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Tittel

The Åmot Area

Forfatter	Dato	Bedrift
Bollingmo, Åse	06.05 1983	Orkla Industrier A/S

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Råstofftype	Emneord	

Sammendrag

ORKLA INDUSTRIER A·S

MINING SECTION
EXPLORATION

GULF ORKLA
LØKKEN VENTURE

Report no: L.V.18 Date: May 6, 1983

Title: The Åmot area

ORKLA INDUSTRIER A.S.

MINING SECTION, EXPLORATION

Report no: L.V.18	Date: May 6, 1983
Title: THE ÅMOT AREA	
Prepared by: Åse Bollingmo	Areas name: Åmot
Map no., name: 1521 II Hølonda	Coordinates (UTM): NW corner, 395.020
Field work period(s): Aug.11 - Aug.27, 1982	Pages: 6 Map enclosures: 7

Summary (purpose, execution, results):

The summer 1982, geological mapping, VLF measurements and hardrock sampling was performed.

A possible stringerzone was discovered, both by the geological mapping and the chemical analysis. Old IP measurements and samples found at the dumpings outside the mine support the theory of a stringer zone.

The summer 1983, IP measurements are planned. Depending on the results, diamond drilling is the next stage.

Key words: Geological mapping, IP, geochemistry

Project initiated (date):	Report finished (date):

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ENCLOSURES

INTRODUCTION

The Amot mines are located 6,5 km east of Løkken (encl.1)

During the most active period, from about 1855 to 1890, the average year production was 300 tonnes of ore.

We have got very unsufficient information about the mineralogy of the Amot ores. Some old documents show that the copper content is 5 % to 21 %, but most probable this ore is separated to a certain degree.

A few maps of the mines exist, but we don't know if they are á jour. A geological description of the mining area is totally lacking.

In 1954, turam measurements were performed, and in 1969, NGU made IP measurements in a small area around the mines.

Since then, there has been no prospecting activity in the area.

Last summer (1982), VLF-measurements, geological mapping and hardrock sampling was done.

GEOLOGY

Lavas dominate the geological map (encl.2). They occur as pillow lavas and more rarely as massive flows and pillow breccia.

The lavas are almost solely vesicular. They are close-packed with no marked rims. In some localities, however, there are pillow lavas and pillow breccia with hyaloclastite between pillows and fragments. These lavas are also vesicular.

In a westerly direction from the mines, there is a zone with greenstones extremely rich in magnetite. This zone is about 1 km long in a NW-SE direction, and 500 metres wide.

What caused the unnormal magnetite content is not certain. It may be a primary feature, or as well a result of hydrothermal alteration.

In only a few localities of pillow lava, we are able to measure the layering, but it seems to be inverted all over the area.

The layering in general strikes about E-W, (NE-SW), and dips relatively steep to the north.

Corsegrained doleritic greenstones are found in an area north of the mines. The relation between these greenstones and the fine-grained lavas is not known.

An unnormal content of magnetite, as mentioned above, does not seem to occur in these greenstones.

Jasper and chert/cherty sediments occur frequently within the lavas, both in the magnetiterich ones (mentioned above) and in lavas with a more normal mineralogy.

The chert is black and contains magnetite and often stilpnomelane.

Alteration and mineralization

There are two main mines in the Åmot area, the "pyrite mine" and the "copper mine". On the dumpings outside the latter, I have found boulders with dark, chlorite-rich greenstone with almost pure chalcophyrite veins of 2 cm thickness. One such vein is analyzed and it contains 10 % Cu.

We also find boulders with greenstone which contain disseminated pyrite, pyrrhotite and chalcopyrite.

There are severeal old prospects near the two mines, at least five. All but one lie in chlorite-rich, dark greenstones with disseminated pyrite, pyrrhotite and traces of chalcophyrite. No massive ore or thick sulphide veins are observed in the old prospects or in their dumpings.

The disseminated sulphides and sulphide veins in the copper mine may represent a feederzone to a massive ore, and this will be further investigated next summer (1983).

The high chlorite content in the greenstones may be caused by hydrothermal alteration, perhaps in connection with ore genesis. In the Løkken mining area chloritization is a common kind of alteration in the stringerzone.

The chloritization is the only kind of alteration observed in the Åmot area.

DEFORMATION

By studying the pillow lava, we are in a few localities able to see that the layering is inverted.

In general, the strike of the layering in the Åmot area varies from 300^{g} to 345^{g}. It dips north with an angle of 40^{o} to 80^{o}.

Schistosity is not well developed, but it seems to strike about E-W with a gentle northerly dip.

The terrain in the surroundings of the Åmot mines is very difficult and hilly. Several fracture zones cut through the area.

The fracture zones run in all possible directions. However, one may say that W, SW-N,NE is a main direction. One fracture zone with this direction runs through the copper mine.

How the fracture zones run to the depth in uncertain yet, and we don't know anything about how the different blocks have moved. This is difficult to tell from the surface map, because there are too few distinct rock types.

GEOPHYSICS

EM helicopter anomalies are totally lacking in the Åmot mine area (encl. 3). Only far south, north of Urvatnet, there is an extensive zone. It strikesNW-SE, and coincide well with a 'vasskis', which is seen in an old diamond drillhole, and a jasper alternating with a cherty sediment, which is observed along the northern shore of Urvatnet.

There is also a weak anomaly by the small lakes Sjursåtjønnene.

The magnetic helicopter measurements give several distinct anomalies. In fact, the whole area north-west from the mines, along Jensineåsen is an anomalous area, Jensineåsen itself showing the highest values.

North-east of Urvatnet at a distance of about 200 m, there is a magnetic anomaly. Precisely at that place I have observed a chert rich in magnetite and stilpnomelane.

Turam measurements were performed by NGU in 1954 (encl.4).

The numerous fracture zones mean some problem for the interpretation of the results.

Most probable some of the fracture zones give weak to distinct electromagnetic anomalies.

For instance, the anomaly lines running SE and east from lake Litle Sjursåstjønn coincide with fracture zones.

NE of Litle Sjursåstjønn there is a 250 m long anomalous zone, and this may be caused by jasper, which is seen at the western end of the anomaly line. The eastern, weaker extension of this anomaly, is most probably a fracture zone.

All the jasper/chert zones in Hårralikamben and Jensineåsen give weak turam anomalies.

The extensive conductor far south in the turam area is most probable a 'vasskis'/jasper/chert. Jasper and chert is observed in several localities along the strike. 'Vasskis' is found by means of diamond drilling east of lake Urvatn.

Between the copper mine and the pyrite mine, there are three extensive conductors with a SW-NE direction. All these coincide with fracture zones which are easily seen in the terrain.

IP, SP and apparent conduvtivity measurements were performed by NGU in 1969 (encl 5 and 6). Theconclusions of these were that many conductivity anomalies are caused by big fracture zones. - So if there is a conductivity anomaly with no IP anomaly belonging to it, we should be a bit suspicious.

According to the NGU report, the most interesting IP anomalies are as follows:

750 N to 850 N / 5950 V to 6250 V
600 N to 700 N / 5650 V to 5900 V
Around 700 N / 6200 V
400 N to 600 N / 5850 V to 6150 V

In addition to the anomalies mentioned here, there is one far north-west in the IP-area without any comment in the NGU report. The shape of it indicates a norherly extension. Such an interpretation fits in with the field observeations. There is an area which has some mineralization and also an old prospect.

The method which NGU used in 1970 does not give any interpretation of the deep structures. Therefore we will try with an other equipment next summer (1983).

VLF-measurements are performed only to a small degree, and they don't give any distinct anomalies (encl. 7).

Anyhow, a weak indication is seen along Jensineåsen down to the Åmot mines. My interpretation is a long continuous zone, but that may be wrong. Most probable there are several interrupted zones each of them coinciding with jasper and chert horizones.

I am not sure if the high magnetite content in the lavas around Jensineåsen give EM anomalies, and if they do, which of the anomalies they cause.

GEOCHEMISTRY

Hardrock samples were picked along two profiles with a north-southerly direction. One of the profiles goes from about 1500 x/1400 y to about 1500 x/1900 y in the VLF system (encl.2). The western profile goes from about 1160 x/1350 y to 1160 x/1750 y in the same system.

These profiles were chosen on the base of observed sulphide mineralization and alteration.

The distance between the sample points was meant to be 50 metres, but because of the vegetation it was impossible to keep the distance completely constant. Besides this system, single samples from sulphide veins were collected.

Special geological fenomena, such as hyaloclastite, pillow rims, shear- and fracture zones, were avoided because of eventuel disturbance from secondary dispersion.

The samples were analyzed with regard to eleven elements: Cu, Zn, Co, MnO, Fe_2O_3, CaO, Na_2O, K_2O, Cr, Sr and S. The result is seen in the table below.

Sample no.	Cu ppm	Zn ppm	Co ppm	MnO pct	Fe_2O_3 pct	CaO pct	Na_2O pct	K_2O pct	Cr ppm	Sr ppm	S ppm
Å 101	15	180	28	0,16	10,60	5,25	2,43	0,25	28	629	< 0,01
Å 102	272	77	10	0,06	3,68	2,98	5,20	0,34	26	620	0,40
Å 106	206	55	52	0,13	9,46	1,01	1,95	0,18	43	7	0,02
Å 107	100	85	44	0,19	9,48	2,47	4,19	0,34	214	47	0,05
Å 108	81	60	43	0,17	11,50	3,55	4,00	0,27	227	64	< 0,01
Å 109	21	92	48	0,13	17,80	3,54	6,11	0,14	10	173	1,78
Å 110	2	48	33	0,11	9,04	3,12	4,18	0,07	30	92	0,02
Å 201	52	78	28	0,13	6,26	8,25	2,72	0,29	180	204	0,13
Å 202	45	65	25	0,15	6,40	9,72	1,07	0,04	183	26	< 0,01
Å 203	43	150	25	0,12	10,00	2,43	5,25	0,11	14	60	< 0,01
Å 204	17	140	32	0,21	10,60	1,85	5,18	0,24	12	80	< 0,01
Å 205	42	67	30	0,22	10,10	3,88	4,93	0,26	269	114	0,06
Å 206	21	87	26	0,18	9,64	10,00	2,72	1,48	133	265	0,03
Å 208	248	290	22	0,14	12,90	1,22	2,14	1,85	18	16	1,52
Å 209	12	80	33	0,20	11,70	3,45	5,11	0,16	163	81	0,02

A few samples, mainly from old prospects and dumpings outside the copper mine, were analyzed only with regard to Cu, Pb, Zn and Ni. (see table below)

All values in ppm

Sample no.	Cu	Pb	Zn	Ni
Å 104 (prospect)	744	13	206	16
Å 105 (prospect)	299	35	158	10
Å 207	115	12	348	17
Å 210 (dumpings)	44 260	27	77	35
Å 211 (dumpings)	104 300	44	83	86

We wanted to see if we could recognize a dispersal pattern.

In spite of the scarce amount of data, some of the elements show clear anomalies,-and for Fe_2O_3, S, Na_2O, Cu and CaO the values indicate anomalous zones both negative and positive with the same direction as the IP anomalies in the area, that means SW-NE.

As mentioned before, the amount of data, is much too small to give any acurate picture of the geochemical conditions in the area.

DISCUSSION AND CONCLUSIONS

Both geological, geophysical and geochemical investigations show that the area around and west of the Åmot mines is interesting with regards to an eventual ore discovery.

West and north of the mines, in the hill called Jensineåsen, there are distinct IP anomalies, geochemical anomalies and geological conditions, indicating that there has been alteration and mineralization of the greenstones.

The layering in the area is normally about E-W. The IP anomalies and the geochemical anomalies in Jensineåsen have a NE-SW direction.

This may be same situation as we see for stringerzones underlying massice sulphide orebodies in the Løkken area.

The reason why the feederzone is not still perpendicular to the layering as it was after the formation is rotating during deformation.

As mentioned before we have very unsufficient knowledge about the mineralization zone NW of the Åmot mines.

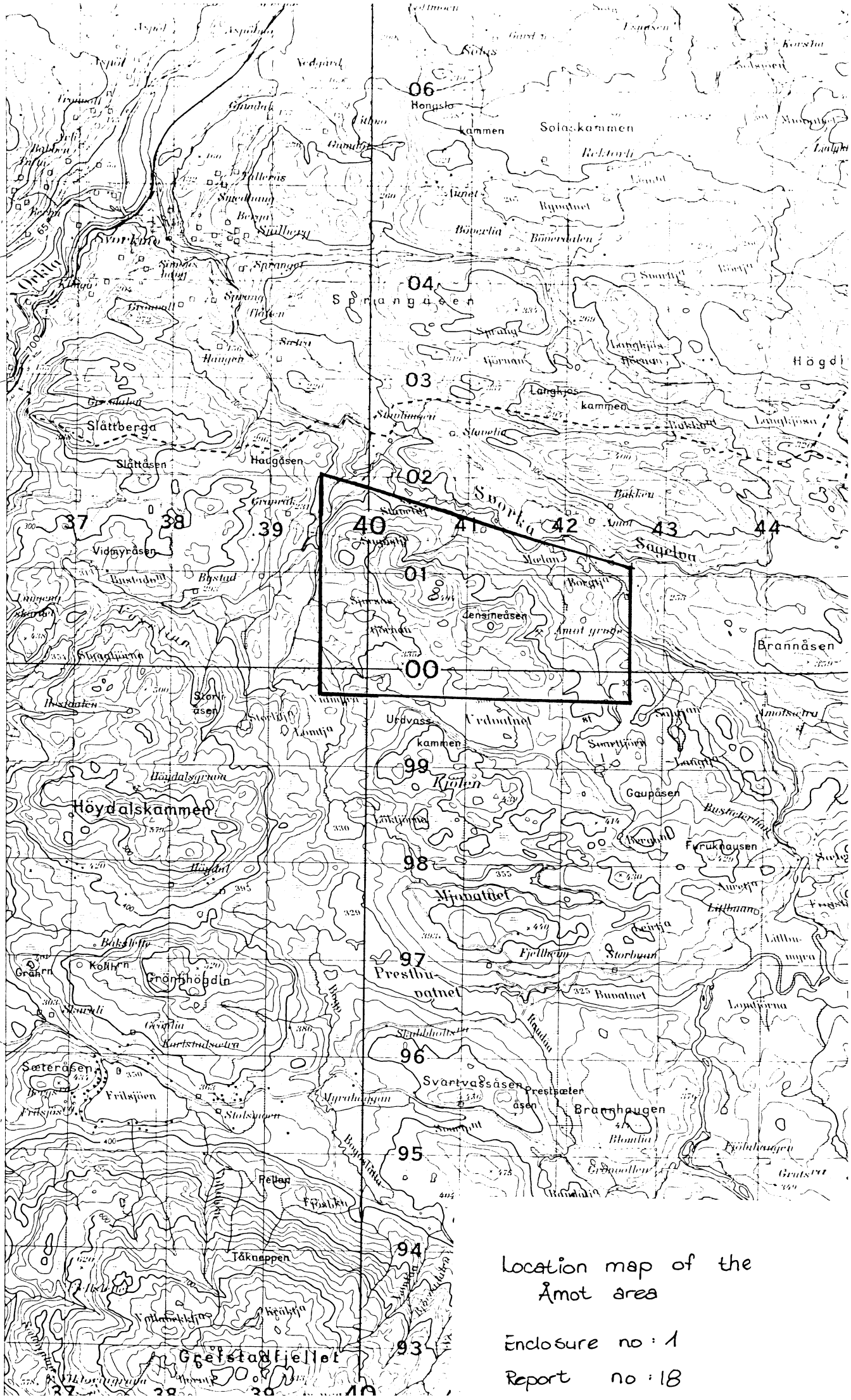
We vill start the furhter investigations with IP measurements. By applying the same equipment as we did last summer (1982), we can get a detailed picture of the zone(s) rich in disseminated sulphides.

Depending on the results of the IP measurements, next stage will be diamond drilling.

By investigations of the cores, we should be able to localize an eventual massive orebody belonging to the stringerzone.

Løkken Verk, 3rd of May 1983

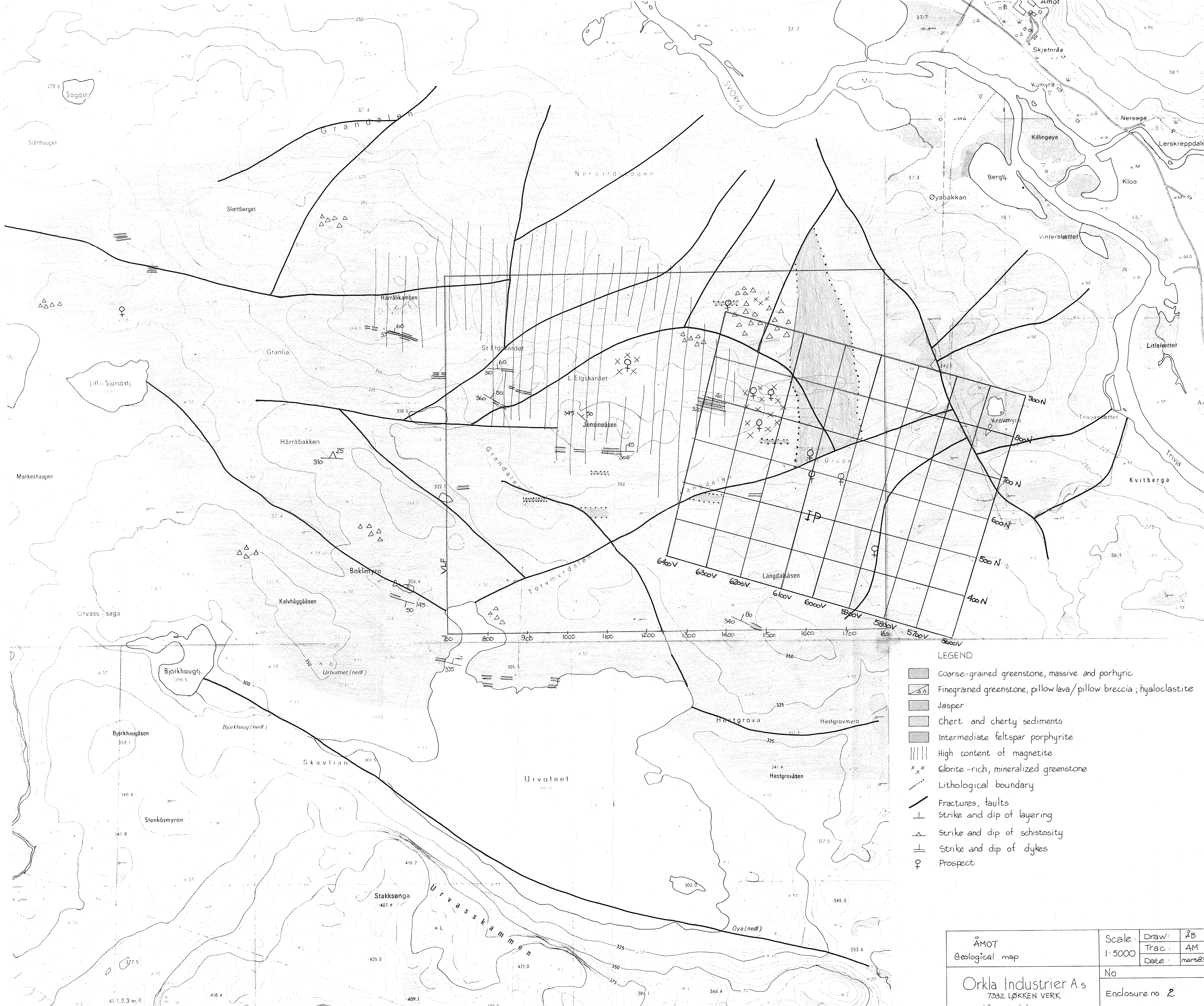
Åse Bollingmo
ÅB/BH



Location map of the Åmot area

Enclosure no : 1

Report no : 18


LEGEND
Coarse-grained greenstone, massive and porhyric
Finegrained greenstone, pillow lava / pillow breccia ; hyaloclastite
Jasper
Chert and cherty sediments
Intermediate feltspar porphyrite
High content of magnetite
Clorite-rich, mineralized greenstone
Lithological boundary
Fractures, faults
Strike and dip of layering
Strike and dip of schistosity
Strike and dip of dykes
Prospect
ÅMOT
Geological map
Scale : 1: 5000
Draw: ÅB
Trac: AM
Date: mars83
No
Orkla Industrier A.s
7332 LØKKEN VERK
Enclosure no 2
Grandalen
Nordgardsboden
Slættberget
Hårrålikamben
St Elgskardet
L Elgskardet
Jensineåsen
Hårråbakken
Granlia
Litl-Sjursåstj.
Merkeshaugen
Boklimyra
Kalvhåggåsen
Urvass-saga
Bjørkhaugtj.
Bjørkhaugåsen
Skavlan
Urvatnet
Stenkåsmyran
Stakksenga
Urvasskammen
Hestgrova
Hestgrovmyra
Hestgrovåsen
Langdalsåsen
Langdalen
Torvmyrdalen
Grube
Krokmyra
Kvitberga
Litlslættet
Trivjaslættet
Vinterslættet
Øyabakkan
Bergtj.
Kloa
Killingøya
Nersage
Lerskreppdalen
Kumyra
Skjetnråa
Åmot
Svorka
Trivja
Sagåstj.
Slåtthaugen
VLF
IP
900N
800N
700N
600N
500N
400N
6400V
6300V
6200V
6100V
6000V
5900V
5800V
5700V
5600V
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800

Enclosure no 3
Report no 18

CABLE LINE III OG III B

1200 N 1200 N

1100 N

1000 N

900 N

800 N

700 N

600 N

500 N

400 N

300 N

200 N

100 N

0 N

7600 V 7500 V 7400 V 7300 V 7200 V 7100 V 7000 V 6900 V 6800 V 6700 V 6600 V 6500 V 6400 V 6300 V 6200 V 5400 V 5300 V

CABLE LINE I

st. Sjursås-tjern

L. Sjursås-tjern

Åmot coppermine

Åmot pyrite mine

Bjørkhaugtjern

URVATN

Svartjern

100 S

200 S

250 S 6100 V

300 S 6000 V

375 S 5900 V

400 S 5700 V

350 S 5500 V

ORH

LEGEND

EL. MAGN. INDICATIONS

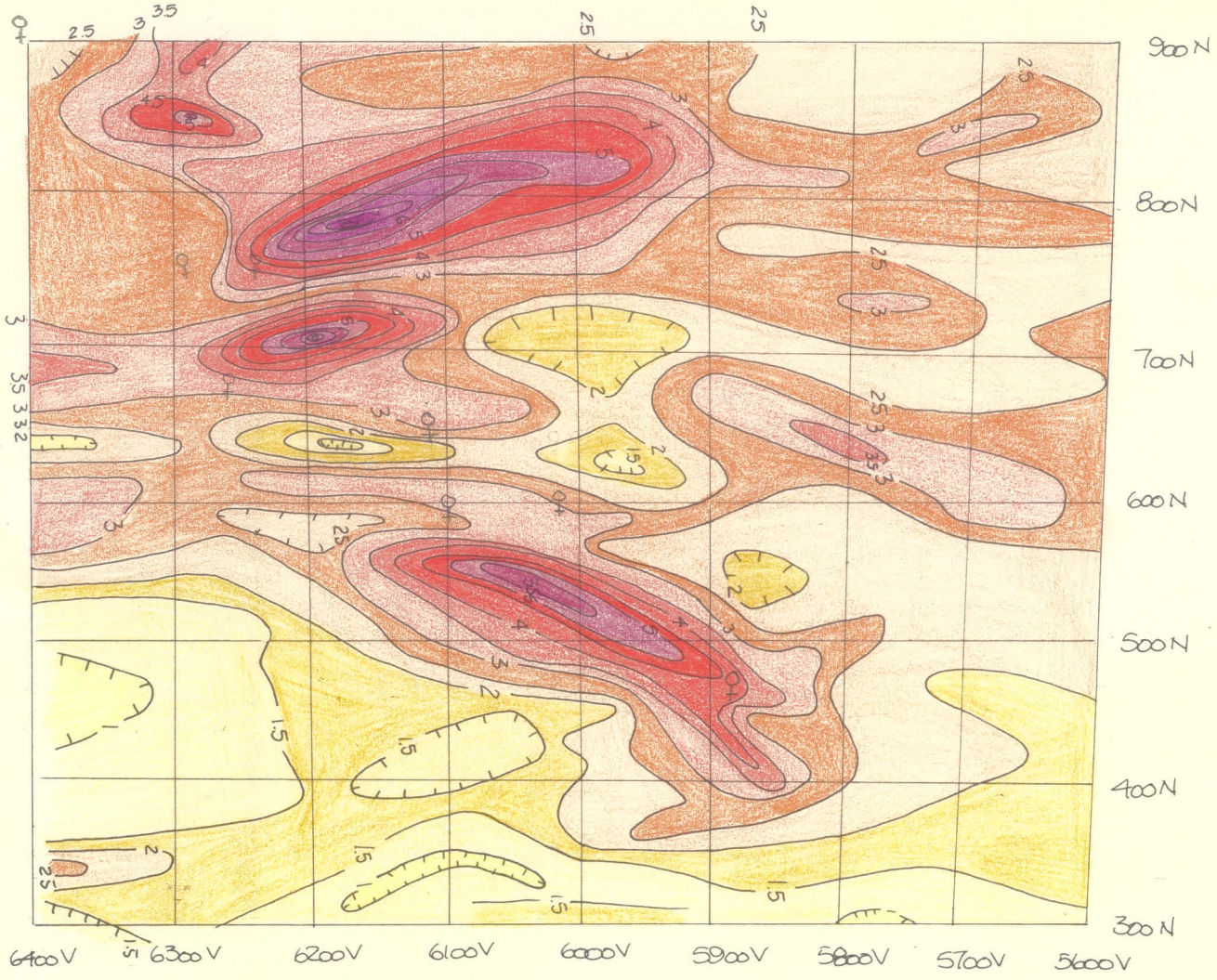
- Very good conductor
- Good conductor
- weak conductor
- very weak conductor
- 50 — indicated conductor, 50 m's depth
- conductive area

- cable line
- electrode
- measuring line (cond.)
- measuring line (Cross ring)
- fixed point

TOPOGRAPHY ETC.

- road
- mine, prospect
- high voltage line
- diamond drillhole
- gabbro
- greenstone

ÅMOT Turam	Scale: ca 1 : 5000	Draw: Trac: AM Date: mars 83
Geofysisk malmleting 1954 (NGU)	No: Enclosure no: 4 Report no: 18	



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NGU 1970	No		
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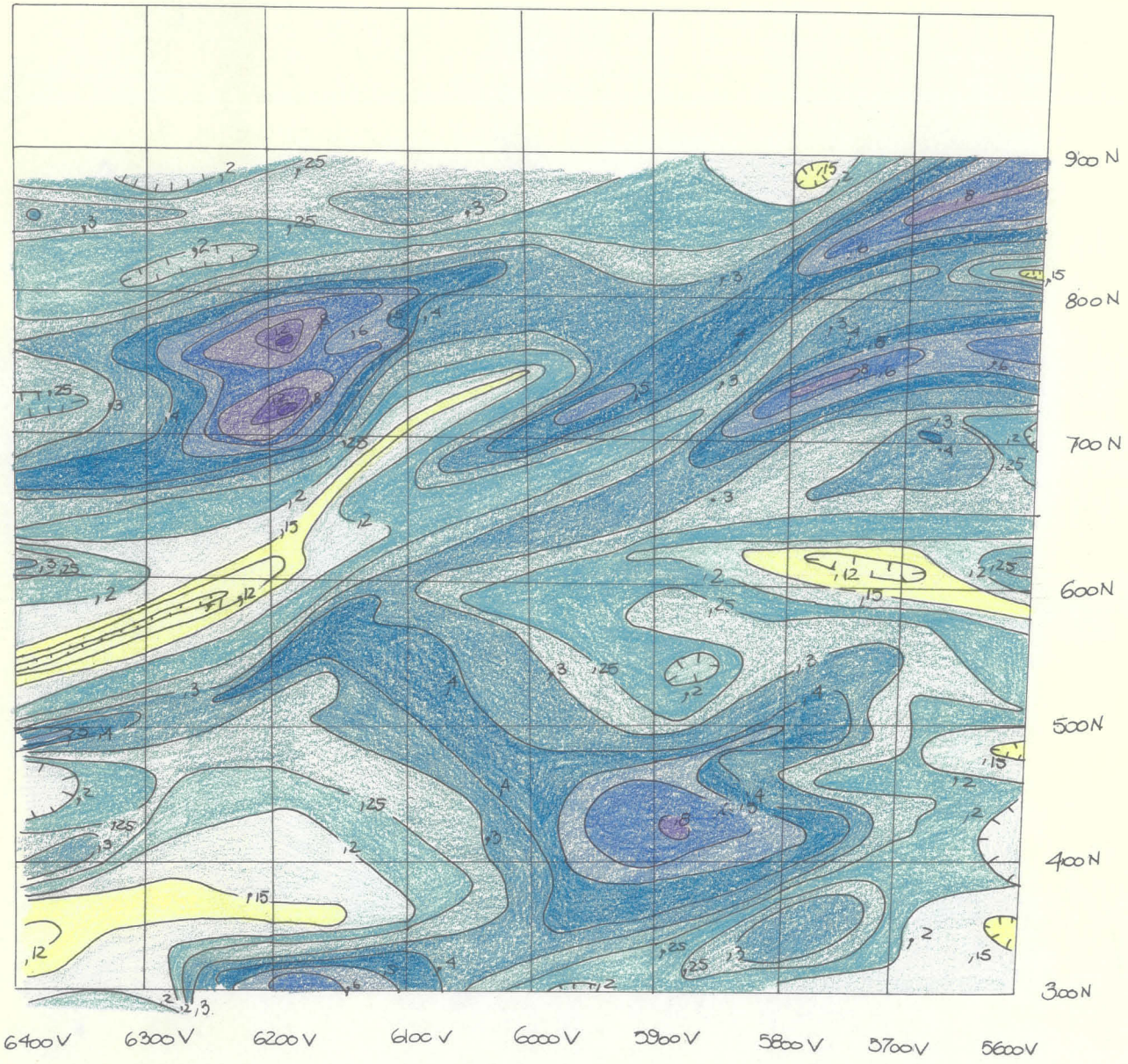
	Report no 18		



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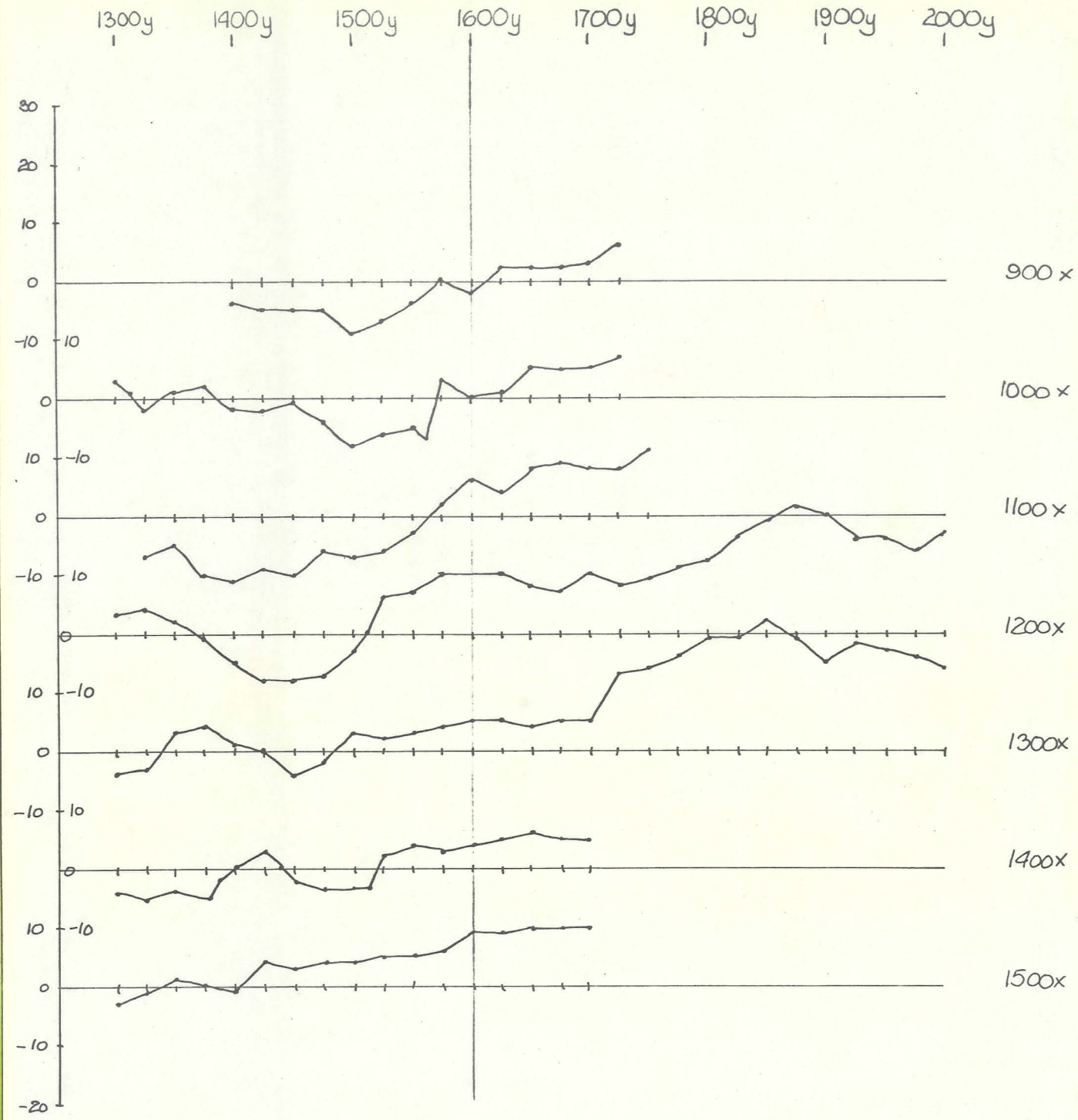
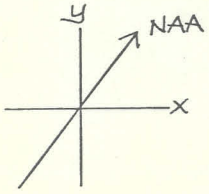
	Enclosure no 6		
	Report no 18		





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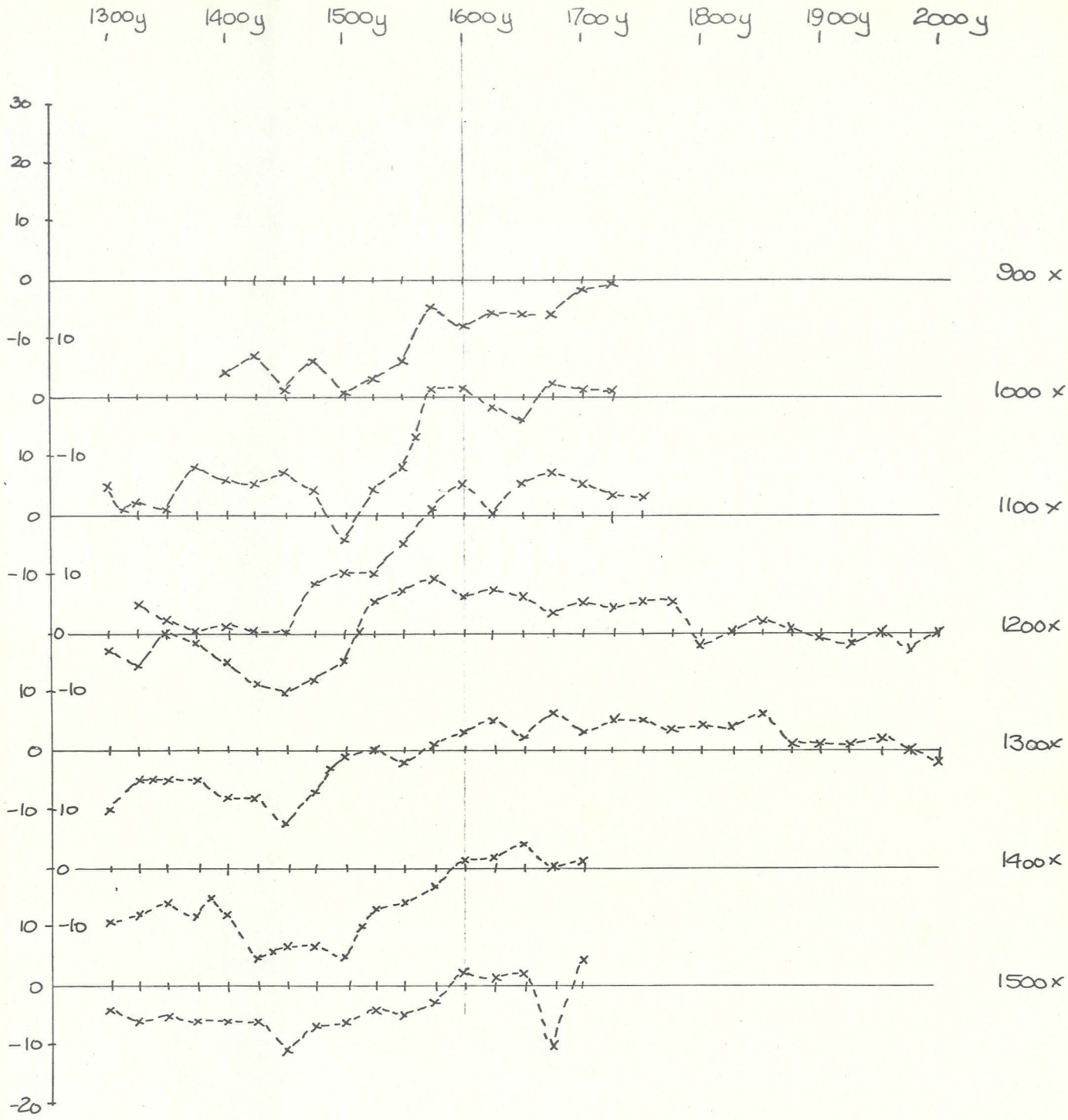
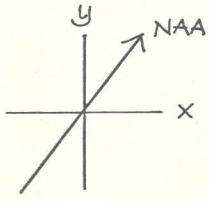
		Date	May 83
Orkla Industrier A.S 7332 LØKKEN VERK Gulf - Orkla Venture	No : Gf I Enclosure no 7 Report no 18		





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		Date	May 83
Orkla Industrier AS 7332 LØKKEN VERK Gulf - Orkla Venture	No: Gf 1		
	Enclosure no 7		
	Report no 18		