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Rapportarkivet

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Østlandske	Aspro 1359		Utmål	

Tittel

Gruveåsen Diamond Drilling 1981 and X-ray surfase measurements. Fen, Ulefoss

Forfatter	Dato	Bedrift
Ivar Hultin	12/12 1982	Prospektering A/S

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Nome	Telemark	Østlandske	17134	Skien

Fagområde	Dokument type	Forekomster
Boring Geofysikk	Rapport	Fensfeltet
Råstofftype	**Emneord**	
Malm/metall	Nb REE	

Sammendrag

Det ble kjerneboret på en antatt Nb- og REE-mineralisering i Bolladalen.
Resultatene viser en lavgehaltig Nb-mineralisering.

REE-mineraliseringen synes å være lavere enn hva som tidligere er registrert.

Videre er det foretatt noen innledende radiometriske bakkemålinger til kartlegging av Th-registreringer. Resultatene er såvidt positive at denne metoden anbefales gjennomført for et utvalgt område, hvor en idag har relativt mange gode analytiske data fra tidligere kjerneboringer.

A/S Sydvaranger.
Prospekteringsavdeling.
Nordraaks vei 2. 1324 Lysaker, Norge.
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INTERN RAPPORT.

DATO: 12.12.82	RAPPORT NR: 1359	KARTBLAD 1713 IV	Antall sider 8 —"— bilag 14

SAKSBEARBEIDER IVAR HULTIN, GEOLOG

RAPPORT VEDØRENDE:

GRUVÅSEN DIAMOND DRILLING 1981 AND X-RAY SURFACE MEASUREMENTS.
FEN, ULEFOSS. NOME KOMMUNE, TELEMARK.

FORDELING

OSLO:

KIRKENES:

ANDRE:

RESYMÉ:

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KOMMENTAR:

F E N

G R U V Å S E N

DIAMOND DRILLING 1981
AND γ - RAY SURFACE MEASUREMENTS

Dec. 1982

Ivar Hultin

INTRODUCTION.

The diamond drilling program of 1981 ended with DDH2-81 in Gruvåsen at the location 142.430 - 52.413 at 59,5 m above sea level, see appendix 2 B.

The task started ultimo Oct. and was finished medio Nov. s.y. The operator was A/S Grunnboring, Oslo.

The purpose with this program was to get a better understanding or control of possible F- and RE-mineralizations in the Bolladalen Fault Zone, see appendix 2 B.

Further on carefully radiometric and mag. susceptibility measurements have been carried out on the cores from DDH2-81. These results are presented in the appendixes 12 & 13.

Also some experimental radiometric surface measurements have been done in Gruvåsen and Bolladalen sub-area this year. These results are given in appendix 2 B.

The routine analyses on the elements Nb, Y, Ce and Th have been carried out by SI, Oslo, while F- and REE-analyses have been done by IFE, Kjeller. The results are given in appendix 13. The loggings and selections of samples for analytical purposes were done by S.D. Olmore and I. Hultin. The geophysical investigations were carried out by J.-E. Wanvik and G. Kompen.

GEOLOGY.

K. Mørk, T. Anderson and G. Foslie completed the hard rock surface mapping of Gruvåsen in 1981. Their works are presented in the report : The Fen Project, by K. Mørk, Sept. 1981.

During their field works they observed two localities with massive fluorite in brecciated rauhaugite situated at the shore of Lake Norsjø south-east of Lillesand. The brecciation could possible represent a continuation of Bolladalen Fault Zone, see appendix 1.

Therefore it was of greatest interest to have a cross-cut of this fault zone to get a better control of possible F- and RE-mineralization.

During FSJ-investigation in 1970 in the Gruvåsen sub-area, a HT-dike, containing about 2,5 % REE, (5 % monazite + parisite + synchizite) and 0,31 % Th,

was registrated in the road-cut very close to the east "edge" of Bolladalen Fault Zone, see appendixes 2 A and 2 B.

Recent investigations indicates that this HT-dike is rather small, about 2 dm thick with a vertical dip and with estimated strike N-S. The dike itself is very radioactive - about 2700 c.p.s. - but also the host rock - rauhaugite - on the western side of the dike. Carefully X-ray investigations, see below, indicates that almost 1 m of the host rock is relatively very active - 2700 - 2400 c.p.s.

Similar active section of rauhaugite is registrated in DDH2-81 at 24 - 28 c.m., and in rødbergite at section 40 - 41 c.m. Both sections are free of HT-dikes, see appendix 2 C.

According to earlier registrations and recent investigations the occurences of small HT-dikes/veins/veinlets in connection with faulted and brecciated/foliated rock sections seem to be quite "normal" in Gruvåsen.

Therefore I believe that the occurrence of this HT-dike within the active rauhaugite located at Vegskjæring, is more or less a coincidence; that there is no or rather small correlation between high HT-concentrations to high γ -ray activity or high Th-content, see appendix 2 C.

A detailed study of old loggings and cores confirms these theory. It seems more obvious that rock sections in close connection to diabase dikes and brecciated/faulted area, generally seen, have the highest content of REE. As we already know, high content of REE follows high content of Th, it ought to be suitable to use radiometric surface measurements as "a tool" in the further detailed surface mapping of the total sub-area, especially between Gruvåsen - Norsjø and Øygården, in which area we already have a lot of sub-surface assays from earlier investigations, as the drillholes F1, F2, F3 and B1 + B2, see appendix 2 A and 2 C.

RADIOMETRIC INVESTIGATIONS.

As already well known the rocks in Gruvåsen contain Nb, Th and REE, and that there is, to a certain extent, a good correlation between the contents of these three elements (S. Svinndal, 1970, and J.A.W. Bugge, 1973).

For this reason carefully routine radiometric analyses have been carried out on cores from DDH2-81 and on the surface within the area between

Fengruva and Bolladalen, see appendixes 2 A and 2 B,-2C

The type of scintillometer is Geo Metrics Mod. nr. GR-101A. The measuring on cores were made in directly contact with the material, in the field - always in the hip level, ca, 1,00 m above surface level.

The latter investigation was completed as an attempt to follow up the Th-mineralization in the hematite-dike (HT-dike) in the road-cut located about 70 m west of Fengruva (S. Svinndal, 1976).

As mentioned earlier this TH-dike contains 5 % RE-minerals as monazite, parisite and synchisite (J.A.W. Bugge, 1973).

The locality is described as a poor HT-ore with about 26,0 % hematite, but with the highest registration of RE, about 2,5 % vol. Further on it is rather radioactive with about 1600/3200 cps. (S. Svinndal, 1967).

The HT-dike has a very distinct outcrop in the roadcut, see fig. 1. The thickness is about 1-2 dm. The ore is inhomogenous, brecciated and filled with relatively clean and white calcite (dolomite). It seems that the RE-minerals are crystallized in the HT-richest part of the ore, in connection with apatiteand carbonates. The hematite itself is very pourous, and shows no specific REE-mineralizations.

A carefully surface radiometric investigation gives following result, see fig.1.

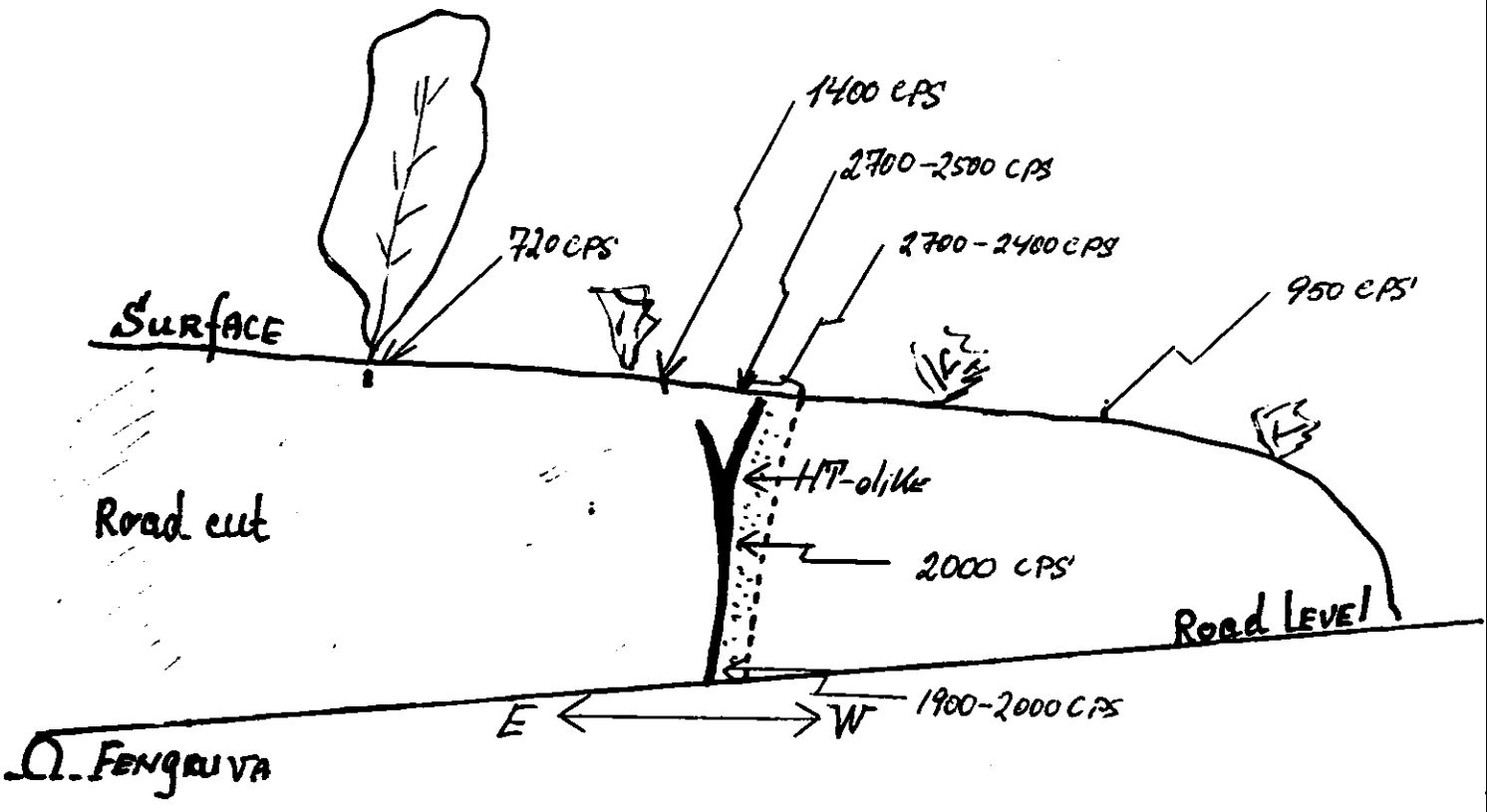

Fig. 1

In contact with the HT-ore gives 2500 - 2700 c.p.s. at "the top edge", - at the "bottom" - 1900 - 2000 c.p.s. Going in east direction; the activety decreasesrelatively quickly to 1400 c.p.s. after 1,00 m. From that on a gradually decrease to about 720 c.p.s. after another 4,00 m.

Going in west direction, the activity maintaines relatively constant between 2700 - 2400 c.p.s. over 1,00 m. After that it falls gradually to 950 c.p.s. after another 4,00 m.

Going in south to south-east direction the activity decreasesgradually to 1500 c.p.s. after 5-6 m, and after that it decreasesto about 700 c.p.s. after another 5 m, see appendix

These surface investigations illustrate rather good how difficult it can be to detect relatively high active zones or sections in the field, and because of this one must be very carefully in the choice of scale to measure grid. In this case it is obvious that a grid of 10 x 5 m or 5 x 5 m is necessary in detecting such type of activity.

As mentioned earlier there are two radioactive sections close to the surface in DDH2-81; one at 24 - 28 c.m. with 400 - 415 c.p.s. and another at 40 - 43 c.m. with up to 565 c.p.s.

Both sections can correspond to the HT-dike in the road-cut, but it is difficult to confirm this according to the surface registration, see appendix 2.

Both sections contain hematite more or less dispersed in the rock. HT-dikes of similar type as in the road-cut is, on the other hand, not observed. They are both high in Th and Ce, for that reason both can correspond to the HT-outcrop. Preliminary optical and microprobe investigations indicates RE & Th-mineralizations together with apatite and carbonate, see app. 15. S. Svinndal (1970) says that it seems most probably that RE-minerals are concentrated in smaller bodies within the Gruvåsen rock complex.

Applying the γ -anomaly pattern from recent investigations it seems that the first section from DDH2-81 at 24 - 28 c.m. corresponds "best" to the HT-dike. Further on that the HT and this section belong to the very same structure pattern with a strike or direction towards SE and which "crops out" with an "anomaly field" with 1750 c.p.s., see appendix

A similar system seems to strike from the road-cut with NGU registration no. 156 of 1968 (S. Svinndal, 1968) and recent registration with anomalies

1250 c.p.s., 1120 c.p.s. and 1500 c.p.s., see appendix.

Compared with V.H. Wiik's investigations of 1980, see appendixes 5, 8, 9 and 10, it is obvious that the anomly patterns of La, Ce, Nd and to a certain extend Th have an "anomaly strike"-direction after SE-NW, in other words, there seems to be a type of correlation between the γ -anomalies and the above mentioned element anomaly patterns.

V.H. Wiik's sampling grid was 50 x 50 m. To-day it seems that this grid has been too large to catch the detailed in the distribution of the actual elements. But the trend seems to be there and parallel to Bolladalen Fault Zone.

DISCUSSION OF THE PRELIMINARY RESULTS.

The diamond drilling confirms that Bolladalen is formed as a result of faults and brecciations.

Any typical fluorite and RE-mineralization are not registrated in connection within the Bolladalen section itself.

Any new informations about the Nb-mineralization is not observed. The investigations so far just support earlier theories that this rock complex seems to have a "typical" low grade mineralizations (J.A.W. Bugge, 1973).

For the time being this mineralization seems to have no economical interest. The finest minralization is 0,20 % Nb_2O_5 - over 3,00 c.m. (129-132 c.m. & 141-144 c.m.) in rødbergite west of Bolladalen. While the average content of DDH2-81 is about 0,10-0,14 % Nb_2O_5. Earlier average calculation gives 0,119 % Nb_2O_5.

The Ce-content is unexpectedly low, with a highest registration of 5000 ppm over 1,00 c.m., or 3800 ppm over 5,00 c.m. (246-251 c.m.) in a brecciated rauhaugite. Earlier calculation gives $\approx$ 6500 ppm.

In some sections, especially in mixed rock of damtjernite and rauhaugite, there is a good correlation between high contents of Ce and Nb (217-221 c.m.).

The fluorite mineralizations are observed mainly as coarse grain veinlets with carbonates + apatite + hematite, and in some sections together with feldspar. In the latter case mostly in brecciated rauhaugite, and/or damtjernite. There is a fine correlation between high contents of F and Ce.

The La- and Nd-contents are also lower than earlier registrated with ≈ 5000 ppm.

That several elements as Ce, La and Nd in this investigation has lower contents than earlier registrated, may be caused by our type of rock sample selections. It has may be been to one-sided.

The theoretical background has been that fluorite and -or- apatite should be the best resources for REE. Therefore we have given priority to specimen containing visible fluorite and apatite. Another control will be done later.

The recent investigations so far seem to indicate that the rock composition is much more complex that earlier described. The changes in structure, mineral composition and texture are rather highly variable. The above mentioned variations may be the reason to the corresponding variations earlier registrated in γ -ray activity and element concentrations.

This is not a criticism of earlier works or investigations. It is meant to be an information for further investigation in this sub-area. It is obvious that new exploration works must be carried out in a much smaller scale than earlier in an attempt to catch or registrate the above mentioned rock composition variations.

The hard rock surface mapping is based on the very few and scattered outcrops, and we know now that this degree of rock exposure in Gruvåsen is too small in giving the same informations as a drillhole does. Therefore, further mapping of the outcrops has no or very little meaning.

On the other side we know now that Th follows RE, see appendix 14. Further on, we also know that the thickness of the overburden here is rather little. Therefore it seems more reasonable to follow up the preliminary γ -ray surface investigations of 1982 with corresponding measurements in 1983.

As mentioned earlier we also know that there is a disparity in the element correlations from surface samples and core specimens. This disparity may be caused by the large applied sampling grid of 50 x 50 m in 1980.

S. Svinndal's theory that the RE-minerals are concentrated in smaller bodies, is rather interesting. According to the preliminary γ-ray investigations it seems that this may be right. But the bodies seem to make a NW - SE pattern with a pitch and swell structure ?, more or less parallel to Bolladalen Fault Zone.

CONCLUSION.

According to former and recent investigations following conclusions ought to be drawn :

- The Nb-mineralizations seem to be of a low grade type, which has no economical interest to-day.
- Further hard rock mapping of the surface will hardly give new informations about the host rock composition and structure.

  Th and Ce follow each other and there is a higher concentration of these elements in connection with brecciated rock sections with or without dikes - veins - veinlets of diabase and hematite.
- In this case Th is an element which will be easy to detect in rock sections close to the surface and in outcrops. Therefore any further investigations in this area ought to be radiometric surface measurements. At first the area from Gruvåsen in west to Ødegården in east should be given the highest priority for such surface investigations, since we already have a lot of sub-surface assays from earlier investigations here.
- After this exploration works any detailed surface sampling can be carried out within interesting Th (REE) anomalies.

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S. Svinndal 1968. Undersøkelse etter sjeldne jordartselementer i Fensfeltet, Ulefoss. NGU-rapport nr. 820.

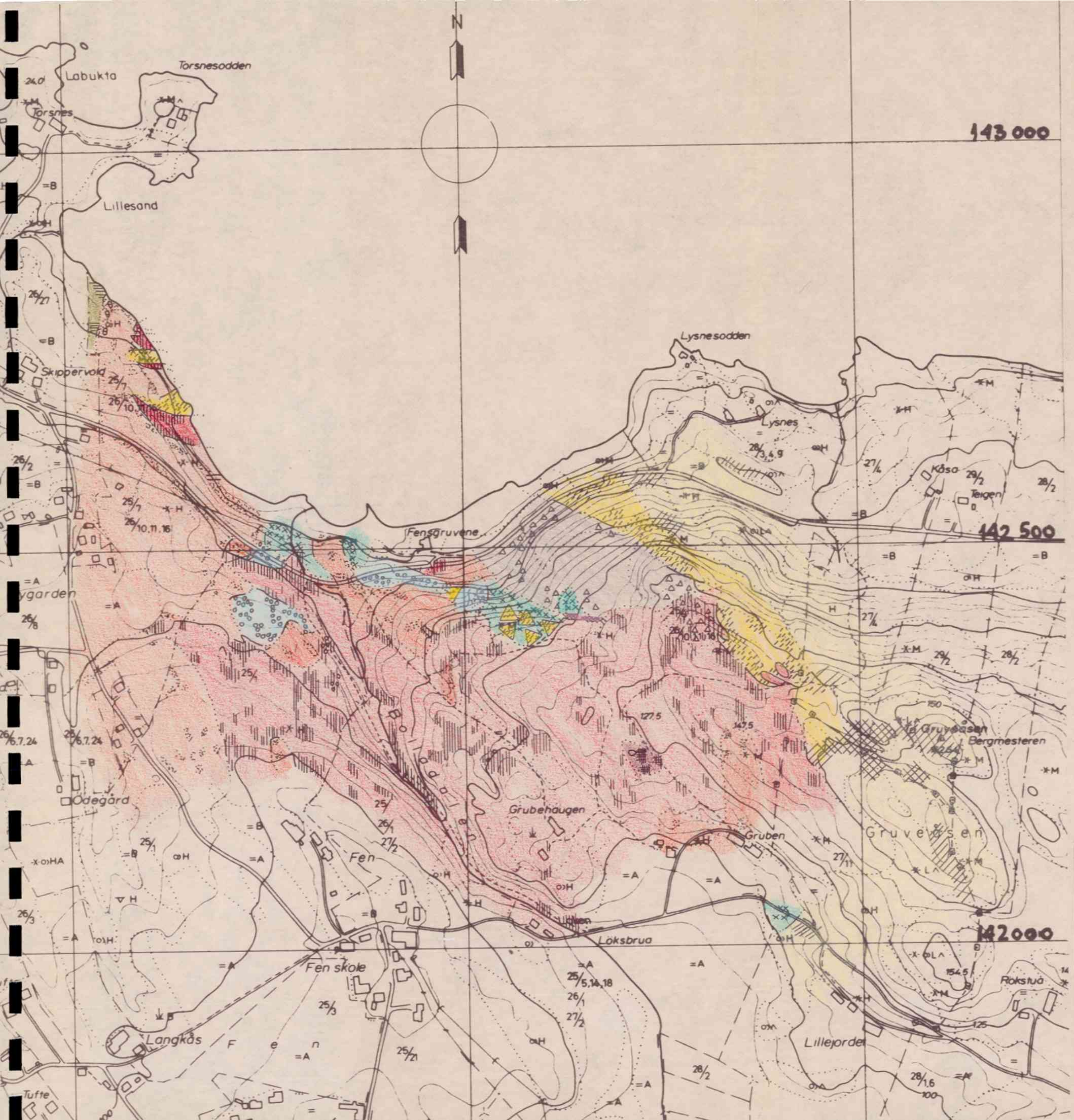
S. Svinndal 1968. Undersøkelse etter sjeldne jordartselementer i Fensfeltet, Ulefoss. NGU-rapport nr. 820 B.

S. Svinndal 1970 Undersøkelse etter sjeldne jordartselementer i Fensfeltet, Ulefoss. NGU-rapport nr. 966.

J.A.W. Bugge 1973 Thorium i Fensfeltet.NGU-rapport nr.1162.

K. Mørk 1981. The Fen Project. Geology of the northeastern sector of The Fen Complex - The Gruvåsen - Bolladalen Sub-Area. Sydvaranger - rapport nr.1243.

IH/bs

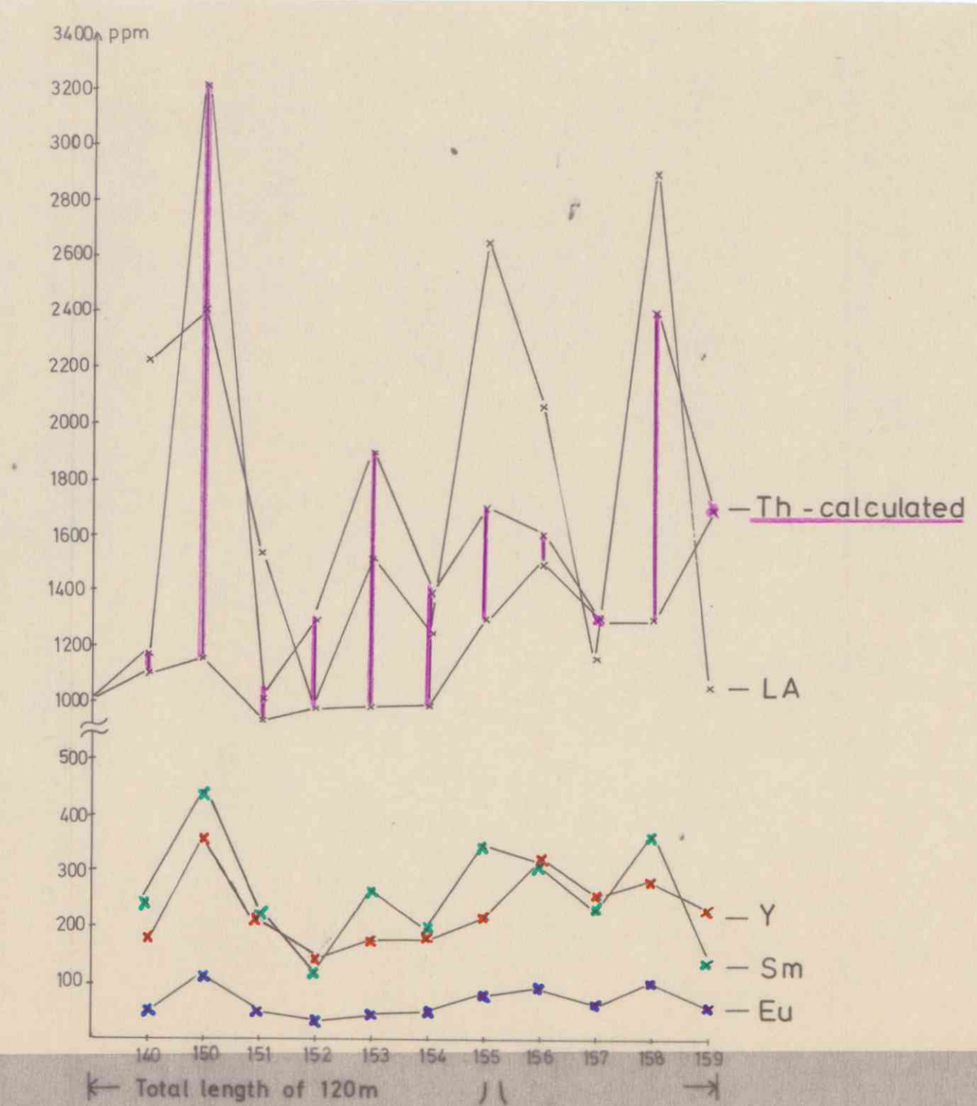


LEGEND.

- Pink fsp. rock.
- Magnetite - basic silicate rock.
- Explosion breccia.
- Rödberg -rödbergization.
- Damkjernite dolomite matrix.
- Damkjernite silicate matrix.
- Rauhaugite
- Basic silicate rock.
- Fenite altered PЄ.
- Granite breccia.
- Foliated PЄ gneiss.
- Fault
- Rock boundary
- Rock, inferred

Outcrops are indicated by rock symbols.

Prelimenary geologic map of the northeastern sector of the Fen Complex.	Sept. 81 K. M.
By K. Mörk, T. Andersen and G. Foslie. September - 81.	Scale 1:5000
A/S SYDVARANGER Gml. Ringeriksvei 14, 1320 Stabekk	Plate no. 1



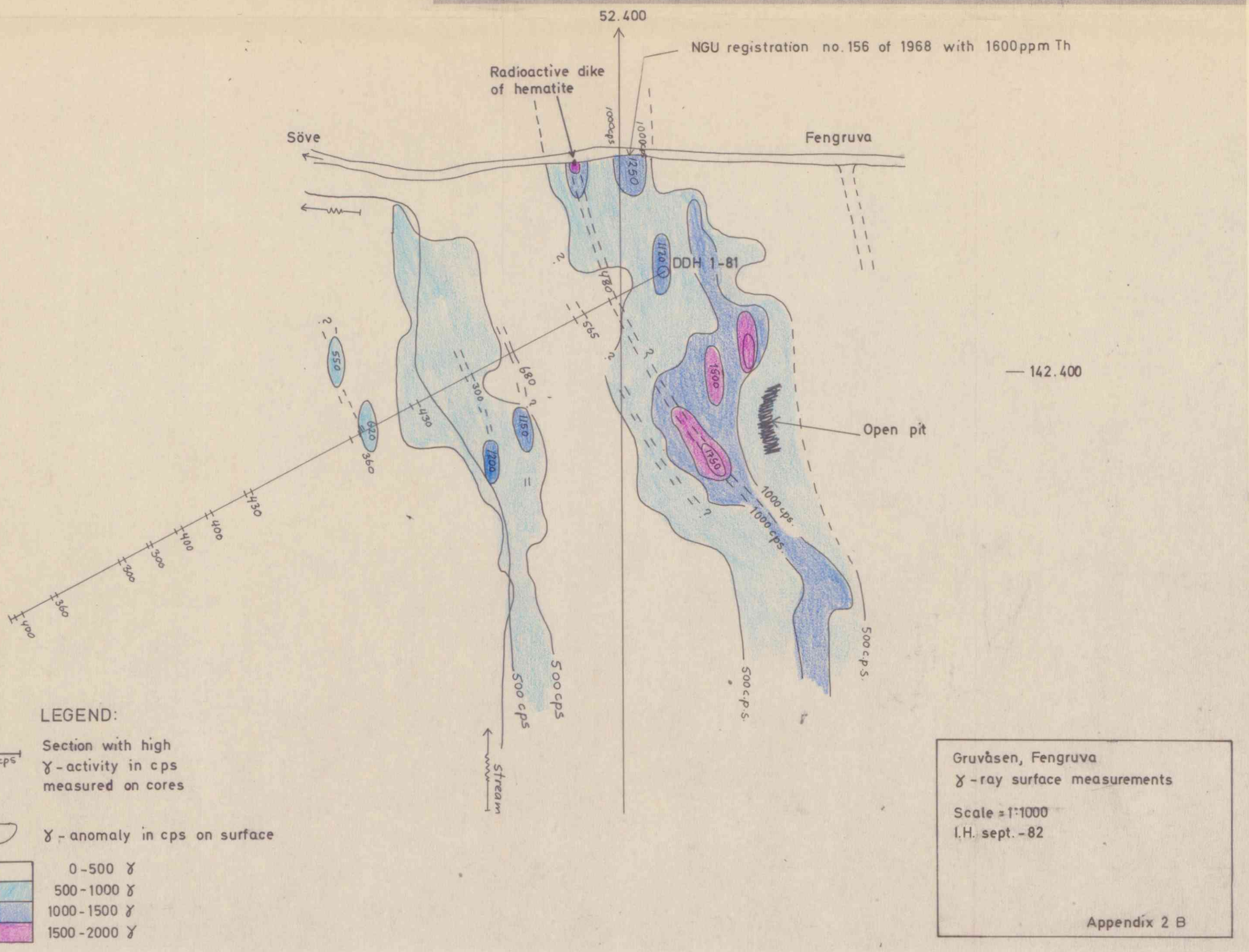
Monazite [CE, LA, Y, Th] PO_4

Bastenäsite [RE, F] CO_3

Sm
Gd
Pr
Nd
Dy

Parisite 2 [(CE, LA, Di)F] CO_3 $CaCO_3$

Synchesite [(CE, LA, Di)F] CO_3 $Ca CO_3$



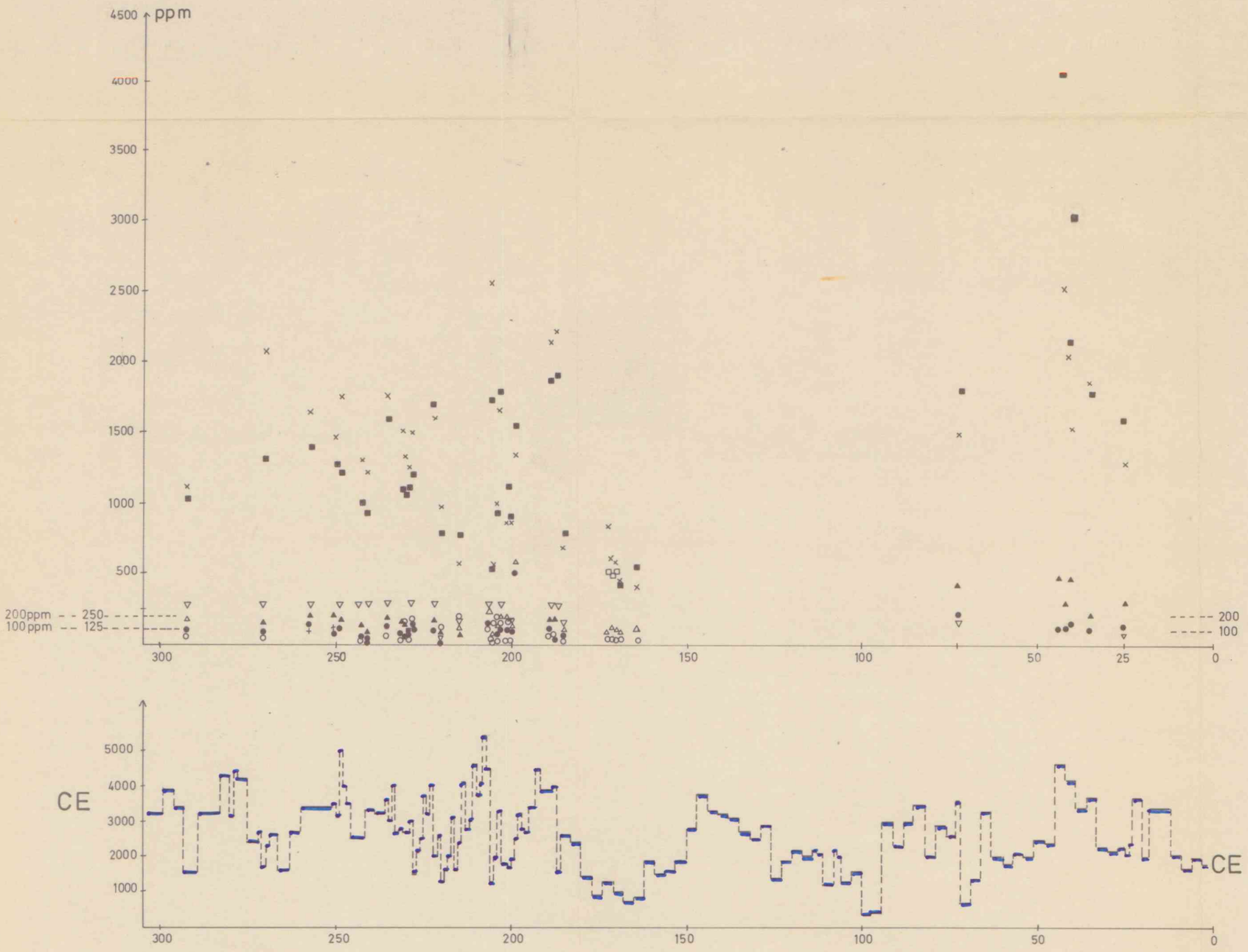
Gruvåsen, Fengruva

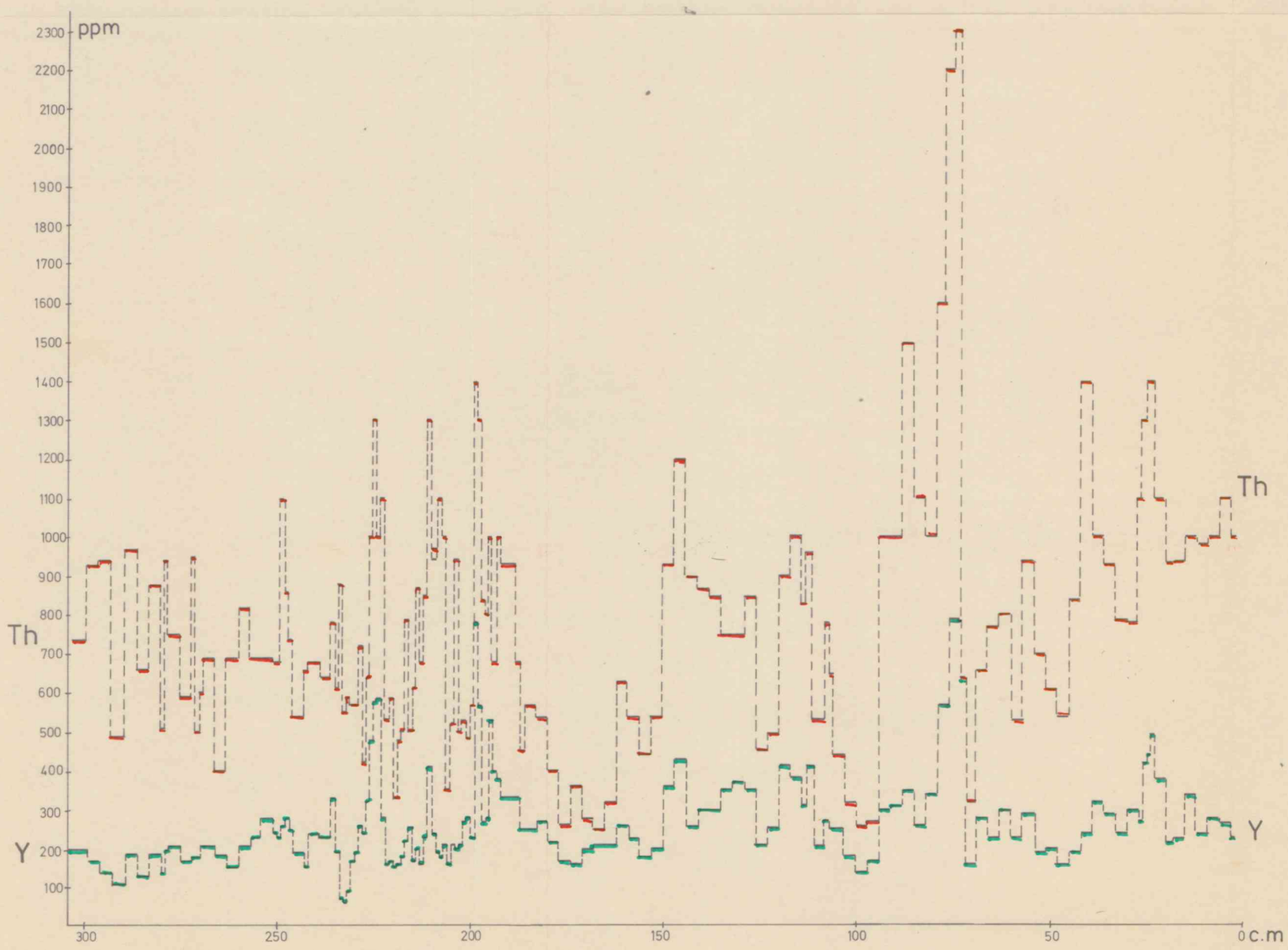
γ-ray surface measurements

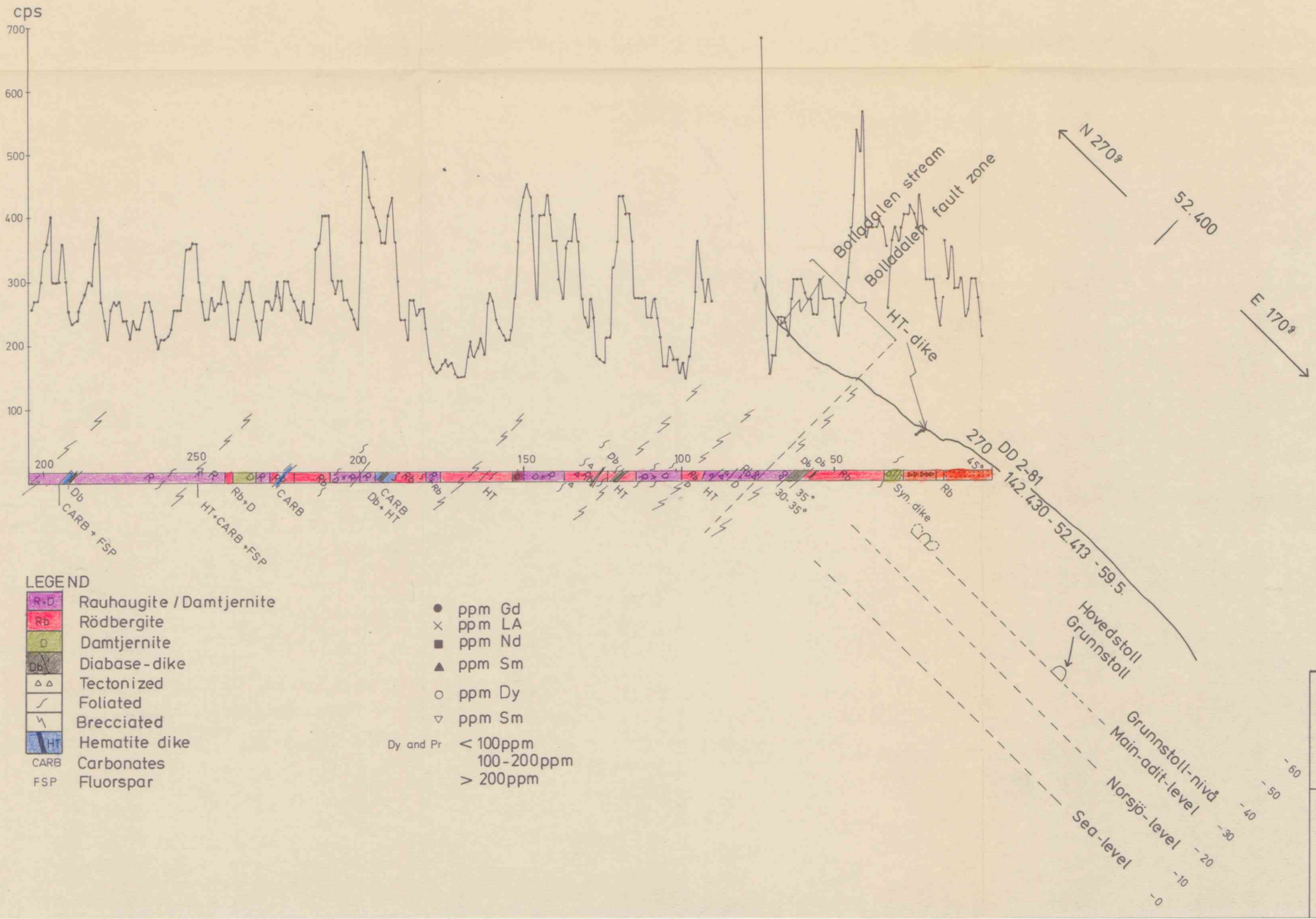
Scale = 1:1000

I.H. sept.-82

Appendix 2 B







LEGEND

R+D	Rauhaugite / Damtjernite
Rb	Rödbergite
D	Damtjernite
Db	Diabase-dike
△△	Tectonized
∫	Foliated
ϟ	Brecciated
HT	Hematite dike
CARB	Carbonates
FSP	Fluorspar

●	ppm Gd
×	ppm LA
■	ppm Nd
▲	ppm Sm
○	ppm Dy
▽	ppm Sm
Dy and Pr	< 100ppm
	100 - 200ppm
	> 200ppm

Gruvåsen
Diamond drilling DDH 2-81
Fenfeltet, Ulefoss
Appendix 2C

Scale 1:1000
I. Hultin Des.- 82
Trace H.B.

X 142 800

NORDSJÖ

F2 222°/ -10% - 195.45 c.m.

F1 - 231°/ -11° -251.10 c.m.

Mainly Rauhaugite

Rauhaugite

Rödbergite

Hollaite

DB

HT

Radioactive dike of hematite with 5.0 % RE - minerals: monazite parisite synchisite

Fensgruva

BH.2 81-270°/-45° - 304.00 c.m.

Mainly rödbergite with and without inclusions of damtjernite

Damtjernite

Mainly rödbergite

Rödbergite /damternite

Rauhaugite

Rödbergite /damtjernite

Rauhaugite

Rödbergite

F3

100°/-15° - 63.80 c.m.

Mainly rödbergite

Rauhaugite

Rödbergite

Carbonates

Rödbergite

Mainly rödbergite with dikes of rauhaugite

B.1 - 300°/0° - 97.00 c.m.

B.2 - 300°/-25° - 88.70 c.m.

Cappelen

Plantefelt

Sove

Gunnar Fehn

Bart Larsen

Gruve

X 142 200

Y 252 600

Y 252 000

FOTOKART A/S

Konstruert og rentegnet av FOTOKART A/S
Fotogrammer oppg. 3695 1971
Grunnlag: Kommunale polygonpunkt
Ajourført: Fotogrammer oppg

EXPLANATION

- Diamond drill hole with direction and length
- DB Dike of diabas
- HT Dike of hematite
- Brecciated rock section in drillhole relatively high content of LA og REE
- High γ-ray activity on cores
- Brecciated area

Gruvåsen, FEN
Location of diamond drillholes

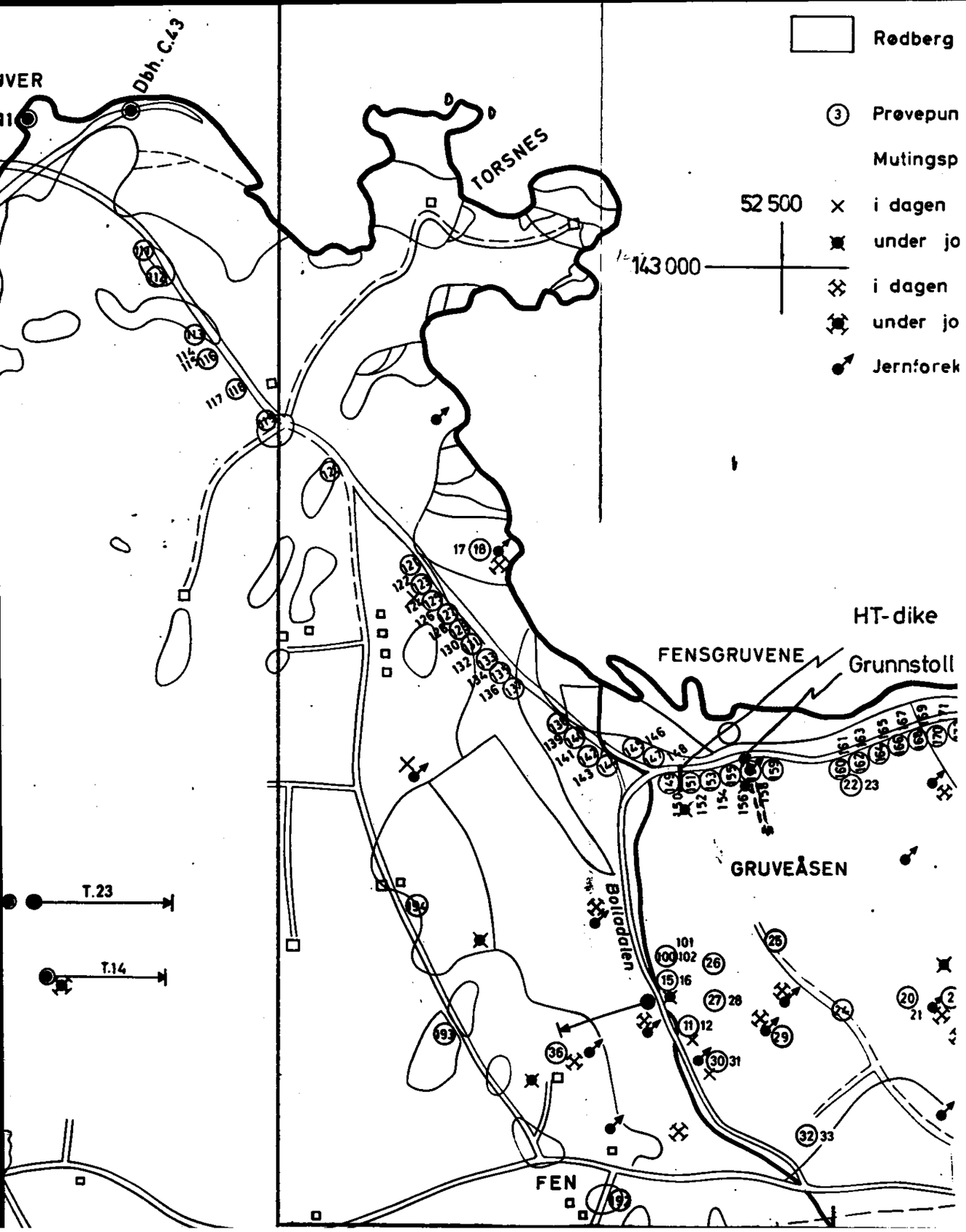
Scale = 1:1000
I.H.

Appendix 2A

NOME KOMMUNE

M = 1:1000 | Tegn:
Ekv. 1m | Trac:

BW 030-1-18



Rødberg

Prøvepun

Mutingsp

i dagen

under jo

i dagen

under jo

Jernforek

	Th +	Y	La	Sm	Eu	
149	1200/1600	180	2230	240	50	
[redacted]						- Probably very close to HT-dike
151	600/1100	210	1540	220	50	
152	950/1300	140	1000	120	35	
153	900/1900	180	1720	260	45	
154	900/1400	180	1240	190	45	
155	1300/1700	220	2640	340	75	
156	1500/1600	320	2070	310	90	
157	1300	260	1150	230	65	
[redacted]						- Fengruva
159	1700	230	1060	140	60	

All values in ppm.

+ Calculated, see NGU-rapp. 820 of 1968.

DDH2-81

33-36	930	290		
35-36			1850	195
39-42	1400	240		
40-41			2070	475
41-42			1515	290
42-43			2575	465
72-73	2300	640	1490	415
73-76	2200	790		

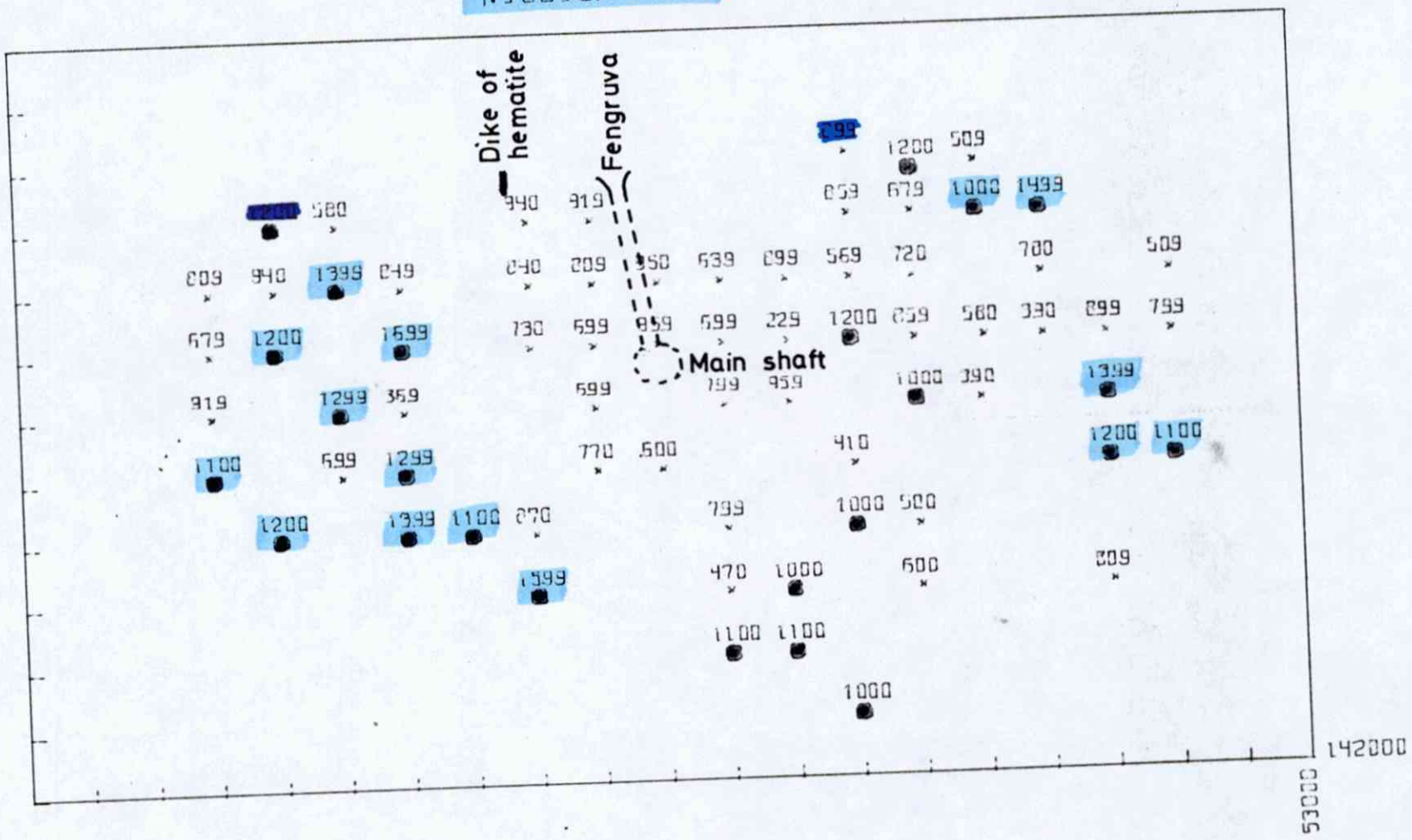
Gruvåsen
Surface sampling - NGU 1968 & DDH 2-81
Fensfeltet, Ulefoss
Scale 1:5000

Appendix 2D

GRUVERAASEN GRID-AREA MAP SCALE = 1:5000

NIOBIUM (PPM)

LEVEL: 1000



Appendix 3

USB Boks 39

22/383
4-4

ASPRO PROSPEKTERING A/S
GAMLE RINGERIKS VEI 14, POSTB. 83 – 1321 STABEKK
HELEID AV AKTIESELSKABET SYDVARANGER
TLF.: (02) 53 89 76 TLF.: (02) 53 08 35
TLF.: (02) 53 08 34 TLF.: (02) 12 05 18
TELEX 72 987 aspro n

Undersøkelser av Statens Bergrettigheter
v/geolog Sverre Svinndal
Postboks 3006
7001 TRONDHEIM.

ARKIV/REF.
IH/rf

STABEKK 11. mars 1983

AD: FEN-RAPPORTER 1982.

I henhold til avtale oversendes herved ett eksemplar av følgende Fen-rapporter for arbeidene i 1981-82.

C.W. Carstens: Comments on criticism from R.B. Ellis and some explorations evaluation. Januar 1983.

Ø. Logn: Fens-feltet. Kommentarer til de utførte geofysiske arbeidene. Februar 1983.

I. Hultin: Gruvåsen diamond drilling 1981 and x-ray surface measurements. December 1982.

R.B. Ellis: Comments on "A Geophysical Survey of the Tufte Area" by C.W. Carstens. November 1982.

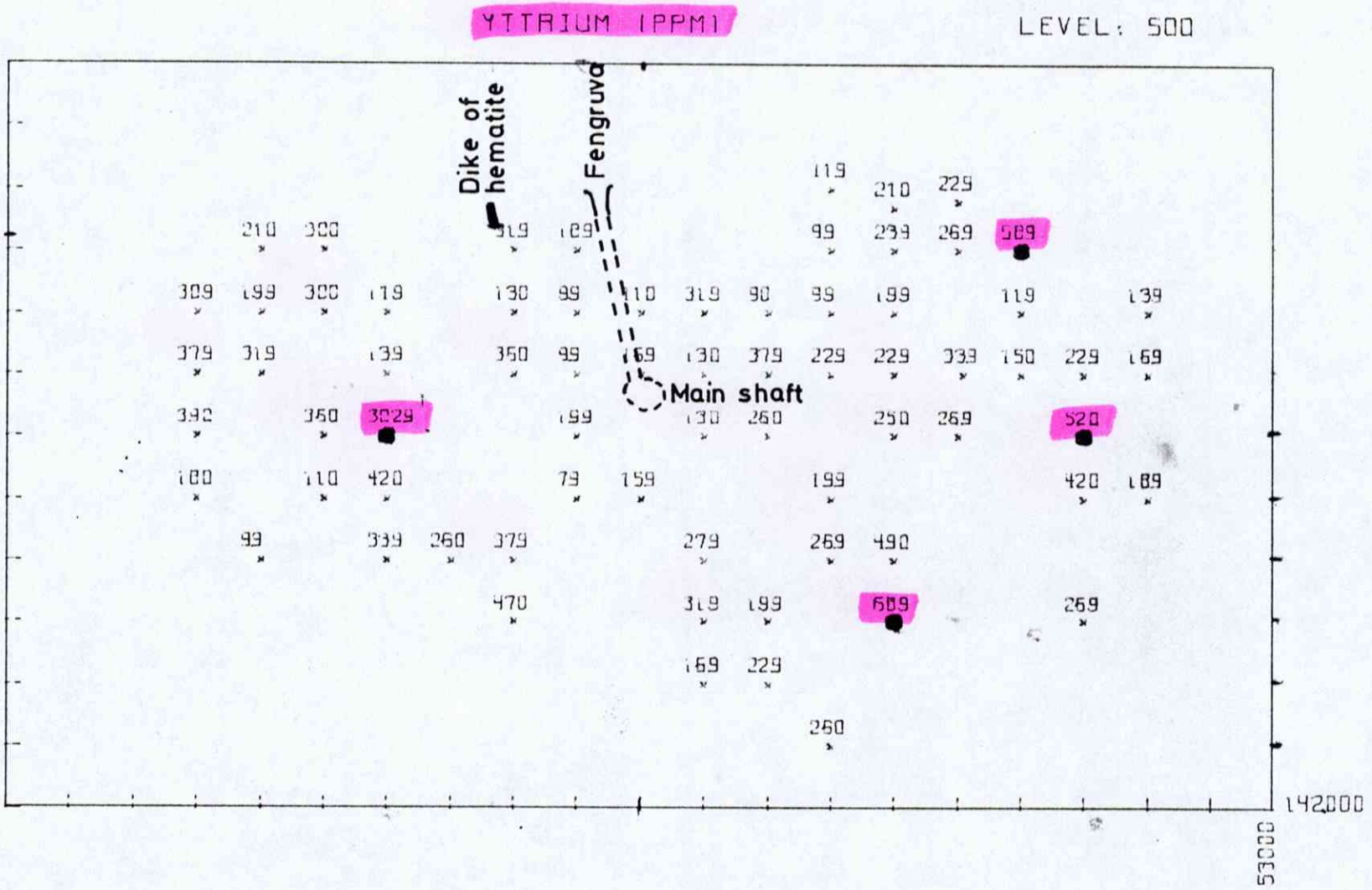
Vennlig hilsen
for PROSPEKTERING A/S

Thor L. Sverdrup
prospekteringssjef

Ivar Hultin

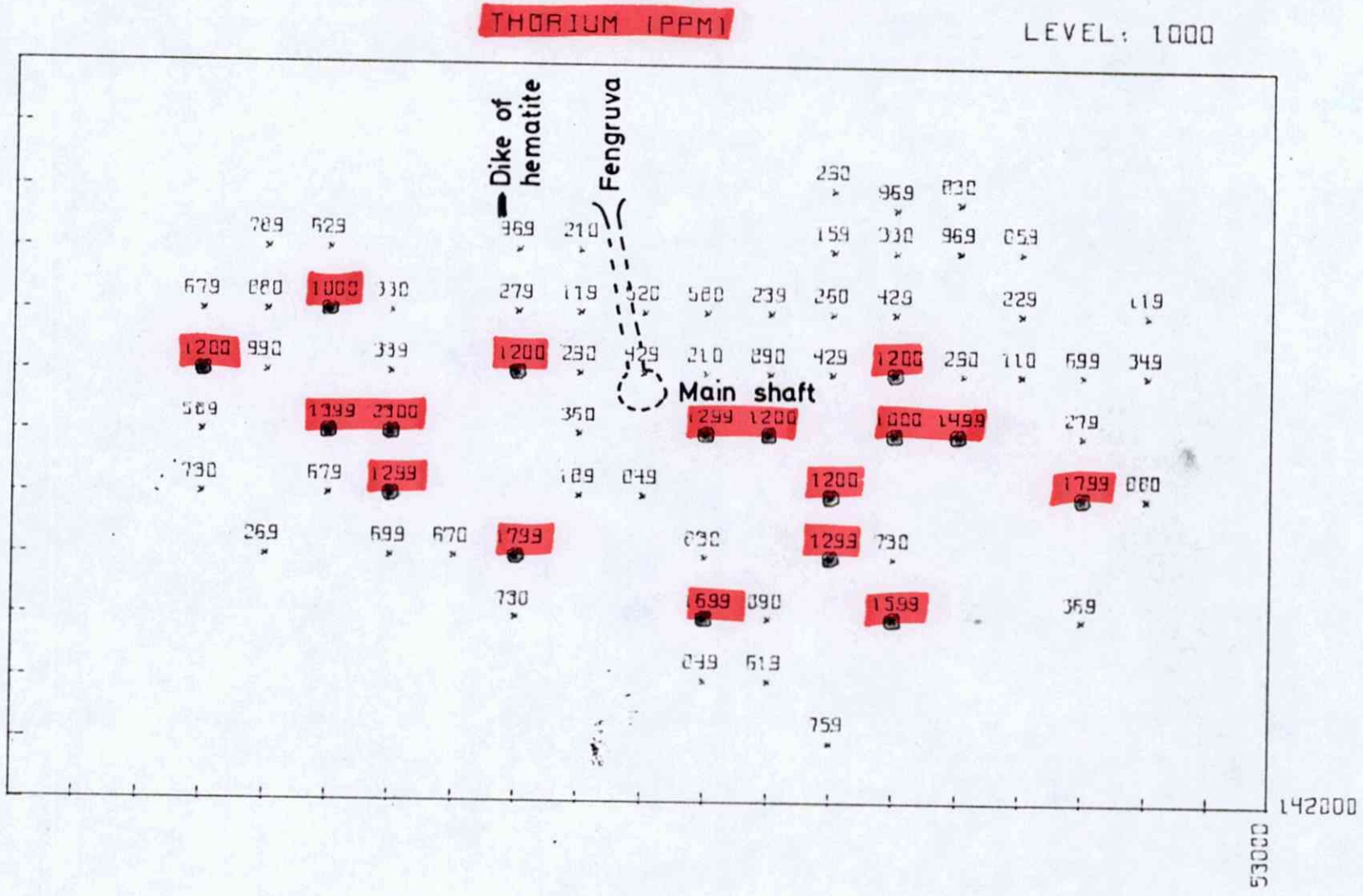
Vedlegg

GRUVEÅSEN GRID-AREA MAP SCALE = 1:5000



Appendix 4.

GRUVEARSEN GRID-AREA MAP SCALE = 1:5000

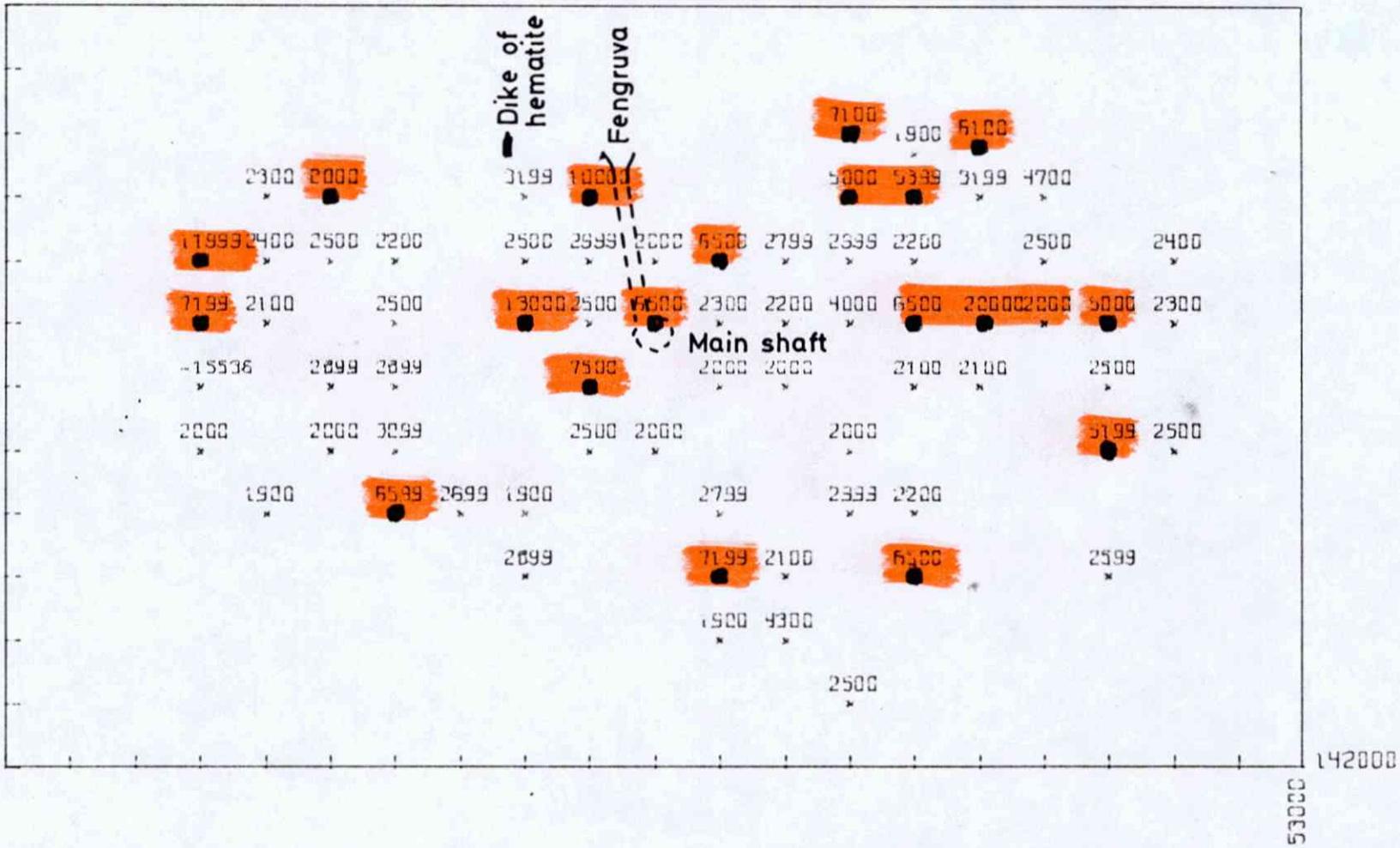


Appendix 5

GRUVERASEN GRID-AREA MAP SCALE = 1:5000

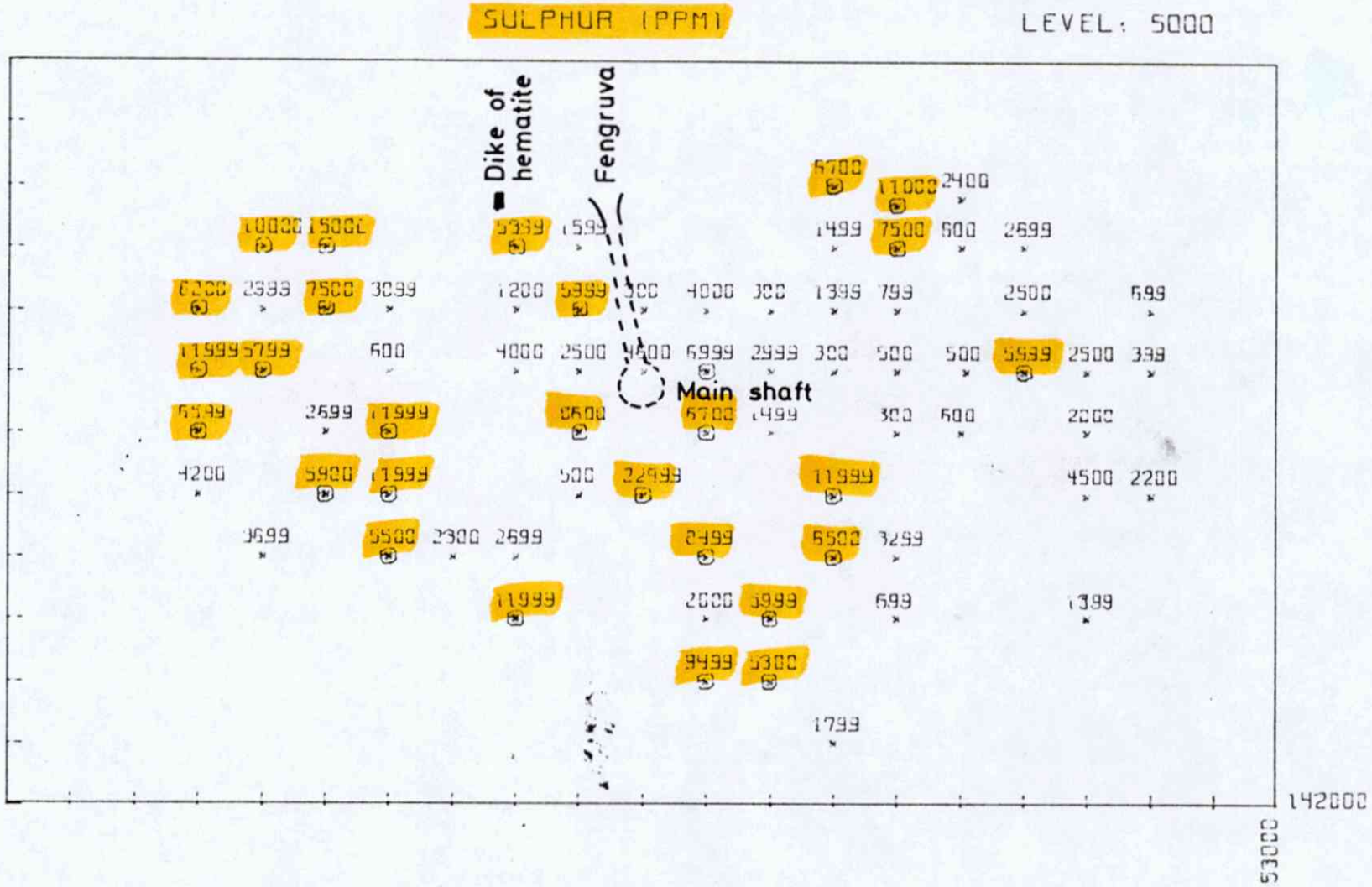
PHOSPHORUS (PPM)

LEVEL: 5000



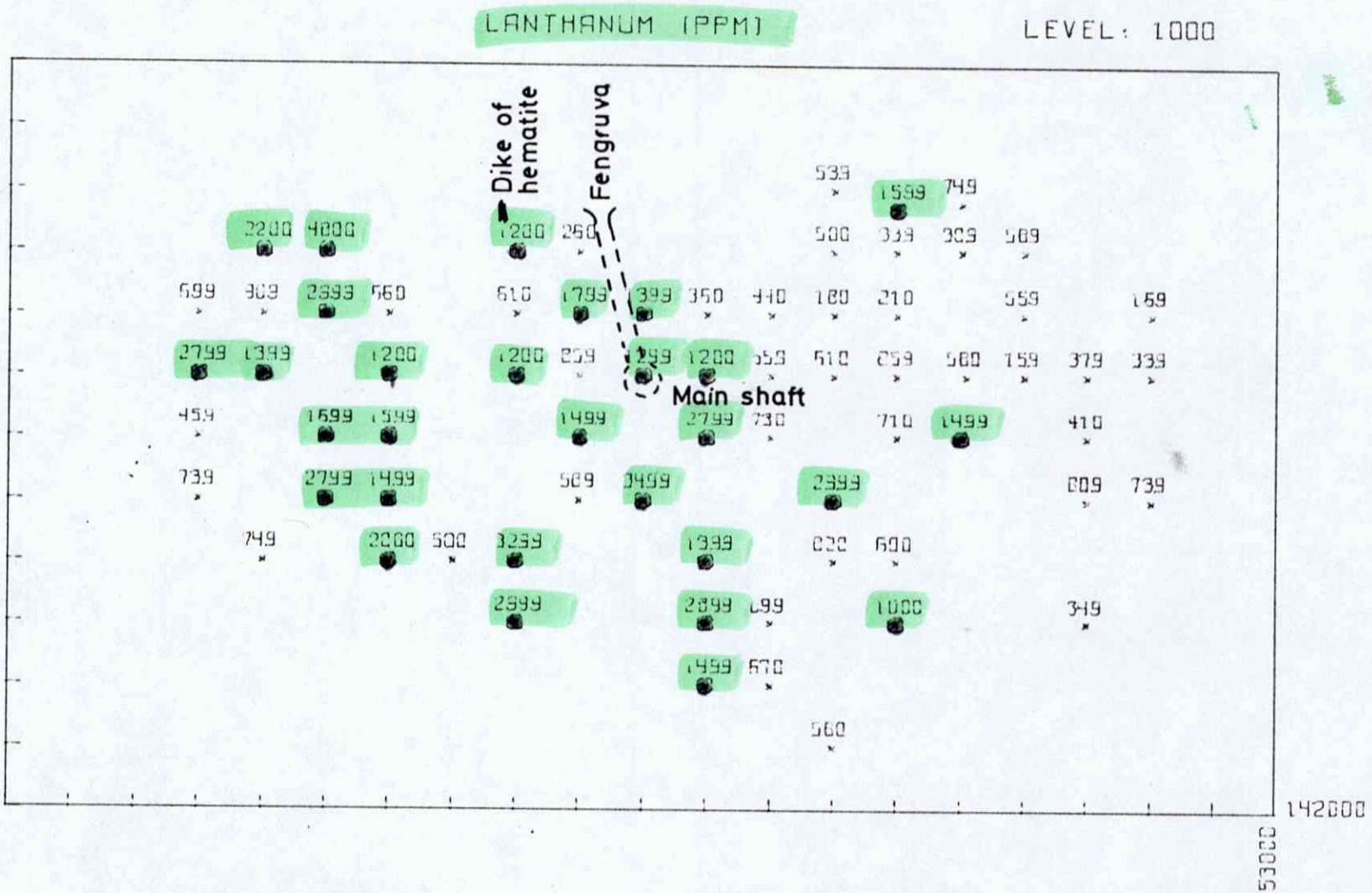
Appendix 6

GRUVERASEN GRID-AREA MAP SCALE = 1:5000



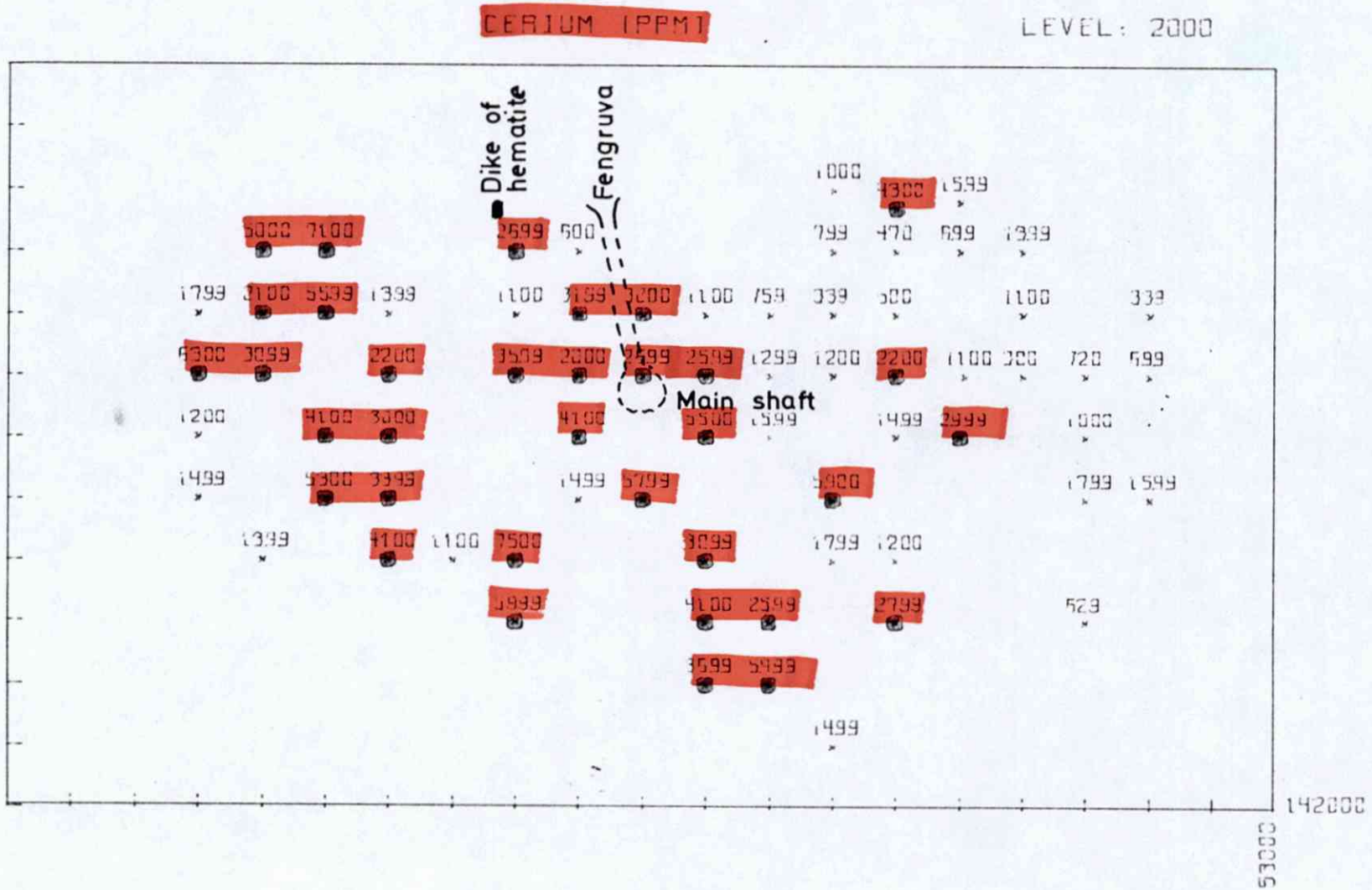
Appendix 7

GRUVEÅSEN GRID-AREA MAP SCALE = 1:5000



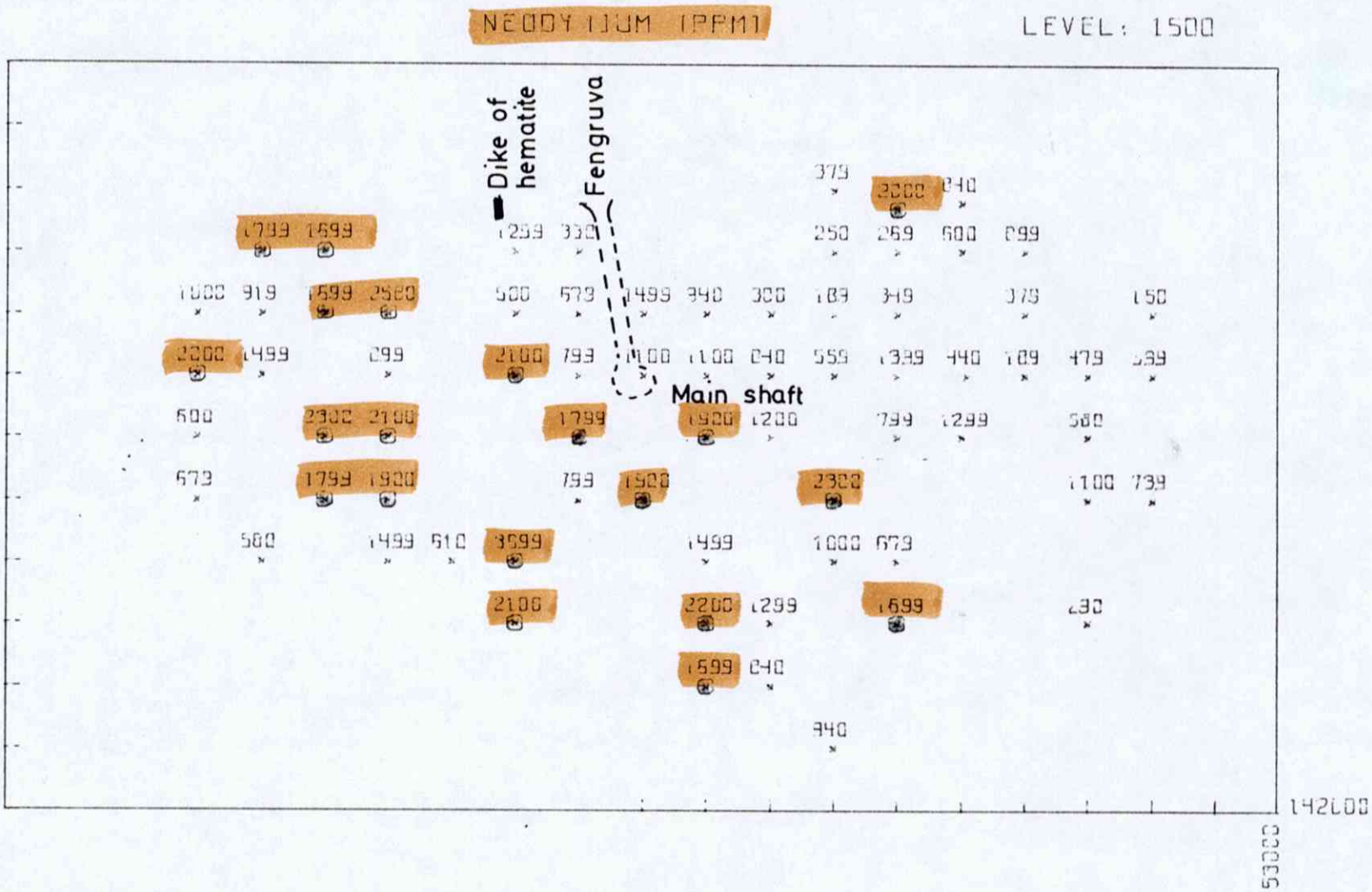
Appendix 8

GRUVERASEN GRID--AREA MAP SCALE = 1:5000



Appendix 9

GRUVERASEN GRID-AREA MAP SCALE = 1:5000



Appendix 10

Appendix 11

Bh 2 1981 Gruvåsen

Dyp (m)	% MT	c.p.s.	Dyp (m)	% MT	c.p.s.	Dyp (m)	% MT	c.p.s.
0 - 1			50 - 51	0	270	100 - 101	0	175
1 - 2			51	0	270	101 -	0,05	195
2 - 3 m	0,0	210	52	0	270	2	0	165
3 - 4 m	0,05	240	3	0	270	3	0	165
4 - 5	0,05	270	4	0	300	4	0	210
5 - 6	0,05	300	5	0	240	5	0	240
6 - 7	0,05	300	6	0	240	6	0	270
7 - 8	0,0	255	7 -	0,1	270	7	0,05	240
8 - 9	0,0	240	8	1,55	270	8	0,1	240
9 - 10	0,0	300	9	0	280	9	0,15	270
10	0,05	280	60	0,05	300	110	0,1	270
11	0,0	280	1	0,85	300	11	0,15	270
12	0,0	350	2	1,2	300	12	0,05	270
13	0,0	300	3	0,6	270	13	0	360
14	0,05	360	4	0,4	210	14	0	400
15	0,0	270	5	0,25	240	15	0	400
16	0,0	225	6	0,05	240	16	0	430
17	0,0	270	7	0,05	240	17	0,05	430
18	0,1	300	8	0,05	180	18	0	360
19 - 20	0,1	300	69 - 70	0	180	19	0	270
20	0,05	300	70 - 71	0	150	120 - 121	0,05	210
21	0,1	380	71 - 72	0	210	21	0,35	210
22	0,1	430	72 - 73	0,05	680	22	2,75	170
23	0,1	380	73 - 74	0,05		23	2,5	175
24	0,2	400	74 - 75	0,05		24	2,6	180
25	0,1	415	75 - 76	0,15		25	2,05	240
26	0,15	400	76 - 77	0,05		26	0,5	270
27	0,05	400	77 - 78	0,1		27	0,05	225
28	0,05	380	78 - 79	0,05		28	0	240
29 - 30	0,2	360	79 - 80	0,05		29	0	270
30	0,2	380	80	0		130 - 131	0	360
31	0,2	360	1	0,05		31	0	400
32	0,1	260	2	0,1		32	0	360
33	0,05	400	3	0,15		33	0	360
34	0,0	430	4	0,35		34	0	350
35	0,0	465	5	0,1		35	0	270
36	0,0	830	6	0,05		36	0	300
37	0,0	830	7	0		37	0	360
38	0,05	830	8	0	270	38	0	360
39 - 40	0,05	815	9	0	300	39	0	400
40	0	565	90	0	270	140 - 141	0	430
41	0	900	1	0	300	41	0	400
42	0	535	2	0	360	42	0	400
43	0	830	3	0	280	43	0	270
44	0	380	4	0	225	44	0	480
45	0	300	5	0	180	45	0	430
46	0	270	6	0,05	140	46	0	330
47	0	255	7	0,05	170	47	0	480
48	0	210	8	0	155	48	0	400
49 - 50	0	240	99 - 100	0	175	149 - 150	0	360

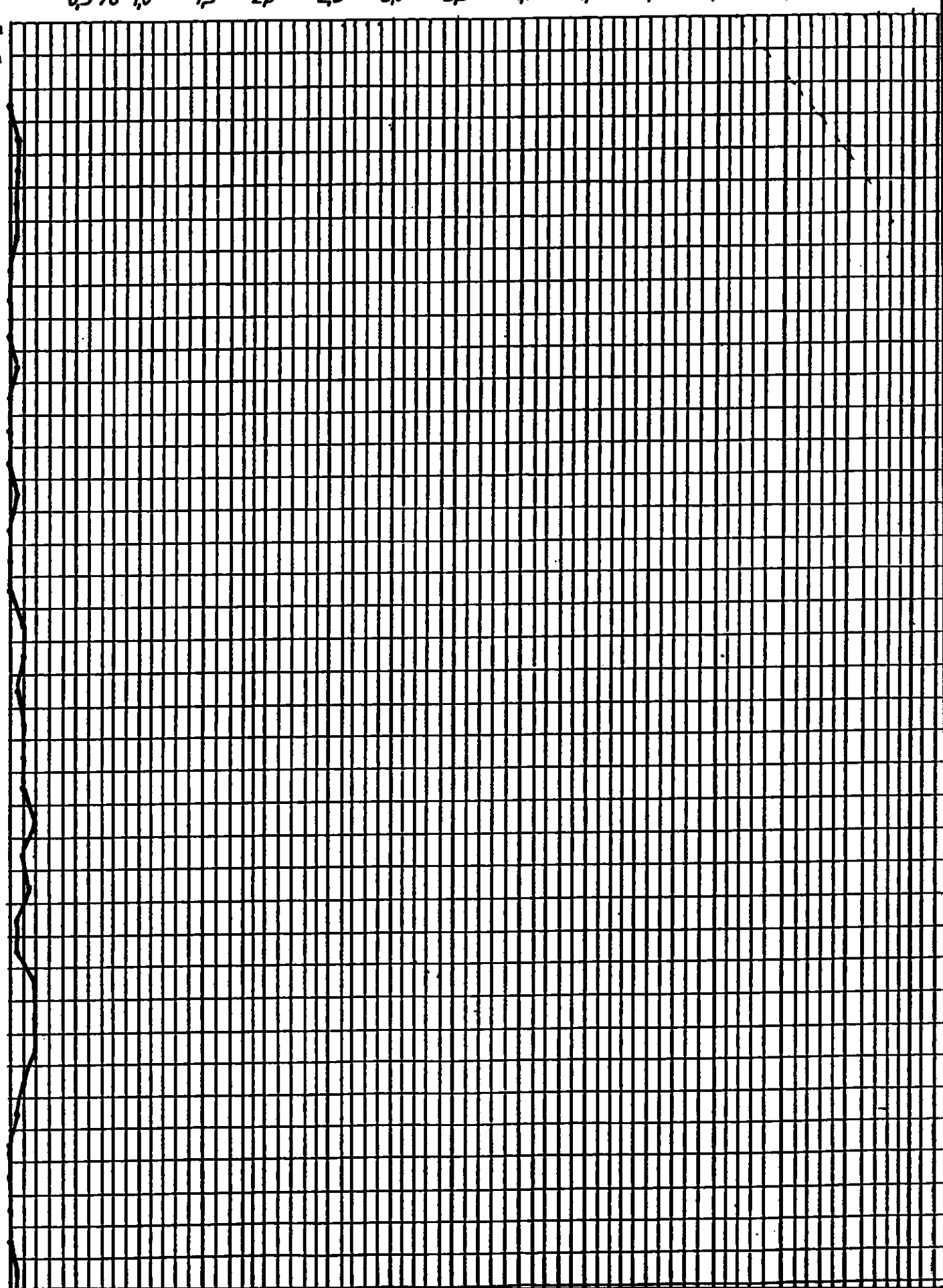
Dyp	% MT	c.p.s.
150 - 151	0	270
151	0	220
2	0	205
3	0,05	205
4	0,05	215
5	0,05	225
6	0,05	240
7	0,05	270
8	0,05	280
9	0	265
160 - 161	0	185
1	0	210
2	0,05	195
3	0,05	180
4	0,05	205
5	0	180
6	0	150
7	0	150
8	0	150
9	0	155
170 - 171	0	170
1	0	165
2	0,05	175
3	0	170
4	0,1	160
5	0,1	155
6	0	165
7	0,05	180
8	0,05	225
9	0,05	255
180 - 181	0,05	255
1	0,05	245
2	0	270
3	0	270
4	0,05	210
5	0	240
6	0	240
7	0	300
8	0	360
9	0	430
190 - 191	0	460
1 - 192	0,05	360
2 - 193	0	360
3	0	380
4	0,15	400
5	0,15	415
6	0,1	430
7	0,15	480
8	0,2	500
199 - 200	0,75	360

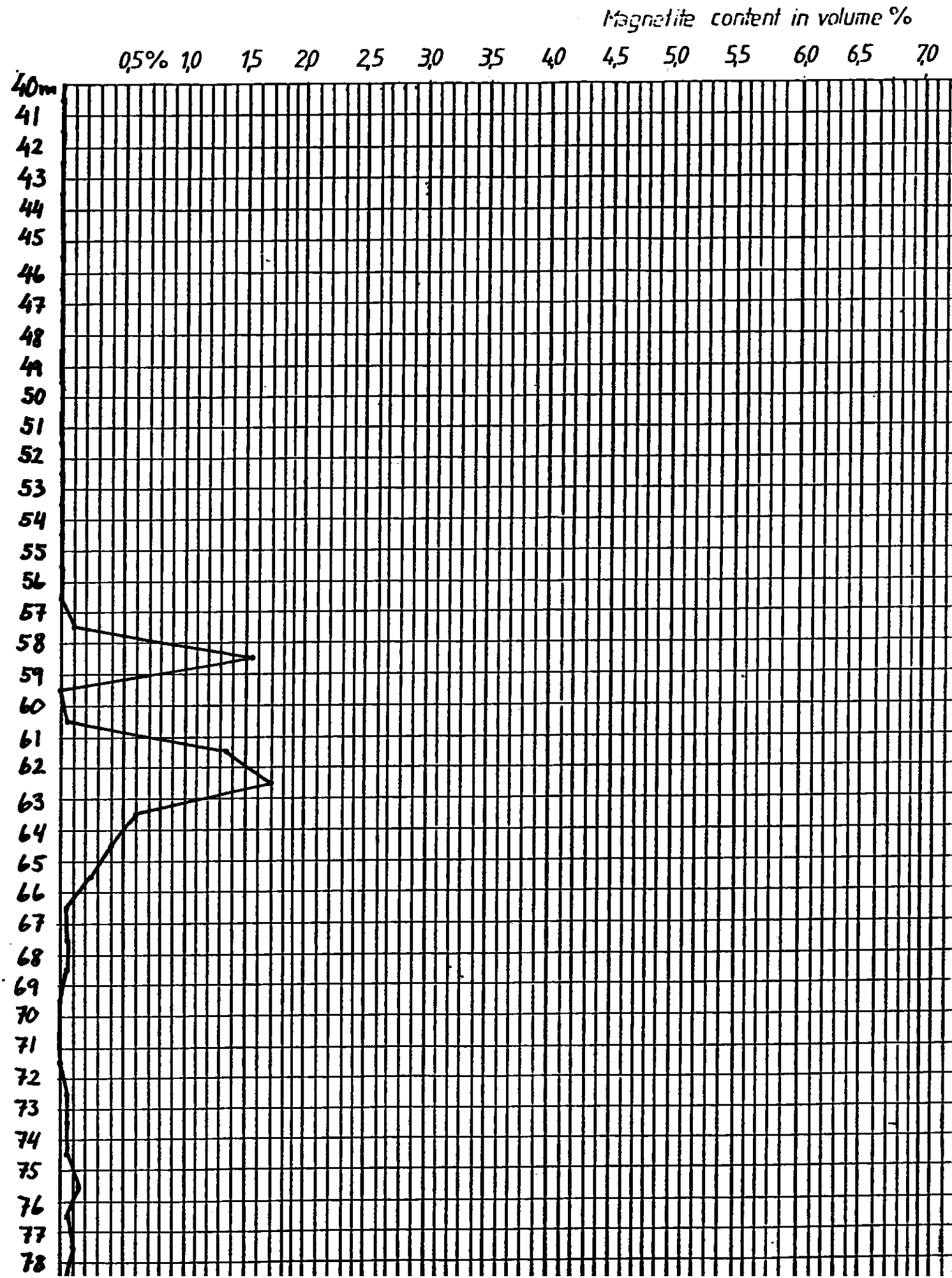
Dyp (m)	% MT	c.p.s.
200 - 201	0,75	225
201	0,45	240
2	0,15	255
3	0,25	270
4	0,2	270
5	0,2	300
6	0,1	360
7	0,05	280
8	0,2	300
9	0,25	400
210 - 211	0,25	400
11	0,2	400
12	0,2	360
13	0,15	350
14 - 15	0,15	265
15 - 16	0,3	235
16	0,15	235
17	0,1	270
18	0,1	240
19	0,1	255
220 - 221	0,05	270
1	0,1	280
2	0	300
3	0,05	300
4	0,2	255
5	0,35	300
6	0,4	280
7	0,5	255
8	0,05	270
9	0,05	270
230 - 231	0,05	240
1	0	210
2	0,1	240
3	0,1	270
4	0,1	300
5	0,1	300
6	0,1	280
7	0,15	270
8	0,05	240
9	0,05	210
240 - 241	0,05	210
1	0	270
2	0,05	300
3	0,1	265
4	0,1	265
5	0,3	255
6	0,05	275
7	0,1	240
8	0,05	240
249 - 250	0,05	270
250 - 251	0,05	300

Dyp (m)	% MT	c.p.s.
251 - 252	0,05	30
2	0,1	360
3	0,1	35
4	0,1	35
5	0,1	280
6	0	25
7	0	25
8	0,05	255
9	0,1	22
60	0,1	21
1	0,05	21
2	0,1	21
3	0,1	195
4	0,05	21
5	0	25
6	0	270
7	0	27
8	0,1	25
9	0,05	225
70	0,1	22
1	0,1	2
2	0	210
3	0	2
4	0,05	2
5	0,05	270
6	0	2
7	0,05	2
8	0,1	255
9	0,05	2
80	0,05	240
1	0,2	270
2	0,3	4
3	0,3	360
4	0,9	2
5	0,7	3
6	1,05	280
7	1,3	2
8	3,8	2
9	3,65	240
90	3,1	2
1	3,85	2
2	4,05	300
3	2,5	3
4	1,5	3
5	0,85	300
6	1,0	3
7	1,25	4
8	0,85	360
9	0,7	3
300 - 301	0,5	3
301	0,8	270
302	2,95	2

Appendix 12

BH.2. 1981. Gruveåsen




Magnetite content in volume %
0,5% 1,0 1,5 2,0 2,5 3,0 3,5 4,0 4,5 5,0 5,5 6,0 6,5 7,0
40m
41
42
43
44
45
46
47
48
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51
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53
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57
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59
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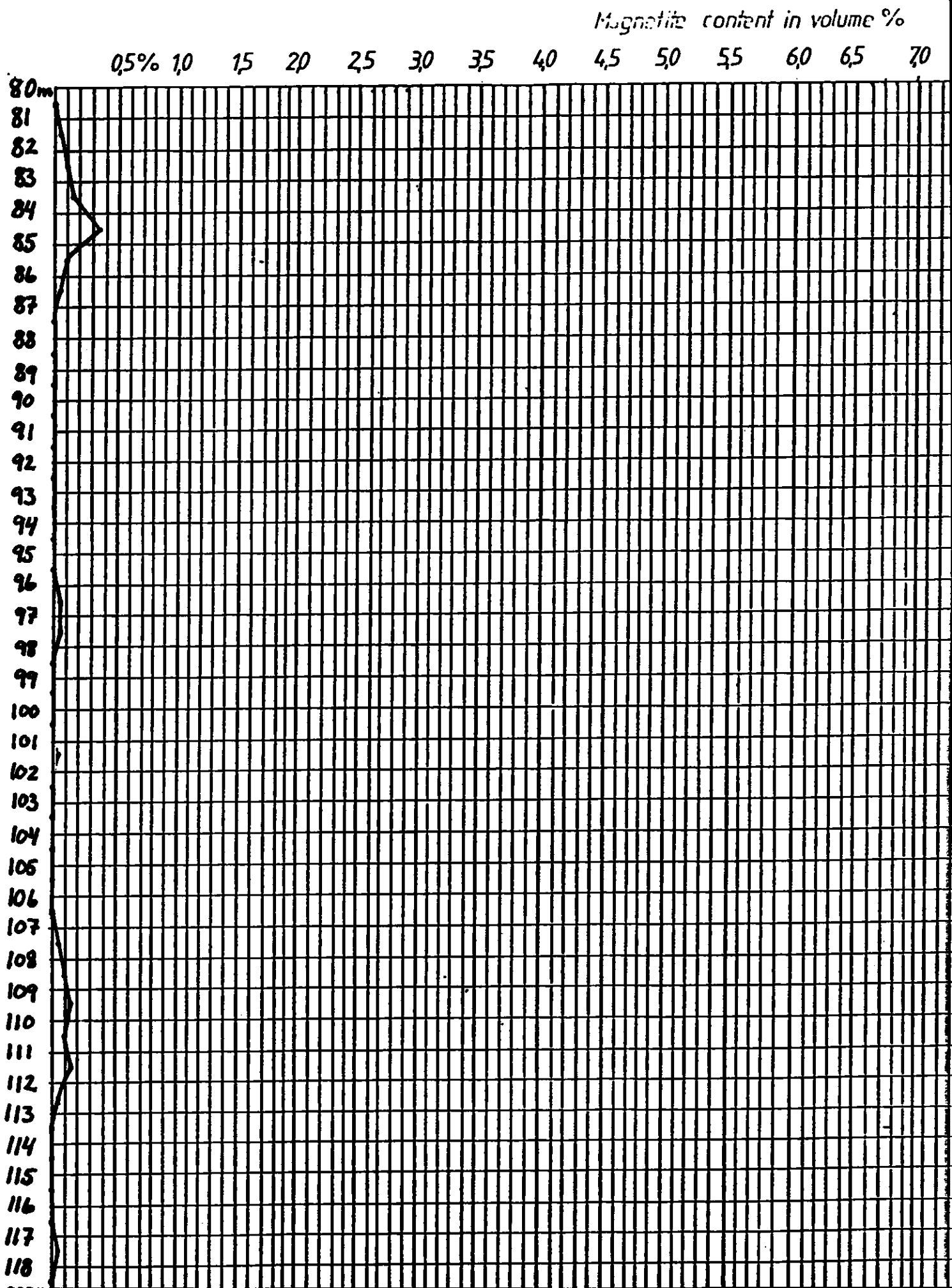
Magnetite content in volume %
0,5% 1,0 1,5 2,0 2,5 3,0 3,5 4,0 4,5 5,0 5,5 6,0 6,5 7,0
80m
81
82
83
84
85
86
87
88
89
90
91
92
93
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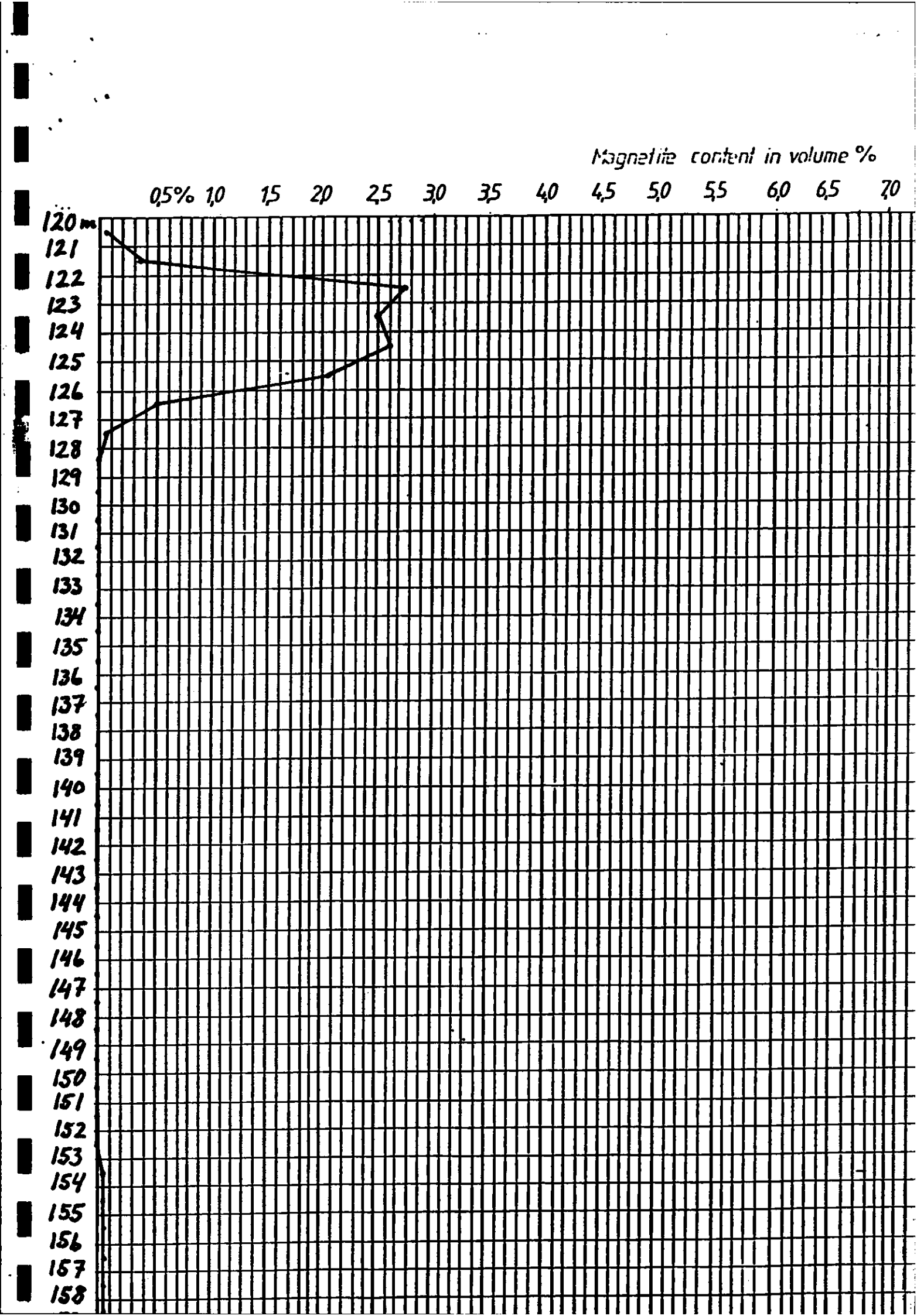
Magnetite content in volume %
0,5%
1,0
1,5
2,0
2,5
3,0
3,5
4,0
4,5
5,0
5,5
6,0
6,5
7,0
120 m
121
122
123
124
125
126
127
128
129
130
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134
135
136
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141
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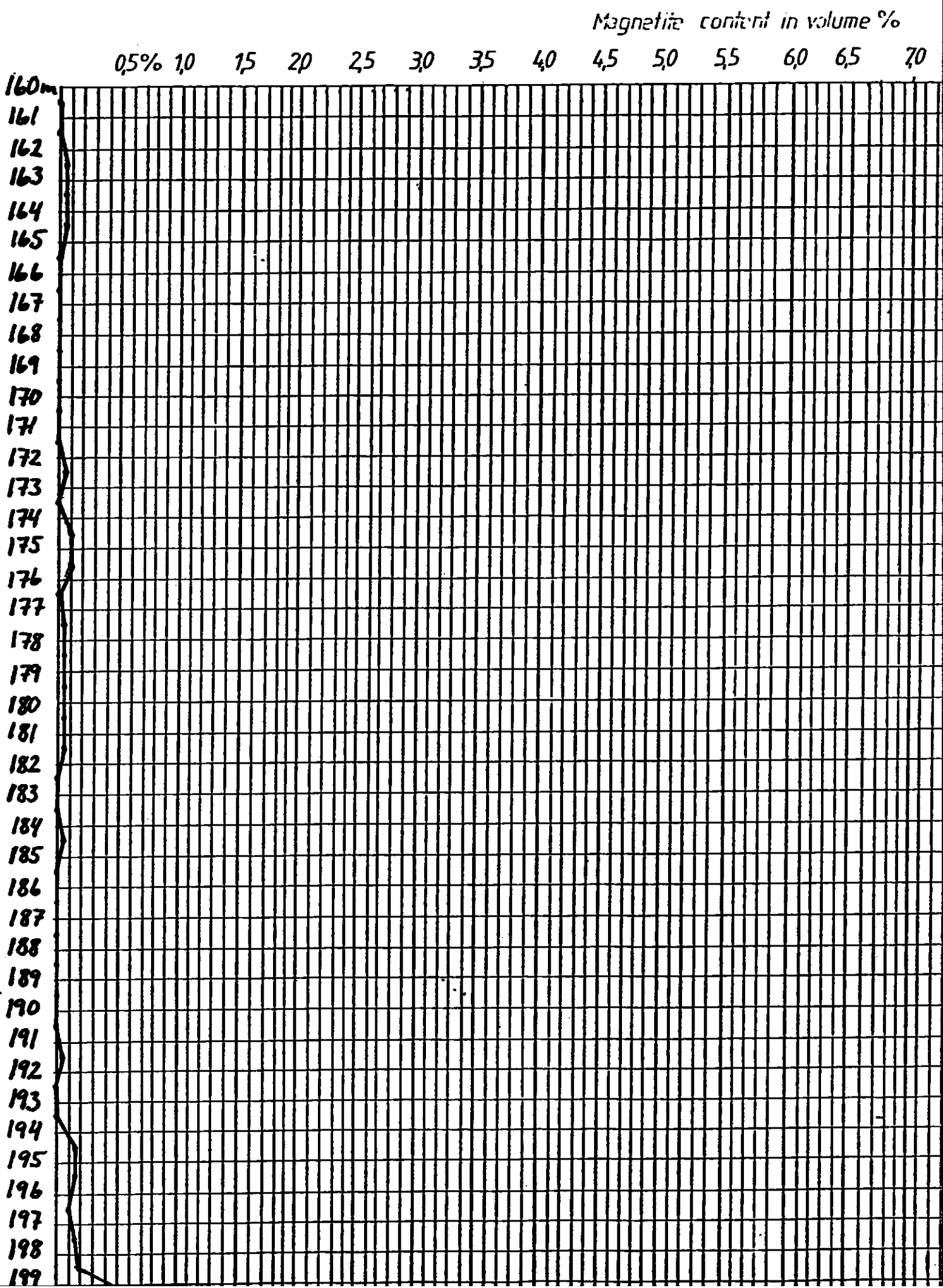
Magnetite content in volume %
0,5%
1,0
1,5
2,0
2,5
3,0
3,5
4,0
4,5
5,0
5,5
6,0
6,5
7,0
160m
161
162
163
164
165
166
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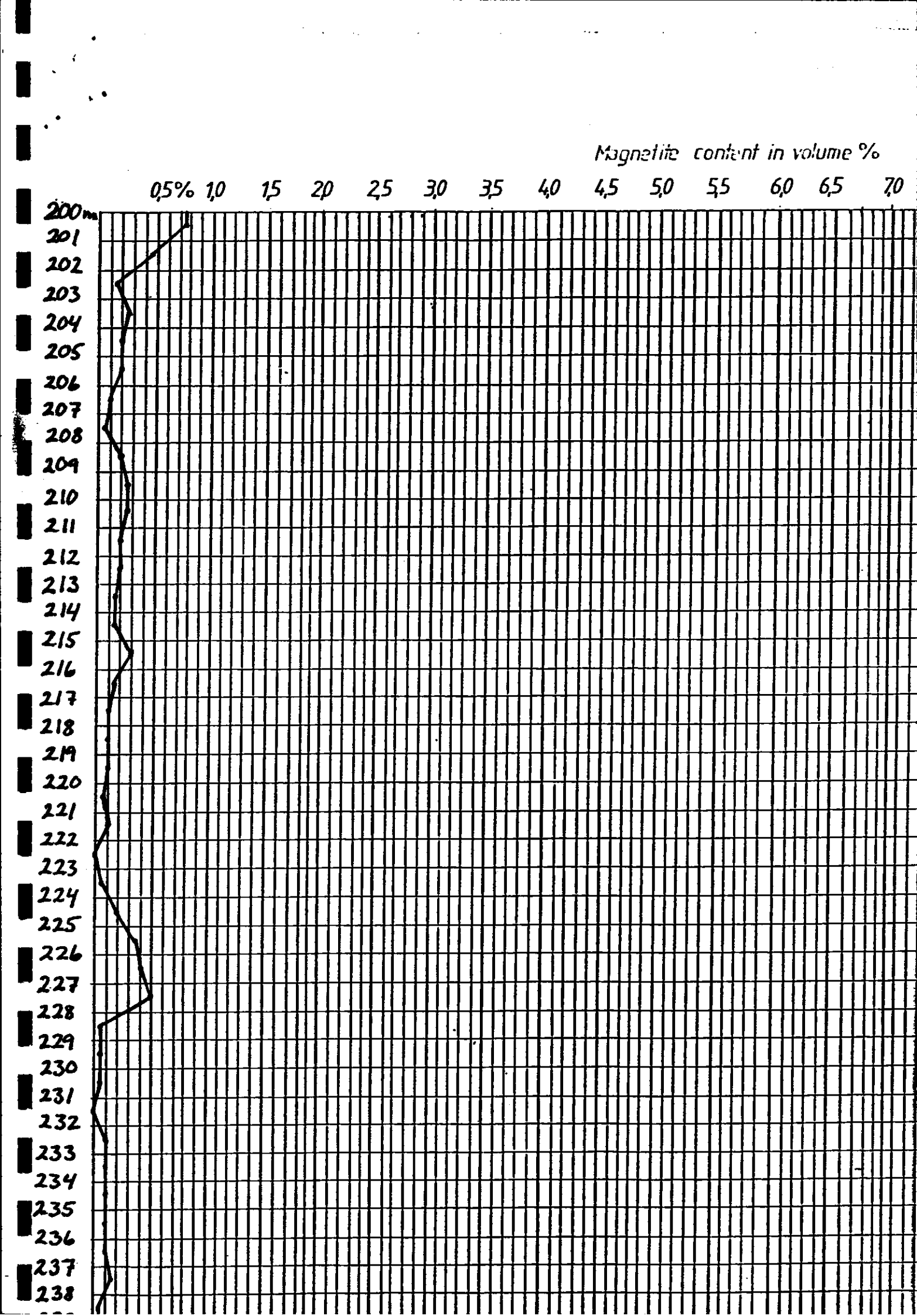
Magnetite content in volume %
0,5%
1,0
1,5
2,0
2,5
3,0
3,5
4,0
4,5
5,0
5,5
6,0
6,5
7,0
200m
201
202
203
204
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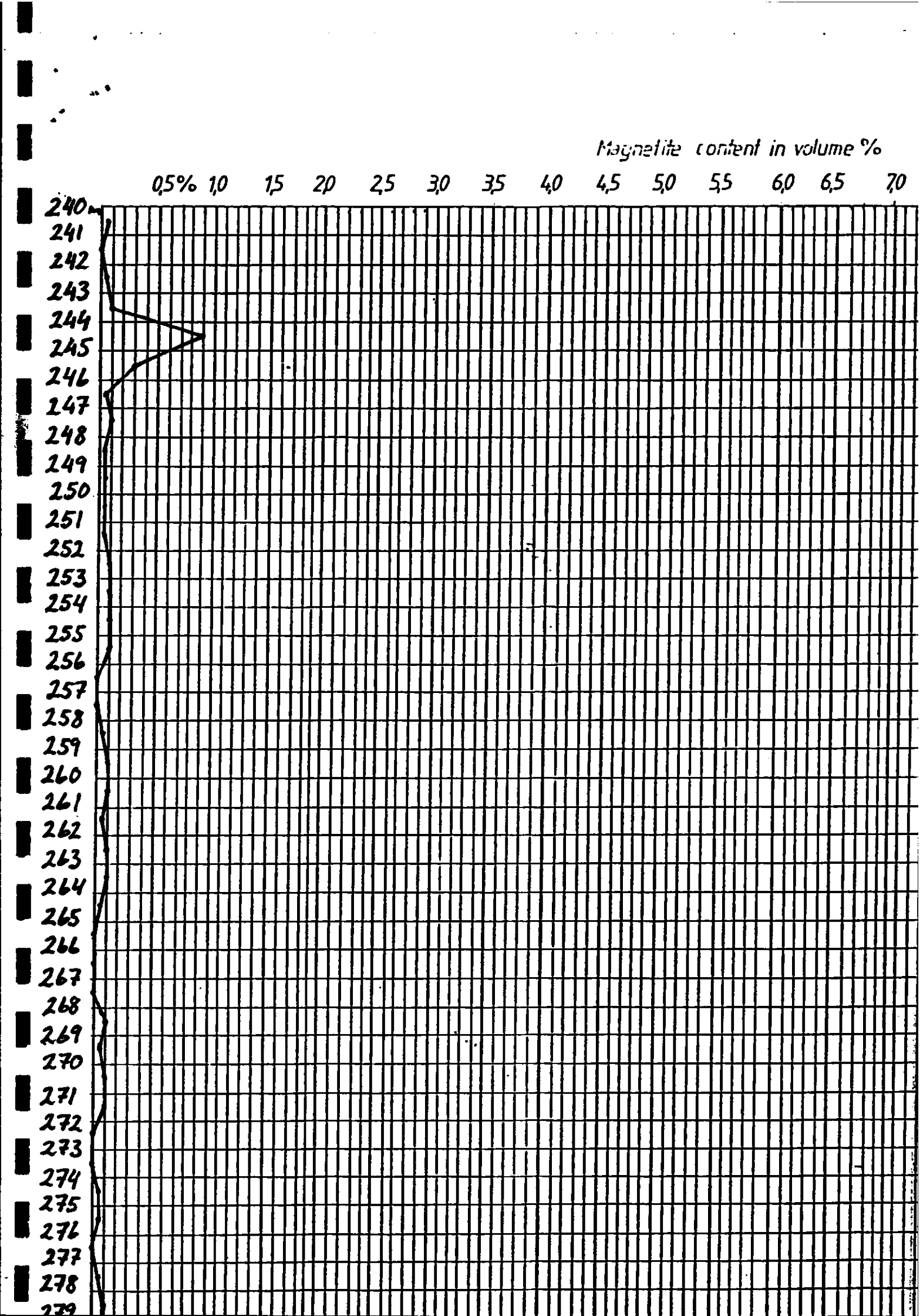
Magnetite content in volume %
0,5% 1,0 1,5 2,0 2,5 3,0 3,5 4,0 4,5 5,0 5,5 6,0 6,5 7,0
240
241
242
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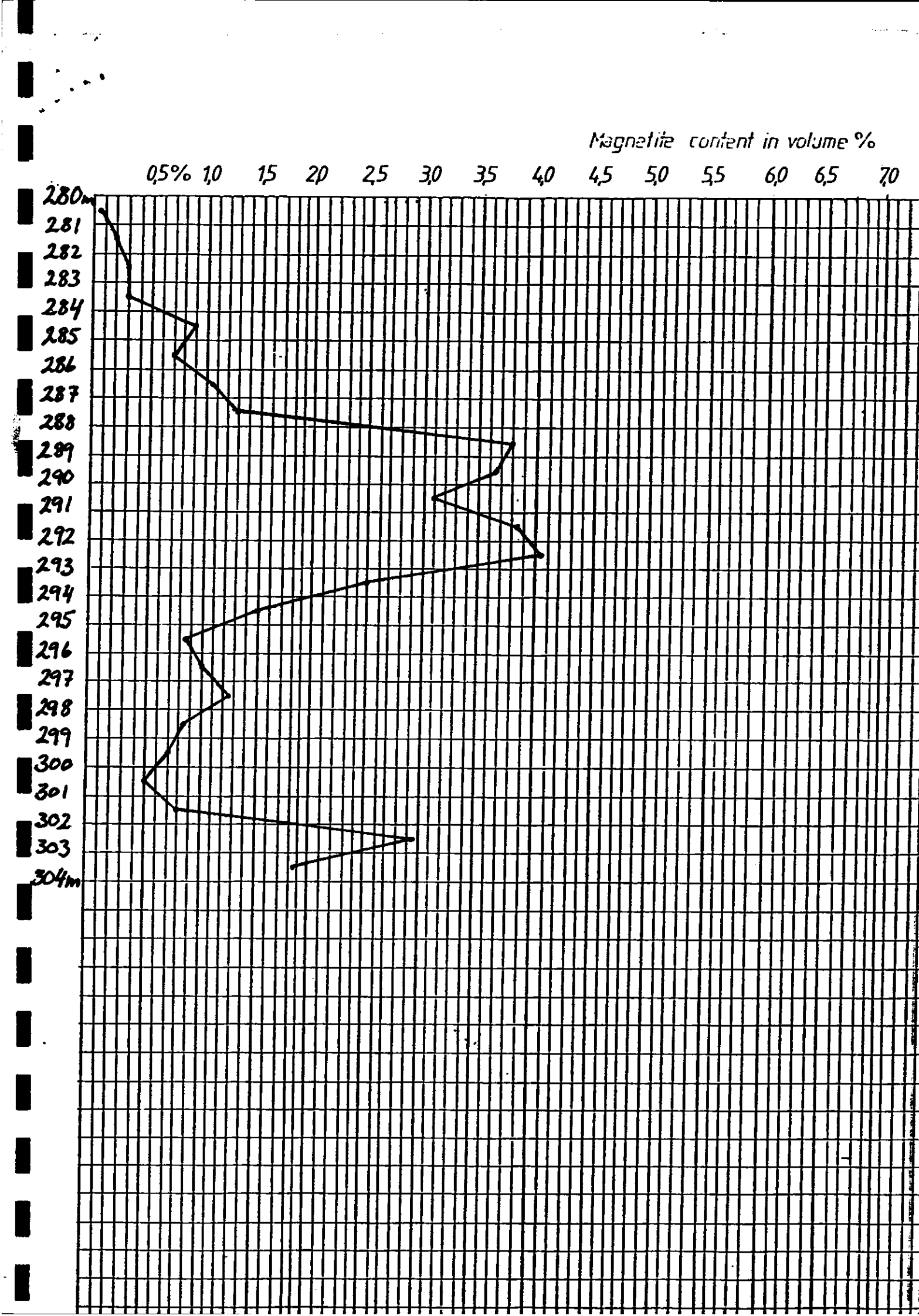
Magnetite content in volume %
0,5% 1,0 1,5 2,0 2,5 3,0 3,5 4,0 4,5 5,0 5,5 6,0 6,5 7,0
280m
281
282
283
284
285
286
287
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289
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295
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297
298
299
300
301
302
303
304m

ANALYTICAL RESULTS

Gruvåsen DDH 2-81, 270°/-45° - 304.00 c.m.

All elements are analysed by XRF exept for F_2. This analyses are carried out by F_2 destilation (Willard Winter,s method).

c.m.	% Nb	% Y	% Th	% Ce	c.m.	La ppm	Pr ppm	Nd ppm	Sm ppm	Gd ppm	Dy ppm	% F	γ- ray c.p.s.
2.5-3	0.092	0.023	0.10	0.18									210
3-6	0.090	0.027	0.11	0.20									240-300
6-9	0.094	0.028	0.10	0.17									240-300
9-12	0.088	0.024	0.083	0.21									280-300
12-15	0.12	0.034	0.10	0.34									300-360
15-18	0.12	0.023	0.060	0.34									225-270
18-20	0.11	0.022	0.058	0.20									300
22-23	0.11	0.038	0.11	0.37									380-430
23-24	0.098	0.049	0.14	0.24									380
24-25	0.087	0.044	0.14	0.21									400
25-26	0.10	0.042	0.13	0.23		1270	+	1600	300	129	-		415
26-27	0.065	0.027	0.11	0.23									400
27-30	0.094	0.030	0.078	0.22									360-400
30-33	0.095	0.024	0.079	0.23									260-380
33-36	0.082	0.029	0.093	0.37	35-36	1850	+	1775	195	113	-		430-465
36-39	0.082	0.032	0.10	0.34									430
39-42	0.054	0.024	0.14	0.42	40-41	2070	++	3030	475	142	-		415-565
42-45	0.041	0.019	0.084	0.46	41-42	1515	+	2180	290	102	-		380-535
45-48	0.035	0.016	0.054	0.24	42-43	2575	++	4280	465	117	-		255-300
48-51	0.065	0.020	0.061	0.25									210-270
51-54	0.083	0.019	0.070	0.20									270
54-57	0.098	0.029	0.094	0.21									240-300
57-60	0.070	0.023	0.053	0.18									270-280
60-63	0.068	0.030	0.080	0.20									270-300
63-66	0.043	0.023	0.077	0.33									210-270
66-69	0.095	0.028	0.066	0.14									180-240
69-72	0.085	0.016	0.032	0.070									150-210
72-73	0.053	0,064	0,23	0,36		1490	+	1795	415	216	-		680
73-76	0.064	0.079	0.22	0.26									Not measured
76-79	0.088	0.057	0.16	0.29									because of
79-82	0.094	0.034	0.10	0.20									uncomplete
82-85	0.088	0.026	0.11	0.35									cores
85-88	0.080	0.035	0.13	0.30									
88-91	0,097	0,031	0,10	0.23									270-300
91-94	0.074	0.030	0.10	0.30									280-360
94-97	0.082	0.017	0.027	0.042									140-225
97-100	0.078	0.014	0.026	0.037									155-175
100-103	0.094	0.018	0.032	0.16									165-195
103-106	0.077	0.025	0.044	0.13									165-240
106-107	0.10	0.025	0.065	0.20									240-270
107-108	0.068	0.027	0.078	0.22									240
108-111	0.076	0.022	0.053	0.13									240-270
111-113	0.078	0.041	0.096	0.21	N.A.								270
113-114	0.070	0.031	0.083	0.22									360
114-117	0.090	0.038	0.10	0.20									400-430
117-120	0.087	0.041	0.090	0.22									270-480
120-123	0.082	0.025	0.049	0.19									170-210
123-126	0.051	0.021	0.045	0.14									175-240
126-129	0.10	0.035	0.085	0.29									225-270
129-132	0.15	0.037	0.075	0.25									270-400
132-135	0.12	0.035	0.075	0.28									350-360
135-138	0.13	0.030	0.085	0.31									270-360
138-141	0.13	0.030	0.088	0.32									360-430
141-144	0.14	0.026	0.090	0.33									270-400
144-147	0.12	0.043	0.12	0.38									400-450
147-150	0.091	0.036	0.093	0.28									360-430
150-153	0.11	0.020	0.054	0.19									205-270
153-156	0.086	0.018	0.044	0.16									205-225
156-159	0.093	0.023	0.054	0.15									240-280
159-162	0.083	0.026	0.063	0.19									185-265

c.m.	% Nb	% Y	% Th	% Ce	c.m.	La ppm	Pr ppm	Nd ppm	Sm ppm	Gd ppm	Dy ppm	% F	γ - ray c.p.s.
162-165	0.085	0.021	0.032	0.082									180-205
164-165						425	-	540	98	52	-	0.22	205
165-168	0.079	0.021	0.025	0.075									150-180
168-171	0.071	0.020	0.028	0.10									150-170
169-170						455	-	445	68	84	-	0.48	155
170-171						575	+	510	90	66	-	0.18	170
171-174	0.080	0.016	0.036	0.13									165-175
171-172						620	+	475	88	57	-	0.17	165
172-173						825	+	500	75	68	-	0.16	175
174-177	0.083	0.017	0.026	0.090									155-165
177-180	0.12	0.022	0.040	0.14	N.A.								180-255
180-183	0.12	0.027	0.054	0.24									225-270
183-186	0.094	0.025	0.057	0.26									210-270
186-187	0.086	0.018	0.045	0.16	-	695	+	820	105	62	-	0.12	240
187-188	0.060	0.018	0.068	0.40	-	2230	++	1680	185	48	-	0.21	300
188-192	0.089	0.023	0.093	0.39									360
192-193	0.12	0.028	0.10	0.45	N.A.								360
193-194	0.16	0.030	0.068	0.33									380
194-195	0.17	0.043	0.10	0.33									400
195-196	0.11	0.028	0.080	0.27									415
196-197	0.15	0.027	0.084	0.28									430
197-198	0.12	0.057	0.13	0.32									480
198-199	0.10	0.078	0.14	0.25									500
199-200	0.11	0.023	0.057	0.19									360
200-201	0.12	0.028	0.048	0.17									225
201-202	0.12	0.027	0.053	0.18	-	860	+	1110	215	100	-	1.6	240
202-203	0.12	0.021	0.050	0.18	-	860	+	905	130	74	-	2.1	255
203-204	0.11	0.020	0.096	0.33	-	1690	++	1800	195	110	+	0.78	270
204-205	0.11	0.021	0.052	0.20	-	1000	+	920	140	95	+	1.7	270
205-206	0.11	0.016	0.035	0.13	-	575	+	550	92	59	-	1.1.	300
206-207	0.080	0.021	0.10	0.45	-	2610	++	1740	225	140	+	1.7	300
207-208	0.089	0.018	0.11	0.54									280
208-209	0.058	0.019	0.097	0.41									300
209-210	0.061	0.024	0.094	0.37									400
210-211	0.092	0.041	0.13	0.46									400
211-212	0.079	0.023	0.085	0.30									400
212-213	0.094	0.016	0.068	0.28	N.A.								360
213-214	0.096	0.020	0.087	0.41									350
214-215	0.067	0.017	0.061	0.24									265
215-216	0.11	0.025	0.050	0.16	-	590	+	790	120	87	+	0.97	235
216-217	0.11	0.022	0.079	0.31	-								235
217-218	0.11	0.018	0.050	0.20									270
218-219	0.12	0.016	0.048	0.16	N.A.								240
219-220	0.14	0.015	0.033	0.13									255
220-221	0.12	0.017	0.059	0.26	-	1190	++	1040	110	75	+	1.2	270
221-222	0.10	0.016	0.053	0.20	-	995	+	790	94	<50	+	1.2	280
222-223	0.077	0.028	0.11	0.40		1620	++	1710	185	120	+	0.40	300
223-224	0.10	0.059	0.10	0.32									300
224-225	0.11	0.057	0.13	0.37									255
225-226	0.10	0.048	0.10	0.25	N.A.								300
226-227	0.068	0.032	0.064	0.21									280
227-228	0.090	0.024	0.042	0.15									255
228-229	0.096	0.026	0.072	0.30	-	1510	++	1190	165	125	+	0.27	270
229-230	0.10	0.019	0.057	0.27	-	1270	++	1100	120	78	-	0.42	270
230-231	0.10	0.017	0.057	0.27	-	1320	++	1070	125	65	+	0.35	240
231-232	0.12	0.009	0.059	0.28	-	1520	++	1180	140	73	-	0.48	210
232-233	0.097	0.006	0.055	0.27									240
233-234	0.12	0.007	0.088	0.40	N.A.								270
234-235	0.13	0.019	0.061	0.30									300
235-236	0.053	0.033	0.078	0.36									300
236-239	0.12	0.023	0.064	0.32									240

c.m.	% Nb	% Y	% Th	% Ce	c.m.	La ppm	Pr ppm	Nd ppm	Sm ppm	Gd ppm	Dy ppm	% F	γ - ray c.p.s.
236-237 A						1890	++	1570	185	125	+	0.53	280
236-237 B						1900	++	1580	190	110	+	0.46	
239-242	0.10	0.024	0.068	0.33									210-270
242-243	0.082	0.015	0.066	0.25	-	1230	++	945	110	53	-	1.7	300
242-244						1310	++	1010	115	70	-	1.5	255-265
243-246	0.093	0.019	0.054	0.25									
246-247	0.14	0.025	0.074	0.35									275
247-248	0.11	0.028	0.086	0.40	N.A.								240
248-249	0.11	0.026	0.11	0.50									240
249-250	0.12	0.023	0.068	0.31	-	1760	++	1460	180	115	+	0.72	270
250-251	0.11	0.024	0.068	0.35	-	1480	++	1260	155	84	+	0.83	360
251-254	0.11	0.028	0.069	0.34									350-360
254-257	0.10	0.023	0.069	0.34									255-280
257-258						1680	++	1400	200	125	+	0.71	255
257-260	0.086	0.021	0.082	0.34									255
260-263	0.073	0.015	0.069	0.27									225-255
263-266	0.079	0.018	0.040	0.16									210-215
266-269	0.078	0.021	0.069	0.26	N.A.								195-255
269-270	0.064	0.021	0.060	0.23									255-270
270-271	0.089	0.018	0.050	0.17									225
271-272	0.072	0.018	0.095	0.27	-	2060	++	1330	160	105	-	0.17	210
272-275	0.083	0.017	0.059	0.24									240-270
275-278	0.071	0.021	0.075	0.42									265-270
278-279	0.077	0.020	0.094	0.44	N.A.								255
279-280	0.072	0.014	0.051	0.31									210
280-283	0.097	0.019	0.088	0.43									240-400
283-286	0.091	0.013	0.066	0.32									295-360
286-289	0.087	0.019	0.097	0.32									255-280
289-293	0.061	0.012	0.049	0.15									240-300
292-293						1370	++	1290	185	91	-	0.16	300
293-296	0.089	0.014	0.094	0.34									300-360
296-299	0.089	0.017	0.093	0.39									300-400
299-304	0.094	0.020	0.074	0.32									270-350

N.A. not analysed
- < 100 ppm
+ 100-200 ppm
++ > 200 ppm

DIAMANTBORING GRUVÅSEN 1981

Kjerneobservasjoner.

Borhull nr. 2-81 Profil 1

Koordinator: Y 142.430 X 52.413

Påsatt i høyde 59.5 m.

" i retning 270°

" med helning -45°

Borhullets lengde 304.00 c.m.

Boret meter	Bergart	γ-ray c.p.s.	Skifrighet	Bergart prøve
0- 2.55	Overburden.			
4.30	Rauhaugit /Damtjernit with plately structure. Homogenous.			
4.50	Rauhaugit /Damtjernit, HT-rich with goethite.			
6.70	Rauhaugit /Damtjernit as 2.55-4.30 c.m. with some goethite.			
6.80	Rauhaugit /Damtjernit - HT-rich.			
7.80	Rauhaugit /Damtjernit as 2.55-4.30 c.m. more or less inhomogenous.			
7.90	Rauhaugit /Damtjernit, HT-rich.			
9.15	Rauhaugit /Damtjernit, mostly as 2.55-4.30 c.m., with a higher content of damtjernit and HT.			
15.05	Rauhaugit /Damtjernit, inhomogenous, rauhaugit dominates.			
18.50	Rødbergit, with HT inhomogenously dispersed.			
18.90	Rauhaugit, mixed with damtjernit with foliated pebblestructure.		60°	
20.80	Rauhaugit, with a higher content of damtjernit than 18.50-18.90, with HT.			
22.30	Rauhaugit, as 18.50-18.90 c.m.			
22.80	Rauhaugit, strongly HT-rich after direction.			
26.10	Rauhaugit, mainly as 20.80-22.30 c.m. with fluorite (FSP).		30°	
29.80	Rauhaugit /Damtjernit with FSP in fragments of syenite and dolomite - pebblestructure.			
30.10	Dike with increasing content of syenitic materials.			
		Aktive 360/415		

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Ark 2 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-my c.p.s.	Skifrighet	Bergart prøve
30.40	Rauhaugit, mainly as 20.80-22.80 c.m.			
31.10	Dike ? finegrained of syenitic material.			
31.55	Dike ? of coarsegrained syenitic material with HT.			
31.60	Damtjernit /syenite, foliated with large fragments of both rocks.		55°	
32.60	Rødbergization, fragments of rauhaugit are more hematite-rich. Weakly foliated	990/960		
39.90	Rødbergit, with two generations of HT, gneissic structure after 60°.	585/565	60°	46.60/46.65
48.90	Contact of foliation, well developed.		40°	
48.90	Rødbergit with rounded fragments of damtjernit, some HT.			
54.40	Rødbergit, foliated, partly with small pebblestructure with light colour. Differentiated hematitiation.		60°	
56.55	Rødbergit, syenitic, foliated. Two generations of HT. Relatively HT-rich.		60°	56.75/56.80
57.60	Rødbergit, built up by fragments. Foliated with HT.			
58.20	Dike, sulfides + carb. in contact with diabas -		35°	
58.20	Diabas,-dike.		35°	
58.25	Rødbergit, mainly as 57.60-58.25 c.m.			
58.70	Rødbergit, mainly as 57.60-58.25 c.m. little HT.			
61.80	Diabas, dike.		30-35°	
62.20	Rødbergit, brecciated + recrystalized and foliated. Fragmented. Two generations of HT.		60-70°	
63.10	Rødbergit, little fragmented lesser HT, than 63.10-66.05 c.m. Two generations of HT. Well developed contact at 66.05 c.m. Foliation plane - HT-rich.		30°	
66.05	Rødbergit, more homogenous with two generations of HT.			
68.50	Rødbergit, mixed with damtjernit, foliated.		60°	
68.80	Rødbergit, with pebblestructure.		60-70°	
70.90	Rødbergit, brecciated and mixed with carbonate. Bolladalen - breccie ?			

Ark 3 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-ray c.p.s.	Skifrighet	Bergart prøve
72.00	Rødbergit, with damtjernit ? Flame structure of hematite. Two generations of HT to 78.00 c.m. Foliated after - with well developed small dikes of carbonate parallel to the foliation plane.	680	40°	72.30/ 77.35
81.00	Brecciated and recrystalized. Bolladalen-structure ?			81.65/ 81.70
81.70	Dike of hemitite, brecciated.			
84.60	" " " , massif.			83.20/ 83.25
84.60	" " " , with fragments of rødbergit.			84.70/ 84.75
84.70	Rødbergit, foliated, partly brecciated.		40-60°	87.45/ 87.55
88.00	Rødbergit, brecciated after a foliation plane. Uneven hematitiation.		40°	89.00/ 89.10
90.50	Rødbergit, strongly brecciated.		40°	
92.60	Rødbergit, with structure like rauhaugit with PY, foliated.		40-50°	
93.90	Rødbergit, with some damtjernit strongly brecciated at 94.60-95.10 c.m.			
95.10	Damtjernit, inhomogenous with some HT with relics of rauhaugit with pebbles of HT.			
97.80	Damtjernit, inhomogenous, weakly hematitiation at 95.10, 96.40-96.90 c.m.			
100.10	Damtjernit /rauhaugit, inhomogenous mixed. Pebblestructure and foliated.		60°	
104.00	Mixed rock, damtjernit with relics of syenite, foliated.		50-70°	
104.40	Damtjernit, inhomogenous with fragments of syenite, hematitiation. Partly brecciated and recrystallized.			
105.40	Mixed rock, damtjernit/rauhaugit with partly hematitiation.			
107.15	Damtjernit, with increasing content of rauhaugit and - may be - of rødbergit.			
109.20	Mixed rock, mainly damtjernit foliated with pebblestructure.		30°	
110.70	Mixed rock, increasing content of carbonates, pegmatitic structure with FSP Foliation plane at 112.10.		30°	111.50/ 111.60
112.10	Rauhaugit, inhomogenous with metamorfic damtjernit/syenite. Partly foliated and brecciated with recrystallized HT.	400/430	40°	

Ark 4 Bh. nr. 2-81 Profil 142.430-52.413

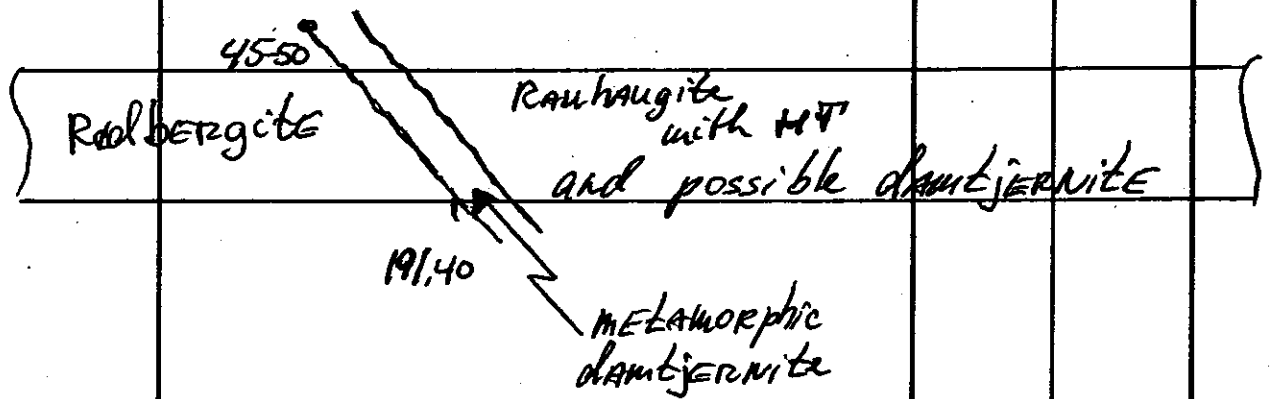
Boret meter	Bergart	γ-ray c.p.s	Skifrighet	Bergart prøve
116.70	Rauhaugit /rødbergit, with fragments of syenite, foliated with PY.		40°	
119.45	Rødbergit, with some HT.			
122.10	Dikes of diabas, cuts the rødbergit at		35°	
125.30	Rødbergit, brecciated.			
126.40	Dike of syenite, cuts ? the rødbergit.		60°	
127.15	Rødbergit, with fragments of syenite.			
128.20	Rødbergit, mixed with some rauhaugit HT-concentration at 132.00 - - - - - - -	360/400		128.80/ 128.90 130.30/ HT? 135.35
135.45	Rødbergit, brecciated with small dikes of carb. + PY parallel the brecciation plane.	360/480	65-70°	
135.60	Rødbergit /Damtjernit, brecciated and recrystallized with HT as 135.45-149.65.			
149.65	Damtjernit ? with pebblestructure with clouds of HT. Brecciated.		30° + 90°	
151.50	Rødbergit, with pebblestructure. Well developed contact at 152.30.		30°	
152.30	Rødbergit, with clouds of feldspar.			
153.45	Rødbergit, pebblestructure with carb.+ feldspar. Weakly developed foliation plane at 155.00-155.30 c.m. with rich hematitiation.			
156.25	Dike of very coarse grained rødbergit. Foliated -		40°	
156.35	Rødbergit, as 153.45-156.25 c.m. Foliated - Partly brecciated with smaller dikes of carbonates.		60°	
157.70	Dike of feldspar + HT.		70-80°	
157.90	Rødbergit, as 152.30-153.45 c.m.			
160.00	Rødbergit, weakly foliated - with porphyroblasts of PY.		60°	
161.10	Rødbergit, with relics of syenite, diabas with sulfides.			161.30/ 161.40
161.70	Rødbergit, relatively massif.			163.65/ 163.70
164.15	Rødbergit, partly brecciated with carb. + feldspar.			

Ark 5 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-ray c.p.s	Skifrighet	Bergart prøve
164.80	Rødbergit, as 161.70-164.15 c.m.			
165.40	Dike of feldspar + carb. + cl. + HT.		60°	
165.45	Rødbergit, relatively massif. Foliated at 167.50 c.m.		30°	
169.30	Contact to a pebblestructure of rødbergit.			
169.50	Rødbergit, with rauhaugit structure. Brecciated and recrystallized with carb. + cl. + HT.		30°	
170.05	Rødbergit, strongly hematitiation.			
170.25	Rødbergit, as 169.50-170.05 c.m.			
173.60	Rødbergit, like syenite, well developed contact-		50°	
173.75	Rødbergit, as 169.50-173.60 c.m.			
173.95	Mixed rock, rødbergit/rauhaugit, well foliated with carbonates.		70°	
176.00	Rødbergit, foliated - Hematitiation at 176.50-176.55 c.m.		70°	
178.20	Rødbergit, with some relics of syenite? Hematitiation at 184.00-184.70 c.m.			
184.20	Rødbergit, with light porphyroblasts of feldspar.			184.40/ 184.50
186.40	DIKE OF CARBONATES :			
	foliation 30° COARSE GRAINED with milk-white carbonate with HT + FSP. foliation 30°	× × × × × × × × × × × ×	Brecciated with HT dikes	
187.30	Rødbergit, as 184.20-186.40 c.m.			
189.10	Rødbergit, with ellipsoidic structure. Weakly foliated, laminated with carbonates.		60-70°	189.10/ 189.15
189.30	Rødbergit, as 184.20-186.90 c.m.	400/430		

Ark 6 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-ray cps	Skifrighet	Bergart prøve
191.40	Transition to rauhaugit.			
192.00	Rauhaugit, brecciated with HT and some FSP.	360/600		
194.60	Rauhaugit, with primary structures at 10° to the axis of drilling and almost 90° to HT-dike. Some FSP. Photo.			194.70/ 194.80
194.80	Rauhaugit, as 192.00-194.60 c.m.			
197.85	Dike of diabas - 60° with HT + rauhaugit.			
198.40	Rauhaugit, brecciated and recrystallized with fragments of diabas and damtjernit. Increasing content of damtjernit after 199.50 c.m. Some HT + FSP.			
200.00	Rauhaugit.			
200.20	Dike of HT + FSP.			
200.20	Rauhaugit, massif.			
200.40	Rauhaugit + damtjernit, foliated -45°, with HT + FSP + carb.		45°	
200.60	Dike of HT -45° with PY.		45°	
200.75	Mixed rock, rauhaugit + damtjernit, foliated.		50-60°	



Ark 7 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-mγ c.p.s	Skifrighet	Bergart prøve
201.15	Damtjernit-dike, metamorphic with PY + HT.		40°	
201.25	Damtjernit /rauhaugit, with HT + some FSP.			
202.80	Rauhaugit /damtjernit, increasing content of rauhaugit.			
203.50	Dike of HT + CL.		30°	
203.60	Dike of carb. + FSP + HT + PY.			
203.90	Rauhaugit /damtjernit, inhomogenous with HT + some FSP.			
205.90	Transition to rauhaugit with some FSP.			
206.05	Rauhaugit, brecciated, recrystallized with some FSP. The contact at 206.05 c.m. is well developed with CL + PY.		40°	
208.50	Rauhaugit, inhomogenous dikes of metamorphic damtjernit.	350/400		
211.55	Rauhaugit, weakly foliated with some damtjernit.		45-60°	
211.90	Damtjernit, metamorphic with rauhaugit.			
212.05	Rauhaugit, inhomogenous, brecciated and recrystallized with carb. + HT + CL. Weakly fluoricing.			
215.10	Rauhaugit, as 212.05-215.10 increasing concontent of damtjernit with HT and some FSP.			
216.00	Rauhaugit, well mixed with damtjernit. Foliated with HT.		30-60°	
216.60	Rauhaugit, strongly hematitiated.			
216.80	Mixed rock, rauhaugit/damtjernit, brecciated, recrystallized. Weakly foliated.			
217.70	Metamorphic damtjernit, relicte CL + BT porphyroblasts, often with HT-porphyroblasts.			
219.40	Rødbergit with recrystallized dolomite. Well developed contact.		60-70°	
220.10	Mixed rock, rauhaugit/damtjernit.			
221.50	Damtjernit, mixed with rauhaugit with HT + FSP			
222.20	Carbonatite, coarse grained, milk white dike with HT.			222.30/ 222.35
223.40	Rødbergit, hematitiated rauhaugite with veinlets of HT.			
223.55	Mixed rock, rauhaugit/damtjernit.			
223.70	Rauhaugit, hematitiated and brecciated.			

Ark 8 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-ray c.p.s.	Skifrighet	Bergart prøve
224.00	Mixed rock, rauhaugit/damtjernit, foliated and brecciated.			
				225.05/ 225.15
227.00	Damtjernit, contact-plane mixed with rauhaugit.		60°	
227.80	Rauhaugit, mixed with damtjernit. Inhomogenous			
232.20	Dike of carb. + CL.			
232.40	Rauhaugit, as 227.80-232.20 c.m.		45°	
235.20	Rauhaugit, brecciated and foliated. Laminated with HT.			
236.10	Mixed rock, rauhaugit/damtjernit.			
237.50	Rauhaugit, as 235.20-237.50 c.m. 238.50 - foliated -		70°	
240.30	Dike of DOLO + HT.		70°	
240.40	Rauhaugit, as 235.20-237.50 c.m.			
242.90	Dike of HT + AP ? + DOLO + FSP.			
243.40	Rauhaugit, brecciated.			
245.10	Mixed rock, rauhaugit/damtjernit. 246.10 foliated -		45°	
246.30	Dike, metamorphic rauhaugit -		50°	
246.50	Mixed rock, rauhaugit/damtjernit.			
248.00	Rauhaugit, metamorphic high content of HT trace of FSP.			
250.60	Rauhaugit, laminated,foliated.	350/360		
250.80	Rauhaugit, brecciated, partly recrystallized and partly laminated (foliated). Partly high content of HT + some FSP.			

Ark 9 Bh. nr. 2-81 Profil 142.430-52.413

Boret meter	Bergart	γ-ray c.p.s.	Skifrighet	Bergart prøve
256.00	Rauhaugit, brecciated with HT + PY -banding -		70°	
257.70	Dike of carb. + FSP.		35°	257.70/ 257.90
257.90	Rauhaugit, as 250.80-256.00 c.m.			
259.20	Basic silicate rock ? Metamorphic ?			
259.70	Rauhaugit, with relics of metamorphic basic silicate rock with HT + PY.			
260.50	Rauhaugit, metamorphic with dusters of CL + MT + PY.			263.90/ 263.95
264.00	Rauhaugit, foliated. High content of carb. + HT. Partly with inclusions of basic silicate rock. 269.90 - fault zone.			
271.30	Rauhaugit, brecciated and hydrothermally attacked.			271.30/ 271.50
271.60	Rauhaugit, as 264.00-271.30 c.m. Partly with goethite.			282.00/ 282.20
289.90	Dike of diabas -		30°	
291.60	Rauhaugit, partly very strong metamorphic with some CL + MT.			
292.10	Dike of carb. + FSP.			
292.15	Rauhaugit, brecciated as 264.00-271.30 c.m.			
304.00	Stop.			