



Bergvesenet rapport nr 2405	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
Kommer fra ..arkiv Elkem Skorovas AS	Ekstern rapport nr	Oversendt fra Elkem Skorovas AS	Fortrolig pga	Fortrolig fra dato:

Tittel
Description of Geological Mapping in Skorovas Gruber from periode March 15 - May 28/73

Forfatter Reinsbakken, Arne	Dato År Nov 1973	Bedrift (Oppdragsgiver og/eller oppdragstaker) Elkem Skorovas AS
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Kommune Samsskogan	Fylke Nord-Trøndelag	Bergdistrikt	1: 50 000 kartblad 18242	1: 250 000 kartblad Grong
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Fagområde Geologi Analyser	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt) Skorovasfeltet Skorovasforekomsten
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Råstoffgruppe Malm/metall	Råstofftype Cu, Zn
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Sammen drag, innholdsfortegnelse eller innholdsbeskrivelse

Beskriver innlednde kartlegging på 6 lokaliteter i gruen. Samtidig indikeres form og opptreden av 3-4 foldetyper som sees i tilknytning til malmen.

Malmen på lokalitetene beskrives, delvis med analyser og skisser av detaljer. Avslutningsvis gis en diagramatisk modell av malmen som viser at den geologiske sekvensen ligger strukturelt opp/ned.

Description of Geological Mapping in Skorovas Gruber from period March 15 → May 28 173.

— A. Reinsbakken
(Oct 11 173)

I outline over original mapping planned and those completed.

① Gamle Renå Strosse.

- May 20 — April 10 173
- completed mapping
- Profils 50 ö-v → 44 ö-v
5 v → 13 v

② 47 L NV and Np }

2-3 days — not completed
because of ventilation problems

③ Kvisten

- sections drawn up.
- not started because of ventilation problems.

④ Gamle Paasche Strosse

- April 24 — May 25 173 off and on
(every other week)
- mapping completed.
- Profils 69 ö-v → 75 öv
and 5 v → 16 v

⑤ L.O. 15p

- reconn. geological mapping
especially strikes and dips.
April 30 — May 4 (part days)

⑥ Ramp 30 — K.O. 7 (Ness orte)

- geological mapping along newly
driven adit 20-25 meters.
— April — May 4 (part days.)

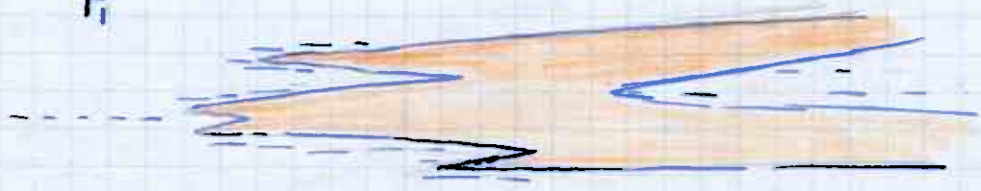
Color code of various rock units mapped.

-  Strongly schistose greenstone Red tuff origin
-  - massive compact pyrite rich sulfides
-  - sulfide stringer, irregular veinlets, impregnation
-  - acid volcanics — Rhyolitic — Dacitic
- light cream grey — to light bluish grey — greenish.
- very dense, compact and brittle (highly fractured)
- generally v.f.g. to aphanitic
- often slightly porphyritic with tiny plag. phenocrysts
- generally amygdaloidal? or small rounded siliceous inclusions
- generally numerous white quartz filled gashes.
-  - Quartzitic Andesite (Dacite)
- bluish grey color, dark greenish grey-brownish (L.O.S.S)
- usually very compact, dense, hard
- none to very minor schistosity
- often a very granular appearance.
- Blocky joints
- often amygdaloidal and containing tiny rounded lighter colored acid vol. fragments
-  - light grey to darker grey-brownish - well banded tuffs
- can be very dense - somewhat schistose
-  - well developed dark green chlorite schists.
-  - dark green massive, slightly schistose basic volcanic flows
- dark green schistose (calc. amyg.) between ore bands in Pillars A — B at Gamke Passche Stream
-  - coarse grained - Strongly schistose
- Highland gabbro (gabbroic andesite?)
- probably sills or dyke intrusives.

-
-  NW, FW S₁ banding of massive ore contacts.
 - Schistosity mostly S₁
 -  - penetrative cleavage - sometimes schistosity S₂
 -  - lineation amygdulites, fragments.
 -  - fold axis trend
 - axial plane showing dip of axial plane.

Fold Styles in Skarovas.

F₁



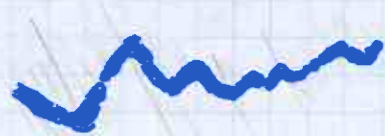
FA - N-S
AP - flat, in schistosity
- penetrative schistosity

compositional banding generally roughly parallel
main schistosity (S₁)

F₂

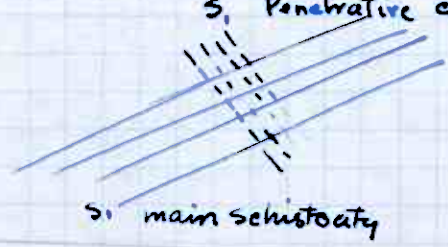
First strong circulation in several places in China 10 to 150°

Strong penetrative cleavage - schistosity



F_A = 240-260° / 0-10° dip

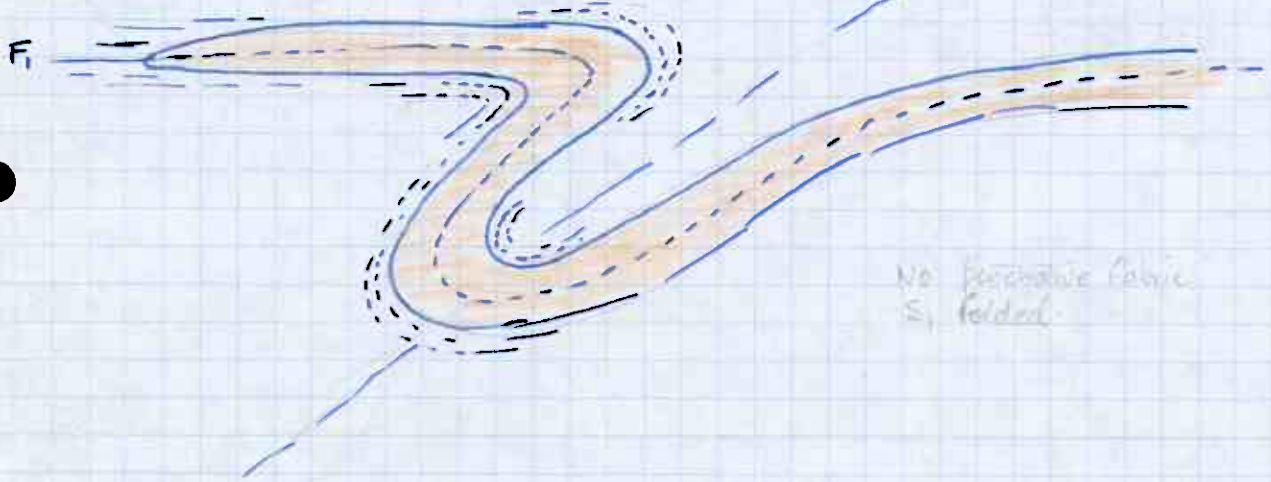
from Hirsinger on Grubejell
S₁ Penetrative cleavage - schistosity



F₃

Second prominent fold style in Skarovas.

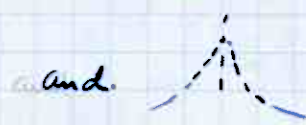
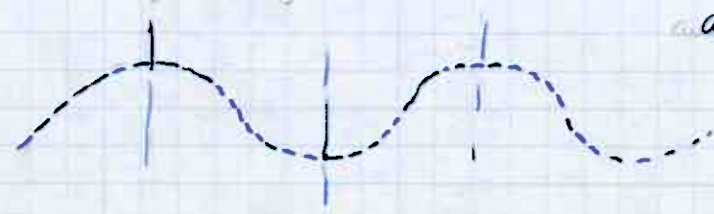
FA ~ 160° plunge N-S
AP 360° S-N



No penetrative cleavage
S₁ folded

Later - more open folding style with near vert. AP.
large wavelengths.

tends generally S-N.



I Gamle Rena Strosse

The massive compact pyritic ore occurs in several $\frac{1}{2}$ to 2 m thick continuous bands separated by thin (up to 20-30 cm) dark green strongly developed chlorite schists

- ore is very fine grained to f.g. granular - analyses AR'73 show 1.6-2.9 Cu which is not visible in hand specimen

- along the SW and NW walls in Rena Strosse one finds hint of light grey - greenish banding (tuffs) in the schists above the main ore bands

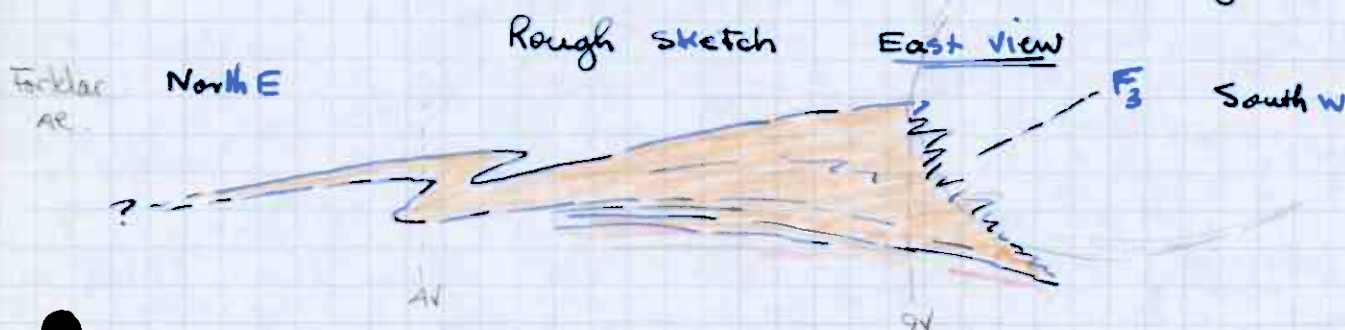
- strong chlorite schists occur at the FW contact of the ore zone

to the NW, in the P45-13V and 44-13V areas find the main ore bands thinning rapidly and pinching out.

Associated with this thinning is an increase in a very hard, dense banded tuff which occurs both above and below the ore bands in this area.

(a similar? banded tuffaceous horizon occurs above and below the thinning ore horizons to West in Gamle Paasche Strosse)

The massive ore bands thicken markedly to the ^{SE} (Magasin 50) and to South W and this appears to be the product of a second later fold phase 160° trending.



the ore zone appears to thin to the NE where the zone plunges moderately to gently towards the magasin in this direction
Connection?

A concentration of sphalerite mineralization appears at the upper contact of the massive ore zone in the SW end of Magasin 50.

Rena strosse

5

W.

E.

dense light to dark banded tuffs.

chlorite schists.

chlorite schists

Cu rich

Cu rich.

Cu rich

chlorite schists

Analyses AR '73

Cu - 1.3 - 2.50%

Zn 0.2 - 2.1%

Samples for Cu-Zn analyses from Rena Strosse May 73 AR.

Sample R.S. I

	% Cu	% Zn
1.65m I	2.30	2.1

Samples II and III R.S.

	% Cu	% Zn	Average %/meter	
			Cu	Zn
0.8m II	2.65	0.3	1.99%	2.16%
1.5m III	1.52	0.2		

Sample R.S. IV

	% Cu	% Zn
2.8m IV	1.3	1.5

Samples R.S. I and VI

	Cu	Zn	Average %/meter	
			Cu	Zn
2.0m I	2.56%	0.67	1.5%	1.1%
2.5m VI	1.96%	1.8%		

II47L NV and Nö.

(6)

This area is dominated by a $1\frac{1}{2}$ m thick massive, fine grained granular compact pyritic sulfide band which is overlain to the NE by a dark green well developed chlorite schist. Directly underlying this massive sulfide band occurs a 10-20 cm thick dark green schistose, somewhat siliceous and fragmental appearing unit with much pyritic stringers or impregnation bands. This impregnated stringer unit is strongly schistose parallel to the massive ore contact.

The massive ore and Fw stringer fragmental unit is underlain to SW (location ①) by a very thick section of very dense, brittle, highly fractured, aphanitic, porphyritic light to moderate green Rhyolitic acid volcanic. Numerous tiny plagioclase phenocrysts, ~~are~~ well formed, are found set in an aphanitic siliceous matrix.

This acid volcanic unit is cut by numerous sulfide (pyrite) stringers which appear to be fracture controlled.

At the junction between 47L Nö and NV, occurs a well developed F_3 tight fold (160 trend) involving the massive ore band and surrounding country rock.

(see Section sketch)

at location ⑤ one finds a similar dark green pyrite rich fragmental band above the ore to NE, which occurred below ore at location ①. This suggests that the massive sulfide band and the acid volcanic unit occur in the core of a large F_3 style fold. (160 trend)

Farther up L.O. 47 NV the massive ore band thins noticeably and two very distinctly differing rock types occur above and below the sulfide band. Dark green, amygdaloidal, massive Basaltic Andesite occurs above the ore to NE and more siliceous, dense volcanics occur below.

IIIKristen

Profil 550-V

12V - 20V area.

Only a one day excursion has been carried out into this area and the area appears characterized by many numerous discontinuous, irregular massive sulfide bands. The country rock appears to be massive dark green, chloritic Basaltic Andesite?

Notes

Much good Zn ore has been taken out at the Kristen horizon Kalc 700
P 550-V 7 and 8V areas.

The Gamle Paasche Strosse is characterized by several continuous overlapping massive sulfide bands. These bands are generally $\frac{1}{2} \rightarrow$ several meters thick and noticeably thin and pinch out ~~the~~ the west and NW direction i.e. P 72 - 15V and P 69 - 15V areas.

In most of the south, SW and SE parts of Paasche Strosse, the massive sulfide bands are directly underlain by and partly infolded (intercalated) into a dense, compact, very hard, light grey, very siliceous acid volcanic horizon which appears to be very thick here.

(See schematic sections)

characteristic of this (Rhyo-dacitic) acid volcanic horizon is the light grey color, extreme hardness, and complete gradation into darker grey more granular dacitic volcanics. Some local banding has been noted assoc. with this acid volcanic unit. Numerous white rounded, fine siliceous or acid volcanic fragments? are ubiquitous and quartz filled fractures and gashes are most characteristic of this acid volcanic unit. Minor sulfide stringers fracture fillings occur throughout.

A calc. amygdate, dark green basic? andesite (strongly schistose) lies between several of the massive ore bands stretching from Pillar D to B and C. This unit is generally 30 - 40 cm thick.

The main ore zone in the Paasche Strosse SE - S - SW and western parts are overlain by a light grey - greenish brown thin banded, somewhat schistose tuffaceous unit. The tuffite is generally very schistose near the ore zones, but can be very dense and massive i.e. 730 - V - 11V. Near location (3) (74 $\frac{1}{2}$ - 7V), a very thin horizon of elongated sulfide and tuff fragments, a very fine agglomeritic band? occurs immediately above the main ore band within the banded tuff unit. Minor, thin, dense, massive Qtz. amygdate quartzitic andesite (Dacite) bands are also found associated with this Hangingwall tuffaceous horizon.

The density, hardness, of the tuffaceous unit, accompanied by and increasing amount of amygdate andesite is found to be associated with the thinning and pinching out of the sulfide horizons to the west and NW. (P 72 - 15V areas and P 69 - 15V) This area is characterized by dense banded tuffs occurring as Footwall and Hangingwall units.

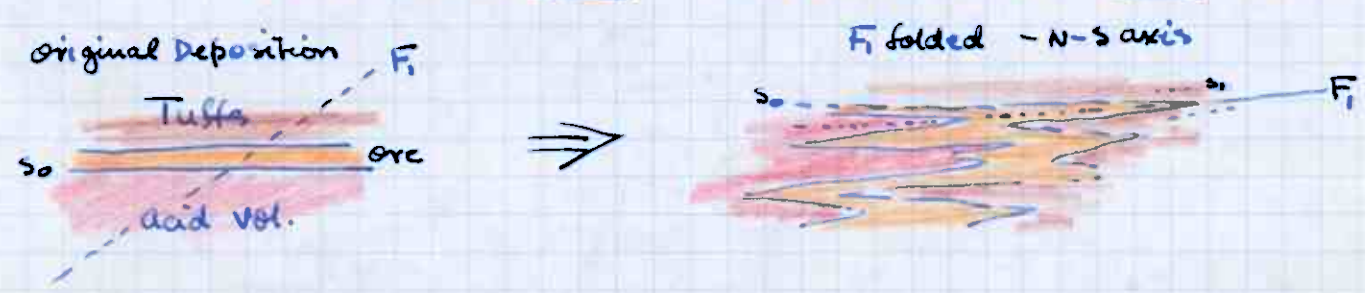
On the north side of Paasche Strosse occurs an extremely schistose (sheared) coarse grained Hornblende gabbroic unit above and infolded into the major sulfide horizons along the NW wall (F₂ - later fold style 160 trend). This unit occurs in the roof directly west of Pillar A and East of Pillar A and also occupies a thin zone in the west wall of the adit near P 69 - 15V.

A similar more massive Hblend rich gabbroic dyke like body occurs folded within the massive sulfide band at the north face of Pillar A. This dyke? probably emplaced early in the tectonic scheme, has been folded by later deformation along with the enclosing sulfides and country rocks. Could this massive coarse grained dyke and the more schistose Hblend gabbro to the north be one and the same unit?

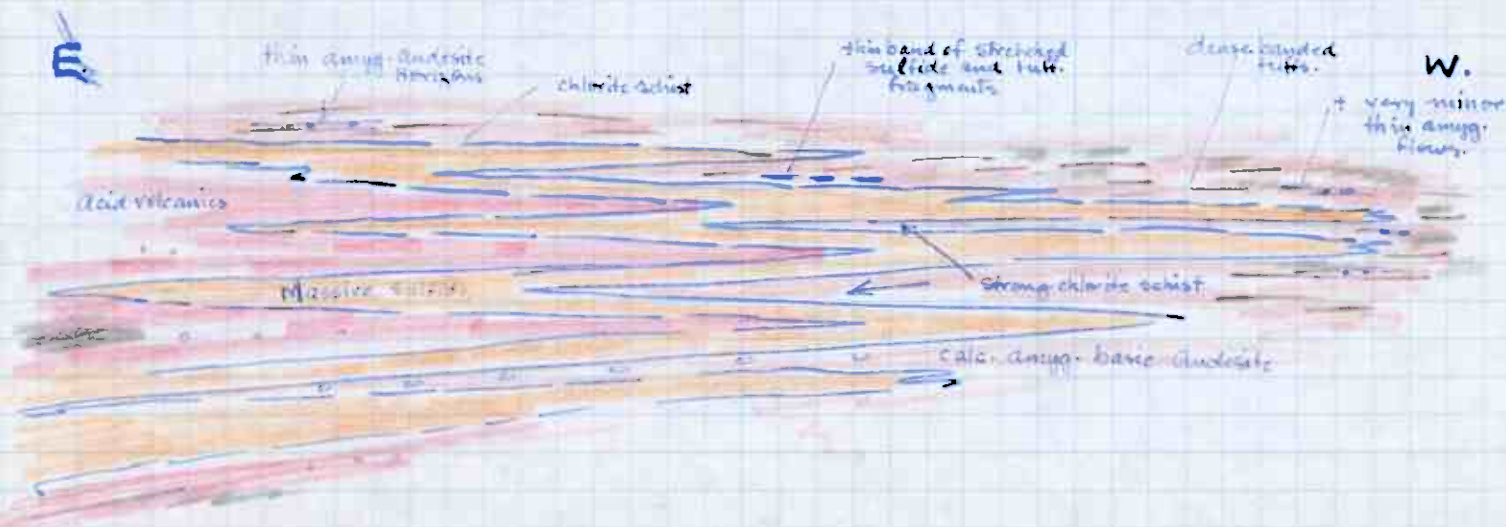
Near locality (22) (68½ - 15V) occurs a mineralized breccia (Dacitic) zone - stretched - elongated, silicified and altered and appears to be an extension of the thinning massive ore zone and could represent a sulfide stringer feeder zone. This Dacitic silicified sulfide stringer zone (breccia zone) dips moderately to the NE and is gradationally overlain, along the adit, by a more dense - light greyish-green acid volcanic horizon.

A similar gradational trend also occurs along F.I.O. 4H. Where coarse grained schistose gabbro is overlain to North (sharp contact) by a thin zone of massive quartzitic Andesite (Dacite) and is in turn gradational overlain to N by a very hard, dense acid volcanic unit with associated numerous sulfide filled fractures and veinlets. A 1-1½ m thick massive sulfide band occurs over this acid volcanic unit and which appears to trend out into the large magasin 69? (S.K.O. 69D)

The accompanying Schematic diagram is designed to show an increasing thickness in the massive sulfide ores in connection with F₁ style folding. ~~off~~ in the Paasche Strosse area, along the interface between acid volcanics below and banded tufts above the ore.

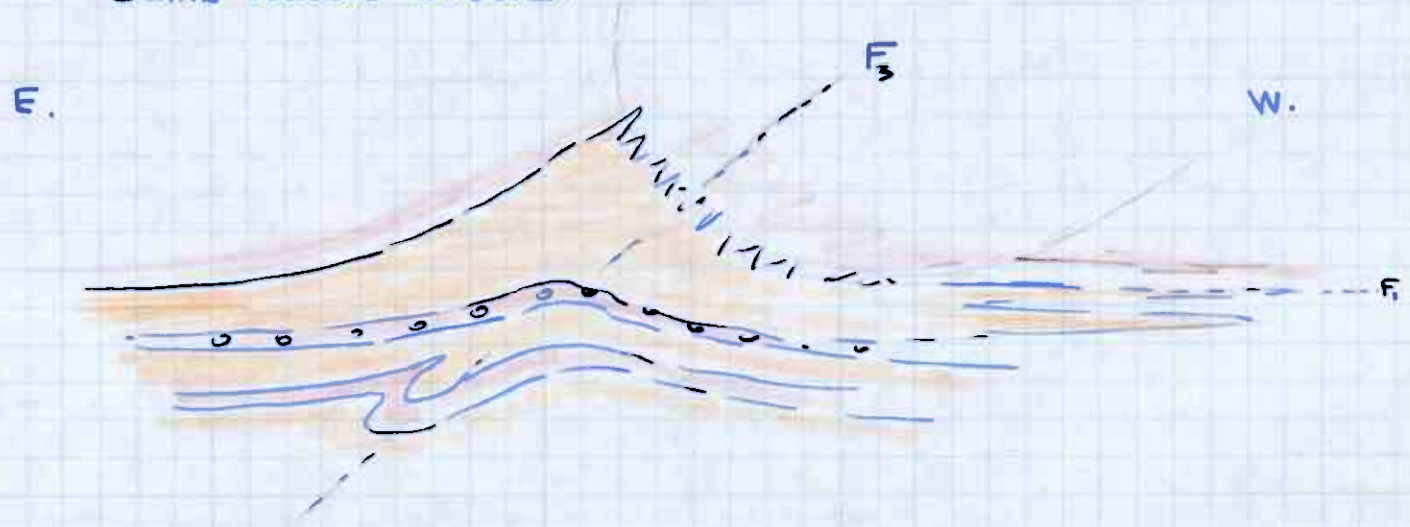


Schematic E-W Section through Paasche Strosse.



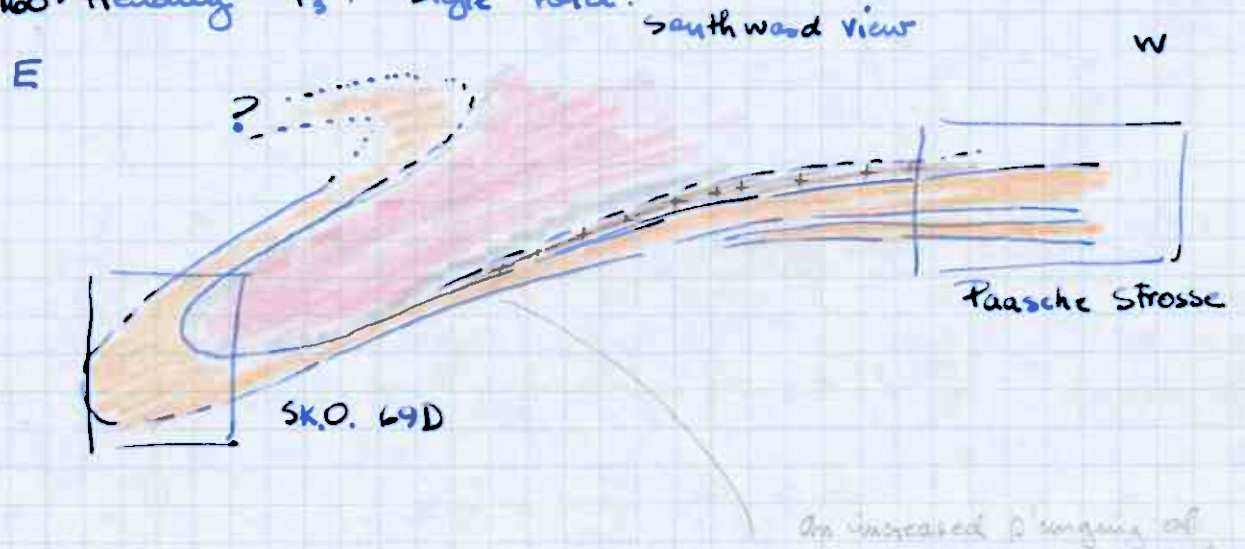
In the Paasche Strosse area, the F_1 type folds appear to be closing to the west with tuffs below and above the sulfide terminations at the west side.
The N-S trending, westerly pinching out (terminations) of the massive sulfide bands follows a trend from P72-15V to P69-15V - along the west side of Paasche Strosse area.

Any increase in ore thickness can occur in connection with a later F_3 ? 160° trending cross trending folding style.
This fold style dominates in both Rena and Paasche Strosse and is illustrated very well by an E-W section through Gamk Paasche Strosse.



connections with outside areas:

The massive sulfide bands associated with acid volcanics in the Gamk Paasche Strosse appears to be connected to the sulfides in the SK.O. 69D (Magasin 69) via a large 160° trending F_3 ? style fold.



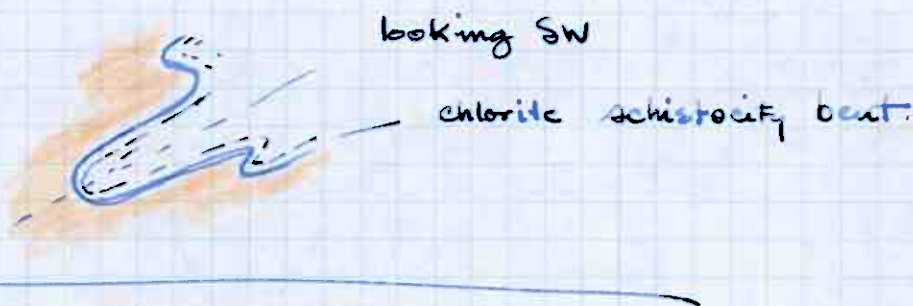
An increased pinching of ore appears associated with this later fold style.

The various rock units found in Paasche Strosse are also present in the L.O. 15p area. with light colored dense acid volcanics and darker amygdaloidal quartzitic andesite to darker grayish brown andesite - predominate. The acid volcanic unit appears to overlie the massive sulfide units to west and south and occurs unfolded with the massive ore in connection with the later 160 crosscutting folding. To the south 110m to 135m, a dense, dark-greenish brownish grey andesite, generally amygdaloidal - overlies the acid volcanic unit. Numerous light colored, rounded siliceous volcanic fragments occur.

From 135m to 145m one finds a gently dipping, sulfide stringer-feeder zone with associated strong bleaching (alteration) of wallrock (somewhat silicified).

Near the end (South) of the adit occurs a moderately dipping dark green schistose basic volcanic flows. with numerous crosscutting strongly deformed thin Qtz veinlets.

The prominent fold style found in the adit appears to be 160° F₂ or F₃ style.



VI Ramp 30 - K.O. 7 (Ness out)

The main ore zone dips gently - moderately to the East - south east. This area is characterized by several moderately sized (65 cm - 1m) well banded (Fectonio) Cu rich massive sulfide ore bands separated by strongly developed chlorite schists.

Massive dense light grey-greenish aphanitic acid volcanics overlies the ore bands to the south and to the east.

Underlying the main ore lenses in the area is a rather massive fine grained moderately grayish-green calc. amygdaloidal andesite. The andesite is highly sheared in proximity to the massive ore bands and occurs as ~~the~~ strongly developed chlorite schists next to the ores. The andesite also occurs gradational into a more dense siliceous volcanic to the north - underlying the thinning massive ore bands.

A very prominent well developed pyritic stringer-feeder zone occurs as an extension and underlying the thinning and terminated massive sulfide lenses. This well developed stringer zone trends gently to the NE and East along the adit. The pyritic stringer zone is associated with a dense strongly bleached and silicified band that extends north and widens

markedly away from the sulfide terminations. This stringer zone occupies the adit from 6h → 22h. where there is a strong increase in numerous small, thin Cu rich lenses and thin bands. This stringer zone and lenses appears to represent a strongly deformed (F. folding) feeder zone to the massive sulfides above.

The massive siliceous volcanic unit overlying the ore bands at the south end dips moderately to the south and SE and occurs as a very thick unit in the N-S trending adit Ramp 30 — below.

This area is intensely deformed and folded by F₁ structure and is characterized by numerous thin terminating lenses and wedges of sulfides and country rocks.

Comments.

The noticeable similarities of the dense acid volcanic units from Paasche Stosse (underlying ore zones), L.O. 15p area and R30 (Ness) area where it overlies the main ore zones, is quite marked.

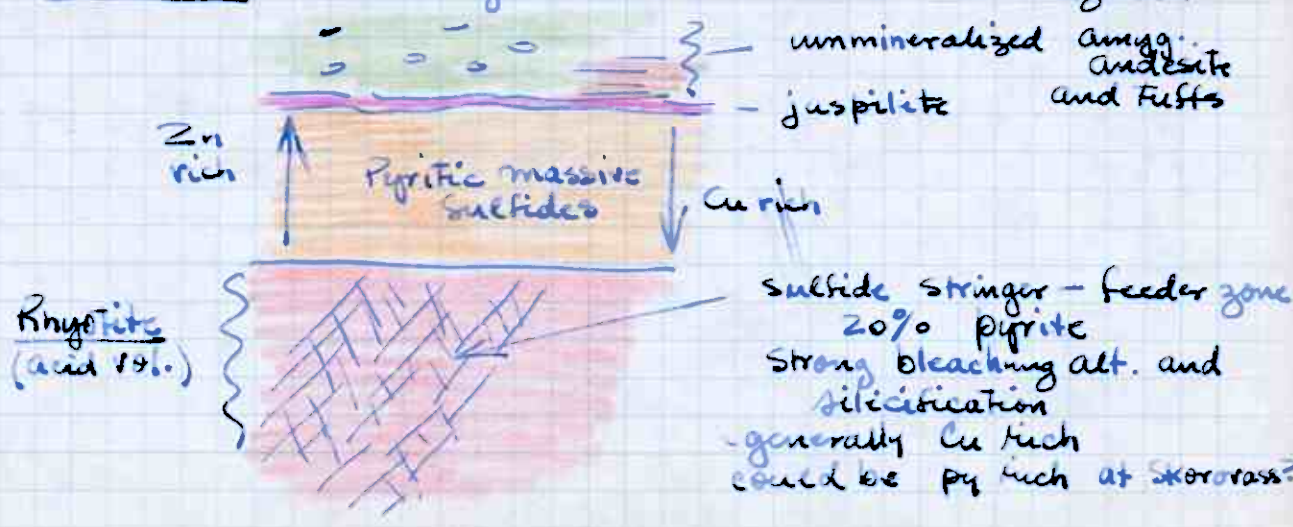
A similar, unmineralized, calc amygdales andesite also occupies the opposite position from the acid volcanics in both the Paasche Stosse and Ness areas. Similar sulfide stringer-feeder zones with strong assoc. bleaching alteration and silicification are found in the three mentioned areas.

One finds a very strong association of Cu rich massive sulfide ores with the thicker dense, acid (Rhyolitic) volcanic units and several interesting questions can be raised about the possible relationships of various rock units to ores and their primary distributions (genetics)

- ① what is the relationship between the Cu rich and Zn rich ores and its assoc. to the acid volcanic units?
- ② what is the relationship of the discontinuous jaspilite found in the mine and the surrounding areas?
- ③ could this all fit into a typical Island Arc Kuroko type massive sulfide mineralization Model?

Schematic

Diagram for Skourvas mineralization



Below the main ore zones in the mine — along both K.O.1 and K.O.2 one finds mostly well banded, light to moderate green, sedimentary tuffs with several thin ($\frac{1}{2}$ ft) continuous pyritic Cu-Zn deficient massive sulfide bands (Vaskiss?). From observations of several E-W sections through the mine one finds many such magnetite rich pyritic (Vaskiss) layers both above and below the main Cu-Zn rich sulfide ores. Such magnetite rich, continuous pyritic bands could be similar to the Vaskiss horizons found North and NE outside the SKORVAS mine area.

A F_1 folding scheme could well be responsible for the duplication of such Vaskiss horizons both above and below the main ore zone. Also quite noticeable from the mine sections is the N-S trending separation between the East and West ore bodies which is connected by a very strongly developed impregnated, $\frac{1}{2}$ sulfide (pyrite) stringer-feeder zone.

Such a configuration could be arrived at by the F_1 transposition of a single massive sulfide zone assoc. with an underlying acid volcanic horizon and a connected feeder zone. The whole sulfide zone is overlain by unmineralized later deposited volcanic flows, generally andesitic. The Vaskiss pyrite bands represent a continuous deposition (precipitation) of iron after the main mineralizing activity is finished. — generally associated with more quiet activities.

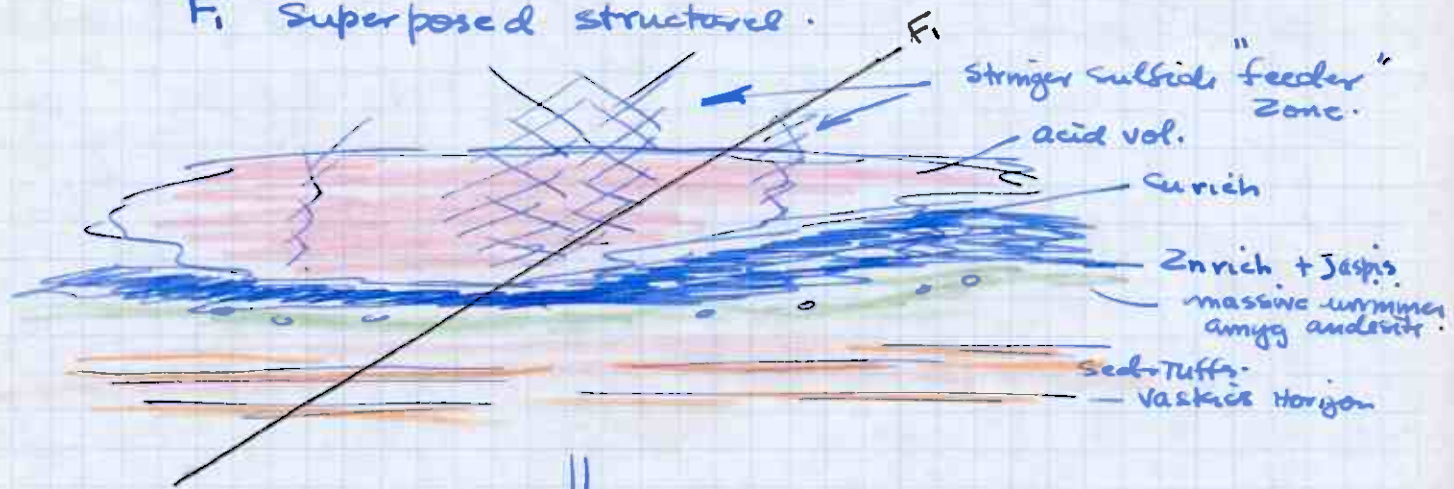
a very Diagrammatic model is given below.

In order for this model to work the whole section must be overturned.

Schematic Model for SHOROVAS GRUBER

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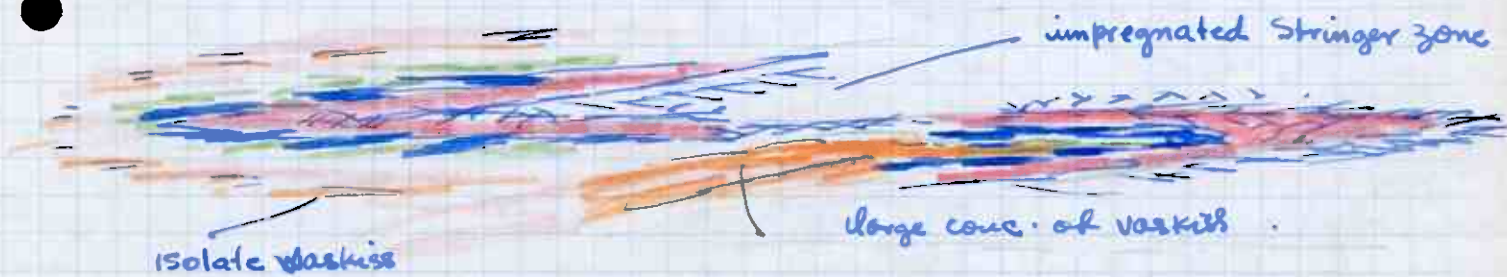
F_1 Superposed structure.



Transposed F_1 fold style with N-S axis.



With increase transposition and extreme flattening develop very isoclinal fold style.



In SHOROVAS GRUBER. this simplified picture is very much complicated by later crosscutting deformation (folding).

Note whole section is overturned.