
1072	11 E	norite	0.36	0.11	0.53
1073	13 E	norite	0.49	0.09	1.2
1074	15 E	norite	0.60	0.16	1.8
1075	16 E	pyroxenite	0.32	0.26	0.80
1076	17 E	norite	0.20	0.25	0.61
1077	18 E	norite	0.18	< 0.05	0.28
1078	19 E	norite	0.29	0.85	1.2
1079	20 E	norite	0.42	0.48	1.3
1081	66 E	pyroxenite	0.11	< 0.05	0.23
1082	69 E	pyroxenite	0.18	< 0.05	0.30
1083	88 E	pyroxenite	0.19	< 0.05	0.51
1084	90 E	pyroxenite	0.16	< 0.05	0.23
1085	92 E	norite	0.10	< 0.05	0.15
1086	95 E	norite	< 0.05	< 0.05	0.22
1087	98 E	norite	< 0.05	< 0.05	0.19
1088	106 E	norite	0.05	< 0.05	0.27
1089	141 E	pyroxenite	0.12	< 0.05	0.19
1090	143 E	pyroxenite	0.11	< 0.05	0.60
1091	146 E	pyroxenite	0.06	< 0.05	0.31
1092	148 E	norite	0.34	< 0.05	0.63
1093	151 E	norite	0.11	< 0.05	0.40
1094	152 E	norite	0.09	< 0.05	0.18
1095	153 E	norite	0.12	< 0.05	0.16
1096	156 E	norite	0.06	< 0.05	0.22
1080	0	pyroxenite	0.27	0.09	0.70
1058	1 V	pyroxenite	0.18	< 0.05	0.41
1059	18 V	norite	0.18	< 0.05	0.26
1060	20 V	norite	0.09	< 0.05	0.18
1061	24 V	norite	0.15	0.28	0.41
1062	28 V	norite	0.20	< 0.05	0.55
1063	29 V	norite	0.38	0.09	0.70

240 N

Sample	Location	Rock Type	Ni	Cu	S
1022	8 E	norite	0.34	< 0.05	0.32
1023	9 E	norite	0.61	0.21	0.52
1024	10 E	norite	0.38	0.13	1.4
1025	11 E	norite	0.30	0.05	0.32
1027	13 E	norite	0.20	0.05	0.40
1028	14 E	norite	0.16	0.05	0.26
1029	15 E	norite	0.15	< 0.05	0.46
1031	17 E	norite	0.11	< 0.05	0.32
1032	18 E	norite	0.10	< 0.05	0.30
1033	19 E	norite	0.12	< 0.05	0.30
1035	21 E	norite	0.07	< 0.05	0.28

APPENDIX 2

FLOTATION TESTS ON ORE FROM JØRSTAD AND GRASGARDLI

Results of preliminary flotation tests carried out by the Norwegian Technical University (N.T.H.).

JORSTAD

The flotation tests followed basically a usual Falconbridge-Sudbury pattern. First flotation in a basic environment to get the richest possible Ni-Cu concentrate, afterwards flotation with $CuSO_4$ in acid environment to float all the sulphides. The following procedure was followed. A standard Denver bench flotation cell was used.

	Reagent		Agitation min.	Flotation min.
Milling	CaO	500 g/t		
Stage 1	CaO	to pH 9.5		
	KAX	20 g/t		
	MIBC		1	1/2
Stage 2	MIBC		1/4	1/2
Stage 3	KAX	12 g/t		
	MIBC		1/4	1
Stage 4	H_2SO_4	to pH 7.5	1	
	KAX	5 g/t	1/2	1
Stage 5	$CuSO_4$	40 g/t	5	
	KAX	5 g/t	1	5
Stage 6	KAX	7 g/t	1/2	5

KAX = potassium amylxantate MIBC = a scummer.

TEST RESULTS JORSTAD

	Weight	Assay %				Distribution %		
		Ni	Cu	S	Insol	Ni	Cu	S
Cons. 1	2.8	6.0	2.75	11.7	34.4	39.3	54.7	13.5
Cons. 2	2.4	3.35	0.52	10.1	37.4	18.8	8.9	10.0
Σ 1 + 2	5.2	4.80	1.70	11.0		58.1	63.6	23.5
All cons.	15.5	2.30	0.69	9.1	ca.37.0	84.2	76.0	58.2
Tail	84.5	0.08	0.04	1.2		15.8	24.0	41.8
Total	100	0.43	0.14	2.4		100	100	100

As can be seen useful concentrates have been achieved, although the silicate content was high. This should be able to be removed by the help of coarser milling, or by bulk flotation in an acid environment. The ratio Ni/S is favourable such that one should be able to achieve good concentrates.

GRASGARDLI

In the first test on the Grasgardli sulphides a bulk flotation at low pH with the resulting concentrates being washed.

	Reagent		Agitation min.	Flotation min.
Conditioning	H_2SO_4 to	pH 6.5	5	
Stage 1	KAX	50 g/t		
		Dowfroth	4	3
Stage 2	KAX	40 g/t	2	3
Stage 3	KAX	60 g/t	2	5

Reflotation of cons. from stage 1, 2 and 3 combined

1 wash	ca. 1/2
2 wash	" 1

RESULTS

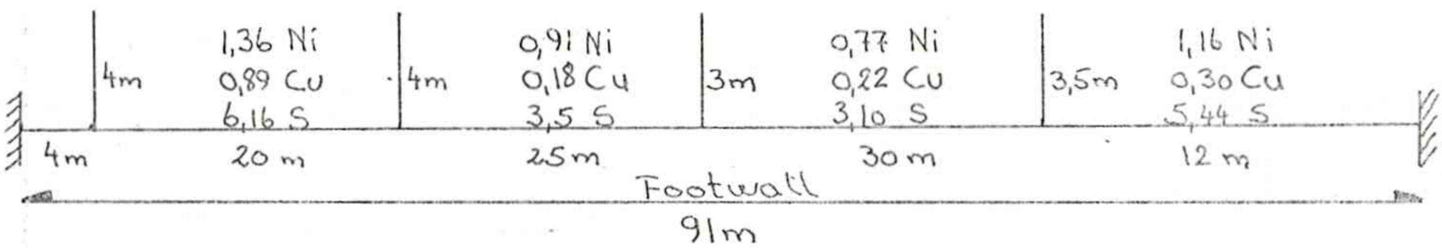
	Weight %	Assay %				Distribution %		
		Ni	Cu	S	Insol.	Ni	Cu	S
Washed cons.	8.1	1.4	1.0	19.6	22.4	38.9	61.8	36.7
Total cons.	21.2	0.85	0.47	12.6	ca.30.0	62.1	76.0	61.8
Tailings	78.8	0.14	0.04	2.1		37.9	24.0	38.2
Total	100	0.29	0.13	4.3		100	100	100

The second test was carried out in the same way and using the same reagents as for Jorstad.

	Weight %	Assays %				Distribution %		
		Ni	Cu	S	Insol.	Ni	Cu	S
Cons. 1	1.7	0.16	0.14	2.5	69.8	0.9	1.7	1.0
Cons. 2	2.1	0.55	0.70	6.5	53.0	3.9	10.9	3.3
Cons. 3	4.3	1.02	0.90	8.1	45.9	14.7	28.0	8.2
Σ 1+2+3	8.1	0.72	0.69	6.5		19.5	40.6	12.5
All cons.	30.7	0.58	0.38	8.9		76.8	84.9	64.2
Tailings	69.3	0.10	0.03	2.2		23.2	15.1	35.8
Total	100	0.29	0.13	4.2				

The amount of insolubles in the concentrates is very high. This is caused by the fact that talc or chlorite easily flotates with the high pH used. Flotation with lower pH as in test 1, gave a cleaner product even though there was still a lot of silicate in the concentrates.

Selecitivity between pyrrhotite and pentlandite is not good. Alternative possibilities which could have been tried are high-intensity magnetic separation, use of settlers for silicate and variation of pH over a larger range. However, total recovery higher than 76.8% Ni which has been achieved here cannot be expected.



A/S SULFIDMALM	
Chip samples EVANS mine	
SCALE	DRAWN FN
DATE 1.75	TRACED LN

LOCATION OF GRIDS. V.L.F. MAG. SURVEY, ESPEDALEN, 1974.	Scale 1:10000	Obs.	
		Draw. DE, FN	3-74,5-74
		Trac. DE	5 -74
		Chk.	
	Map. no. ENCL. 1		
A/s Sulfidmalm	15-74-E3		
	Map. sheet 1717 I / 1717 IV		

LOCATION OF GRIDS.
V.L.F. MAG. SURVEY, ESPEDALEN,
1974.

A/s Sulfidmalm

Scale	1:10000
Obs.	
Draw. DE, FN	3-74, 5-74
Trac. DE	5-74
Chk.	
Map. no.	ENCL. 1
	15-74-E3
Map. sheet	1717 I / 1717 IV

Bilag 2

FRAZER CONTOURED DIP-ANGLE DATA, V.L.F. EM. SURVEY. VESLE GRID, ESPEDALEN, NORWAY.	Scale 1:5000	Obs. DE FH	3-74
		Draw. DE	5-74
		Trac. DE	5-74
		Chk. FN.	5-74
	INST: CRONE RADEM		
A/s Sulfidmalm	15-74-B4		
	Map. sheet 1717 I / 1717 IV		

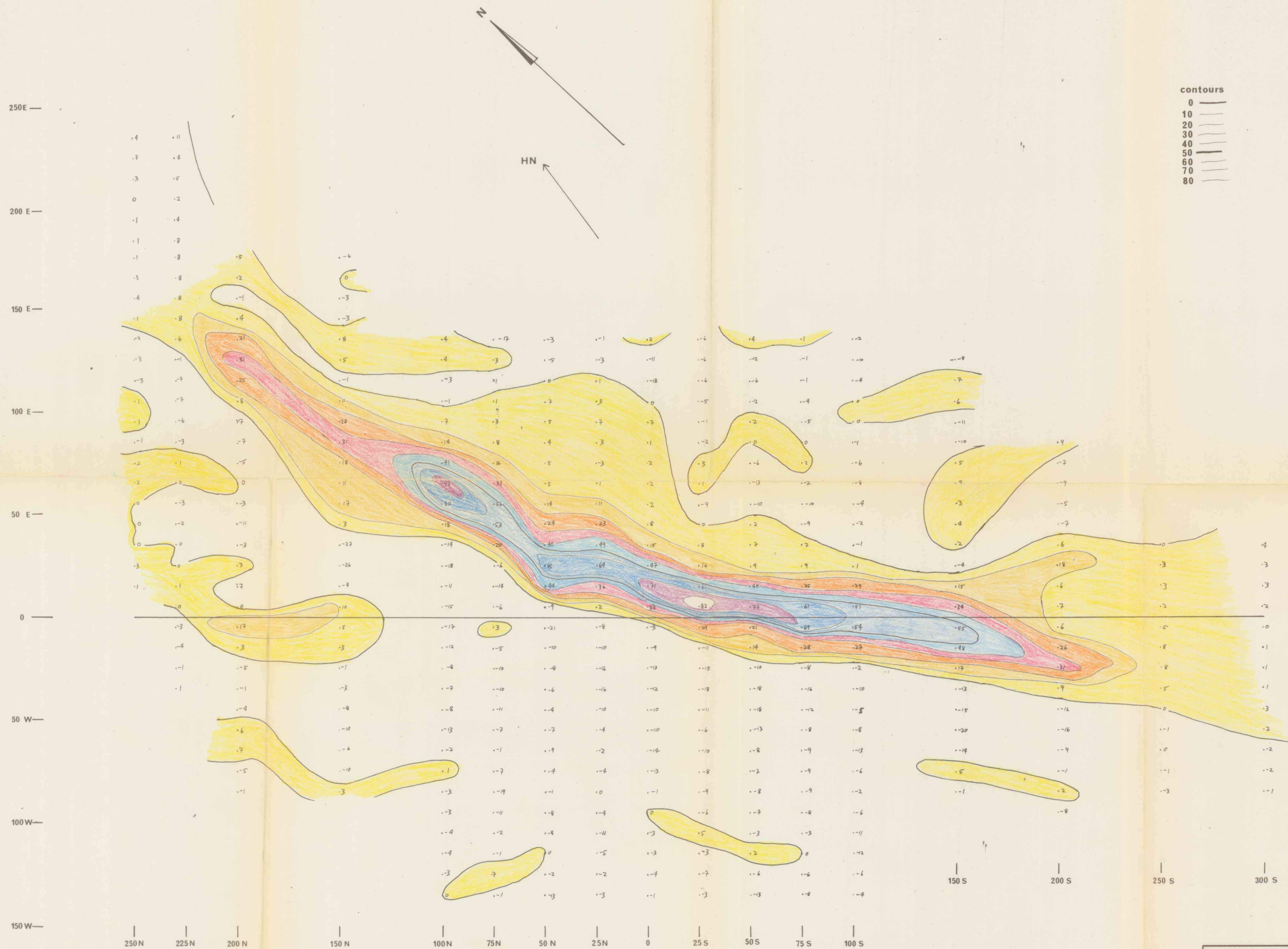
MAGNETIC ANOMALY MAP. VESLE GRID, ESPEDALEN, NORWAY.	Scale 1:5000	Obs. LN FN 3-74 Draw. DE 5-74 Trac. DE 5-74 Chk. [illegible] 5-74
	INST: McPHAR M 700	
A/s Sulfidmalm	15-74-B6	
	Map. sheet 1717 I / 1717 IV	


1700N
1500N
1250N
1000N
750N
500N
250N
0
700W
600W
500W
400W
300W
200W
100W
0
100E
200E
300E
400E
500E
600E
700E
800E
900E
1000E
1100E
1200E
1300E
N
HN
ESPEDALSVANN
CONTOURS
0 – 10
10 – 20
20 – 30
30 – 40
>40
LAKE SHORE
FRAZER CONTOURED DIP ANGLE
DATA V.L.F. EM SURVEY
NORDGÅRDSÆTER GRID
ESPEDALEN, NORWAY.
Scale 1:2500
Obs. FN LM 3 - 74
Draw. DE 5 - 74
Trac. DE 5 - 74
Chk. FN 5 - 74
Map no. INST CRONE RADEM
A/s Sulfidmalm
15-74-B7
ENCL. 4
Map sheet 1717 IV

MAGNETIC ANOMALY MAP. NORDGÅRDSÆTER GRID. ESPEDALEN, NORWAY.	Scale 1:2500	Obs. DE	3 – 74
		Draw. DE	5 – 74
		Trac. DE	5 – 74
		Chk. FW	5 – 74
	Map. no. 15 – 74 – B8		
A/S Sulfidmalm	INST. McPHAR M700 ENCL. 5		
	Map. sheet 1717 IV		

GRASGARDLI - ESPEDALEN V.L.F. FRAZER CONTOURS	Scale 1:2500	Obs. LN.DE 3.74 Draw. FN 3.74 Trac. FN 5.74 Chk. FN 5.74
	Map. no. 15.74.85	
A/s Sulfidmalm	CRONE E.M.16. STATION. BOF. ENCL. 6	
	Map. sheet 1717 IV	


900W
800W
700W
600W
500W
400W
300W
200W
100W
0
100E
200E
300E
400E
500E
600E
700E
800E
900E
1000E
700S
600S
500S
400S
300S
200S
100S
100N
200N
300N
400N
500N
600N
700N
800N
900N
1000N
1100N
1200N
0 0
SURVEYED 1973.
ESPEDALSVANN
<0 γ
0-500 γ
500-1000 γ
1000-1500 γ
1500-2000 γ
2000-3000 γ
>3000 γ
GRASGARDLI- ESPEDALEN
MAGNETIC SURVEY
Scale 1:2500
Obs. LN DE 3.74
Draw. FN 5.74
Trac. FN 5 74
Chk. FN 5 74
Map. no. 15. 74 B9
A/s Sulfidmalm
McPHAR M700.
ENCL. 7
Map. sheet 1717 IV



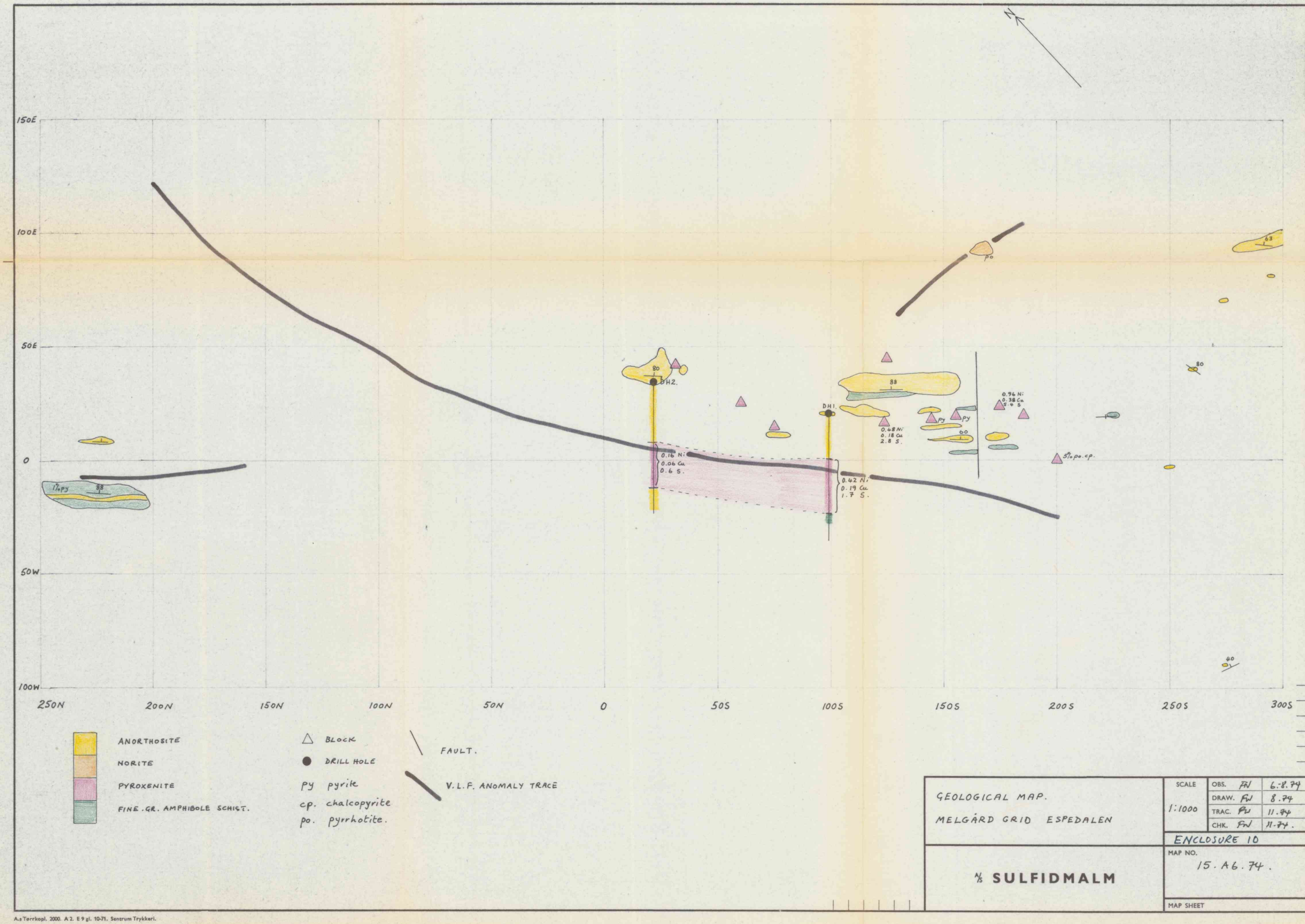
bilag 8

FRAZER CONTOURED DIP-ANGLE DATA. V.L.F. EM. SURVEY, MELGÅRD GRID, ESPEDALEN, NORWAY	SCALE 1:1000	OBS. FN LN	3-74
		DRAW. DE	3-74
		TRAC. DE	5-74
		CHK. FN	5 74
	INST.: CRONE RADEM		
A/S SULFIDMALM	MAP NO. 15-74-B2		
	MAP SHEET SVATSUM 1717 I		

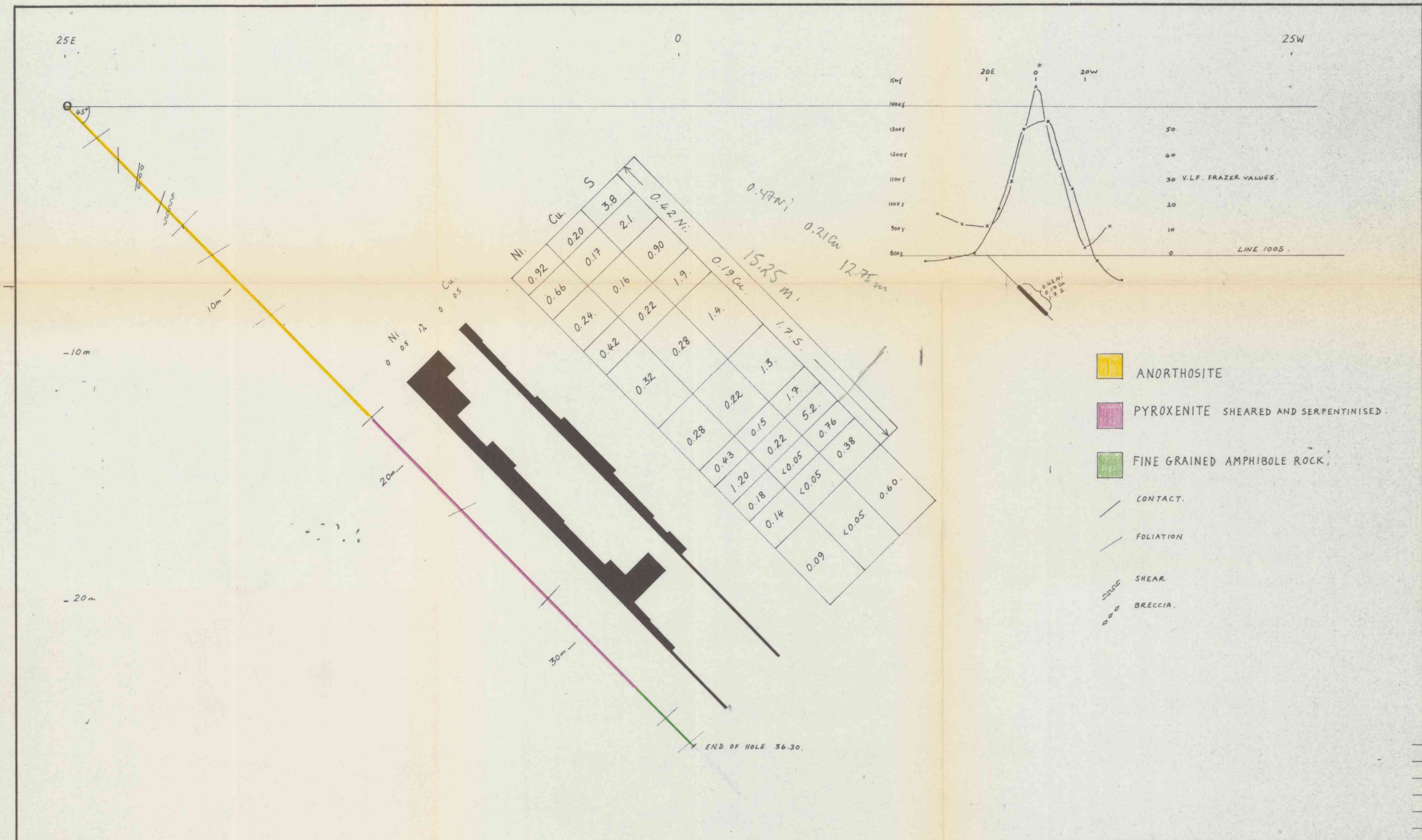
A.s Terrkopi. 3000. A 1. 1.9 gl. 10-71. Sentrum Trykkeri.

MAGNETIC ANOMALY MAP. MELGÅRD GRID, ESPEDALEN, NORWAY.	SCALE 1:1000	OBS. FN DE	3-74
		DRAW. FN	3-74
		TRAC. DE	5-74
		CHK. FW	5.74
	McPHAR M 700		
A/S SULFIDMALM	MAP NO. 15-74-B3		
	MAP SHEET SVATSUM 1717 I		

A.s Tarrkopi. 3000. A 1. 8.9 gl. 10-71. Seestrum Trykkeri.



A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.



DRILL HOLE 1. 100S/25E. 45° W.	SCALE	OBS. FN	7.74
MELGARD GRID. ESPEDALEN.	1:100.	DRAW. FN	7.74.
		TRAC. FN	11.74
		CHK. FN.	11.74.

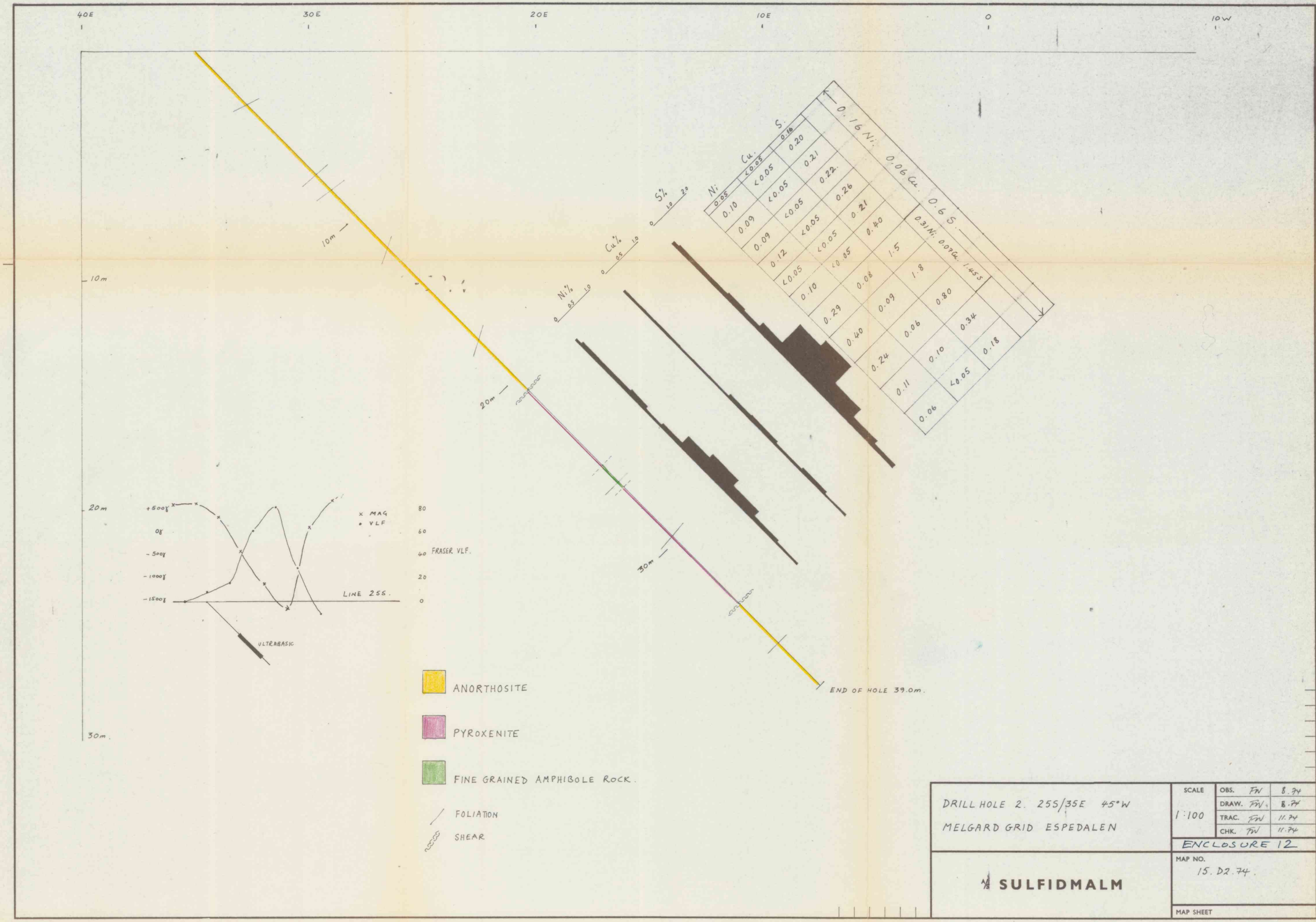
ENCLOSURE 11

MAP NO. 15.74.D.1.

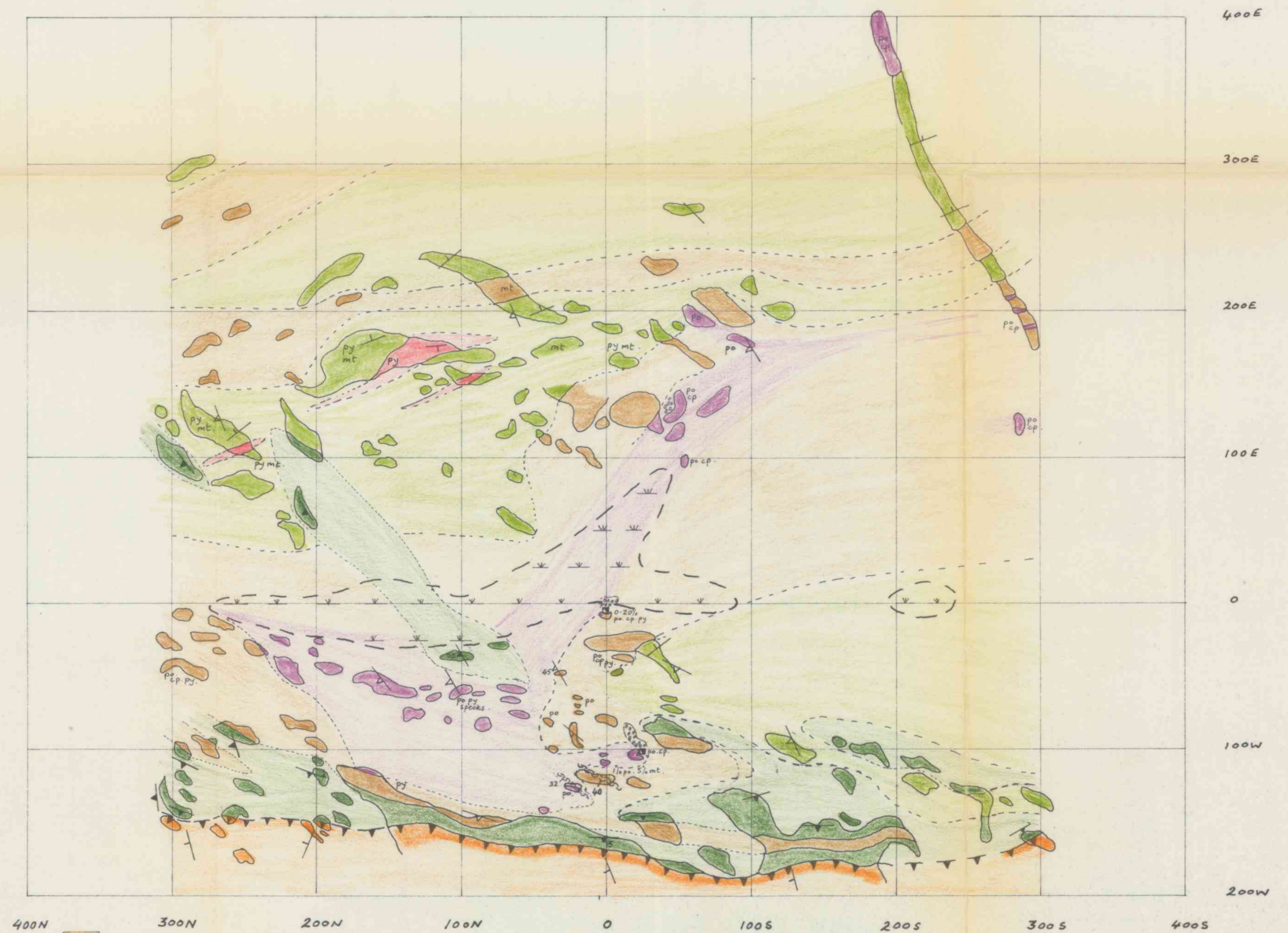
A/S SULFIDMALM

MAP SHEET

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.



A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.



SPARAGMITE

ARGILLITE SCHIST.

GARNET.-BIOTITE GNEISS.

PYROXENITE

NORITE - LEUCONORITE

PYROXENE GNEISS.

FOLIATION

SCHISTOSITY

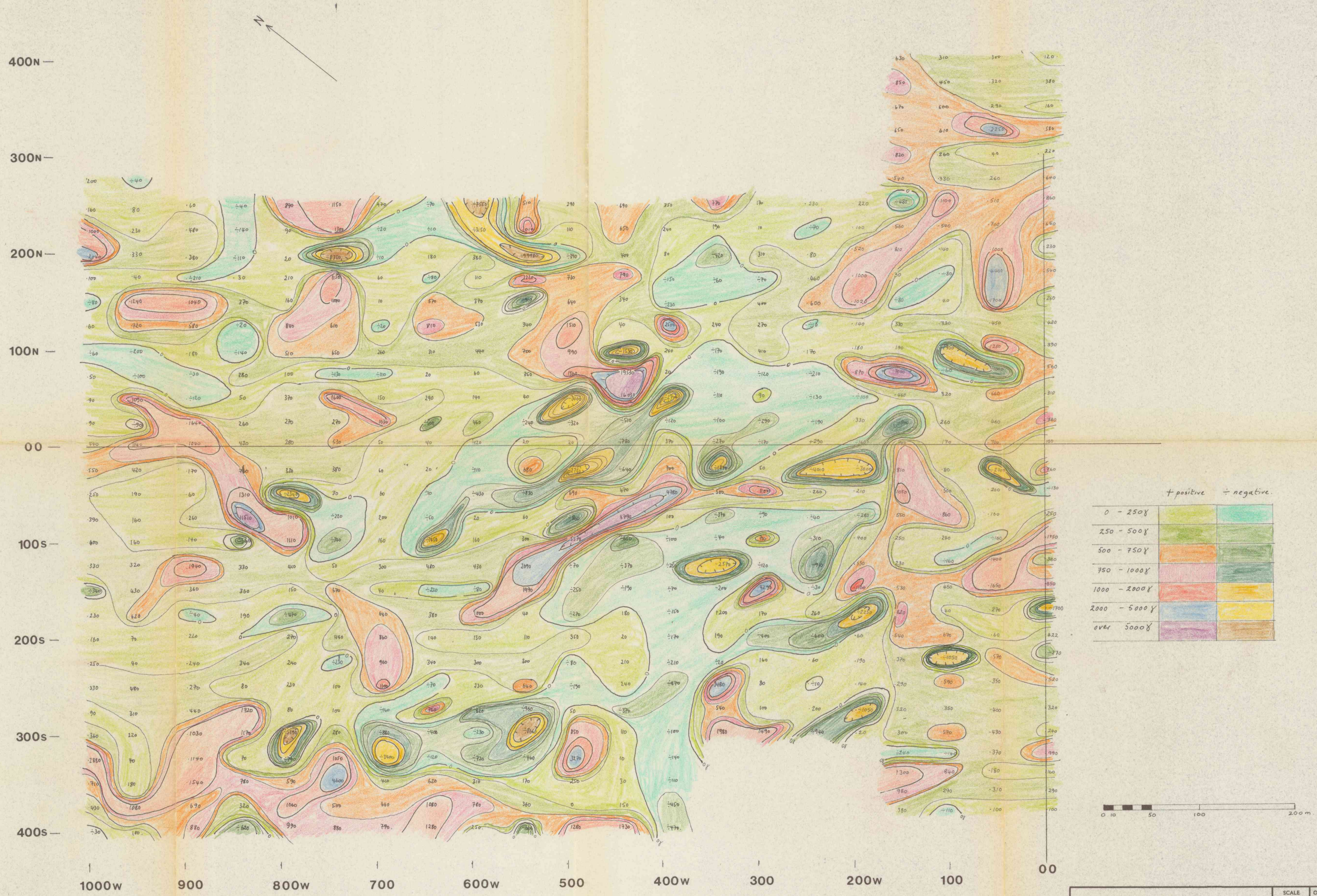
CLEAVAGE.

GEOLOGY GRASGARDLI GRID. ESPEDALEN	SCALE 1:2500	OBS. FN J.P 7.8.74
		DRAW. J.P. 8.74
		TRAC. FN 11.74
		CHK. FN. 11.74
	ENCLOSURE 20	
A/S SULFIDMALM	MAP NO. 15.74 A8.	
	MAP SHEET	

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.

E.M. SURVEYS. JÖRSTAD ESPEDALEN.	SCALE 1:2000	OBS. N.H. A/S SULFIDMALM	72. 74.
		DRAW. PN	10.74
		TRAC. PN	10.74
		CHK. PN	10.74
	ENCLOSURE 28		
A/S SULFIDMALM	MAP NO. 15. 74. B11.		
	MAP SHEET		

A.s Terrkop. 3020. A 1. E 9 gl. 10-71. Sentrum Trykkeri.



MAGNETIC MAP **JÖRSTAD ESPEDALEN**	SCALE **1:2000**	OBS. FN	6.74
		DRAW. FN	7.74
		TRAC. FN	10.74.
		CHK. FN.	
	McPHAR. M.700.FLUXGATE.		
A/S SULFIDMALM	MAP NO. 15.74.B.10. ENCL. 29		
	MAP SHEET		

A.s Tørrkopi. 3000. A 1. E 9 gl. 10-71. Sentrum Trykkeri.

ULTRABASIC

NORITE

ANORTHOSITE

drill hole

showing

pyrhotite

pyrite

shearing

GEOLOGY JÖRSTAD, ESPEDALEN	SCALE 1:2000	OBS. P.E. FN. T.V. MR.	70.74.
		DRAW. FN	7.74
		TRAC. FN.	10.74.
		CHK.	
	ENCLOSURE 30.		
A/S SULFIDMALM	MAP NO. 15. A2.74.		
	MAP SHEET		

V. L. F. FRASER VALUES.	
(yellow)	0 - 5
(orange)	5 - 10
(red)	10 - 15
(light blue)	15 - 20
(green-blue)	20 - 30
(blue)	30 - 40
(violet)	40 - 50.

MAGNETIC VALUES IN GAMMA.

POSITIVE +	NEGATIVE ÷	GAMMA RANGE
		0 - 250
		250 - 500
		500 - 750
		750 - 1000
		1000 - 1500
		1500 - 2000
		2000 - 3000
		3000 - 4000
		4000 - 5000
		over 5000

VLF TRANSMITTING STATION CUTLER MAINE.

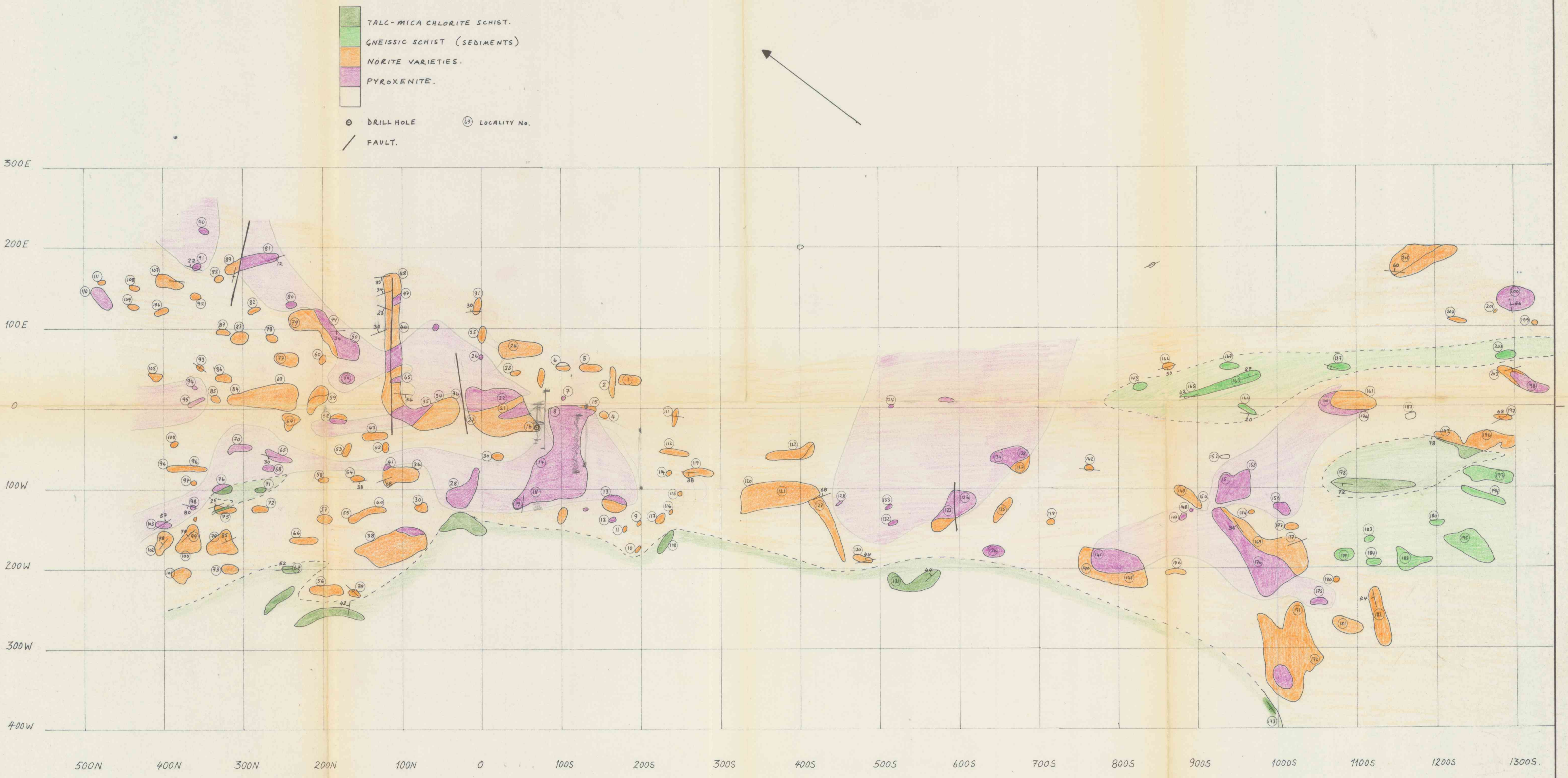
INSTRÙMENTS. CRONE E.M.16
MCPHAR M.700. FLUXGATE.

N

V.L.F. TRANSMITTER 17.8 KHZ

V. L. F. E. M. AND MAGNETIC SURVEYS. MEGRUNDSTJERN ESPEDALEN.	SCALE 1:2500	OBS. P.S.-OB. 6.7.74 / DRAW. FN 7.74 / TRAC. FN 11.74 / CHK. FN 11.74.
		ENCL. 22.
A/S SULFIDMALM		MAP NO. 15.74.816.
		MAP SHEET

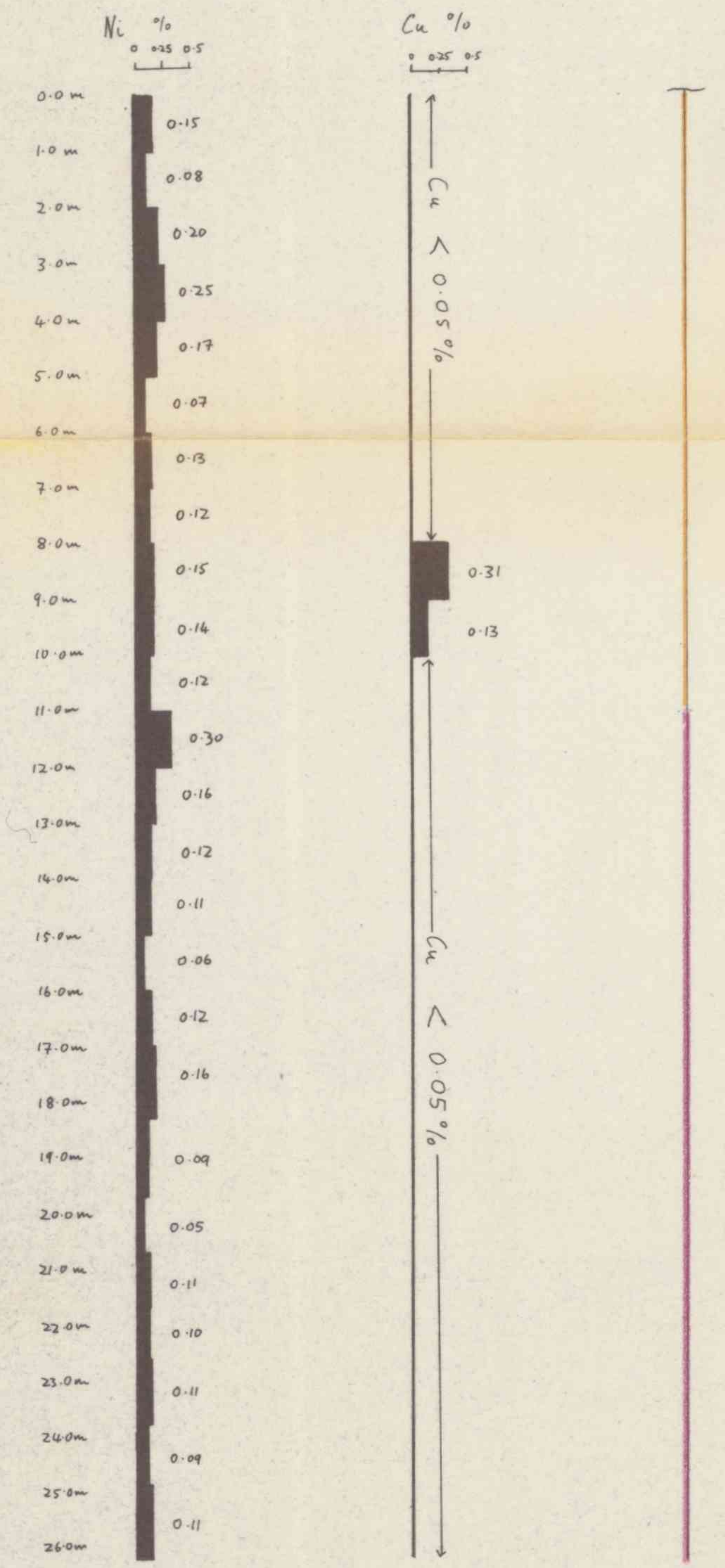
A.s Tørrkopi. 3000. A 1. E 9 gl. 10-71. Sentrum Trykkeri.



GEOLOGY. MEGRUNDSTJERN ESPEDALEN.	SCALE 1:2500	OBS. P.E. FN	6-8.74
		DRAW. PE	8.74
		TRAC. FN.	11.74
		CHK. FN.	11.74.
	ENCL. 25		
A/S SULFIDMALM	MAP NO. IS.74.A7.		
	MAP SHEET		

A.s Tørrkopi. 3000. A 1. E 9 gl. 10-71. Sentrum Trykkeri.

WDH 2 - MEGRUND

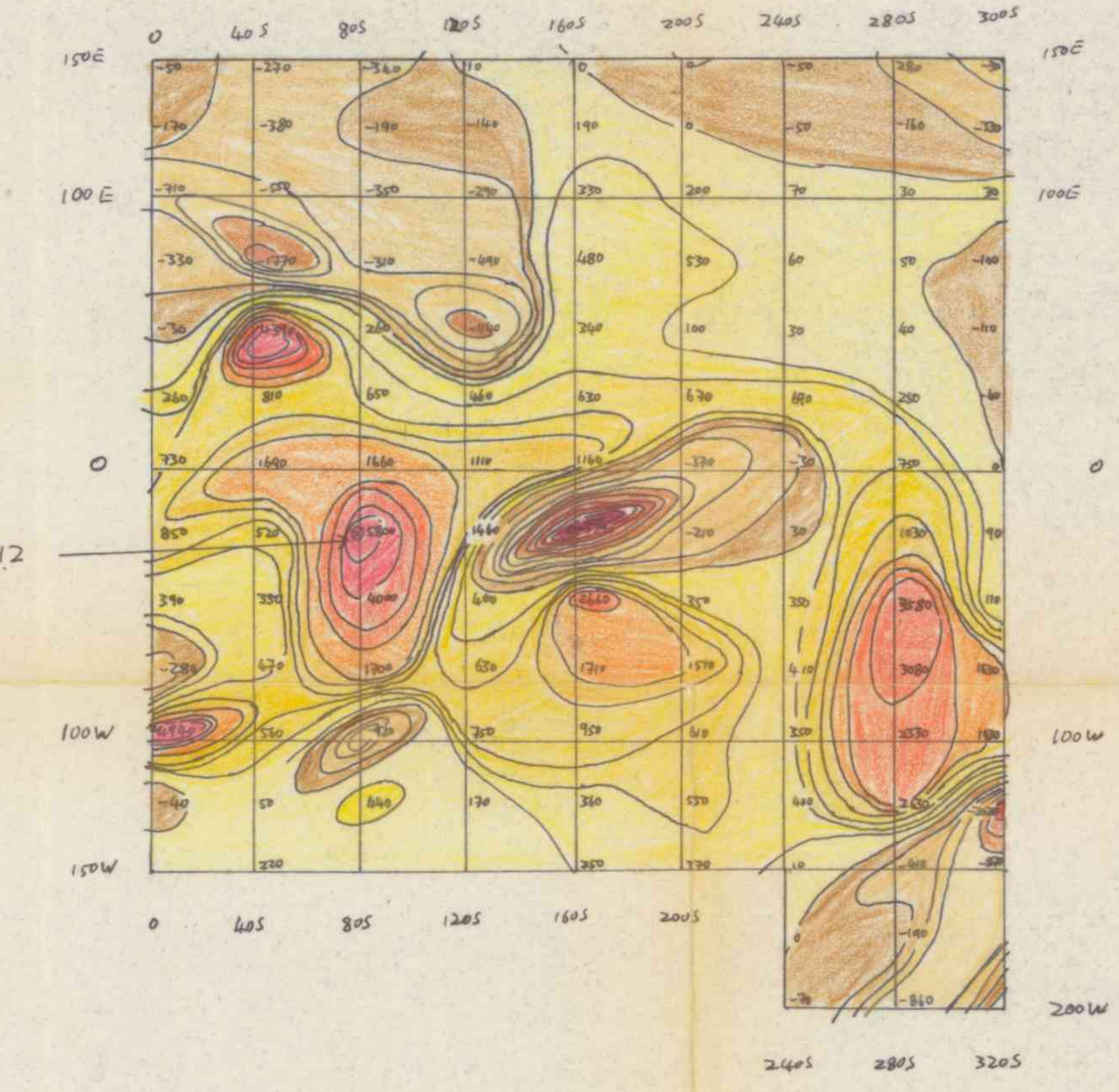


END OF HOLE 26.20 m

1:100

NORITE. (BASIC-MED-COARSE GR.)

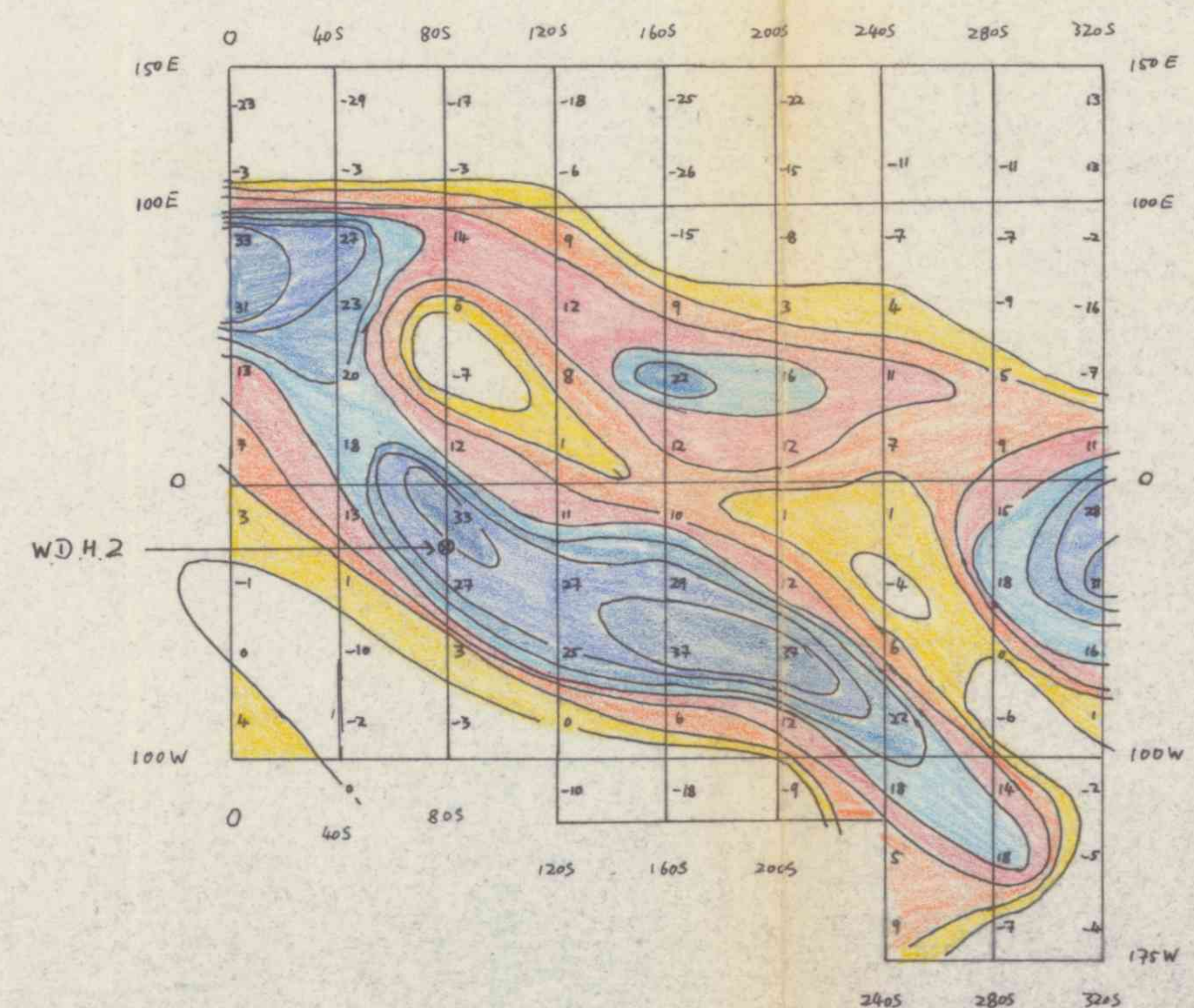
ULTRABASIC.



MAGNETIC MAP OVER AREA OF WINKIE DRILL HOLE 2.

γ	Positive +	Negative −
0 – 250		
250 – 500		
500 – 750		
750 – 1000		
1000 – 1500		
1500 – 2000		
2000 – 3000		
3000 – 4000		
4000 – 5000		
> 5000		

1:2500



V.L.F. EM. MAP OVER AREA OF WINKIE DRILL HOLE 2, CONTOURED FRASER VALUES

0 – 5
5 – 10
10 – 15
15 – 20
20 – 25
25 – 30
30 – 40

1:2500

DRILL HOLE 2. 80S/25W VERTICAL.
MEGRUNDSTJERN ESPEDALEN.

SCALE		
1:100.	OBS. FN	8.74
	DRAWN BE/FN	11.74
	TRAC. BE.	11.74
	CHK. FN.	11.74

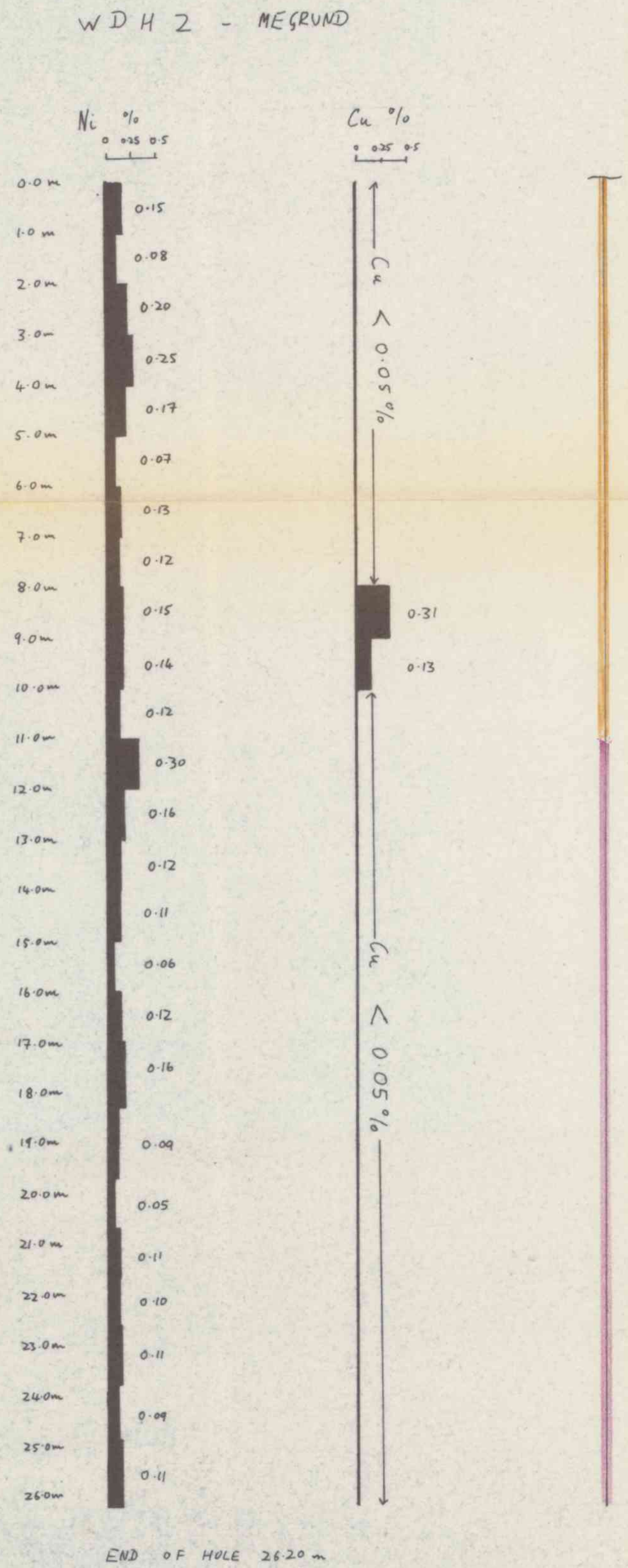
ENCL. 26.

A/S SULFIDMALM

MAP NO. 15.74.D3.

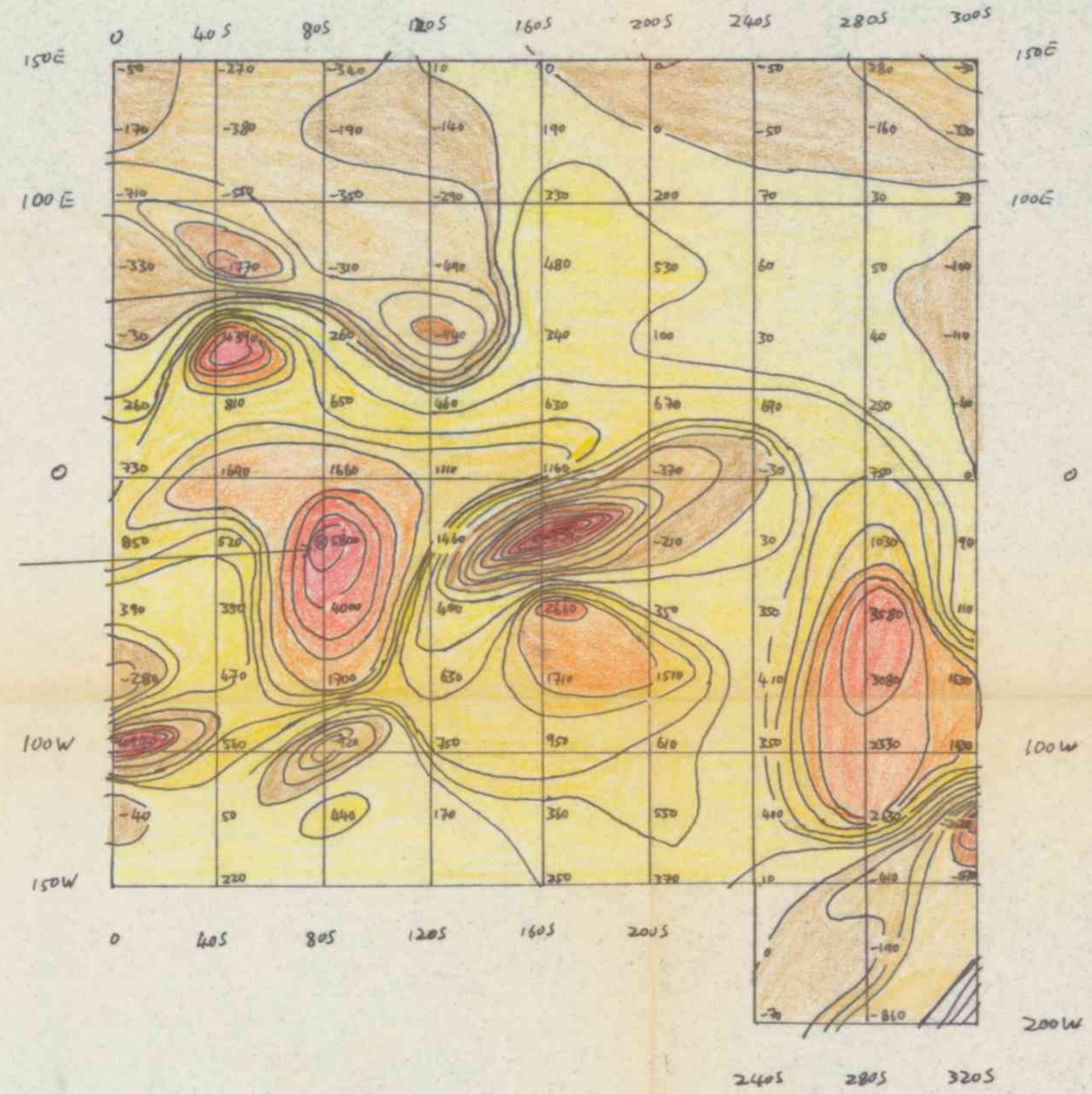
MAP SHEET

A.s Terrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.



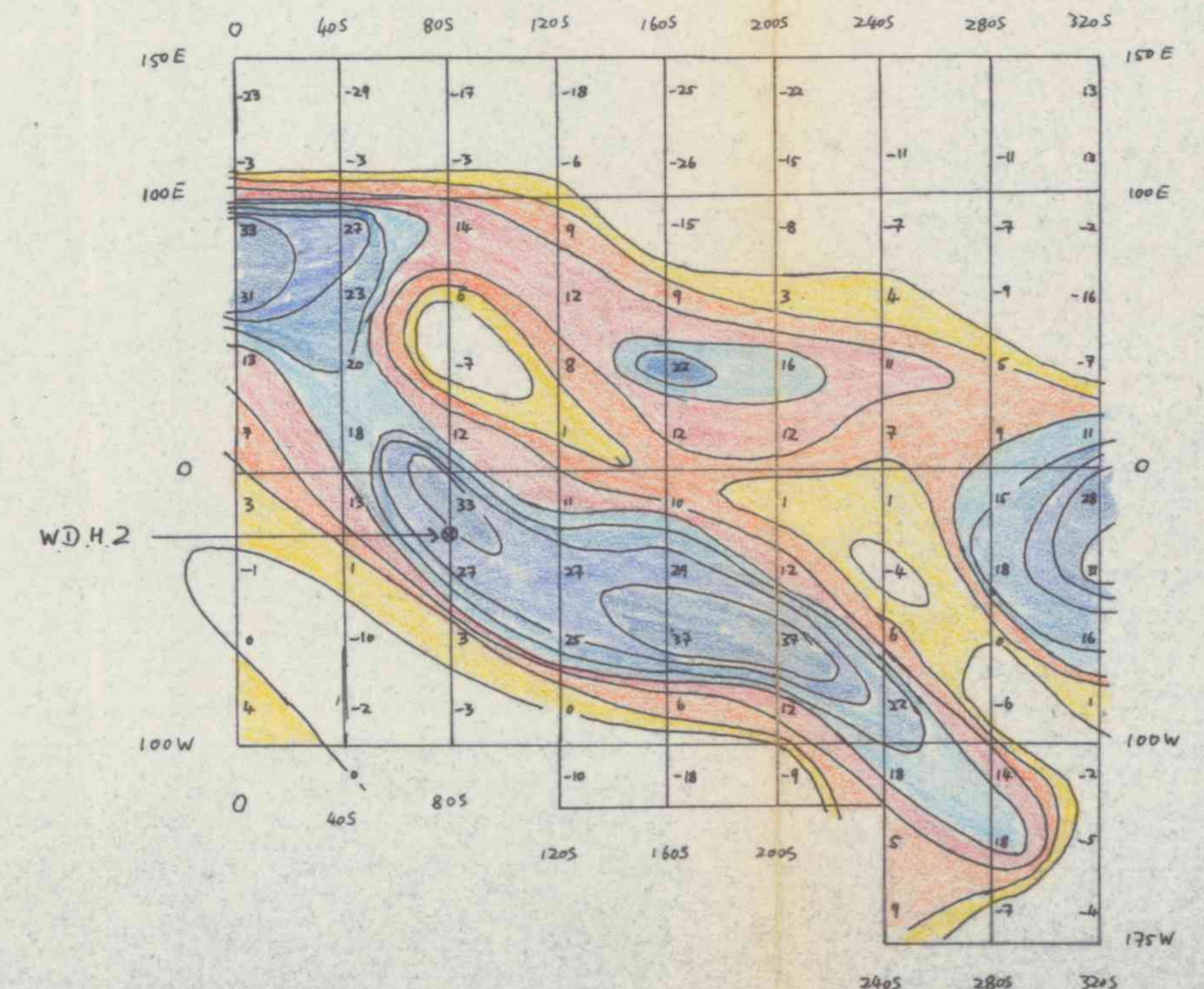
NORITE. (BASIC-MED-COARSE GR.)

ULTRABASIC.



MAGNETIC MAP OVER AREA OF WINKIE DRILL HOLE 2.

γ	Positive +	Negative −
0 – 250		
250 – 500		
500 – 750		
750 – 1000		
1000 – 1500		
1500 – 2000		
2000 – 3000		
3000 – 4000		
4000 – 5000		
> 5000		



V.L.F. EM. MAP OVER AREA OF WINKIE DRILL HOLE 2, CONTOURED FRASER VALUES

0 – 5	
5 – 10	
10 – 15	
15 – 20	
20 – 25	
25 – 30	
30 – 40	

DRILL HOLE 2. 80S/25W VERTICAL.
MEGRUNDSTJERN ESPEDALEN.

SCALE			
1:100.	OBS.	FN	8.74
	DRAW	BE/FN	11.74
	TRAC.	BE.	11.74
	CHK.	FN.	11.74.

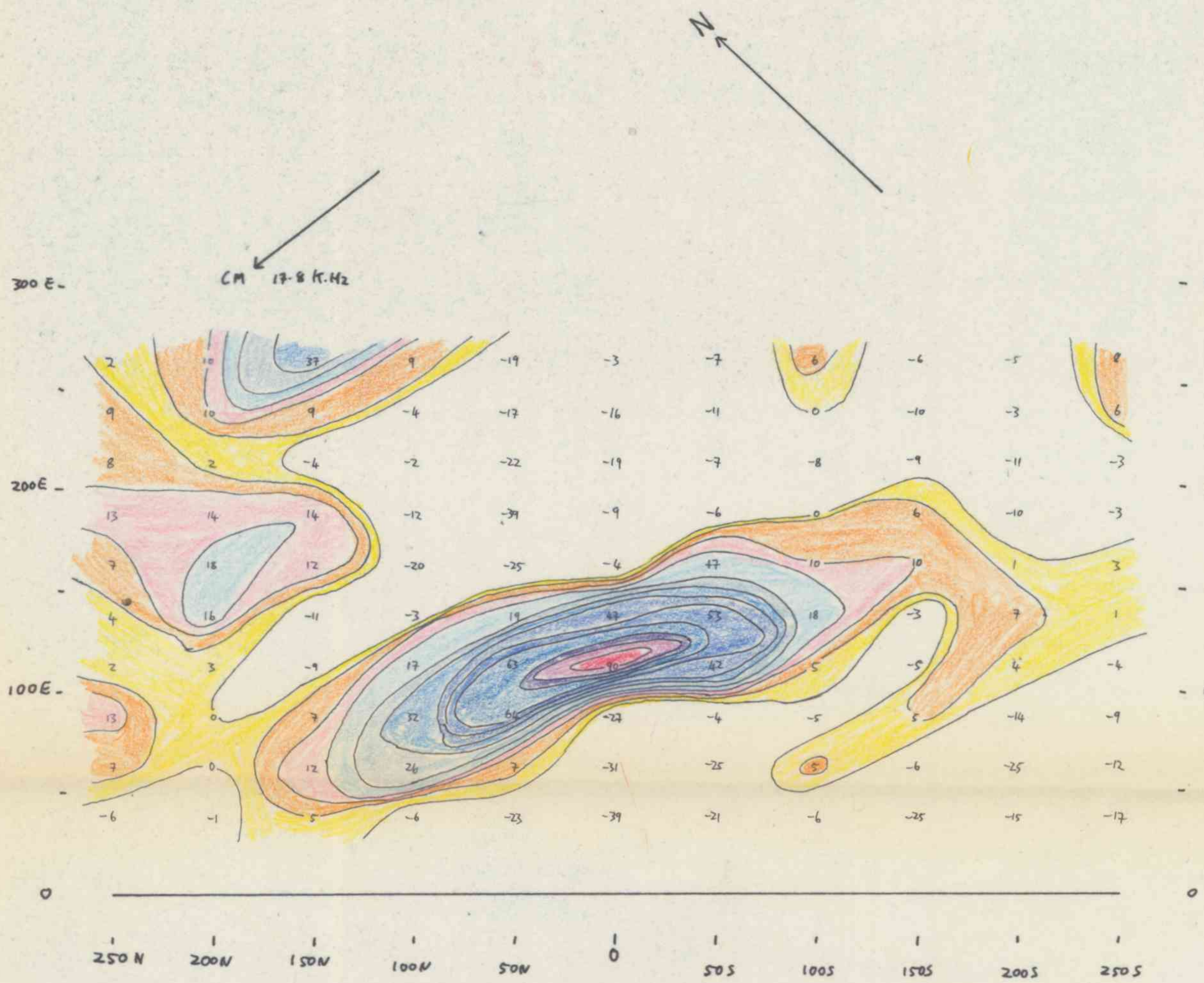
ENCL. 26.

MAP NO. 15.74.D3.

A/S SULFIDMALM

MAP SHEET

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.

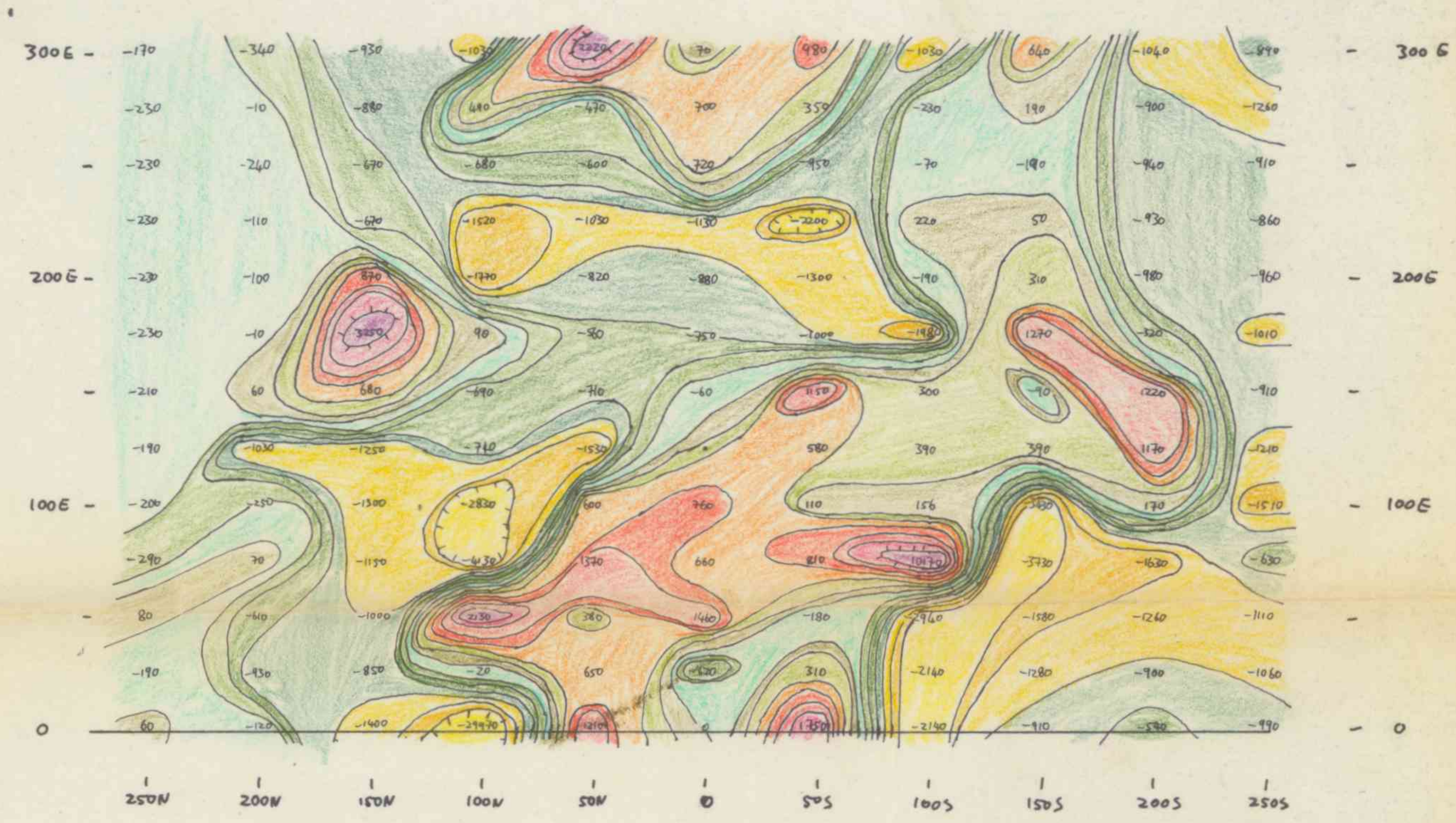


V.L.F. EM   INST. CRONE RADEM

FRASER CONTOURS

0 – 5	
5 – 10	
10 – 15	
15 – 20	
20 – 30	
30 – 40	
40 – 50	
50 – 60	
60 – 70	
70 – 80	
80 – 90	
90 – 100	

STATION C.M.



MAGNETIC DATA   INST. MC.PHAR M700 FLUXGATE

γ	+	−
0 – 250		
250 – 500		
500 – 750		
750 – 1000		
1000 – 1500		
1500 – 2000		
>2000		

V.L.F. EM & Magnetic data Stang grid Espedalen	SCALE 1:2500	OBS. PS. OB. 6-74 DRAW. DE 1-75 TRAC. DE 1-75 CHK.
	ENCL. 27	
A/S SULFIDMALM	MAP NO. 15 - 75 - B1 MAP SHEET	

A.s Tørrkopi. 2000. A 2. E 9 gl. 10-71. Sentrum Trykkeri.