



Bergvesenet

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Rapportarkivet

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Tittel Investigations at Vakkerlien Kvikne 1977.				
Forfatter F Nixon		Dato 1977	Bedrift Sulfidmalm A/S	
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Råstofftype Malm/metall	Emneord Cu Ni			
Sammendrag				

FOR FALCONBRIDGE NIKKELVERK A/S
A/S SULFIDMALM
PROJECT 905-20

INVESTIGATIONS AT VAKKERLIEN,
KVIKNE 1977.

By
F. Nixon

Report No. 466/77/20

SUMMARY

- 1) Pulse E.M. measurements carried out in the Vakkerlien area gave no indication of a southerly continuation of the known Vakkerlien ore body. A P.E.M anomaly parallel to the main zone was investigated by drilling. No new gabbro was discovered and it is concluded that the P.E.M anomaly investigated was caused by an edge effect of the main zone.
- 2) Two holes were drilled south of the main zone where drilling in 1975 had intersected 0.60 m of gabbro. The two holes were barren.
- 3) A new gabbro discovered to the east of the main zone was investigated by drilling. Although no significant sulphides were found this discovery is of considerable interest as it is thought to represent a piece of a larger gabbro body which was also parent to the main Vakkerlien body and might suggest that similar bodies to Vakkerlien are present in the vicinity.

INTRODUCTION

Work carried out in the Vakkerlien area in 1977 was based on trying to find a continuation of the known ore body and also to locate similar bodies in the immediate vicinity.

The work consisted of a winter Pulse E.M. program, and subsequent detailed prospecting, V.L.F. and magnetic surveys and drilling.

Pulse E.M survey and drilling of results.

In a hope to find a continuation of the known Vakkerlien ore body a P.E.M survey was carried out in April 1977.

The survey was carried out by Suomen Malmi Oy of Finland. The coil configuration was horizontal loop usually with 80 meters coil separation and with a transmit loop of 10 meters diameter. Some profiles were measured with 60 or 40 meters, coil separation and with a 4 meters transmit loop. The primary pulse was 1000 div. when possible and all the final results were normalized to 1000 div. 19 profil kms were surveyed. No indication of a southerly continuation of the known zone was picked up and several V.L.F. anomalies in the immediate vicinity of the Vakkerlien zone that were covered by one or two PEM profiles also gave no. PEM anomalies.

During the course of the survey it was decided to run check profiles of the known ore body in order to see what kind of anomaly was obtained. It was found that the ore body gave a marked anomaly especially when near surface but at increasing depth the anomaly became rapidly weaker.

A parallel anomaly to the main zone some 70 m to the east was interpreted by Suomen Malmi Oy (see enclosures 2, 3, 4, 5, 6) to be due to another conductor (than the main zone) having approximately the same conductivity but at a somewhat greater depth.

This interpretation was the subject of some discussion with arguments being put forward that the "twin anomalies" were due to one common source i.e. the Vakkerlien ore body and that they represented an edge effect anomaly over a small isolated flat lying conductor.

With so much doubt as to the cause of this anomaly and the possibility of locating a new deposit it was decided to test by drilling.

Four drill holes were put down on profile 650S (enclosure 7). On this profile the Vakkerlien gabbro was located at a depth of ca. 10-18 m. Three holes were spotted at a distance of 25 m, 55 m and 85 m east of the known zone and drilled down to 60 m and 70 m respectively. A fourth hole was located in the centre of the known gabbro and drilled down to 98 m. No new gabbro bodies were located in any of these holes, and the conclusion was drawn that the edge effect theory was correct with the "twin anomalies" representing only the known Vakkerlien zone. Drill logs of the holes drilled here are attached.

DRILLING ON SUPPOSED CONTINUATION OF VAKKERLIEN

During drilling in 1975 hole 34 located on profile 1550S intersected 60 cm (105.65-106.25) of Vakkerlien type gabbro (enclosure 8). It was thought that this might possibly represent a disconnected continuation of the Vakkerlien zone. Two holes were drilled 15 m on each side of hole 34/75. Both drill logs are attached. Both holes were taken down to 124 m with no gabbro being intersected.

INVESTIGATIONS ON NEW GABBRO IN VAKKERLIEN AREA

Several outcrops of a gabbro type similar to the main Vakkerlien gabbro were found in an area from 1100S-1400S approx. 250 m west of the main Vakkerlien zone. This gabbro was found already in 1975, but with a more detailed mapping and trenching several more outcrops were found and in one outcrop a very weak mineralization was discovered.

Proton mag. and V.L.F. measurements were carried out over the gabbro and its supposed continuation to the south. No V.L.F. anomalies were found, but a magnetic anomaly that was thought to represent the gabbro was seen to extend down to profile 2300S (enclosure 9).

Despite detailed prospecting no new gabbro outcrops were found except in the original discovery area.

On profile 1400S four short holes were drilled through the gabbro. The gabbro has a cross-section from that is similar to gabbro and has essentially the same mineralogy and variation. Judging from this section it seems to carry more ultrabasic material than the main Vakkerlien gabbro and also to carry more schist xenoliths.

No significant mineralization was found. In hole 100/77 a 2 cm bend of 10-15% sulphides occurred, the dominant sulphide being pyrrhotite but with visible pentlandite.

Enclosure 10 shows the "new gabbro" on profile 1400S in relation to the main Vakkerlien zone which is located 200 m to the west and at a depth of 75 m. It is thought likely that the "new gabbro" is genetically connected to the main Vakkerlien body and has probably been separated from it by the prevailing tectonic history - why the sulphides are only concentrated in the "main body" is as yet obscure but this discovery of a "new gabbro" certainly gives hope of finding more mineralization in the Vakkerlien region.

A drill hole was also put down on a proton magnetic anomaly some 750 m south of the drilled profile on 1400S. A magnetic anomaly zone had been traced from the gabbro outcrops on 1400S and was thought to represent a southerly continuation of the gabbro.

The drill hole intersected a mixture of schist, trondhjemite and gabbro. Gabbro was intersected between 43.7 m and 48.5 m, it was unmineralized and cut by several trondhjemite dykes.

Two small unmineralized meta-gabbro intersections were also found between 92.3-93.9 m and 102.05 and 102.9 m.

Drill logs are attached.

CONCLUSIONS

Investigations in the Vakkerlien area in 1977 failed to find any continuation of the known zone but it is thought that the discovery of a similar gabbro in the immediate vicinity suggests that the main Vakkerlien body is part of a larger body that has been broken up by tectonics and that other portions of the original body may occur quite nearby in the immediate vicinity. This opens the possibility of finding a new mineralized body, however it should be remembered that the area is extremely well covered by surface geophysics and at the time of writing no marked geophysical targets are present. During the spring of 1978 an office evaluation of the geophysical data will be undertaken.

LIST OF ENCLOSURES

1. Summary map of Kvikne region.
2. Comparison of V.L.F, Slingram, Resistivity, Magnetic C.P. and P.E.M measurements over the Vakkerlien ore body profile 500S.
3. Vakkerlien, P.E.M Survey, 500S TX-RX 40 m.
4. Vakkerlien, P.E.M Survey, 500S TX-RX 80 m.
5. Vakkerlien, P.E.M Survey, 550S TX-RX 80 m.
6. Vakkerlien, P.E.M Survey, 650S TX-RX 80 m.
7. Vakkerlien Profile 650S, DDH 12, 25, 71, 96, 97, 98, 99.
8. Vakkerlien South, Summary Map.
9. Magnetic Anomaly Map of New Vakkerlien Gabbro.
10. Vakkerlien Profile 1400S, DDH 41, 42, 100, 101, 102, 106.

^A/_s SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/425E BEARING: Vert. DIP: - HOLE NO: 41 SHEET NO: 1
 LOGGED BY: R. Sivertsen STARTED: PROPERTY Vakkerlien
 CASING: 27.0 m FINISHED:
 CORE SIZE: 35 mm TESTS (CORRECTED):

From	To	Description
0	26.0	Overburden
26.0	79.8	Banded biotite, chlorite, plag, quartz schist - band thickness micro-10mm. The schist has zone through two strong deformations. Strong folding of an early banding (in places nearly parallel to core string) is common. A later deformation has reorientated and imposed a new schistosity on the existing - in places is this late schistosity cataclastic. Th.m. at 52.0 - 52.3, 54.8 - 54.9, 65.9 - 66.6.
79.8	82.15	Alternating medium grained metagb. and more basic layers. Very weak sulphide content, specks.
82.15	83.0	Medium grained th.m. with gneissic texture.
83.0	83.8	Banded schist
	83.8	End of hole

A/s SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/425E BEARING: Vert. DIP: - HOLE NO: 41 SHEET NO: 2
 LOGGED BY: R. Sivertsen STARTED: PROPERTY Vakkerlien
 CASING: 27.0 m FINISHED:
 CORE SIZE: 35 mm TESTS (CORRECTED):

From	To	Description
		Core angles
	26.5 - 17°	Schistosity
	28.6 - 16	"
	30.7 - 19	"
	35.3 - 21	"
	38.7 - 18	"
	40.3 - 13	"
	44.5 - 9	"
	49.6 - 14	"
	51.6 - 15	"
	53.5 - 17	"
	59.1 - 11	"
	61.4 - 26	"
	63.5 - 25	"
	69.5 - 21	"
	71.8 - 11	"
	73.5 - 20	"
	79.6 - 9	"
	83.6 - 18	"

1/s SOLFIDALM

DIAMOND DRILL RECORD

LOCATION: 1400S/400E BEARING: DIP: 90 HOLE NO: 42 SHEET NO: 1
 LOGGED BY: F. Nixon STARTED: 20.10.75 PROPERTY: Vakkerlien
 CASING: FINISHED: 27.10.75
 CORE SIZE: TESTS (CORRECTED):

From	To	Description
0	22.60	Overburden
22.60	56.95	Schist well foliated and banded but with remnants of original deformation still preserved. Cut by small Trondhjemite and quartz veins.
56.95	57.20	Breccia zone in contact with Trondhjemite
57.20	58.60	Coarse grained Trondhjemite
58.60	60.05	Schist
60.05	73.65	Coarse gr. trondhjemite. From 70.00-73.65 the trondhjemite is itself cut by fine grained basic dyke rocks.
73.65	74.30	Schist
74.30	79.91	Gabbro. Fairly gradational contacts with schist. The gabbro contains quite a lot of feldspar material and not much real ultrabasic types are present. In several places there are remobilized concentrations of phlogopite and gedrite and feldspar often carrying some chalcopryrite. Only two portions carry significant sulphides 1) 5% cp with gedrite from 74.60-74.90 2) 77.70-77.95 coarse to medium grained sulphide blebs 2-5%
79.91	81.50	Schist and Trondhjemite
	81.50	End of hole

DIAMOND DRILL RECORD

From	To	Description
		Core Angles
	23.50 - 64	schistosity
	25.40 - 60	"
	27.40 - 72	"
	29.50 - 72	"
	31.50 - 74	"
	33.60 - 85	"
	35.40 - 80	"
	37.50 - 62	"
	39.50 - 85	"
	42.40 - 65	"
	44.50 - 60	"
	46.50 - 70	"
	48.40 - 75	"
	50.20 - 85	"
	52.40 - 70	"
	55.50 - 90	"
	52.60 - 60	contact

^{A/s} SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/195E

LOGGED BY: FN/JT

CASING: 6 m

CORE SIZE: T

BEARING: - DIP: 90

STARTED: 13/8/77

FINISHED

TESTS (CORRECTED):

HOLE NO: 100/77 SHEET NO: 1

PROPERTY: Vakkerlien

From	To	Description
0	6	Overburden
6.00	12.70	Dominantly grey massive talc/chlorite rich ultrabasic Plag. segregations at 11.00-11.10. At 9.85 6 cm of 20-30% sulphides equal amounts of cp. po. several pn grains noted.
12.70	13.00	Ultrabasic-biotite rich running into amph./plag. rock at 13.00.
13.00	13.40	Fine gr. meta gabbro slightly sheared seems to contain xenoliths of more basic material. At 13.20. 2 cms of 10-15% sulphides dominantly po but with the odd speck of cp pn.
13.40	15.70	Sheared ultrabasic - biotite chlorite rock Some plag and amphibole coming in towards bottom.
15.70	16.30	Ultramafic grading into meta gabbro.
16.30	16.87	Sheared meta gabbro with schist xenoliths.
16.87	18.30	Biotite schist.
18.30	25.50	Contaminated and xenolithic trondhemite full of schist xenoliths. Gabbro and ultramafic xenoliths come in around 23 m.
25.50	33.90	Good clean trondhemite - massive quartz vein at 32.10-32.40.
33.90	34.15	Gabbro xenolith.
34.15	35.80	Trondhemite
	35.80	End of hole.

A/s SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/215.80E BEARING: - DIP: 90 HOLE NO: 101/77 SHEET NO: 1
LOGGED BY: FN STARTED: 15.8.77 PROPERTY: Vakkerlien
CASING: 2.50 FINISHED: 16.8.77
CORE SIZE: T TESTS (CORRECTED):

From	To	Description
0	2.50	Overburden
2.50	22.30	Meta Gabbro - plag. chlorite amph. rock with some biotite. Amphiboles as well rounded grains. From around 16 m becoming more ultrabasic and more biotite rich. Sulphides as isolated specks throughout dom. po. one speck pn seen. From 21.00-26.30 becomes more gabbroic.
22.30	26.30	Gabbro and schist intermingled.
26.30	30.50	Dominantly schist with some contaminated and xenolithic trondhjemite.
30.50	35.80	Dominantly contaminated and xenolithic trondhjemite.
	35.80	End of hole.

A/s SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/236E

BEARING -

DIP: 90

HOLE NO: 102/77

SHEET NO: 1

LOGGED BY: JT

STARTED: 16.8.77

PROPERTY: Vakkerlien

CASING: 4 m

FINISHED: 16.8.77

CORE SIZE: T

TESTS (CORRECTED):

From	To	Description
0	4.0	Overburden
4.0	7.50	Coarse metagabbro containing many schist xenoliths and ultramafic xenoliths. Plagioclase content varies from 70% to 20% in bands. 5.60-5.70 - fine grained trondhjemite vein.
7.50	9.05	Banded schist, politic quartz biotite schist with calc-cilicate bands. 7.85-7.95 - Gabbroic vein 8.30-8.55 - Fine grained trondhjemite
9.05	9.85	Psammitic schist with tourmaline rich bands.
9.85	12.20	Banded schist, with cross-cutting fine grained trondhjemites at 10.70-11.00 & 11.60-11.70.
12.20	19.60	Trondhjemite: pegmatitic to 14.10, grading into coarse trondhjemite (increase in Giotite) to 19.60 14.65-15.20 - banded schist, xenoliths. 12.70-12.40, 15.50-15.60, 15.80-16.05, 16.15-16.20 - all later fine grained trondhjemites.
19.60	22.20	Trondhjemite becomes increasingly cartaminated - probable gradation into gabbroic rock type - contact not preserved. Metagabbro contains abundant ultramafic and schist xenoliths.
22.20	25.30	Gabbroic rock type enclosing large bands of schist. 23.00-23.50, becomes very brecciated, with angular schost fragments in fine grained gabbroic matrix. 23.55-23.80, 24.65-25.15, - medium grained trondhjemites with clear chilled margins.
25.30	29.70	Generally gabbroic rock type with ultramafic xenoliths to 26.00 - then becoming gradationally more mafic to an ultramafic biotite (pseudomorphs of amphibole) - chlorite rock from 26.70-27.00.

DIAMOND DRILL RECORD

BLARING - DIP: 90 HOLE NO: 102/77 SHEET NO: 2
STARTED 16.8.77 PROPERTY Vakkerlien
FINISHED 16.8.77
TLSTS (CORRECTED)

From	To	Description
		Gradational change to gabbroic rock again at 29.70. Ultramafic xenoliths appear again 27.90-27.98 - Cross-cutting fine grained trondhjemite veins.
29.70	30.60	Banded schist with calcareous tourmaline bearing psammitic sections. 30.75-31.50 - trondhjemite
38.60		End of hole

A/s SULFIDMALM

DIAMOND DRILL RECORD

LOCATION: 1400S/170E
 LOGGED BY: R. Sivertsen
 CASING: 7.0 m
 CORE SIZE:

BEARING: DIP: 90 HOLE NO. 106 SHEET NO. 1
 STARTED: PROPERTY Vakkerlien
 FINISHED:
 TESTS (CORRECTED):

From	To	Description
	6.5	Overburden
6.5	8.0	Metagabbro/metabasite The central part has a basic composition with a more gabbroic envelope. The metagabbroic parts have suffered strong shearing. Weak dissemination po.
8.0	14.9	Quartz biotite schist with narrow trondhjemitic dykes. Schist fragments are common in the dykes.
14.9	33.3	Coarse grained trondhjemite with a gneissic texture.
	33.3	End of hole
Core Angles:		
8.8	- 70°	schistosity
11.6	- 75	"
13.5	- 80	"
20.3	- 70	"
24.2	- 75	"
29.8	- 65	"
31.7	- 70	"

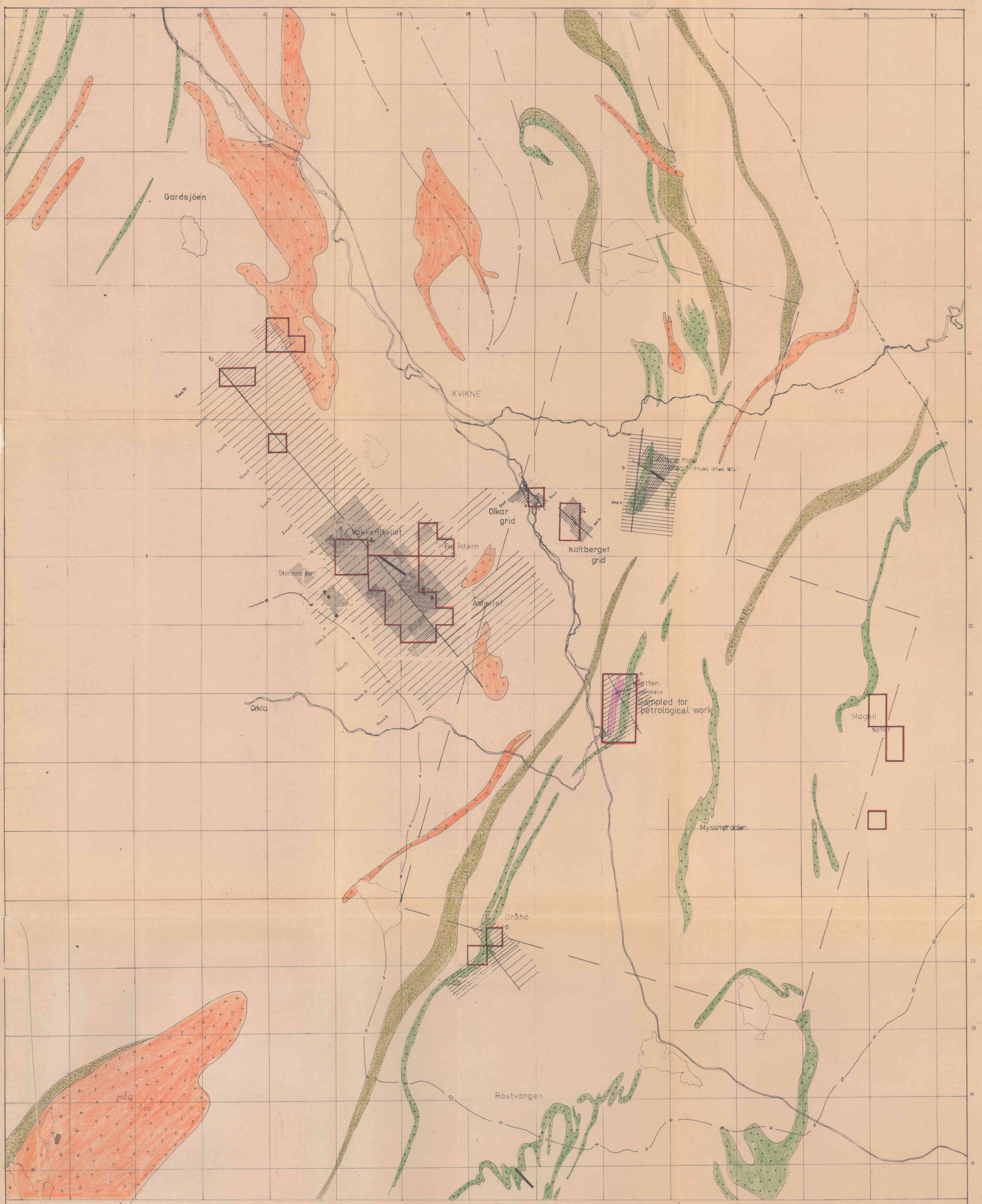
A/S SULFIDMALM
INTER-OFFICE MEMORANDUM

Date: 14th February, 1978 ✓
To: Falconbridge Nikkelverk A/S
cc: W. D. Harrison, H. T. Berry, R. Sivertsen
From: F. Nixon
Subject:

Please find enclosed a report on our investigations in the Vakkerlien region. It is of interest to note the discovery of a new gabbro to the east of the main zone. This might suggest that similar bodies to Vakkerlien are present in the vicinity.

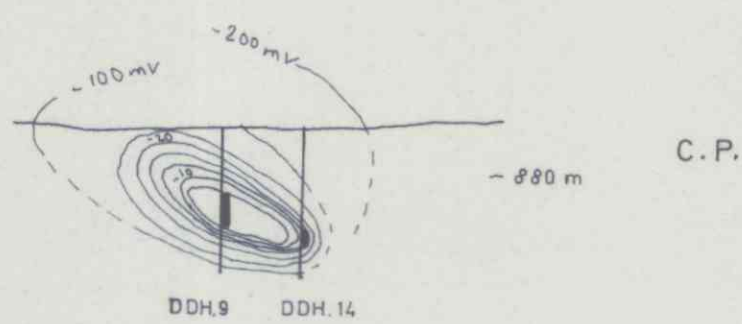
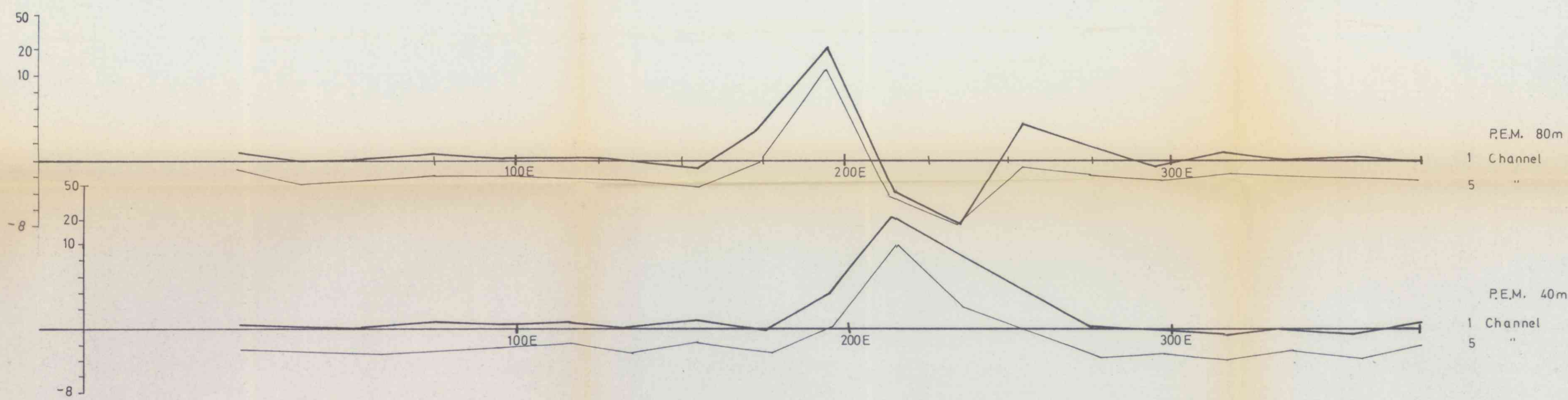
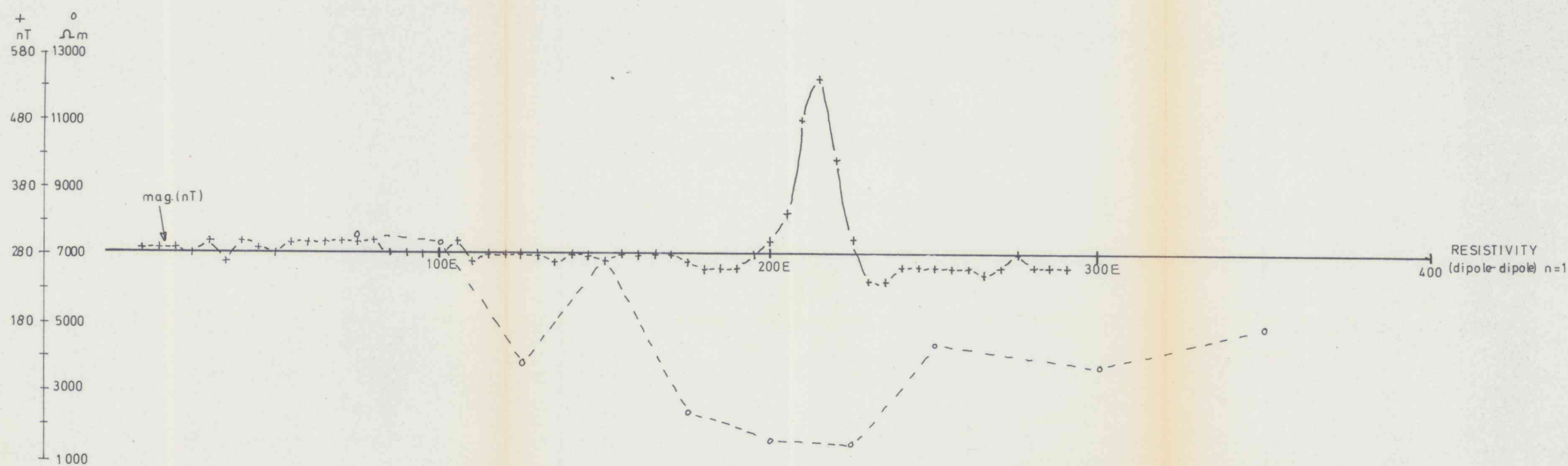
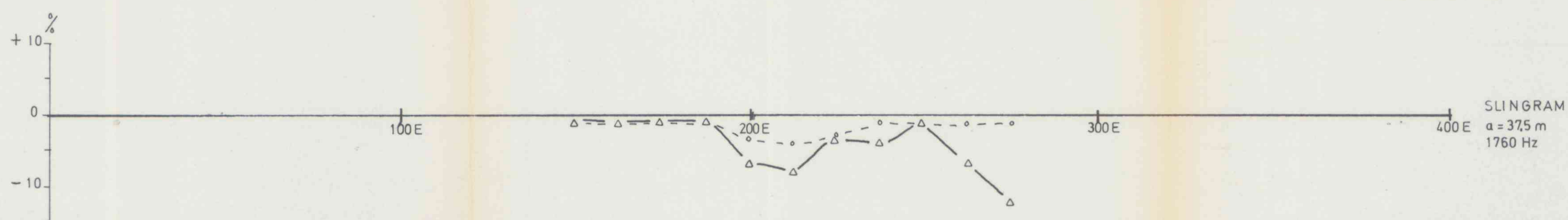
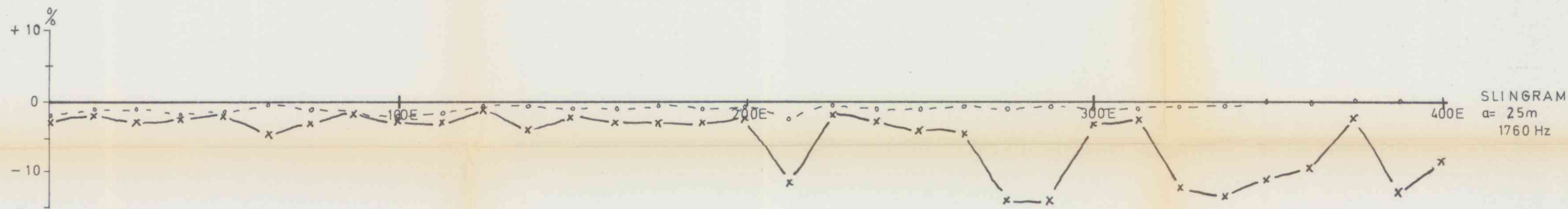
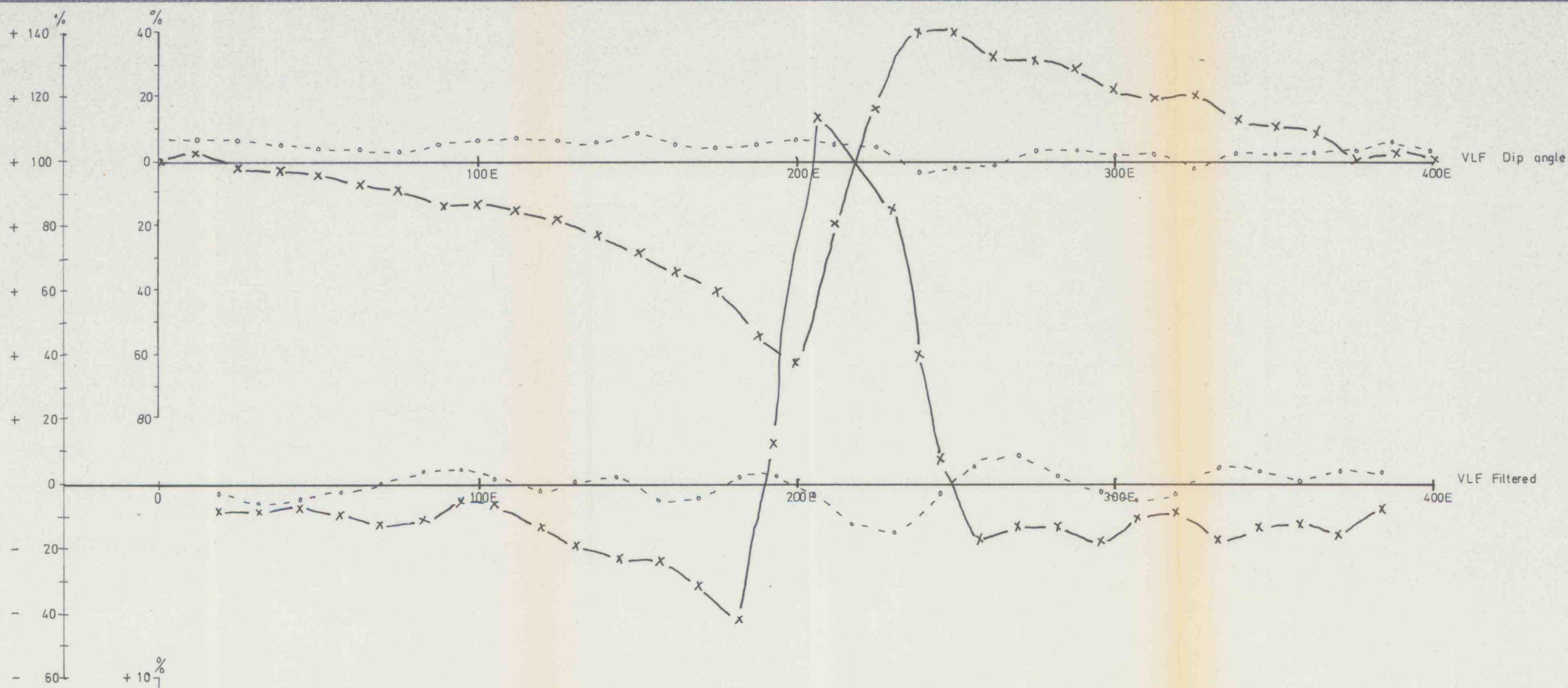
Frank Nixon

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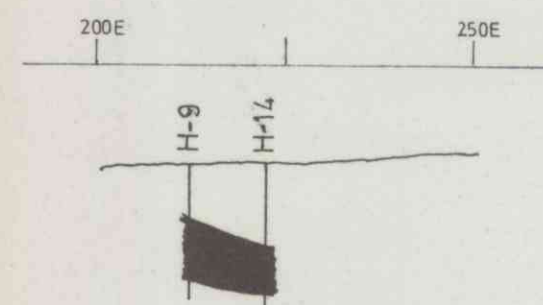
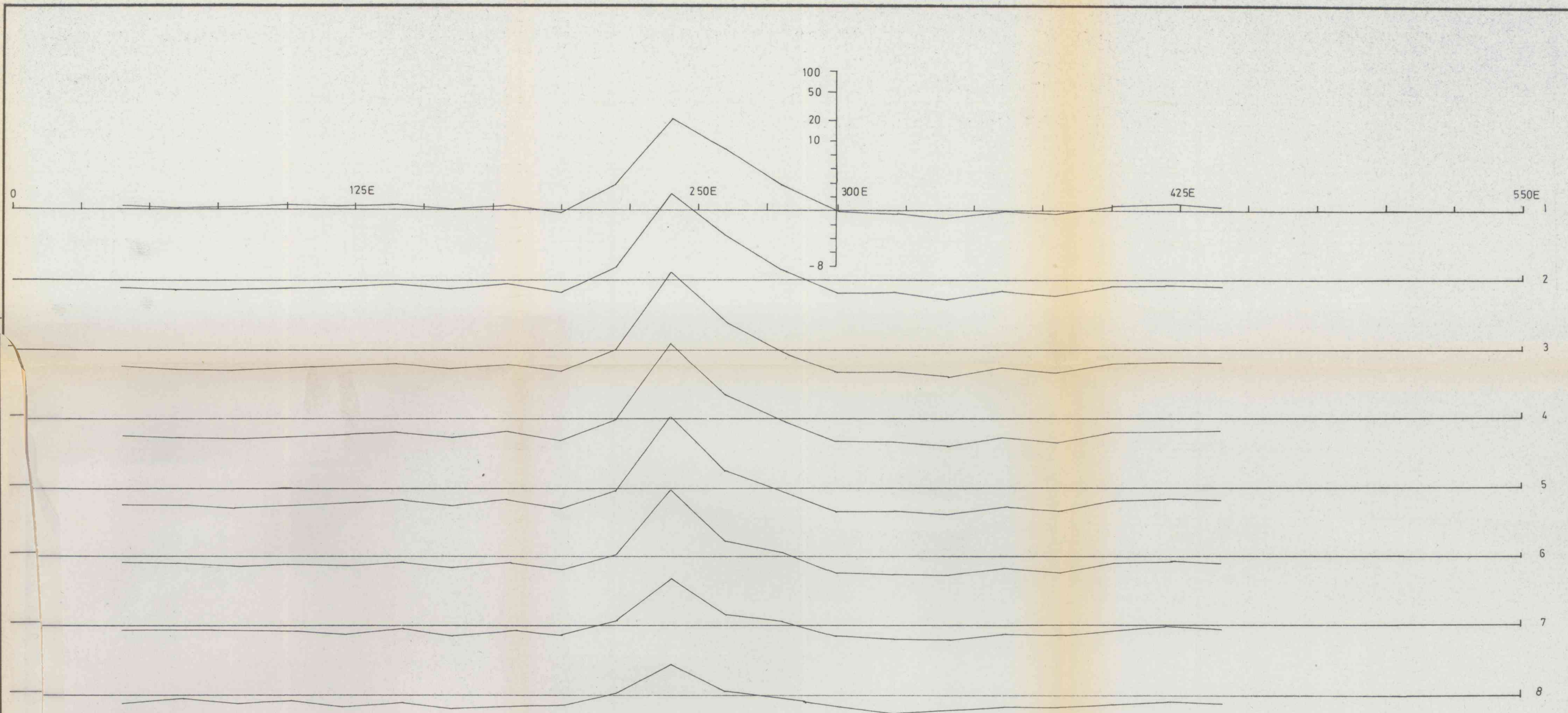


- Greenstone } STÖREN GROUP
- Siltstone
- Graphite schist } GULA GROUP
- Schist
- Ultrabasic
- Gabbro
- Acid intrusives
- Stream sed sampled area
- Helicopter survey area
- Claim blocks
- Vakkerliel grid summer 1975.
- Vakkerliel grid winter 1976.
- Detailed geophysical grid
- Position and direction of known mineralized bodies

KVIKNE AREA LOCATION AND SUMMARY	SCALE	OBS.	O.N.
	1:50000	DRAW.	R.S.
		TRAC.	R.S.
		CHK.	
% SULFIDMALM	MA. NO.		
	MAP SHEET		

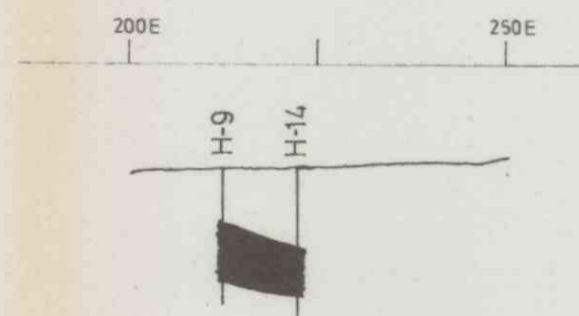
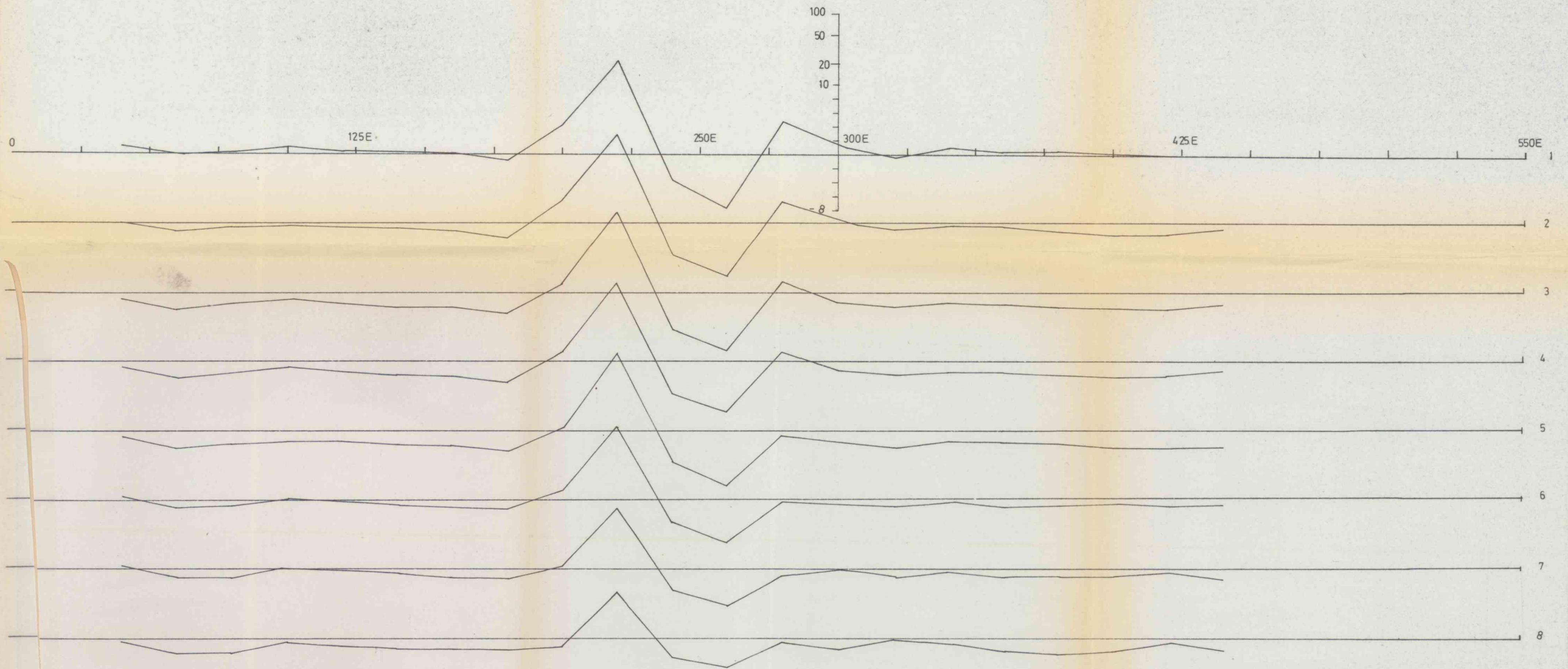


COMPARISON OF REM. C.P. MAG. VLF SLINGRAM AND RESISTIVITY SURVEYS VAKKERLIEN 500 S	SCALE	OBS.	
	1:1000	DRAW.	
		TRAC. LN	2-78
		CHK.	
% SULFIDMALM	MAP NO.		
	MAP SHEET		



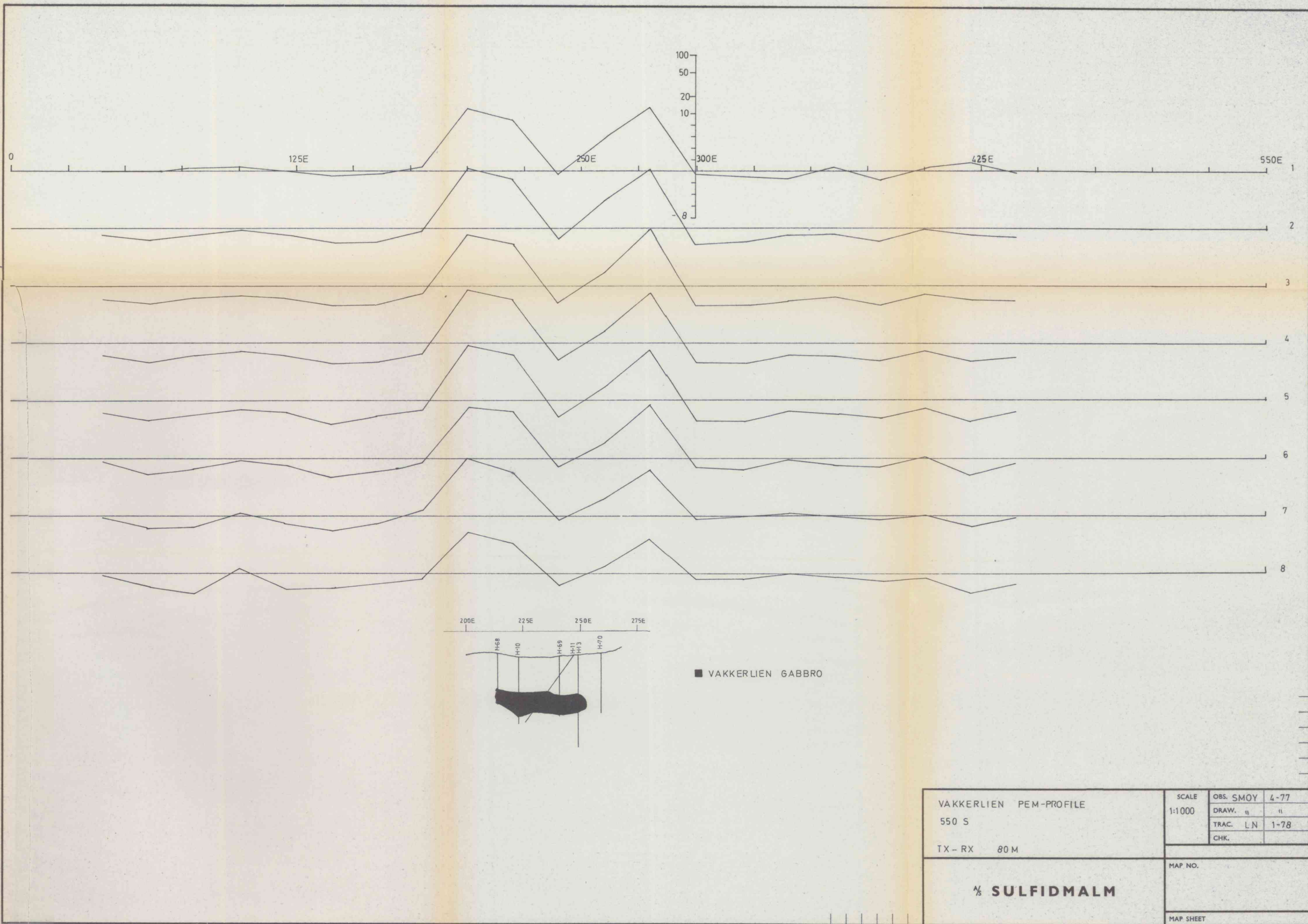
■ VAKKERLIEN GABBRO

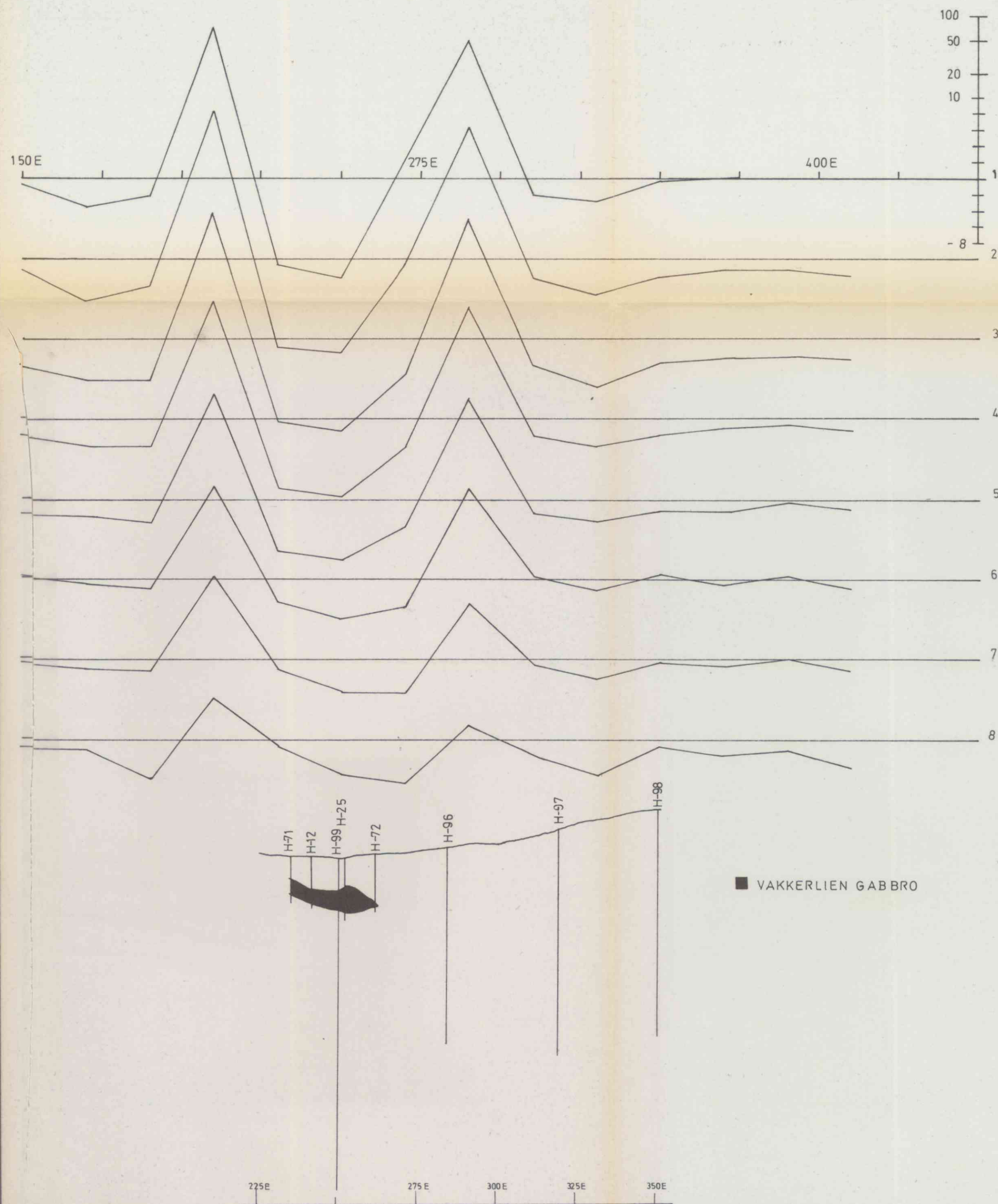
VAKKERLIEN PEM-PROFILE 500 S TX-RX 40M	SCALE	OBS. SMOY	4-77
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		TRAC. LN	1-78
		CHK.	
1/8 SULFIDMALM	MAP NO.		
	MAP SHEET		



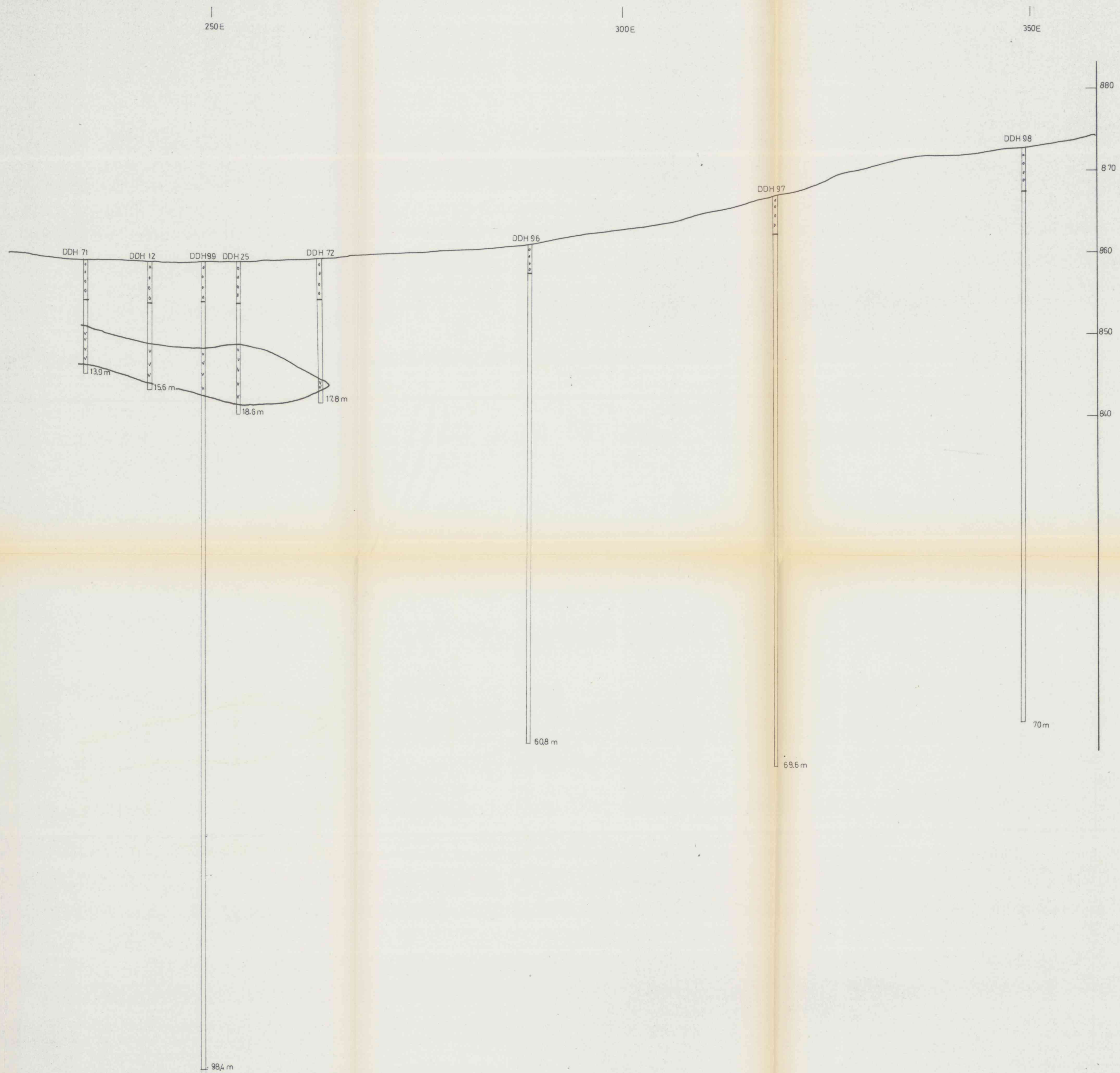
■ VAKKERLIEN GABBRO

VAKKERLIEN PEM-PROFILE 500 S TX - RX 80M	SCALE	OBS. SMOY	4-77
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		TRAC. LN	1-78
		CHK.	
$\frac{1}{8}$ SULFIDMALM	MAP NO.		
	MAP SHEET		

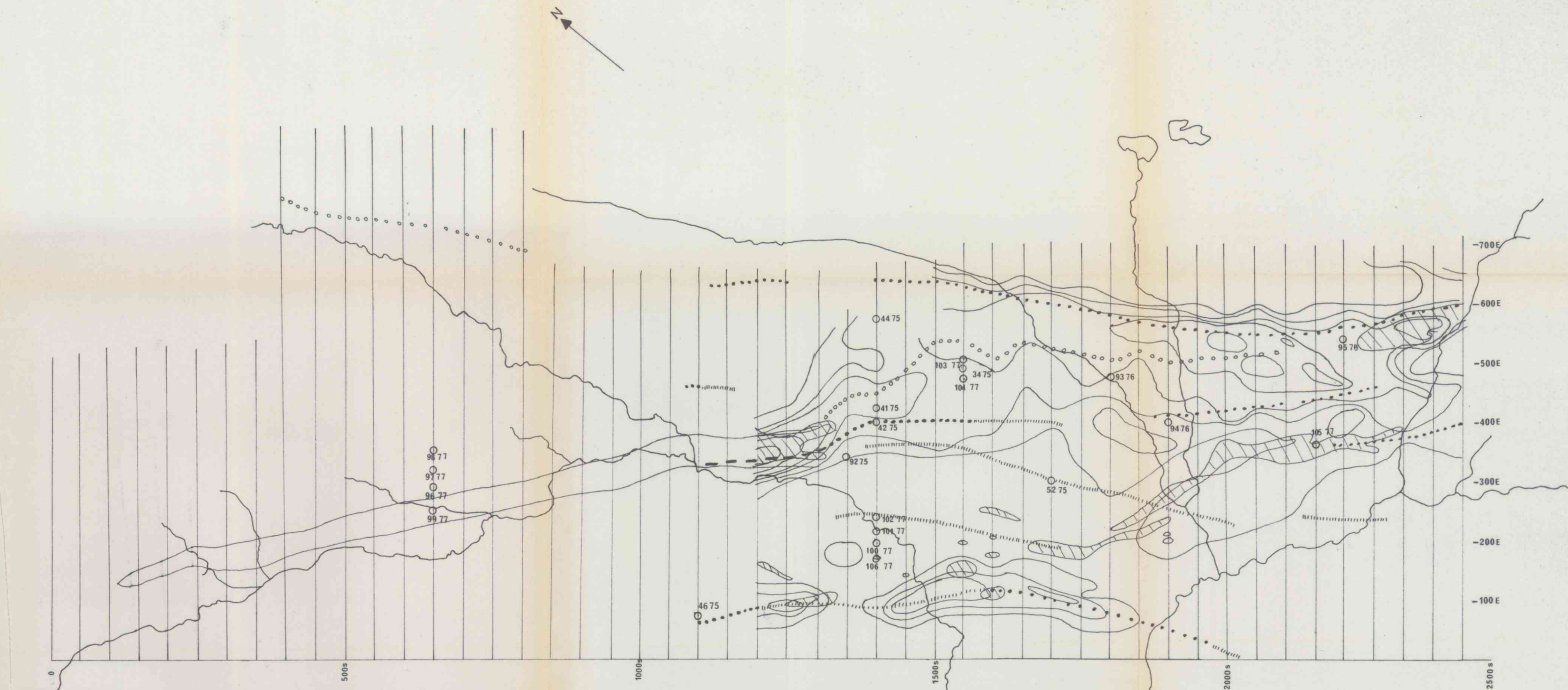




VAKKERLIEN PEM-PROFILE 650 S TX - RX 80M	SCALE	OBS. SMOY	4-77
	1:1000	DRAW. "	"
		TRAC. LN	1-78
		CHK.	
1/2 SULFIDMALM	MAP NO.		
	MAP SHEET		



VAKKERLIEN PROFILE 650S DDH 12-25-71-72-96-97-98-99	SCALE	OBS. RS EN	75 76
	DRAW. #		
	TRAC. LN	12-77	
	CHK.		
SULFIDMALM	MAP NO.		
	MAP SHEET		



□ VAKKERLIEN MINERALIZED GABBRO PROVED BY DRILLING 1975

TURAM SURVEY 1975

— — — — — STRONG
 WEAK
 ~~~~~~ VERY WEAK

VLF SURVEY 1976

o o o o o o o o TRACE OF DIP ANGLE CROSS OVER

0 - 5  
 5 - 10  
 10 - 15 FRASER CALCULATED DIP ANGLE DATA  
 15 - 20  
 > 20

MAGNETIC PROTON SURVEY 1976

▨ AREAS OVER 50400 γ

DRILL HOLES

|                                                  | HOLE DEPTH |
|--------------------------------------------------|------------|
| ○ 34.75 GABBRO NON-MINERALIZED 105-65 - 106-25   | 107-25 m   |
| ○ 41.75 GABBRO WEAKLY MINERALIZED 79-8 - 82-15   | 83-8 m     |
| ○ 42.75 GABBRO WEAKLY MINERALIZED 74-3 - 79-91   | 81-5 m     |
| ○ 44.75 BARREN                                   | 148-6 m    |
| ○ 46.75 NON-NICKEL BEARING SULPHIDES 12-95-13-05 | 16-15 m    |
| ○ 52.75 BARREN                                   | 109-4 m    |
| ○ 92.75 TRONDHEJEMITE                            | 78 m       |
| ○ 93.76 BARREN                                   | 151-1 m    |
| ○ 94.76 BARREN                                   | 146-3 m    |
| ○ 95.76 BARREN                                   | 121-2 m    |
| ○ 96.77 BARREN                                   | 60-8 m     |
| ○ 97.77 BARREN                                   | 69-6 m     |
| ○ 98.77 BARREN                                   | 70-0 m     |
| ○ 99.77 GABBRO WEAKLY MIN. 10-16m                | 98-4 m     |
| ○ 100.77 GABBRO WEAKLY MIN. 6-16-87m             | 35-8 m     |
| ○ 101.77 GABBRO VERY WEAKLY MIN. 2-5-22.3 m      | 35-8 m     |
| ○ 102.77 GABBRO 4-7.5 22.2-29.7 m                | 38-6 m     |
| ○ 103.77 BARREN                                  | 124-5 m    |
| ○ 104.77 BARREN                                  | 124-7 m    |
| ○ 105.77 GABBRO NON MIN. 43.7-48.5m 92.3-93.9m   | 136-6 m    |
| ○ 106.77 GABBRO 6-5-8m                           | 33-3 m     |

VAKKERLIEN SOUTH

SUMMARY MAP

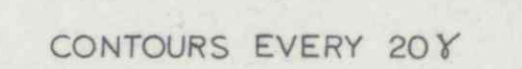
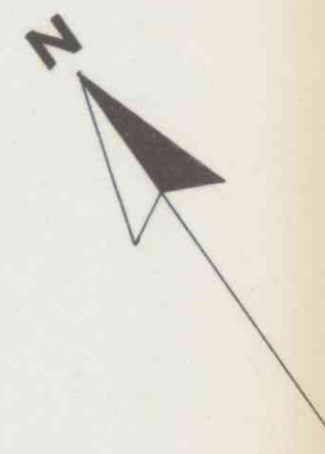
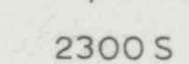
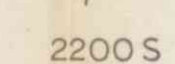
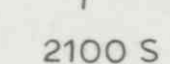
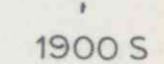
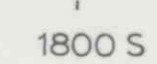
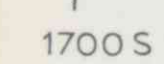
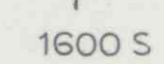
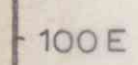
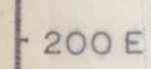
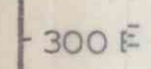
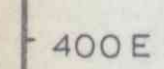
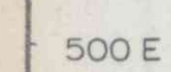
1/8 SULFIDMALM

| SCALE  | OBS.                   |
|--------|------------------------|
| 1:5000 | DRAW. <i>FN</i> , 1.77 |
|        | TRAC. <i>FN</i> , 1.77 |
|        | CHK.                   |

MAP NO.  
 20.77 A1

MAP SHEET





VAKKERLIEN GRID (SOUTH)  
MAGNETIC SURVEY

$\frac{1}{5}$  SULFIDMALM

|                     |          |      |
|---------------------|----------|------|
| SCALE               | OBS.     |      |
| 1:1250              | DRAW.    |      |
|                     | TRAC. DE | 1-78 |
|                     | CHK.     |      |
| INST: McPHAR PROTON |          |      |
| MAP NO.             |          |      |
| MAP SHEET           |          |      |



