Bergvesenet

Postboks 3021, 7002 Trondheim

Rapportarkivet

Bergvesenet rapport nr	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
BV 2216				**Fortrolig**
Kommer fra ..arkiv	**Ekstern rapport nr**	**Oversendt fra**	**Fortrolig pga**	**Fortrolig fra dato:**
Sulitjelma Bergverk A/S	"522132001"			

Tittel

Detailed geological mapping of the KongOscar ore-field. Geologi. Kartlegging.

Forfatter	Dato	Bedrift
HARRISON J D.	1975	Sulitjelma Gruber A/S

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad

Fagområde	Dokument type	Forekomster
Råstofftype	**Emneord**	

Sammendrag

Rapport fra detaljgeologisk kartlegging i KongOscar omrüdet. Petrografisk skildring av Mourki -fyllitt, karbonatrike skifre, svartskifre, sure vulkanitter, övre fyllitter og Furulund-skifrene. Stratigrafisk antas bergartene č tilhöre Mourkiavdelingen. Av mineraliseringer finnes magnetitt i Mourki-fyllittene, dessuten spor av pyritt. Hovedmineraliseringene opptrer i de sure vulkanittene, som disseminert py. cpy og sl i band og linser i lyse omvandla bergarter. Geologi. Basemetaller. Edelmetaller.

022.033

A/S Sulitjelma Gruber
Prospektering 1975
Prosjekt 7.502/A
Feltrapport

TSH/JDH/KH
/10-1975

Detailed geological mapping of the Kong Oscar ore-field (EH211)

Contents | Page

Abstract.

Outcrop mapping of the Kong Oscar orefield, 8 km SSE of Sandnes, suggests the presence of a volcanic basin with primary enrichment in economic sulphide minerals, the latter being concentrated during later events. Further work is recommended.

1. INTRODUCTION

The Kong Oscar ore-field was mapped during July and August 1975 by J.D.Harrison. Previously it had been included in a regional mapping project by S.Kollung (1970). Some time in the past several trial holes had been blasted,and a quantity of ore quarried at the main claim and stockpiled for transportation. There is approximately fifty cubic metres in this pile, mostly pyrite in disseminated bands.

Stratigraphically, the Kong Oscar zone lies at the boundary of the Muorki Group and the Furulund Group. Geographically, it lies between Lomivann and Calalvesjaure, and is covered by sheet EH 211, lying between eastings Y32 000 and Y34 000 and between northings x1009 000 and x1011 000.

Aerial photographs (415 series) were used as field maps. Due to lateral discontinuities of rock types and the presence of more than one oxidized level, the base of the Furulund schist and the top of the green phyllites of the Muorki Group were chosen as the boundaries of the area to be mapped in detail.

Bad weather delayed the field work and large snow patches obscured some important outcrops until late in the season.

2. TOPOGRAPHY

The Kong Oscar ore-field lies along one side of the valley of the main river, which feeds Calalvesjaure. It is not an area of generally strong relief and rises from 650 m in the SW to 850 m in the NW. The main river has cut into the base of the Furulund schist, providing the only major topographic feature. Elsewhere, small but distinct features often outline geological boundaries. The many faults which cross the area, stand out as marked weathering features, often utilized for drainage.

Outcrop is generally good, although the river referred to above runs in a drift filled valley. Elsewhere strips of drift demark softer lithologies. The transverse faults provide good exposure. The outcrops of green phyllites are characterized by an abundance of the classic features of ice erosion.

3. PETROGRAPHY

For purposes of description the rock types are here divided into five groups, which are not strictly in correct stratigraphical sequence.

3.1 Muorki Phyllites

These are generally homogeneous, medium grained dark green phyllites. They are strongly foliated and extend down succession far below the area mapped. They form large ice-polished outcrops and are generally evenly dipping at around 30° to 50°. Mineralogically, they are finely banded chlorite-hornblende phyllites with some quartz and feldspar. They are very well cleaved. There are some quartz rich, pyrite rich and magnetite rich bands.

A notable conglomerate horizon was found towards the top of these phyllites, with quartzite pebbles up to 10 cm diameter. The conglomerate is sheared and the clasts are elongated up to 3 x 1. This conglomerate is not parallel to the upper boundary of the phyllites. It is not clear whether the unconformity of the overlying rocks is primary, tectonic or metamorphic, but the first alternative is favoured.

3.2 Carbonates

A persistent, but discontinuous level of carbonate occurrence is found overlying the Muorki phyllites. The lithology varies from a massive impure dolomite to a calcareous shale. The observed thickness is never more than 5 m. The boundaries of the carbonate band are sharp, and it is considered to be a primary carbonate, an opinion strongly reinforced by the discovery of a compound coral in a thick dolomite (at 32 550 E 1010 570 N). Along with this coral were a number of nodules with an observed hexagonal weathering pattern on the surface. These are thought to be possibly another coral type. A separate study of the coral is being undertaken, hopefully leading to identification and some evidence for the age of the dolomite.

Two other outcrops of calcareous shale were observed at different levels in the Acid Volcanic Group. These are considered as isolated lenses of primary sedimentary (or possibly volcanic) origin. It appears that a single time-stratigraphic unit may be represented at one point by a calcareous shale and elsewhere by blackschists.

3.3 Blackschists

Blackschists are found at a number of levels in the area. A discontinuous band occurs above the main carbonate level. Its thickness varies from nil to 15 m at one locality. At this point the lower 5 m is a strongly weathered brown with colour banding. The graphite content of these schists is nowhere very high, but locally is probably high enough to influence VLF measurements.

Other isolated outcrops of blackschist are seen higher in the succession and a thin band is found below the base of the calcareous schist. The extension of this band to the SW from the two observed outcrops is speculative, but it is in accordance with the topographical pattern.

The blackschists are all deeply weathered and poorly exposed. Hence little may be seen of their petrography and relations. The thick band underlying the tuffs show banding and sulphide layers parallel to bedding, and these are thought to be primary features of a fine-grained marine sediment. However, other blackschists observed within the acid volcanic sequence suggest disconformity and may be early or late shear zones.

3.4 Acid Volcanics

This name was given by Kollung to the ore-bearing rocks at Kong Oscar, and the term is adopted here. Within the sequence there is considerable variation in rock composition, and in the degree of alteration. At the base of the group there is seen, in some localities, a well preserved tuff breccia, overlying the main blackschist. In places the original texture of this rock is unmistakedly displayed. This tuff does not appear to be continuous. A persistent layer of a darker, porphyritic (feldspar) rock overlies the tuff and is interpreted as a lava flow. Alteration is again of limited extent. Higher still, at Kong Oscar itself, occurs the ore-bearing member, a white rock locally appearing like quartzite, elsewhere being strongly cleaved and deeply weatheres. Kollung determined microscopically that this rock type, for which the field-term used was quartzite, is, in fact, effusive.

The thickness of this group, which Sjögren mapped as a "natronsyenitporfyr" in his 1914 map, varies considerably and it pinches out completely at the northern and southern ends of the area mapped.

As well as sharp boundaries between rock types, gradual variations in composition are observed through the lavas, but no systematic variation was discernible.

The relative differences in the degree of alteration are remarkable; for example the contrast between the relatively fresh tuff breccia at the base of the pile and the highly altered ore-bearing rocks above.

Included in the acid volcanic group is a series of metapelites. These are considered to be volcaniclastic sediments (reworked tuffs and lavas). A sedimentary character is suggested by the presence of alternating bands of different thickness and grain size, and at one locality a possible example of crossbedding. These rocks are again of variable thickness laterally, and they appear at different levels in the sequence. Some blackschists also appear in this series. That these rocks are little reworked and of local origin is suggested by their low quartz content.

Due to their extensive alteration, the history of the ore-bearing rocks is not evident without microscopic study. Kollung does not describe these rocks in detail, and it is not possible in the field to determine whether the alteration is primary or secondary. However, these rocks are entirely lacking in dark minerals.

3.5 Upper Phyllites

These phyllites are very similar to the Muorki Phyllites, but are generally lighter coloured, often slightly pink, and more rusty than the latter. The thickness of them varies. They often show compositional banding and quartz agglomerations as boudins are typical.

Also feldspars occur in a similar way. These boudins are often rusty. The layering is due to changes in relative abundance of chlorite, quartz and feldspar. These phyllites are generally coarser grained and less compact than the Muorki Phyllites, but are equally well foliated.

3.6 Furulund Schists

The basal Furulund Schists overly a thin black schist which marks the top of the Upper Phyllites. A considerable thickness of schist shows a variety of lithologies, but the basal schists are characteristically calcareous. No evidence of mineralization was seen in these rocks, and they were not studied in detail.

4. STRUCTURE

The entire area dips to the north-west with the dip varying from 20° to 80°. Some drag folding was seen at the top of the Muorki Phyllites, and also below the base of the Furulund Schist, but elsewhere the folding only amounts to mild undulations in the general dip. This pattern suggests that the volcanic group has acted as a competent unit during tectonism, with less competent bands above and below bearing the deformation. However, within the volcanic group it is considered that some of the blackschist occurrence (e.g. Hill 744 at 33 100 E, 1009 800 N) may represent tectonic belts. In this particular example the blackschist appears to be non-conformable with the surrounding rocks.

A large number of faults cross the area perpendicular to the strike,and these are often exploited by the drainage and hence provide good exposure. Despite the fact that these faults are such well-marked features, extending for several kilometers, none of them show any great movement. These faults all have a vertical orientation. Apart from the possibility discussed above of movement within the volcanic group, no other evidence of faulting or thrusting was observed.

Some of the finer grained rocks (e.g. the graphitic schists) show a very strongly developed cleavage, in contrast to some of the carbonates and igneous rocks which display no structural features. Some of the ore-bearing rocks show a foliation which is presumed to be of tectonic origin. A cleavage lineation is also apparent in the underlying phyllites and overlying schists.

5. MINERALIZATION

The principle mineralization in the Kong Oscar area occurs in the Acid Volcanic sequence, but some is also found in the Muorki Phyllites.

5.1 The Muorki Phyllites

Magnetite is found at various levels in the Muorki Phyllites as thin bands with up to 5% of scattered well formed magnetite octahedra up to 2 mm grain size. Nowhere is the magnetite in economic quantity. Also in the Muorki Phyllites are a number of pyrite rich bands. Again the mineral occurs as well formed euhedral crystals. One particular such band, noted by Kollung, was examined in detail over a distance of 2 km, but was found to contain an average concentration of approx.1% pyrite over an average thickness of 2 m. The richest locality found was in a fault defined river section (32 240 E 1009 350 N), but even here there is less than 5% pyrite over a thickness of 5 m. A trace of chalcopyrite was also seen at this locality. Hence this area of the Muorki Phyllites may be dismissed economically.

5.2 Acid Volcanics

The mineralization in the Acid Volcanic sequence occurs mainly in the strongly altered white rocks which appear to form discontinuous lenses, predominantly towards the top of the sequence. The majority of the mineralization is in the form of pyrite disseminations in bands and pods. The pyrite occurs as fine grained aggregates and nowhere are euhedral crystals seen. Chalcopyrite and sphalerite are also present at some localities in subordinate proportions. The richness and thickness of the ore-zone varies rapidly laterally, and it dies out, of course, with the Acid Volcanics. Within the ore bearing rocks the areas of ore-enrichment appear to take the form of lenses. However, it is not clear what form these lenses take down-dip from the exposure. The only indicator is in the form of the ascial direction of the cleavage foliations which is common in the ore-bearing rocks, especially in the neighbourhood of the main claim. This foliation is sub-horizontal with a slight plunge to the north of 5^o-10^o. If, as is contended below, the localization of the sulphide and the tectonic history are related, then the direction of elongation of an ore-body can be reasonably postulated to be in accordance with the line of least resistence to migration; i.e. along the axes of foliation. On the basis of this hypothesis it is suggested here that if there in fact is a polarity to the ore-bodies, this polarity will show a shallow northward plunge. A comparison of the strike and the orientation of the mineralized levels, show that these two are not always parallel. Thus perhaps we may consider the ore-bodies as consisting of a series of semi-discrete lenses arranged in echelon.

In addition mention can be made of a minor magnetite mineralization (again in the form of small scattered euhedral octahedra) in the lowest level of the Acid Volcanic sequence on the previously mentioned Hill 744. The concentration is less than 5%. Minor magnetite is found irregularly in other parts of the zone, for example underlying claim C.

The thick blackschist in the section b_1 b_2 contains a fine grained pyrite mineralization (average 2%) along the cleavage partings over a thickness of 5 m.

Reliable estimations of ore mineralogy and content were best made at the site of old claims, and this information is set out in tabulated form at appendix A.

6. CONCLUSION

The Kong Oscar ore-field is considered to be a minor volcanic basin. Its limits are thought to be essentially primary, but there has undoubtedly been some tectonic and metamorphic influence on these limits. The drag folding above and below the Acid Volcanics suggest that the latter have behaved as a competent unit. From this it can be reasoned that any similar basins may have behaved in similar fashion in a similar tectonic setting and be preserved relatively intact. It does, however, seem probable that some deformation on a local scale has taken place within the ore-bearing rocks, but exposure was not adequate to clarify the situation, especially with respect to the role of the blackschists.

The discovery of a fossil in the thick dolomite underlying the Acid Volcanics at section b_1b_2 is notable, and the identification of the species may be of use in providing a lower age limit for the volcanic rocks.

The problem of ore-genesis leads to no certain explanation. However, the following points must be noted:

1) The mineralization is closely related to the strongly altered, more acid rocks of the sequence.
2) It occurs as pods, lenses and bands and not as evenly distributed disseminations.
3) There is a crude layering of the ore, insofar as magnetite only is found at the base of the sequence and less so higher up, where sulphides predominate.
4) The boundaries of the Acid Volcanics correspond to a boundary of mineral enrichment.
5) A background mineralization of pyrite and magnetite is found in the Muorki Phyllites, with no apparent relationship to the mineralization above.

From these points it may be argued that the mineralization is a result of primary enrichment of S, Fe, Cu, Zn in the volcanic basin, modified by local migration and differentiation within the volcanic series, associated with a major tectonic event.

To a limited extent, the mineralization appears slightly richer in the neighbourhood of the main faults, but this is thought to be merely an impression due to the increased fracturing and exposure in these areas. Certainly there is no mineralization trends along the faults, which are considered to represent a late event in the history of the area.

7. EXPLORATION

Concurrently with this work a VLF programme is being undertaken at Kong Oscar (Project 7.505), and a geochemical sampling programme is planned (Project 7.503).

In the light of the results of these two projects a shallow drilling programme may be justified to verify:

1) The lateral continuity or otherwise of the mineralized zone in areas where its probable position is not exposed.
2) The possibility or otherwise of mineralization under the main stream of the area, which parallels the strike.

Deeper drilling would show what form the basin takes down dip. Deep geophysical work may also be useful for this latter work.

With regard to work outside the Kong Oscar zone itself, the following work is recommended, in the light of the possibility of there being other similar basins.

1) Research into any written material about the Muorki/Furulund boundary.
2) Recconaissance mapping of this boundary.
3) Geochemical and geophysical work in those areas where this boundary is drift covered (as for example immediately to the SW of Kong Oscar, where an area of comparable size to the Kong Oscar orefield is entirely drift covered. In contrast, the NE continuation of the zone is exposed, and is seen to contain extensive carbonates, but.no mineralization was observed).

CLAIM	PERCENT SULPHIDE	THICKNESS M	ORE MINERAL PROPORTIONS	ORIENTATION	EQUIVALENT CLAIMS	OXIDN. VALUE 0≤R≤8	NOTES
A	25	2	pyrite 80% chalcopyrite 20%	$040^{G}/32^{\circ}$ NW	B C D E F	R 4	Mineralization appears to cross-cut the strike to Claim C. The ore is banded
B	2	2	——	$055^{G}/55^{\circ}$ NW	A C D E F	R 4	Weathering colour suggests that copper is present. The host rock is muscovite- and felspar-rich.
C	40	4	pyrite 80% chalcopyrite 10% sphalerite 10%	$060^{G}/40^{\circ}$ NW	A B D E F	R 6	Ore body is lenticular. Host rock is blue with muscovite pods, felspar and chlorite. It is strongly cleaved and the ore is banded.
D	15	10	pyrite 95% chalcopyrite 5%	$044^{G}/42^{\circ}$ NW	A B C E F	R 5	Ore is banded and also more widely disseminated.
E	5	4	pyrite 100%	——	A B C D F	R 4	Host rock is blue-gray with minor chlorite and epidote.
F	10	1	pyrite 90% chalcopyrite 10%	$020^{G}/50^{\circ}$ NW	A B C D E	R 3	Ore body terminates rapidly along strike
G	25	2	Samples taken for	$030^{G}/40^{\circ}$-70° NW	H	R 6	Cleavage foliations (10 cm scale) and much small-scale folding present.
H	20	2	accurate analysis	$030^{G}/40^{\circ}$ NW	G	R 6	as G
I	3	3	pyrite 100%	——	——	R 2	Host rock is very white and strongly fractured.

GEOLOGICAL MAP OF THE KONG OSCAR OREFIELD

Caran D'Ache Series 999 No

KEY

59	Furulund Schists
9	Blackschists (partly graphitic)
230	Upper Phyllites
70	Strongly altered white ore-bearing volcanics (Acid Volcanics)
5	Volcanogenic sediments (Acid Volcanics)
21	Less altered acid and intermediate volcanics (Acid Volcanics)
160	Carbonates (dolomites, limestones and calcareous shales)
25	Muorki Phyllites

Note: observed outcrops are delineated and marked with heavy colouring
Other geology is interpolated

geological boundary

fault

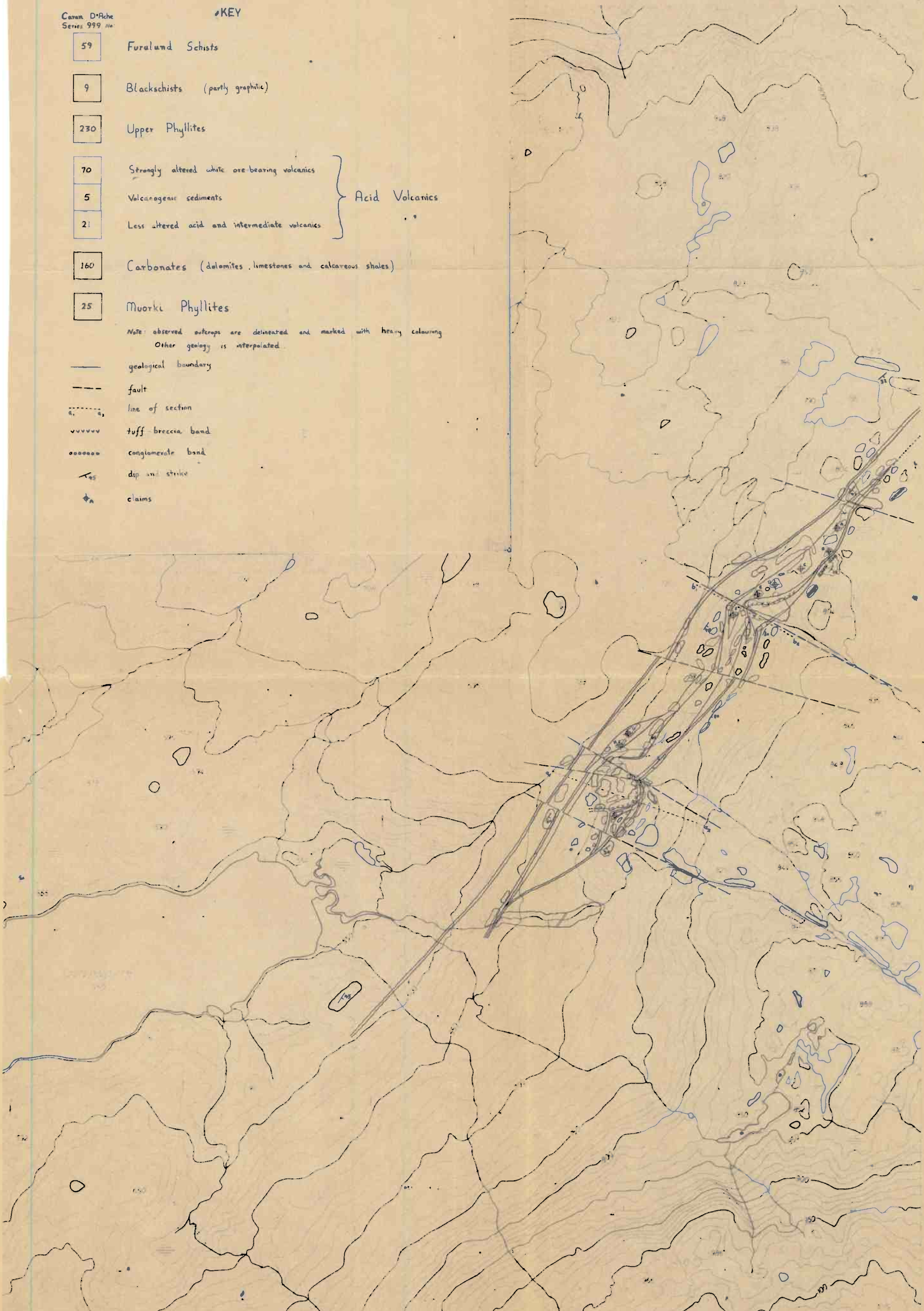
line of section

tuff - breccia band

conglomerate band

dip and strike

claims

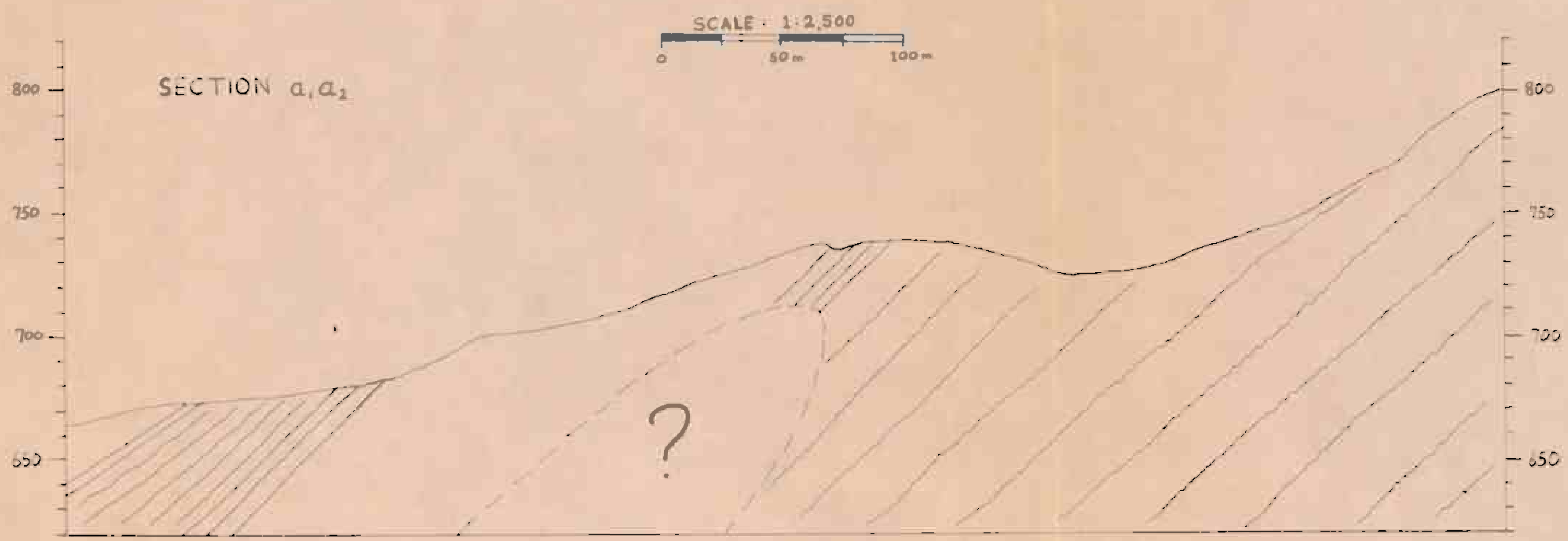


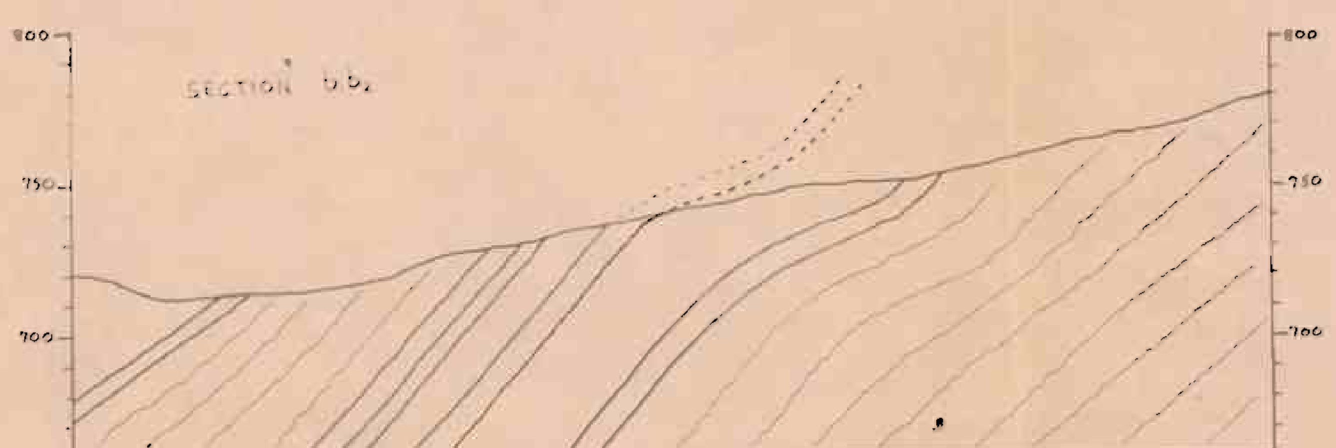
KONG OSCAR MALMFELT Detalj-geologisk blotnings-kartlegging	Målestokk 1:10 000	Tegn. J.D.H	30.9-75
		Trac. J.D.H.	30.9-75
		Kfr. T.S.H.	
	Erstatning for		
a/s SULITJELMA GRUBER Prosjekt 7.502/A			
	Erstattet av		

EG 212	EH 212	EJ 212
EG 211	EH 211	EJ 211
EG 210		

CROSS-SECTIONS

KEY AS FOR MAP





022.033

A/S Sulitjelma Gruber
Prospektering 1975
Prosjekt 7.502/A
Feltrapport

TSH/JDH/KH
/10-1975

Detailed geological mapping of the Kong Oscar ore-field (EH211)

Contents

Abstract.

Outcrop mapping of the Kong Oscar orefield, 8 km SSE of Sandnes, suggests the presence of a volcanic basin with primary enrichment in economic sulphide minerals, the latter being concentrated during later events. Further work is recommended.

1. INTRODUCTION

The Kong Oscar ore-field was mapped during July and August 1975 by J.D.Harrison. Previously it had been included in a regional mapping project by S.Kollung (1970). Some time in the past several trial holes had been blasted,and a quantity of ore quarried at the main claim and stockpiled for transportation. There is approximately fifty cubic metres in this pile, mostly pyrite in disseminated bands.

Stratigraphically, the Kong Oscar zone lies at the boundary of the Muorki Group and the Furulund Group. Geographically, it lies between Lomivann and Calalvesjaure, and is covered by sheet EH 211, lying between eastings Y32 000 and Y34 000 and between northings x1009 000 and x1011 000.

Aerial photographs (415 series) were used as field maps. Due to lateral discontinuities of rock types and the presence of more than one oxidized level, the base of the Furulund schist and the top of the green phyllites of the Muorki Group were chosen as the boundaries of the area to be mapped in detail.

Bad weather delayed the field work and large snow patches obscured some important outcrops until late in the season.

2. TOPOGRAPHY

The Kong Oscar ore-field lies along one side of the valley of the main river, which feeds Calalvesjaure. It is not an area of generally strong relief and rises from 650 m in the SW to 850 m in the NW. The main river has cut into the base of the Furulund schist, providing the only major topographic feature. Elsewhere, small but distinct features often outline geological boundaries. The many faults which cross the area, stand out as marked weathering features, often utilized for drainage.

Outcrop is generally good, although the river referred to above runs in a drift filled valley. Elsewhere strips of drift demark softer lithologies. The transverse faults provide good exposure. The outcrops of green phyllites are characterized by an abundance of the classic features of ice erosion.

3. PETROGRAPHY

For purposes of description the rock types are here divided into five groups, which are not strictly in correct stratigraphical sequence.

3.1 Muorki Phyllites

These are generally homogeneous, medium grained dark green phyllites. They are strongly foliated and extend down succession far below the area mapped. They form large ice-polished outcrops and are generally evenly dipping at around 30° to 50°. Mineralogically, they are finely banded chlorite-hornblende phyllites with some quartz and feldspar. They are very well cleaved. There are some quartz rich, pyrite rich and magnetite rich bands.

A notable conglomerate horizon was found towards the top of these phyllites, with quartzite pebbles up to 10 cm diameter. The conglomerate is sheared and the clasts are elongated up to 3 x 1. This conglomerate is not parallel to the upper boundary of the phyllites. It is not clear whether the unconformity of the overlying rocks is primary, tectonic or metamorphic, but the first alternative is favoured.

3.2 Carbonates

A persistent, but discontinuous level of carbonate occurrence is found overlying the Muorki phyllites. The lithology varies from a massive impure dolomite to a calcareous shale. The observed thickness is never more than 5 m. The boundaries of the carbonate band are sharp, and it is considered to be a primary carbonate, an opinion strongly reinforced by the discovery of a compound coral in a thick dolomite (at 32 550 E 1010 570 N). Along with this coral were a number of nodules with an observed hexagonal weathering pattern on the surface. These are thought to be possibly another coral type. A separate study of the coral is being undertaken, hopefully leading to identification and some evidence for the age of the dolomite.

Two other outcrops of calcareous shale were observed at different levels in the Acid Volcanic Group. These are considered as isolated lenses of primary sedimentary (or possibly volcanic) origin. It appears that a single time-stratigraphic unit may be represented at one point by a calcareous shale and elsewhere by blackschists.

3.3 Blackschists

Blackschists are found at a number of levels in the area. A discontinuous band occurs above the main carbonate level. Its thickness varies from nil to 15 m at one locality. At this point the lower 5 m is a strongly weathered brown with colour banding. The graphite content of these schists is nowhere very high, but locally is probably high enough to influence VLF measurements.

Other isolated outcrops of blackschist are seen higher in the succession and a thin band is found below the base of the calcareous schist. The extension of this band to the SW from the two observed outcrops is speculative, but it is in accordance with the topographical pattern.

The blackschists are all deeply weathered and poorly exposed. Hence little may be seen of their petrography and relations. The thick band underlying the tuffs show banding and sulphide layers parallel to bedding, and these are thought to be primary features of a fine-grained marine sediment. However, other blackschists observed within the acid volcanic sequence suggest disconformity and may be early or late shear zones.

3.4 Acid Volcanics

This name was given by Kollung to the ore-bearing rocks at Kong Oscar, and the term is adopted here. Within the sequence there is considerable variation in rock composition, and in the degree of alteration. At the base of the group there is seen, in some localities, a well preserved tuff breccia, overlying the main blackschist. In places the original texture of this rock is unmistakedly displayed. This tuff does not appear to be continuous. A persistent layer of a darker, porphyritic (feldspar) rock overlies the tuff and is interpreted as a lava flow. Alteration is again of limited extent. Higher still, at Kong Oscar itself, occurs the ore-bearing member, a white rock locally appearing like quartzite, elsewhere being strongly cleaved and deeply weatheres. Kollung determined microscopically that this rock type, for which the field-term used was quartzite, is, in fact, effusive.

The thickness of this group, which Sjögren mapped as a "natronsyenitporfyr" in his 1914 map, varies considerably and it pinches out completely at the northern and southern ends of the area mapped.

As well as sharp boundaries between rock types, gradual variations in composition are observed through the lavas, but no systematic variation was discernible.

The relative differences in the degree of alteration are remarkable; for example the contrast between the relatively fresh tuff breccia at the base of the pile and the highly altered ore-bearing rocks above.

Included in the acid volcanic group is a series of metapelites. These are considered to be volcaniclastic sediments (reworked tuffs and lavas). A sedimentary character is suggested by the presence of alternating bands of different thickness and grain size, and at one locality a possible example of crossbedding. These rocks are again of variable thickness laterally, and they appear at different levels in the sequence. Some blackschists also appear in this series. That these rocks are little reworked and of local origin is suggested by their low quartz content.

Due to their extensive alteration, the history of the ore-bearing rocks is not evident without microscopic study. Kollung does not describe these rocks in detail, and it is not possible in the field to determine whether the alteration is primary or secondary. However, these rocks are entirely lacking in dark minerals.

3.5 Upper Phyllites

These phyllites are very similar to the Muorki Phyllites, but are generally lighter coloured, often slightly pink, and more rusty than the latter. The thickness of them varies. They often show compositional banding and quartz agglomerations as boudins are typical.

Also feldspars occur in a similar way. These boudins are often rusty. The layering is due to changes in relative abundance of chlorite, quartz and feldspar. These phyllites are generally coarser grained and less compact than the Muorki Phyllites, but are equally well foliated.

3.6 Furulund Schists

The basal Furulund Schists overly a thin black schist which marks the top of the Upper Phyllites. A considerable thickness of schist shows a variety of lithologies, but the basal schists are characteristically calcareous. No evidence of mineralization was seen in these rocks, and they were not studied in detail.

4. STRUCTURE

The entire area dips to the north-west with the dip varying from 20° to 80°. Some drag folding was seen at the top of the Muorki Phyllites, and also below the base of the Furulund Schist, but elsewhere the folding only amounts to mild undulations in the general dip. This pattern suggests that the volcanic group has acted as a competent unit during tectonism, with less competent bands above and below bearing the deformation. However, within the volcanic group it is considered that some of the blackschist occurrence (e.g. Hill 744 at 33 100 E, 1009 800 N) may represent tectonic belts. In this particular example the blackschist appears to be non-conformable with the surrounding rocks.

A large number of faults cross the area perpendicular to the strike,and these are often exploited by the drainage and hence provide good exposure. Despite the fact that these faults are such well-marked features, extending for several kilometers, none of them show any great movement. These faults all have a vertical orientation. Apart from the possibility discussed above of movement within the volcanic group, no other evidence of faulting or thrusting was observed.

Some of the finer grained rocks (e.g. the graphitic schists) show a very strongly developed cleavage, in contrast to some of the carbonates and igneous rocks which display no structural features. Some of the ore-bearing rocks show a foliation which is presumed to be of tectonic origin. A cleavage lineation is also apparent in the underlying phyllites and overlying schists.

5. MINERALIZATION

The principle mineralization in the Kong Oscar area occurs in the Acid Volcanic sequence, but some is also found in the Muorki Phyllites.

5.1 The Muorki Phyllites

Magnetite is found at various levels in the Muorki Phyllites as thin bands with up to 5% of scattered well formed magnetite octahedra up to 2 mm grain size. Nowhere is the magnetite in economic quantity. Also in the Muorki Phyllites are a number of pyrite rich bands. Again the mineral occurs as well formed euhedral crystals. One particular such band, noted by Kollung, was examined in detail over a distance of 2 km, but was found to contain an average concentration of approx.1% pyrite over an average thickness of 2 m. The richest locality found was in a fault defined river section (32 240 E 1009 350 N), but even here there is less than 5% pyrite over a thickness of 5 m. A trace of chalcopyrite was also seen at this locality. Hence this area of the Muorki Phyllites may be dismissed economically.

5.2 Acid Volcanics

The mineralization in the Acid Volcanic sequence occurs mainly in the strongly altered white rocks which appear to form discontinuous lenses, predominantly towards the top of the sequence. The majority of the mineralization is in the form of pyrite disseminations in bands and pods. The pyrite occurs as fine grained aggregates and nowhere are euhedral crystals seen. Chalcopyrite and sphalerite are also present at some localities in subordinate proportions. The richness and thickness of the ore-zone varies rapidly laterally, and it dies out, of course, with the Acid Volcanics. Within the ore bearing rocks the areas of ore-enrichment appear to take the form of lenses. However, it is not clear what form these lenses take down-dip from the exposure. The only indicator is in the form of the ascial direction of the cleavage foliations which is common in the ore-bearing rocks, especially in the neighbourhood of the main claim. This foliation is sub-horizontal with a slight plunge to the north of 5^{o}-10^{o}. If, as is contended below, the localization of the sulphide and the tectonic history are related, then the direction of elongation of an ore-body can be reasonably postulated to be in accordance with the line of least resistance to migration; i.e. along the axes of foliation. On the basis of this hypothesis it is suggested here that if there in fact is a polarity to the ore-bodies, this polarity will show a shallow northward plunge. A comparison of the strike and the orientation of the mineralized levels, show that these two are not always parallel. Thus perhaps we may consider the ore-bodies as consisting of a series of semi-discrete lenses arranged in echelon.

In addition mention can be made of a minor magnetite mineralization (again in the form of small scattered euhedral octahedra) in the lowest level of the Acid Volcanic sequence on the previously mentioned Hill 744. The concentration is less than 5%. Minor magnetite is found irregularly in other parts of the zone, for example underlying claim C.

The thick blackschist in the section b_1 b_2 contains a fine grained pyrite mineralization (average 2%) along the cleavage partings over a thickness of 5 m.

Reliable estimations of ore mineralogy and content were best made at the site of old claims, and this information is set out in tabulated form at appendix A.

6. CONCLUSION

The Kong Oscar ore-field is considered to be a minor volcanic basin. Its limits are thought to be essentially primary, but there has undoubtedly been some tectonic and metamorphic influence on these limits. The drag folding above and below the Acid Volcanics suggest that the latter have behaved as a competent unit. From this it can be reasoned that any similar basins may have behaved in similar fashion in a similar tectonic setting and be preserved relatively intact. It does, however, seem probable that some deformation on a local scale has taken place within the ore-bearing rocks, but exposure was not adequate to clarify the situation, especially with respect to the role of the blackschists.

The discovery of a fossil in the thick dolomite underlying the Acid Volcanics at section b_1b_2 is notable, and the identification of the species may be of use in providing a lower age limit for the volcanic rocks.

The problem of ore-genesis leads to no certain explanation. However, the following points must be noted:

1) The mineralization is closely related to the strongly altered, more acid rocks of the sequence.
2) It occurs as pods, lenses and bands and not as evenly distributed disseminations.
3) There is a crude layering of the ore, insofar as magnetite only is found at the base of the sequence and less so higher up, where sulphides predominate.
4) The boundaries of the Acid Volcanics correspond to a boundary of mineral enrichment.
5) A background mineralization of pyrite and magnetite is found in the Muorki Phyllites, with no apparent relationship to the mineralization above.

From these points it may be argued that the mineralization is a result of primary enrichment of S, Fe, Cu, Zn in the volcanic basin, modified by local migration and differentiation within the volcanic series, associated with a major tectonic event.

To a limited extent, the mineralization appears slightly richer in the neighbourhood of the main faults, but this is thought to be merely an impression due to the increased fracturing and exposure in these areas. Certainly there is no mineralization trends along the faults, which are considered to represent a late event in the history of the area.

7. EXPLORATION

Concurrently with this work a VLF programme is being undertaken at Kong Oscar (Project 7.505), and a geochemical sampling programme is planned (Project 7.503).

In the light of the results of these two projects a shallow drilling programme may be justified to verify:

1) The lateral continuity or otherwise of the mineralized zone in areas where its probable position is not exposed.

2) The possibility or otherwise of mineralization under the main stream of the area, which parallels the strike.

Deeper drilling would show what form the basin takes down dip. Deep geophysical work may also be useful for this latter work.

With regard to work outside the Kong Oscar zone itself, the following work is recommended, in the light of the possibility of there being other similar basins.

1) Research into any written material about the Muorki/Furulund boundary.

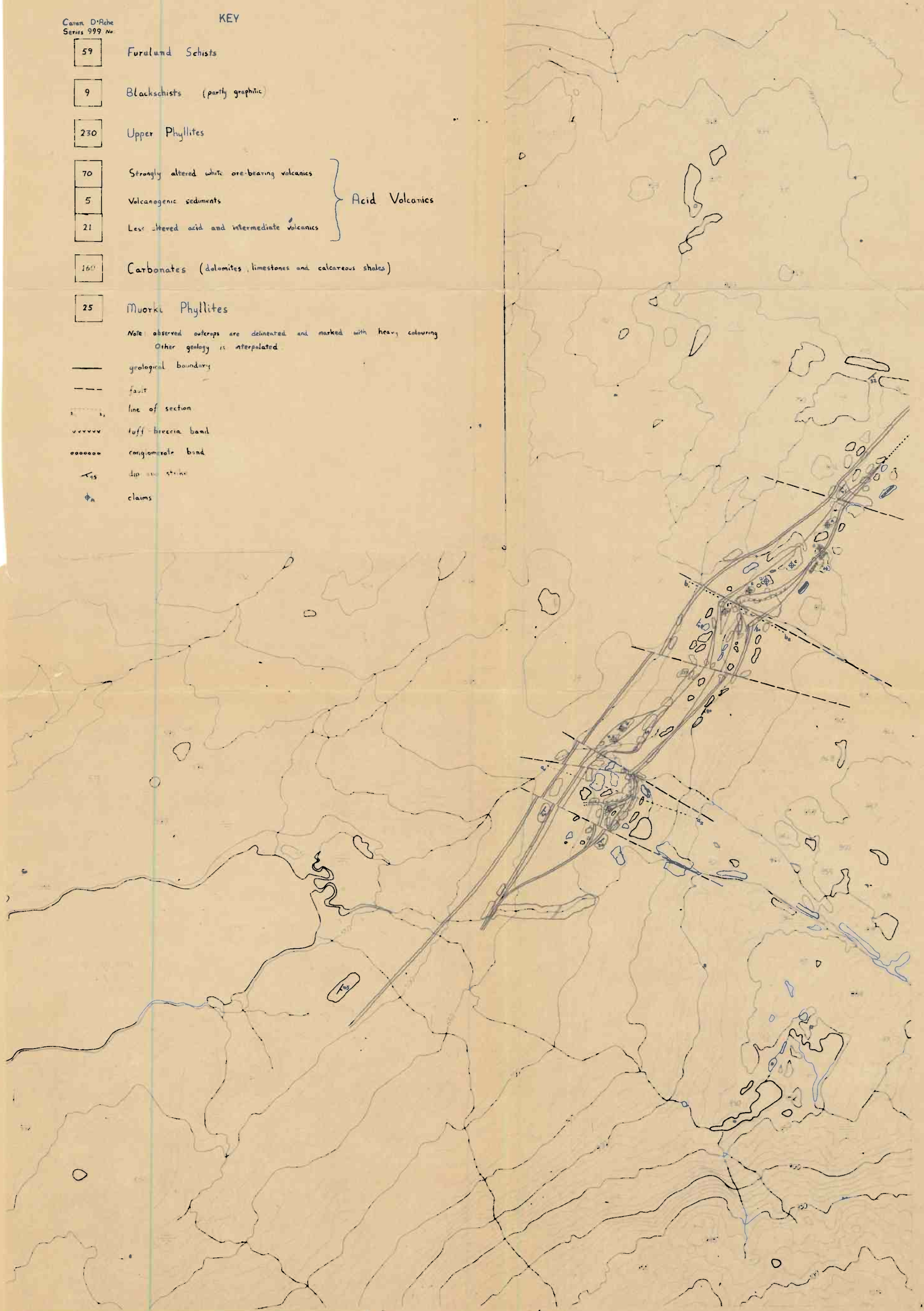
2) Recconaissance mapping of this boundary.

3) Geochemical and geophysical work in those areas where this boundary is drift covered (as for example immediately to the SW of Kong Oscar, where an area of comparable size to the Kong Oscar orefield is entirely drift covered. In contrast, the NE continuation of the zone is exposed, and is seen to contain extensive carbonates, but no mineralization was observed).

APPENDIX A. Analysis of Mineralization at Claims.

CLAIM	PERCENT SULPHIDE	THICKNESS M	ORE MINERAL PROPORTIONS	ORIENTATION	EQUIVALENT CLAIMS	OXIDN. VALUE $0 \leq R \leq 8$	NOTES
A	25	2	pyrite 80 % chalcopyrite 20 %	$040^{G}/32^{\circ}$ NW	B C D E F	R 4	Mineralization appears to cross-cut the strike to Claim C. The ore is banded
B	2	2	—	$055^{G}/55^{\circ}$ NW	A C D E F	R 4	Weathering colour suggests that copper is present. The host rock is muscovite- and felspar-rich.
C	40	4	pyrite 80 % chalcopyrite 10 % sphalerite 10 %	$060^{G}/40^{\circ}$ NW	A B D E F	R 6	Ore body is lenticular. Host rock is blue with muscovite pods, felspar and chlorite. It is strongly cleaved and the ore is banded.
D	15	10	pyrite 95 % chalcopyrite 5 %	$044^{G}/42^{\circ}$ NW	A B C E F	R 5	Ore is banded and also more widely disseminated.
E	5	4	pyrite 100 %	—	A B C D F	R 4	Host rock is blue-gray with minor chlorite and epidote.
F	10	1	pyrite 90 % chalcopyrite 10 %	$020^{G}/50^{\circ}$ NW	A B C D E	R 3	Ore body terminates rapidly along strike
G	25	2	Samples taken for	$030^{G}/40^{\circ}$–70° NW	H	R 6	Cleavage foliations (10 cm scale) and much small-scale folding present.
H	20	2	accurate analysis	$030^{G}/40^{\circ}$ NW	G	R 6	as G
I	3	3	pyrite 100 %	—	—	R 2	Host rock is very white and strongly fractured.

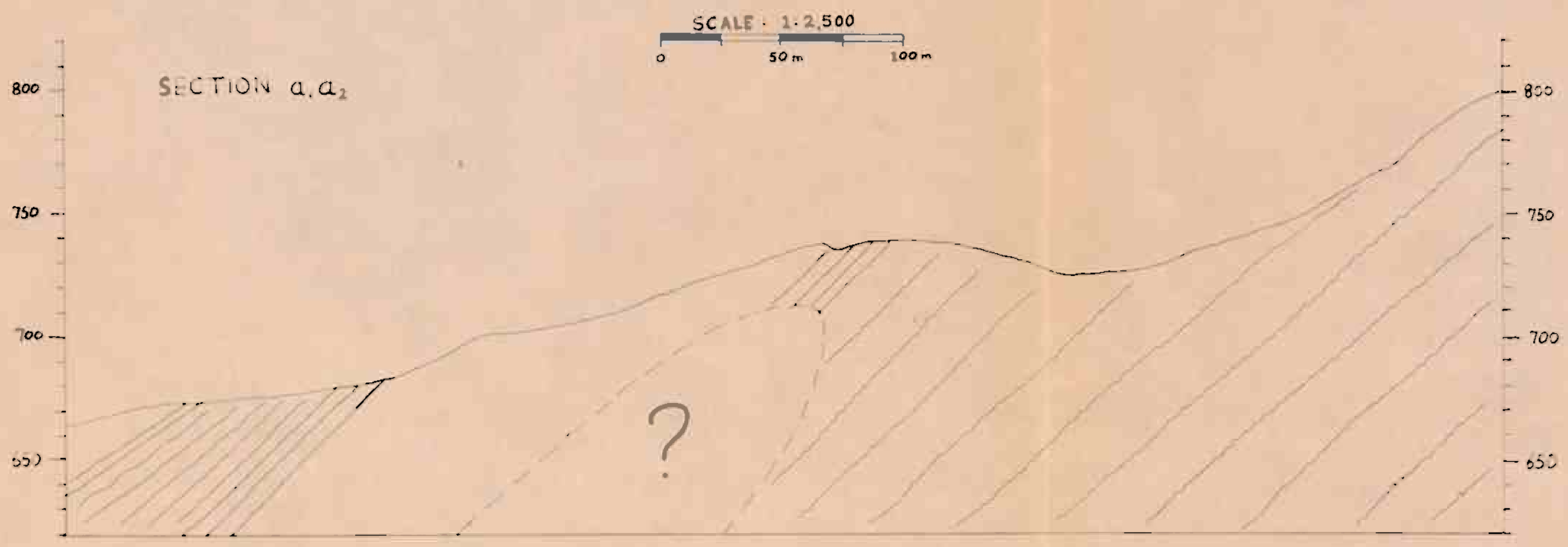
GEOLOGICAL MAP OF THE KONG OSCAR OREFIELD

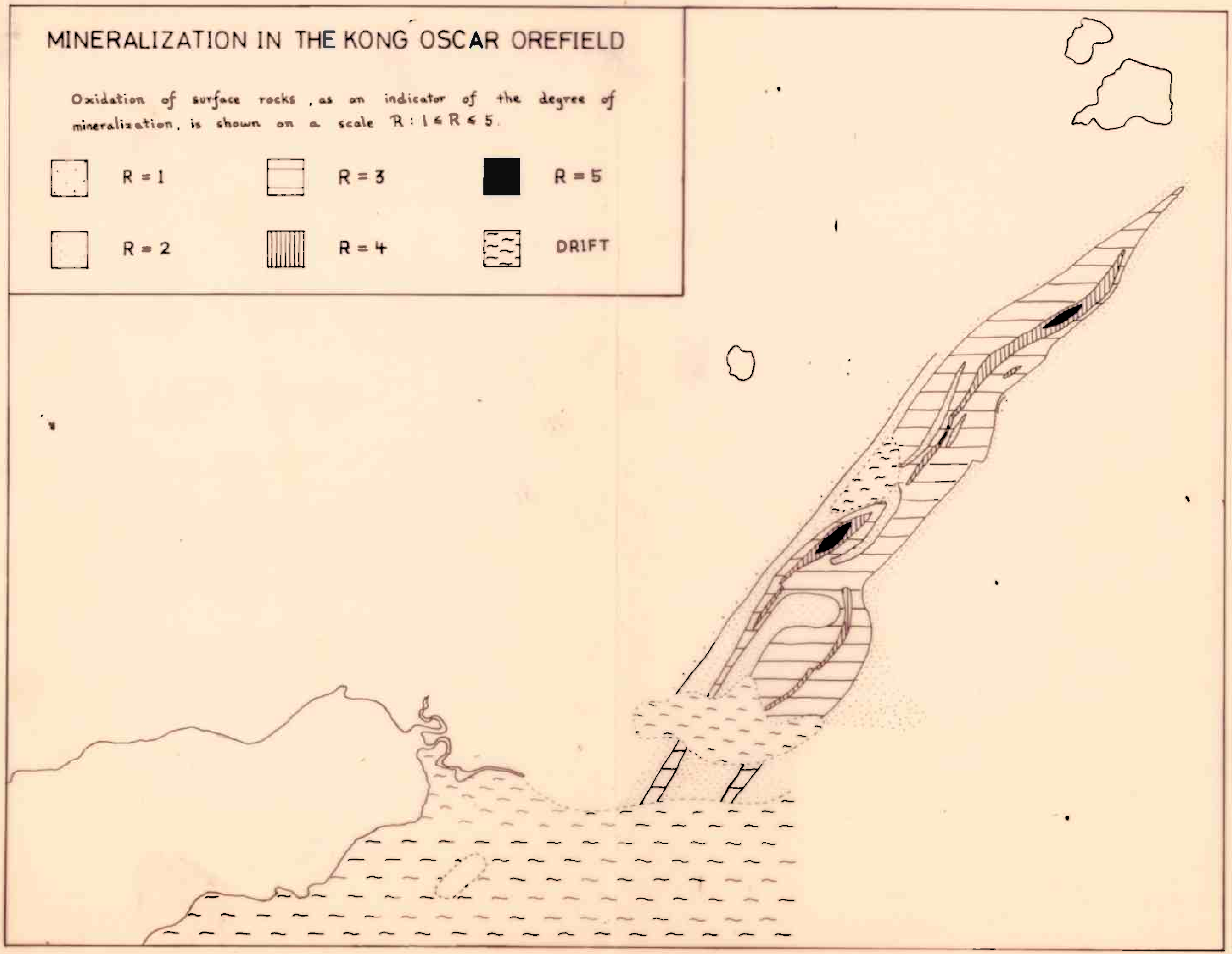


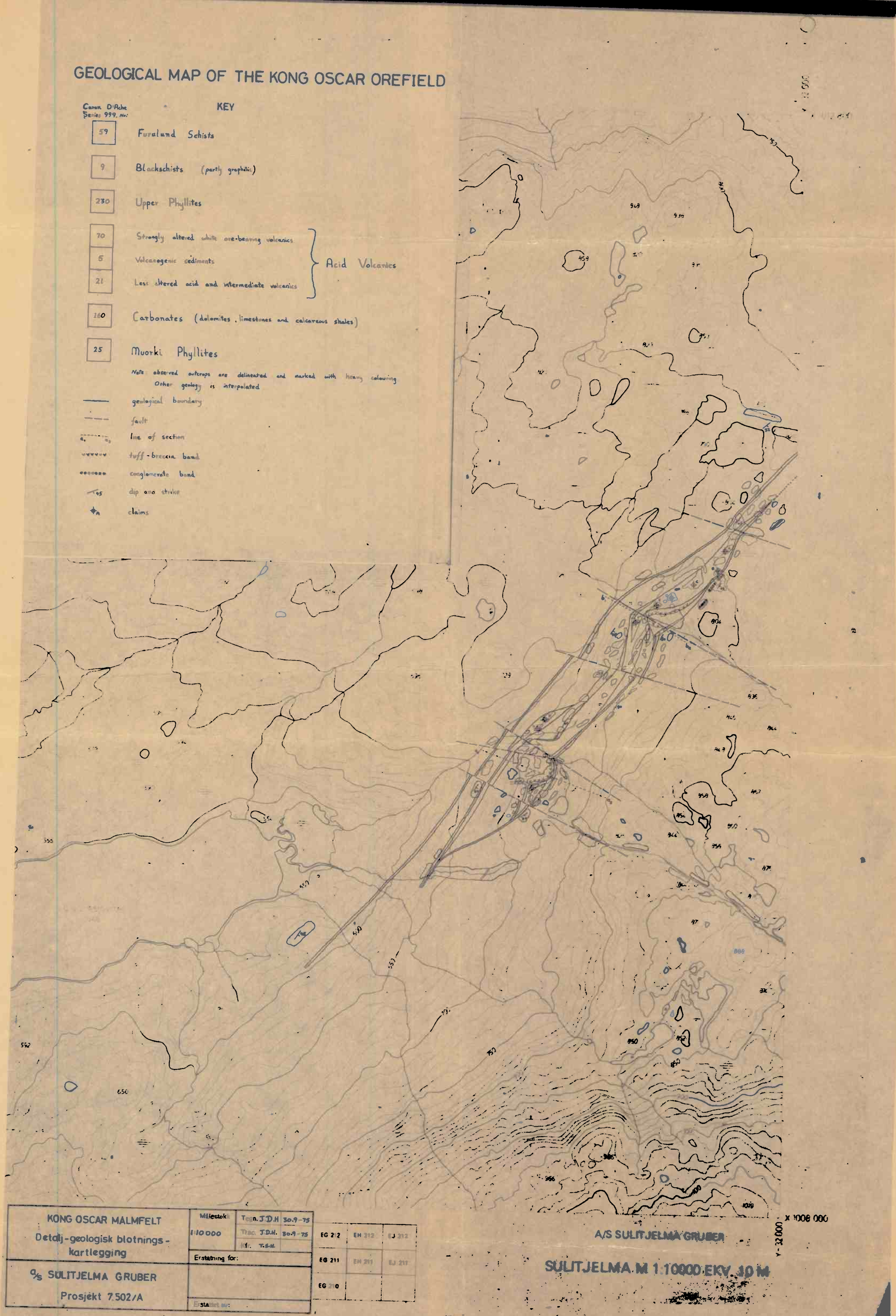
KONG OSCAR MALMFELT Detalj-geologisk blotnings-kartlegging	Målestokk 1:10 000	Tegn. J.D.H. 30.9-75 Trac. J.D.H. 30.9-75 Ktr. T.S.H.	EG 212 · EH 212 · EJ 212 EG 211 · **EH 211** · EJ 211 EG 210
	Erstatning for		
a/s SULITJELMA GRUBER Prosjekt 7.502/A	Erstattet av		

CROSS-SECTIONS

KEY AS FOR MAP

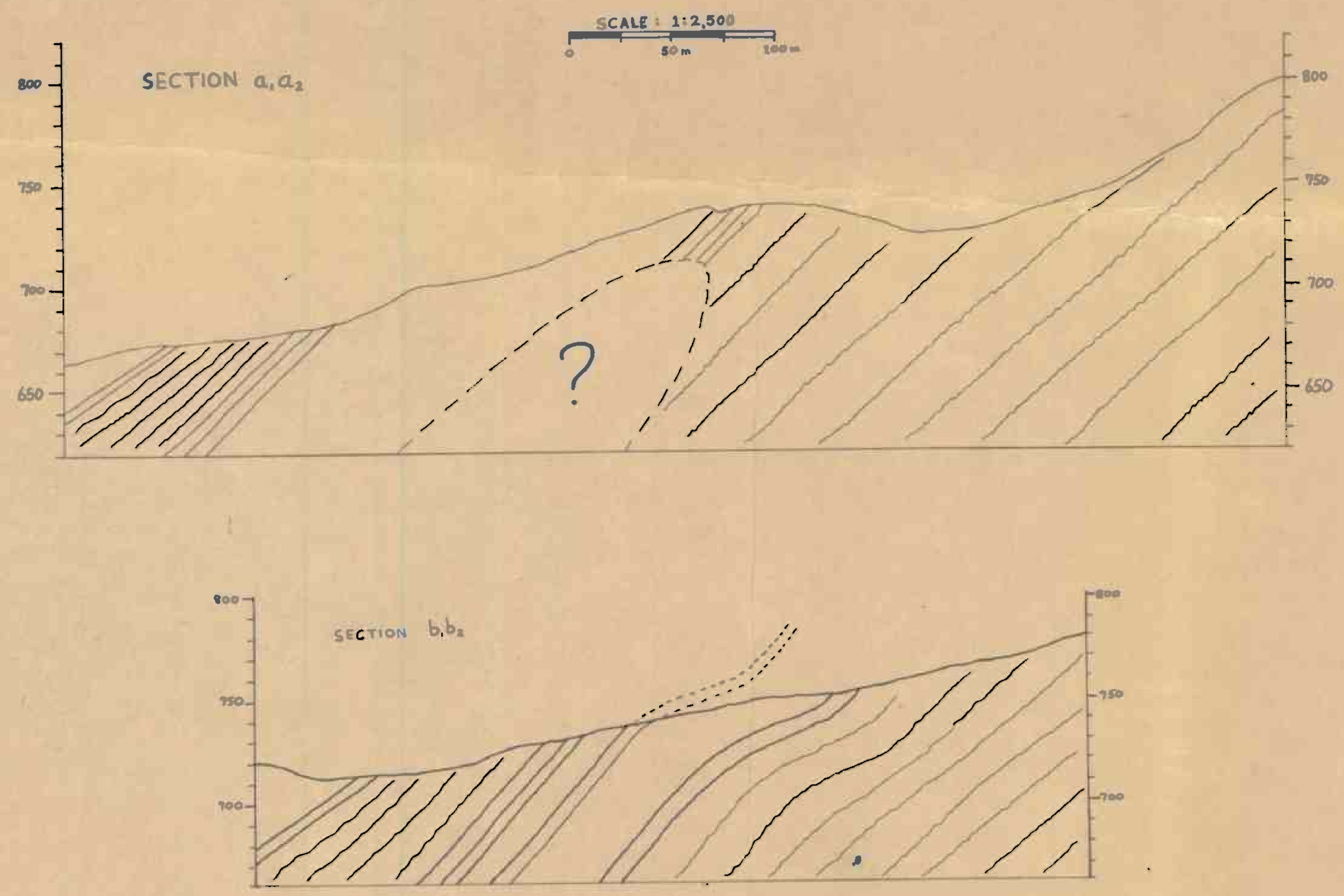



MINERALIZATION IN THE KONG OSCAR OREFIELD
Oxidation of surface rocks, as an indicator of the degree of mineralization, is shown on a scale R : 1 ≤ R ≤ 5.
R = 1
R = 2
R = 3
R = 4
R = 5
DRIFT


GEOLOGICAL MAP OF THE KONG OSCAR OREFIELD
Caran D'Ache Series 999. No:
KEY
59 Furulund Schists
9 Blackschists (partly graphitic)
230 Upper Phyllites
70 Strongly altered white ore-bearing volcanics
5 Volcanogenic sediments
21 Less altered acid and intermediate volcanics
Acid Volcanics
160 Carbonates (dolomites, limestones and calcareous shales)
25 Muorki Phyllites
Note observed outcrops are delineated and marked with heavy colouring
Other geology is interpolated
geological boundary
fault
line of section
tuff-breccia band
conglomerate band
dip and strike
claims
KONG OSCAR MALMFELT
Detalj-geologisk blotnings-kartlegging
A/S SULITJELMA GRUBER
Prosjekt 7.502/A
Målestokk 1:10000
Tegn. J.D.H 30.9-75
Trac. J.D.H. 30.9-75
Kfr. T.S.H.
Erstatning for:
Erstattet av:
EG 212
EH 212
EJ 212
EG 211
EH 211
EJ 211
EG 210
A/S SULITJELMA GRUBER
SULITJELMA M 1:10000 EKV. 10 M
X 1008 000
Y-32000

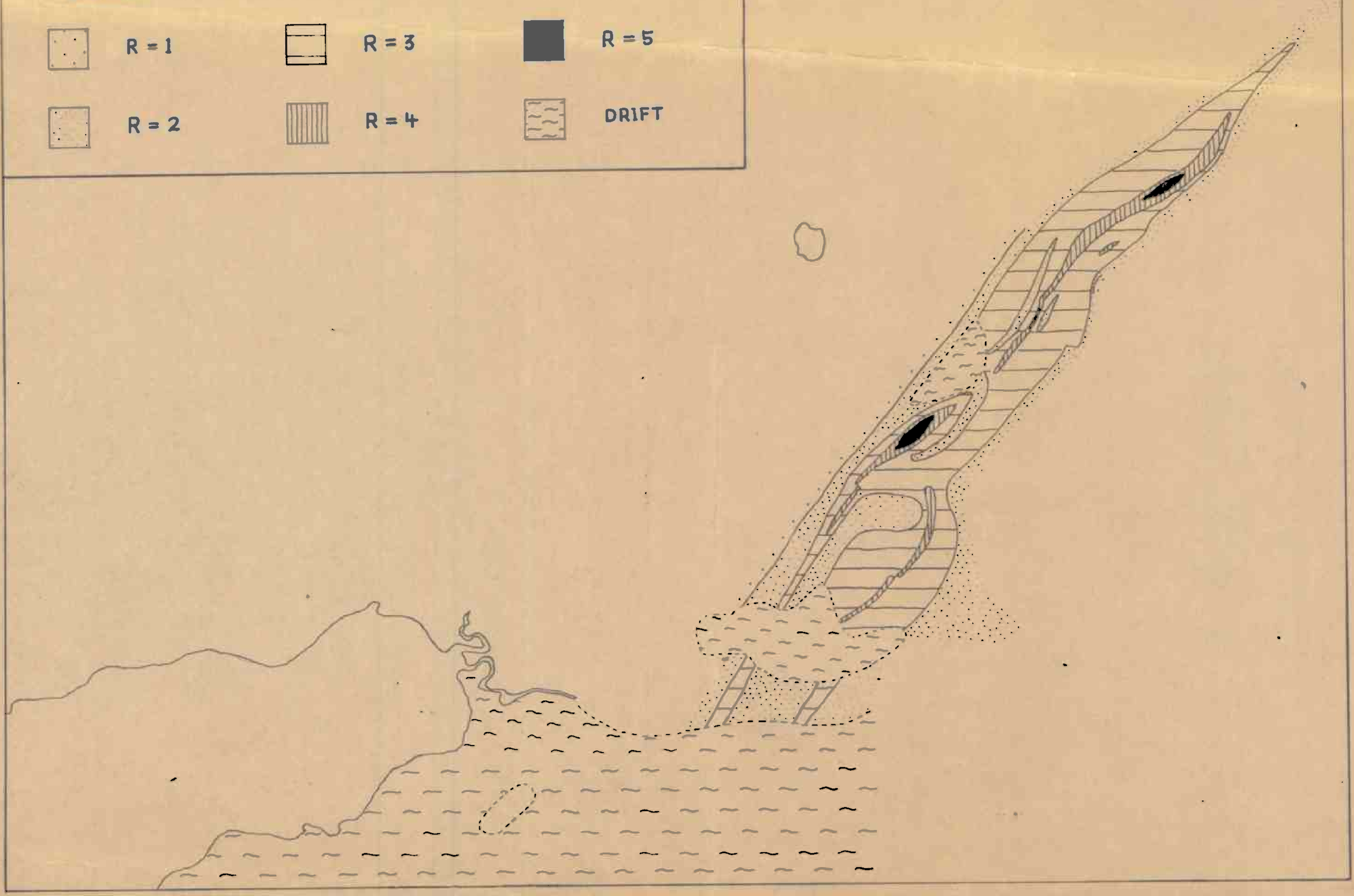
CROSS-SECTIONS

KEY AS FOR MAP



MINERALIZATION IN THE KONG OSCAR OREFIELD

Oxidation of surface rocks, as an indicator of the degree of mineralization, is shown on a scale R: 1 ≤ R ≤ 5.



KONG OSCAR MALMFELT Detalj-geologisk blotnings-kartlegging	Målestokk KART 1:10 000 PROFILER 1:2 500	Tegn. J.D.H. 30.9-75 Trac. J.D.H. 30.9-75 Kfr. T.S.H.
	Erstatning for	
A/S SULITJELMA GRUBER Prosjekt 7.502/A	Erstattet av	

colouring