Bergvesenet

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Tittel

Geological mapping, sampling and VLF survey in the Eidsvoll Cu - Au - Ag region with special reference to the Brøstad - Gullkis Mines.

Forfatter	Dato	Bedrift
Kjærsrud, Kenneth	Jan 1982	Sulfidmalm A/S

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Eidsvoll	Akershus	Østlandske	19151	Hamar

Fagområde	Dokument type	Forekomster
Geologi	Rapport	Brøstadgruva Gullkis
Råstofftype	Emneord	
Malm/metall	Au Cu Pb Ag	

Sammendrag

Summary

To date, mapping has revealed a series of qtz-veins and breccias within a sequence of metavolcanics, gneisses of probable sedimentary origin and granites, diorites and gabbros. The veins, which are dominantly oblique to the regional strike direction often carry substantial amounts of pyrite and chalcopyrite with additional Au. Previous mining activity has invariably been concentrated on this type of mineralization.

The tectonic/hydrothermal origin of the Au-bearing quartzveins seems indisputable, but the source rock for the sulphide /Au mineralization is still unknown. The best known occurrences are within the gneisses, but this is not invariably the case. The Au-bearing veins are rather small and scattered, but still occur in sufficient amounts in this region to qualify for further investigations.

A small scale VLF-survey concentrated on the two mines failed to pick up the mineralized horizons. Further geophysical work is now being discussed.

FAGRAPPORT
TECHNICAL REPORT

A/S SULFIDMALM

Kompl6tt

Dato/Date	Rapport Nr./Report No	Kartblad/Mapsheet	
Jan. 82	525.34.82.		

Forfatter / Author: Kenneth Kjærsrud

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Andre relevante rap
Other relevant reps

516.34.81

Kommentarer/Comments

Fordeling
Distribution

- [ ] Canada
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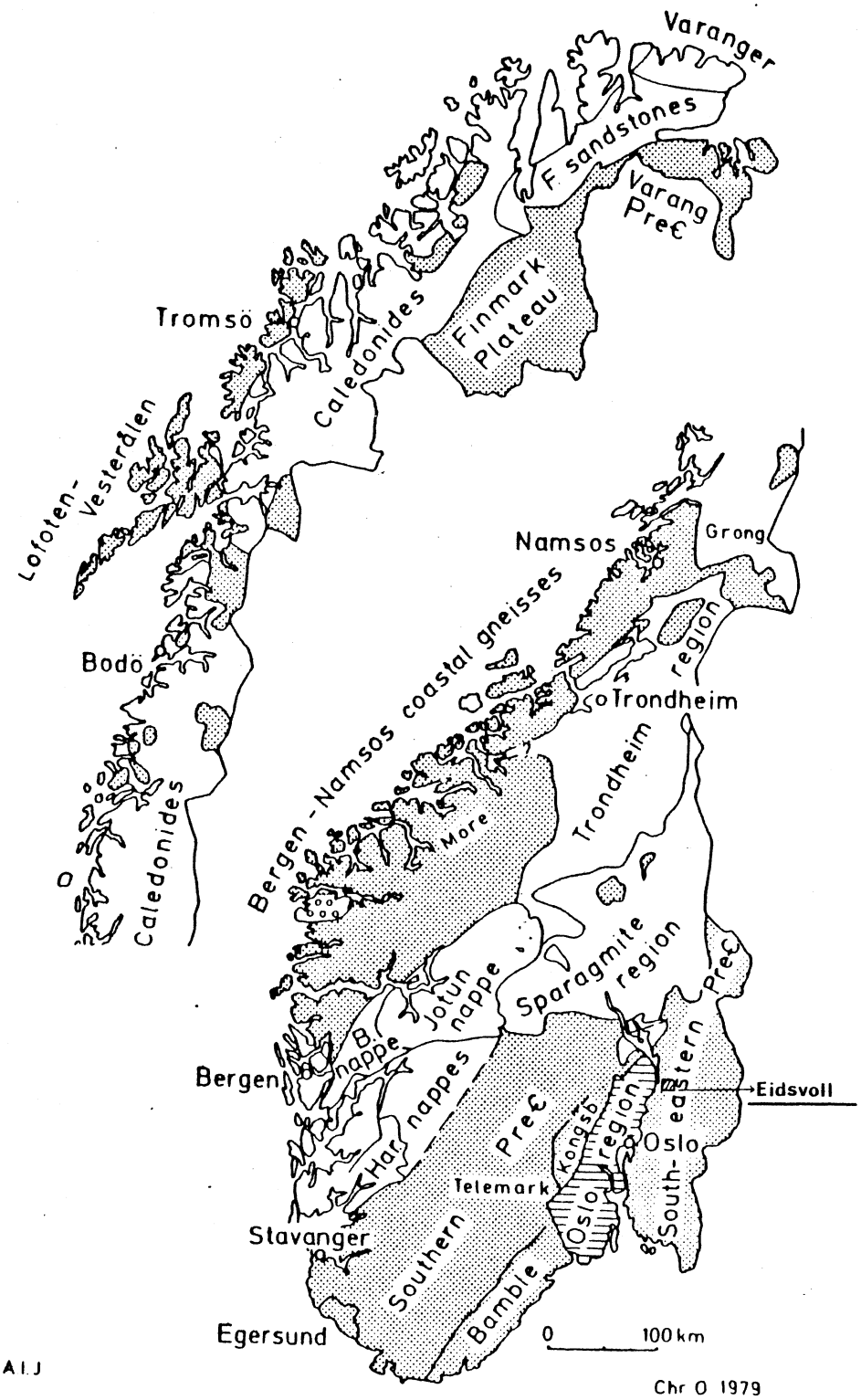
C O N T E N T



Main geological units of Norway. Dotted — Precambrian rocks. White — Precambrian and Cambro-Silurian rocks within the Caledonian zone. Rings — Devonian.

1. INTRODUCTION

A number of Cu-Au mines and showings have been reported from the Eidsvoll region, and the present report is an attempt to obtain a better general understanding of some of the mineralized areas. A list of the different mines and showings was prepared by B. Lieungh (1979), and based on further literature studies, two months of geological mapping and some geophysical work was concentrated in the Gullverket-Brøstad area the previous summer.

Quartz veins and breccias are the host-rocks for a mineral association composed of qtz, pyrite, chalcopyrite and quite often substantial amounts of silver and gold. They are situated within pre-cambrian gneisses of, so far, unknown origin. A greenstone belt of the same relative age is situated within the gneisses, with gabbroic bodies in close association. Later intrusives are diorites and granitic bodies. It is a highly deformed area with mylonites developed on a regional scale, and more than one episode of hydrothermal activity has influenced the mineralizations. Late permian rifting has most probably reactivated pre-existing zones of weakness, the importance of these late movements is not known. It is however believed that the sulphides had been introduced before this late stage deformation.

2. GEOLOGICAL SETTING

Regionally, the Eidsvoll area is situated within the Mjøsa-Vänern mylonite zone, belonging to the south eastern pre-cambrian of Norway. Immediately S-SW there is the Romeriks grey gneisses and to the N-NE the Odalen granite/Solør gneisses. To the west, the zone is striking into the intrusives of the permian Oslo graben.

Recent geochronology studies by Pedersen (1979) has presented a middle Proterozoic age for the gneisses in this area. Subsequent strong tectonic activity 1600-1500 m.y. B.P. resulted in the emplacement of large amounts of hyperite bodies within the gneisses as well as several bodies of granitic composition. From the present shape of the hyperite bodies, it is believed they pre-date the main mylonitization event. Strong eastward overthrusting related to the Sveconorwegian metamorphism (1050 m.y. B.P.) has been proven south of the Ringeriks grey gneisses, a series of strong movements which is also believed to be reflected by the Mjøsa-Vänern mylonite zone.

As to the original geological environment for the different lithologies constituting the gneisses, we still have only a very limited knowledge. Both well preserved metasediments and meta-volcanics can be observed within the

actual mylonite zone, and only granites, diorites and occasional small gabbro bodies can be stated as of definite intrusive origin. The gneisses which hold the mineralized veins and breccias in the Eidsvoll region may indeed be of sedimentary origin.

3. PREVIOUS MINING AND PROSPECTING ACTIVITY

A) Gullkis Mine

In 1758, gold was found for the first time in the Eidsvoll region. At this locality, a qtz-vein contained a 15 - 30 cm wide mineralized zone of py, cpy and a little visible gold. Mining was taken up the same year, and went on more or less continously until 1768. A northern shaft went down to 62 m, a southern down to 30 m. Smaller crosscutting shafts displayed a pattern of several parallel qtz-veins, 2-6 m wide, but nothing is told about the sulphide/gold content of these other veins.

From 1881-83, the two shafts, filled with water and gravel, were objects for a renewed mine-operation. Work only succeeded in emptying the southern shaft, where a 2 m wide N-S running qtz-vein was observed at the bottom. A minor shaft towards west cut two similar qtz-veins with a rusty colouring. A slight pyrite-impregnation was present in the qts-veins. It is fairly obvious that several of the veins have been mined, but the only numbers given refer to the first period of mining. 3 tons of ore gave an average of 35.9 g/t Au.

The two shafts are at present filled with water and gravel, and no sulphides can be seen at the mine entrance.

B) Brøstad Mine

This property, approximately 5 km north of the Gullkis Mine, was originally mined for Cu on a 3 m wide qtz-vein. The width of the qtz-vein increased downwards, and at 34 m depth it reached a width of 10 m. The vein is known to extend for at least 450 m strike.

From 1768 it was also prospected for Au at this property and from 1794 it was mined only for gold, but after a few years they were forced to go back to Cu-mining with Au as a by-product. There was obviously no continous mining during this period, and from 1807 it was permanently closed down.

In 1896 the different shafts were cleared, and a year later the English company "Golden Mint Ltd." bought the Brøstad Mines. From now on work went on rather continously, allthough on a rather small scale for the first three years. A crushing-mill was built, with a capacity

of 50 t ore per day. Also accomodation for the workers was established in the mining area. The number of employees settled on approx. 40 men when the actual mining started.

1900 Repeated sampling from different shafts (1016 kg in all) gave an average of:

14.4 g/t Au
25 g/t Ag
1.38 % Cu

1901 Number of employees: 23.
Only 400 t of ore was taken out. and no information on ore-grade.

1902 Number of employees: 76.
11.519 tons of ore gave 1125 tons of concentrate.
Treated concentrate:

51.439 kg = 45.7 g/t Au
81.321 kg = 72.3 g/t Ag
34.545 kg = 3.07 % Cu

Average grade of ore: 4.5 g/t Au
7 g/t Ag
0.3 % Cu

1903 Number of employees: 83 men for three months.
3197 tons of ore gave 236.63 tons of concentrate.
Treated concentrate:

11.120 kg = 47 g/t Au
9.323 kg = 39.4 g/t Ag
11.997 kg = 0.05 % Cu

Average grade of ore: 3.5 g/t Au
3 g/t Ag
0.003 % Cu

Work then ended i April 1903, but was taken up once more by a new company, the "Brustad Mines Ltd." in July 1905. No reports are presented from this period which ended in 1907.

In the years 1935-36, approximately 250 tons of sand from the old separation site was treated. The result was 348.6 grams of Au (average 1.4 g/t Au).

There are no reports on any later work on these properties.

C) Mines and showings outside the mapped area.

Approximately 10 mines and 40 showings previously connected to Au-prospecting are situated within a 10 km radius from the Gullkis and Brøstad Mines. They all seem to be represented by qtz-veins or breccias with associated pyrite and to a certain degree chalcopyrite. With the close down of the Brøstad Mine in 1907, the mining and prospecting activity in this area was put to an end.

What appears from the previous activity is that we may, in some areas, have rather continous linear elements produced by early rifting. This is best reflected some 2 km south of the Gullkis Mine, where a remarkable straight line (striking E-NE) can be drawn through three mining areas, with a strike continuity of approximately 5 km. (See B. Lieungh, Rep. 516.34.81, Sander Mines to the west, Gressli Mines to the east). From both mines is reported a steeply N-NW dipping qtz-vein with sulphide mineralization. The Sander mineralization is known to extend for at least 1 km, whereas the Gressli mineralization extends for at least 250 m. Previous assays from the two mines average 10-15 g/t Au with accompanying high, up to 3 % Cu values from the Sander Mine. It has been tried to prove such linear continuities between other mines and showings, but large distances and extensive lack of exposures makes it all very tentative.

On the other hand, parallel running qtz-veins were discovered during the mining activity in the Gullkis Mine, whereas only one qtz-vein can be observed on surface. Whether these parallel veins represent offshoots from a main vein, or simply a series of separate parallel veins, they should be equally interesting from an economical point of view.

The conclusions must be that so far, we have found no definite limitations to the length-extension of the mineralized veins.

4. WORK CARRIED OUT

A) Mapping

As previously mentioned, there is only a very limited knowledge of the different lithologies within the Mjøsa-Vänern mylonite zone. The rocks were referred to as undifferentiated pre-cambrian gneisses, until Gvein/Gustavsen (1967) proved both volcanic and sedimentary supracrustals as well as later intrusives to be present in the Kongsvinger region (some 40 km E-SE in the regional strike direction). Unfortunately there are no reports on any follow up work from the "mylonite zone".

It was then decided to concentrate the mapping to a quadrangle containing both Brøstad and the Gullkis Mine. A series of augened to granitic gneisses are dominating the map-sheet, together with banded micaceous gneisses and diorites. The regional extent of a greenstone belt and accompanying gabbros also seem to be quite conspicious. The strong tectonic activity is clearly demonstrated by development of mylonites and tectonic breccias. It is within these qtz-breccias and veins we find the precious metals (Au-Ag) in close association with sulphides, mainly pyrite and chalcopyrite.

1) Lithologies

Red augen gneiss: This lithology dominates the SW part of the map-sheet, and is the main factor controlling topography, representing the higher areas in a terrain of rather low topographic relief. 1-5 cm feldspar augens (probably microcline) dominate in a ground-mass consisting of feldspar, quartz and some biotite. Minor amounts of amphibole, chlorite and epidote may be present. Opaques are represented by magnetite and occasional pyrite-cubes. On a macroscopic scale, the impact of stress seems highly variable. A situation of fairly random orientation of the feldspar augens may be transitional into strongly foliated gneisses with a mylonitic fabric. It has been suggested by Gvein/Gustavson (NGU-report 1967) that these gneisses represent metasomatic products of original sediments, although no final conclusion was made. It may be important to note already at this stage, that it is within this lithology the two main gold bearing veins are situated.

Grey augen-gneiss: The reason for dividing the augen-gneisses into two separate units is based on compositional differences. In the grey augen-gneiss, 0.5-2 cm large augens of plagioclase composition are dominant. The lack of K-feldspar is also reflected in the greyish ground-mass. The difference reflected in mineralogy between the two gneisses may be either primary or of metasomatic origin (K-Na-Si metasomatism). Similar gneisses in the Kongsvinger region are geochemically almost identical to adjacent greywackes (Gvein 1967), suggesting a sedimentary origin for the gneisses; metamorphosed and metasomatic differentiates from sandstones and greywackes. However, the idea that the greywackes have originated from the gneisses can not be ruled out. Only the apparent lack of conglomeratic horizons may rise objections to a sedimentary origin for the gneisses. Quite strong erosional forces must have been present to produce such an extensive sequence of sandstones and greywackes. Coarser clastic sediments are usually present under such circumstances.

Granite: Rocks of granitic appearance and composition are present in the mapped area, but the relationship between the granite and the gneisses has not been investigated in detail. From the Kongsvinger region however, veins from the actual granite body are seen to be axial planar to late folds in the surrounding gneisses. Also the mineral-paragenesis in the granites seem to indicate a post peak-metamorphic emplacement.

Diorites: An extensive qtz-diorite body is seen just SE of the present mapsheet, whereas the diorite crossing N-Holsjøen displays an often far more basic composition. Feldspar and biotite seem to be the main constituents, but frequently large amounts of bluish-grey qtz-grains are seen. The boundary relationship between the diorite and surrounding gneisses is often obscured by a pegmatitic development of feldspar, qtz and mica. It may look like these "pegmatitic veins" are intruding the diorite. Isolated gneiss-lenses within the diorite have been observed which may well represent xenoliths. But as far as no final conclusion is made on the origin of the gneisses, no further interpretations seem necessary at this stage.

Banded micaceous gneisses: These gneisses are of a fairly basic composition, where mica-amphibole rich bands dominate over more qtz-feldspar rich bands. In several outcrops, the term mica-schist is a better classification of the lithology. The qtz-feldspar bands vary from usually 1-20 cm in thickness, while the more basic layers may reach a thickness of several meters. Disseminated sulphides, mainly pyrite and a little chalcopyrite, are occasionally observed, and magnetite seems to be fairly common.
In the field it is not always easy to differentiate micaceous/amphibolitic gneisses from sheared diorites or even gabbros. So far, the geological map is based solely on observations in the field with no support from geochemical analyses or microscopy studies. However, it is believed that some of the mapped "banded" gneisses have an igneous origin.

Greenstone/keratophyre: This sequence dominating the NW part of the mapped area was discovered quite late in the field season, and to date no attempt has been made to separate the basic from the more acid volcanics on the map.
Greenstone: The basic lava-flows are now seen to be both folded and flattened, and the original thickness of different units is hard to define. Most pillow-like structures are believed to represent pinch and swell of continous flow-units, although some outcrops may represent extremely flattened pillows. More acid tuff-layers seem to be common, and occasional horizons of green sediments are present.
Small sulphide concentrations are seen in several places, both pyrite and chalcopyrite.
Keratophyre: The volcanic sequence seems to be increasingly more acid eastwards, and keratophyre is an important lithology here. It is a light grey rock with larger feldspar crystals in a qtz-feldspar rich matrix. Some outcrops display a blastomylonitic appearance.

Gabbro: The few exposures we have seen of gabbroic rocks are always well within the volcanic sequence. The boundary relationship is complicated by the strong shearing and flattening of the gabbroic bodies, and it is reasonable to believe that gabbroic textures may have been completely obliterated in the boundary areas. The true extent of the bodies is rather uncertain, but in the central part, it is a true saussurite gabbro with amph/pyroxene, feldspar and chlorite. No layering has been seen, and the intrusive origin is indisputable.

Brecciated horizons: Two main directions are present, striking N-NE (Verket breccia) and NW (Raudvatnet breccia). While definite strike extension is not known, they are seen to be at least 10-25 m wide, a true width as they are usually very steeply dipping.

1. Breccias of tectonic origin in the Verket area are striking between N 10 - 30 E, and where observed they are situated within augengneiss, preferrably the red variant. Remobilized qtz invaded fractures produced by shearing or faulting, resulting in horizons vary-

ing from pure qtz-sulphide veins to well developed tectonic breccias. The latter seems to carry a rather substantial amount of hematite displaying an intense reddish-brown weathering colour. This is best observed in the horizon along the road immediately south of Verket. This (Verket) breccia was believed to carry a fair amount of jasper. this I now believe represents syn-tectonic hematite contamination of macrocrystalline quartz rather than a primary chemical precipitate, as hematite is easily transported in qtz-solutions. The other NE-trending brecciated horizons are more pure in qtz, and also carry more sulphides.

2. The nearly strike-parallel "brecciated" horizon crossing Raudvatnet seems to represent not as much a breccia as merely a sheared zone. This horizon has not been seen to carry any serious sulphide mineralization, and no showings are reported from earlier investigations. Also our own assays for Au proved negative. But this horizon deserves a closer look based on its position relatively to the volcanic sequence. The southeastward extension of the sheared zone does seem to be penetrative into the greenstone-units. Strike extension so far is observed to last for at least 3 km, but there is no reason to believe it does not continue in both directions.

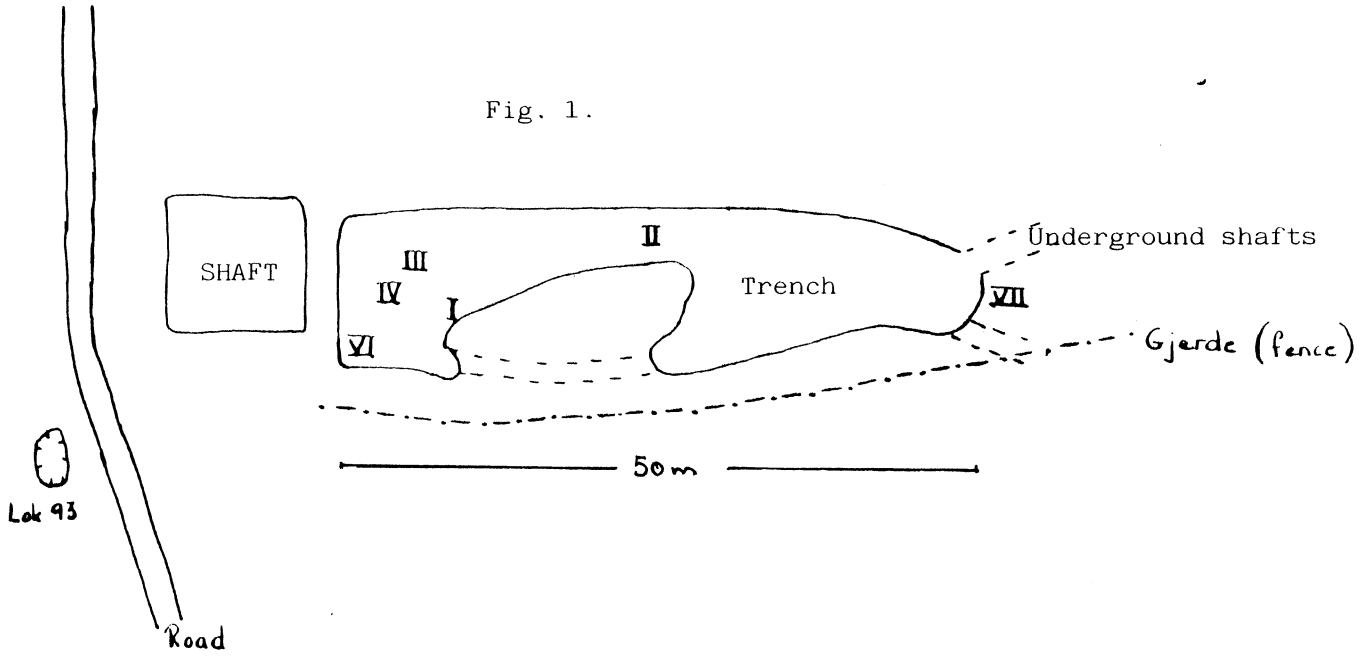
Qtz-veins: The near vertical qtz-veins, from a few cms up to 3 m wide, are observed in all lithologies in the mapped area. They are usually strikingly pure. On a regional scale, quite a number are seen to be sulphide-bearing to the extent that they were worth exploiting in the past. As mentioned earlier in the report, some 10 mines and 40 showings are situated within the Eidsvoll region. And they seem to be invariably connected to qtz-veins or qtz-rich breccias. Qtz and pyrite is the common mineral association, often with accessory chalcopyrite. Of extreme interest is that all ten mines and approximately half of the showings are reported to be Au- and sometimes Au-Ag-bearing, with assays often well within the economic range.
The qtz-veins of importance in the mapped area are never seen to be strike parallel to the main lithologies, and must be the result of tectonic breaks produced by faulting and/or folding processes. There is a regional pattern in the occurrence of the veins, displayed by the N-NE and W-NW trending fracture zones. We have not been able to observe any horizontal displacement accompanying qtz-veins or breccias, and due to the little overall structural control we have, age relationship is hard to predict. But is is reasonable to believe that pre-existing fractures were reactivated during Permian rifting (fits well with the observed directions) and some may even be of Permian age.

B) Brøstad Mine at present

There is no access to any of the shafts, which are all filled with water and presumably quite large amounts of gravel. The qtz-vein was reported to be 3 m wide on surface (fig. 1), reaching a thickness of 10 m at a depth of approx. 32 m. But the mineralized section seemed to have a fairly constant thickness from surface and downwards. As virtually no ore is left on surface, no zonal ore-mineral distribution can be stated. But it may seem like the central part of the vein carries the stronger chalcopyrite concentration, which also gives the highest Au-values. Pyrite is scattered throughout the vein, which is also the case for Au (table 1).

BRØSTAD MAIN SHAFT.

Fig. 1.



I	0.64 g/t Au.
II	115.84
III	2.24
IV	5.76
VI	0.32
VII	34.56
Lok 93.	11.84

The trench, trending N 110 E, is approximately 5 m deep, with water/gravel filled shafts at the bottom. The samples II and VII are taken from what remains of the Cu-rich ore, whereas the other samples consisted of qtz and pyrite. The samples from loc. 93, a very small showing, consisted of qtz, pyrite and a little chalcopyrite.

Originally, the Brøstad mineralization was described as two qtz-veins, crosscutting each other at an angle of approximately 30° (see fig. 1). But there is a possibility they are only convergent at this locality as all mine operations was concentrated only on the northeastern extension of the vein system. This indicates that only this horizon was worth mining. Unfortunately, no surface observations can exclude any of the two possibilities.

The sulphide-bearing qtz-vein in the Brøstad Mine was mined down to a depth of approximately 100 m. The upper of the 5 horizontal shafts was worked along strike for a distance of 270 m, the lower shaft for approximately 200 m. But smaller shafts west and east of the main mine prove an extension of at least 450 m.

C) Gullkis Mine at present

Very little is written from the mining period of this property. All we can observe today are two water and gravel-filled shafts, the northern one reported to be 62 m deep and 10 m south the southern 30 m deep. The central part of the breccia/vein is approximately 2 m wide and extremely qtz rich with only small amounts of hematite. No sulphides could be observed at the northern mine entrance. Towards the boundaries of the brecciated horizon, the red augen-gneiss is clearly fragmented and sheared with fairly equal amounts of qtz and rock-fragments. The zone affected by the tectonic activity is in the range of 8-10 m wide, at least. Possibly more, as a small river 3-5 m east of the exposed zone, is reported to drain into the northern shaft, and hence caused the immediate stop of mining activity in this shaft. The area occupying a possible southward extension of the vein-system is partly covered by cultivated ground, the rest covered by a forestry area. The northern extension seems equally difficult to trace on surface, due to heavy vegetation cover. An attempt was made trying to trace the mineralized horizon with VLF measurements. This failed, in the first instance due to electric wires along the road. Thus it seems like only diamond drilling and detailed geochemical sampling can give the information necessary for evaluating this property.

D) Other showings

The showings visited this summer are situated along a fairly straight line, with a N-NE strike direction. The southernmost showing lies approximately 250 m NW of the Gullkis Mine, whereas the northern Lesja showing lies 600 m further NE. It is reasonable to believe the three showings belong to the same mineralized horizon. This horizon is most probable parallel to the Gullkis breccia, and not the continuation of this latter breccia. How-

ever, a fault could be easily missed in this heavily overgrown area.

The three showings are numbered 1 - 2 - 3 successively northwards (see regional map).

1. Within the red augen gneiss there is a 2 m deep pit with a radius of some 3 m. The pit is partly infilled with gravel and new vegetation. A small dump is situated next to it, where pyrite and some chalcopyrite is seen in the qtz-rich specimens. Two specimens from this dump assayed 0.16 and 16.5 g/t Au respectively. Unfortunately, nothing of the eventual mineralized horizon is exposed.
2. This is a brecciated horizon within the red augen-gneiss, very much like the Gullkis Mine. Disseminated pyrite is seen in a 2.5 m wide and 4 m long showing, striking N 20 E. Assays gave 0.16 and 0.06 g/t Au.
3. In earlier reports, this is referred to as the Lesja showing (or showing nr. 4) where some 2500 m^3 of rock have been mined. This activity is dated back to 1777-78. Some avtivity also took place around 1900, and a 75 cm wide qtz-pyrite vein is reported from the old showing (see fig. 2). From the dumps we could observe the common qtz-pyrite mineralization, whereas little sulphides could be seen in the actual showing. This is also reflected in the Au-assays (fig. 2).
   Finally, the 1981 VLF-profiles covered all three showings, but with negative results.

E) VLF-survey

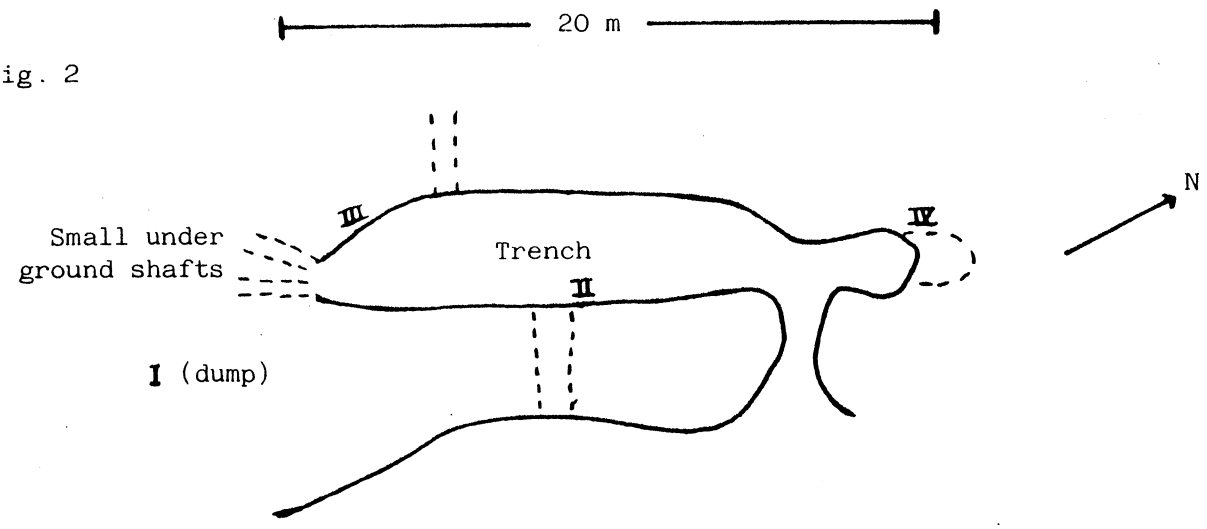
Brøstad. Station NNA
Base-line N 100° E

The small scale anomalies can be explained by present day topography and vegetation. There is a small anomaly at the banks of lake Putten. The anomalies at the shafts are small enough to be caused by the fences surrounding the shafts. The eastern part of the grid is occupied by boggy areas and a small pond, which may well reflect the anomaly at this site.

Gullkis Mine. Station FOB
Base-line N.-S.

As mentioned earlier, electric wires along the road completely destroy the chances of pinpointing the mineralized qtz-veins by VLF-surveys. Only the showings 1 - 2 - 3 are free from any outside disturbances, and here we get no anomalies at all.

Fig. 2



This is the Lesja showing, the northernmost of the three showings described. It is approximately 4 m deep with vertical walls. Quite large dumps can be observed slope towards the river some 15-20 m eastwards.

I	2.18	g/t Au
II	0.3	g/t Au
III	0.06	g/t Au
IV	Nil	

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ANALYTICAL CHEMISTS • ASSAYERS • CONSULTANTS

Certificate of Analysis

Certificate No. 52560 Date: Oct.20, 1981

Received Oct.9, 1981 45 Samples of ore

Submitted by A/S Sulfidmalm, Norway Att: F. Nixon

SAMPLE NO.	GOLD Oz./ton
E-85 & 87	NIL
-93	0.37
-96	NIL
-125	0.002
-127	0.01
-128	0.002
-138	0.002
-269	0.01
-285	NIL
-357	NIL
-365	NIL
-545-1	NIL
-545-2	NIL
-546	0.27
-546-1	0.02
-546-2	3.62
-546-3	0.07
-546-4	0.18
-546-6	0.01
-546-7	1.08
FRA TIPPEN 547	0.01
-547	0.05
-547-1	0.17

SAMPLE NO.	GOLD Oz./ton
E-548-1	0.002
-548-2	0.002
-549-1	0.002
-549-2	0.002
-549-3	0.02
-549-4	0.002
-553	NIL
-571-1	NIL
-571-2	NIL
-571-3	NIL
-571-4	NIL
-572	0.03
-572-1	0.30
-590-1	0.005
-590-2	0.53
-592-1	0.005
-592-2	0.002
-593-1	0.07
-593-2	0.01
-593-3	0.002
-593-4	NIL
TIPP PROVER BRAJTAD	0.04

Per G. Lebel
G. Lebel, Manager

Sample-localities

E - 85-87 Breccia NE of the northern end of N-Holsjøen.

93 Small showing within augen-gneiss, 15 m SW of main Brøstad shaft.

96 Boundary grey-gneiss/augen gneiss close to Putten.

125 Breccia at the north end of Raudvatnet.

127 Clastic rock at the north end of Raudvatnet, a little visible sulphides

128 Micaceous gneiss at the north end of Raudvatnet.

138 Brecciated boulder by the lake Putten.

269 Diorite on the NW side of N-Holsjøen (a little sulphides present).

285 Diorite on the E side of N-Holsjøen.

357 Greenstone N-NW of Engerfjellet

541 - 1-2 Gullverket breccia.

546 | BRØSTAD | Qtz with pyrite

546 - 1 | BRØSTAD | Massive ore

2 | BRØSTAD | West end of main shaft

3 | BRØSTAD |

4 | BRØSTAD |

6 | BRØSTAD | Massive ore

7 | BRØSTAD |

547 | The mine close to lake Putten, first two samples from the dump,

547 | the latter from the actual mine.

547 - 1 |

548 - 1-2 Shaft E of main Brøstad shaft, close to end of main road.

549 - 1-2-3-4 Breccia NE of the northern end of N-Holsjøen.

553 Breccia/greenstone south of Engerfjellet.

571 - 1-2-3-4 Gullkis Mine.

572 | Dumps of slag some 50 m south of the Gullkis mine.

572 - 1 |

590 - 1-2 Showing 1 NW of the Gullkis Mine

592 - 1-2 Showing 2 NW of the Gullkis Mine

593 - 1-2-3-4 Showing 3 NW of the Gullkis Mine, see fig. 2.

CONCLUSION

To date mapping has revealed a series of quartz veins and breccias which are dominantly oblique to the regional strike direction. Several of the quartz veins carry py-cpy mineralization and in addition often carry Au. All previous mining activity in the area has been concentrated on this type of mineralization.

The geology of the area consists of a series of meta volcanics and probable meta sediments (now various gneisses) intruded by gabbros and diorites.

No obvious hydrothermal alteration has been noted - except for hematite which is usually confined to breccia zones, and no concentrations of sulphides outside the quartz veins have been located.

The tectonic origin of the Au bearing quartz veins seems indisputable, but the source rock for the sulphides and Au mineralization is still unknown. Most of the gold bearing veins are located in the gneissic rocks.

The Au bearing veins seem to be too small and scattered and the gold content too erratic (although high in places) to be of economic interest. However the fact that so many gold bearing veins are located to the area and the interesting geological environment warrant further work.

RECOMMENDATIONS

1. A selection of rock types have been picked out for microscopic investigation and whole rock analysis. It is hoped that this will give a better understanding of environment and possible alteration areas.

2. It is recommended that the area of interest be covered by a ground VLF and magnetic survey to supplement geological interpretation and possibly locate structural traps and/or sulphide concentrations.

3. At least 60.000 tons of tailings from the Brustad Mine are stockpiled near the mine. Test sampling in the mid thirthies indicated an average of 1.4 g/t for this material. This should be checked as should waste dump material at the mine.

LEGEND

- Augen/granitic gneiss
- Banded micaceous gneisses
- Dorites/quartz-diorites
- Greenstone/ keratophyre
- Gabbro
- Brecciated zones

- Dip/strike of planar structures
- Fold-axis
- Mine-dumps.
- Trace of showings

Söndre-Ottvegen
Kampe-myra
Grönnsjöen
Raud-vatnet
Bröstad mine
Putten
Engerfjellet
Nordre-Holsjöen
Vivangmyra
Holsvangen
Röysi-vangen
Röysi-tjennet
Brandte-berga
Lesja
Verket
Vesle-Bjerten
Stein-sjöen
Svart-putten

N

SCALE	OBS. 1981	KK – MS
1:10000	DRAW.	KK
	TRAC.	KK
	CHK.	

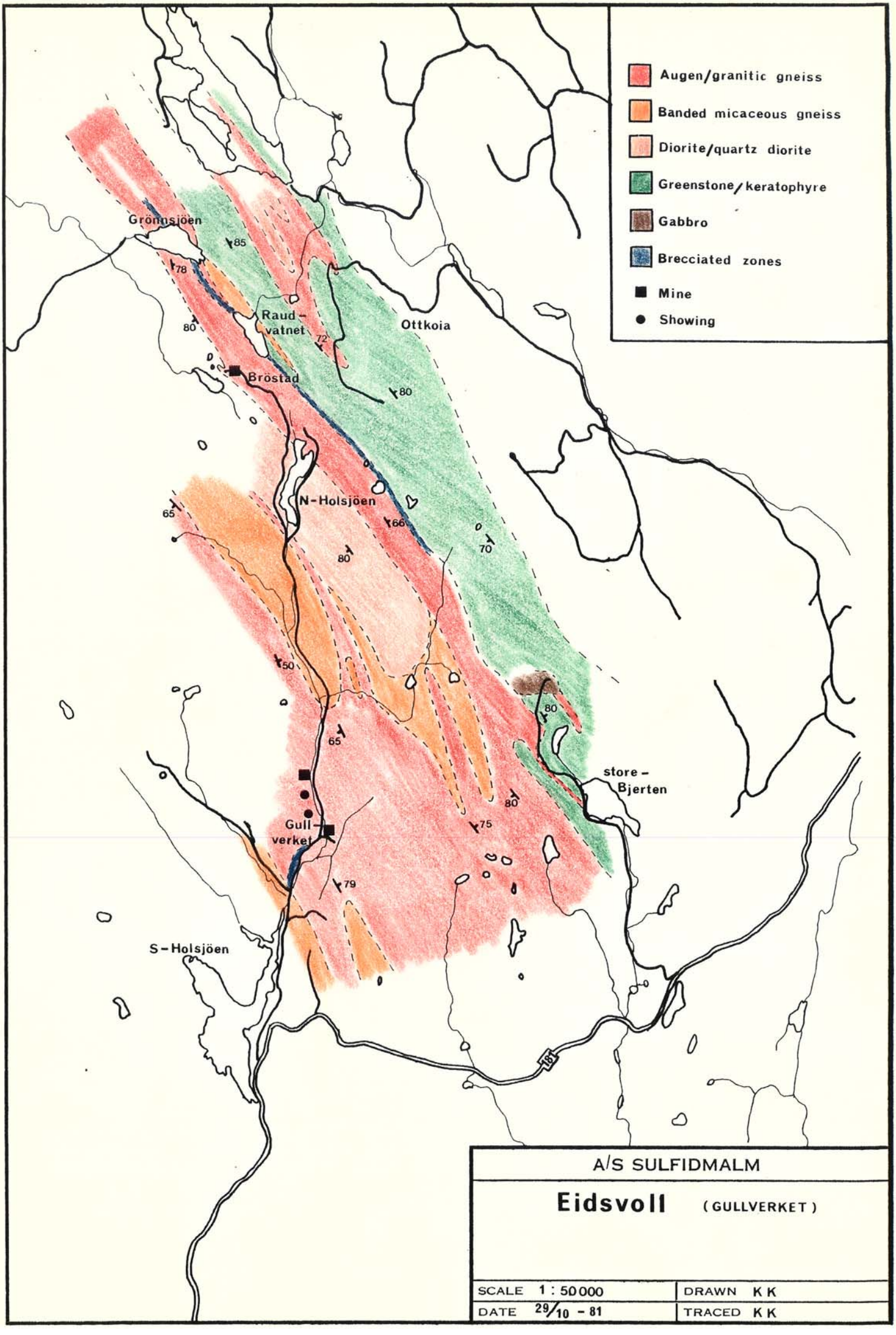
MAP NO.

MAP SHEET

GEOLOGICAL SURVEY

GULLVERKET (EIDSVOLL)

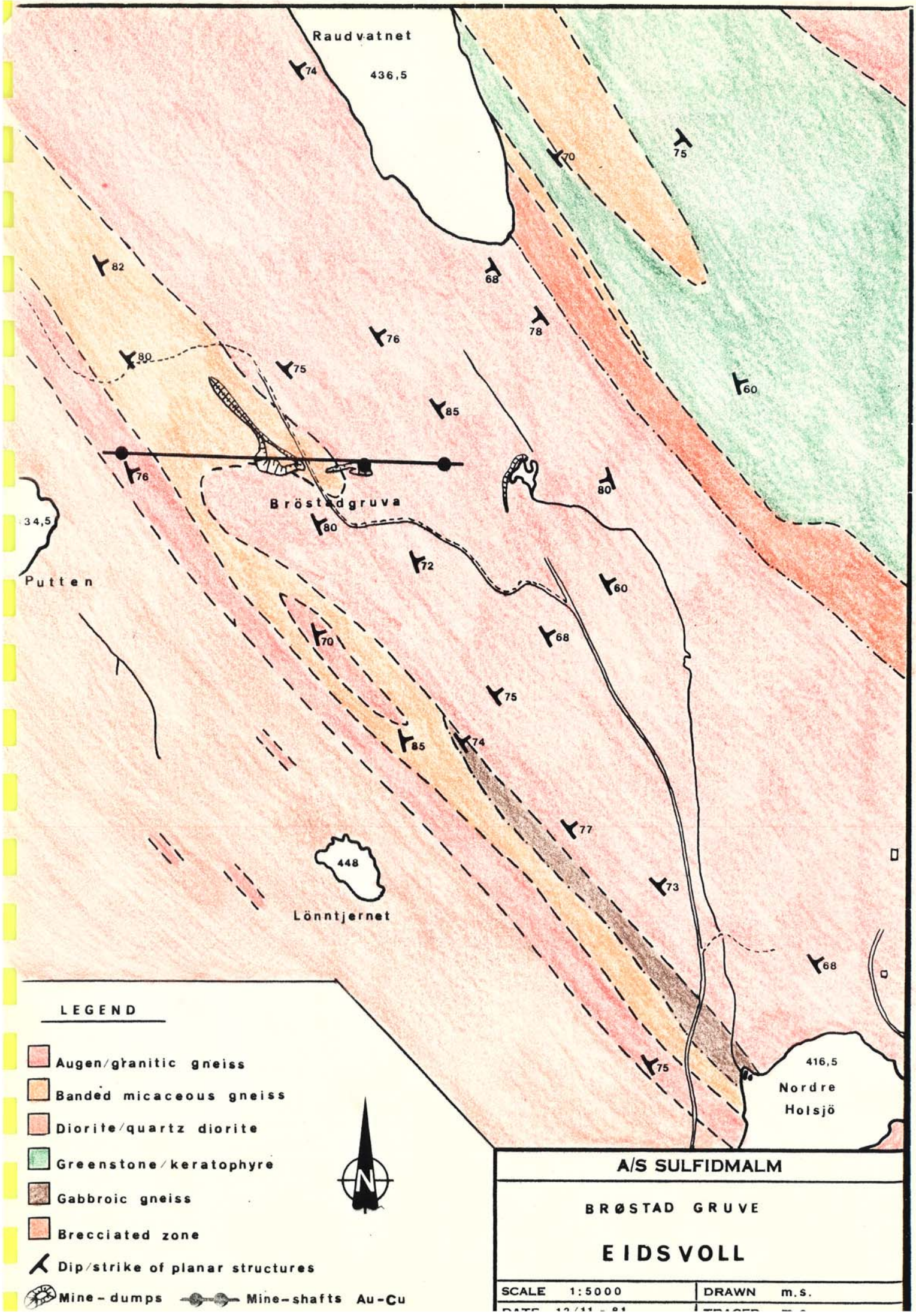
% SULFIDMALM

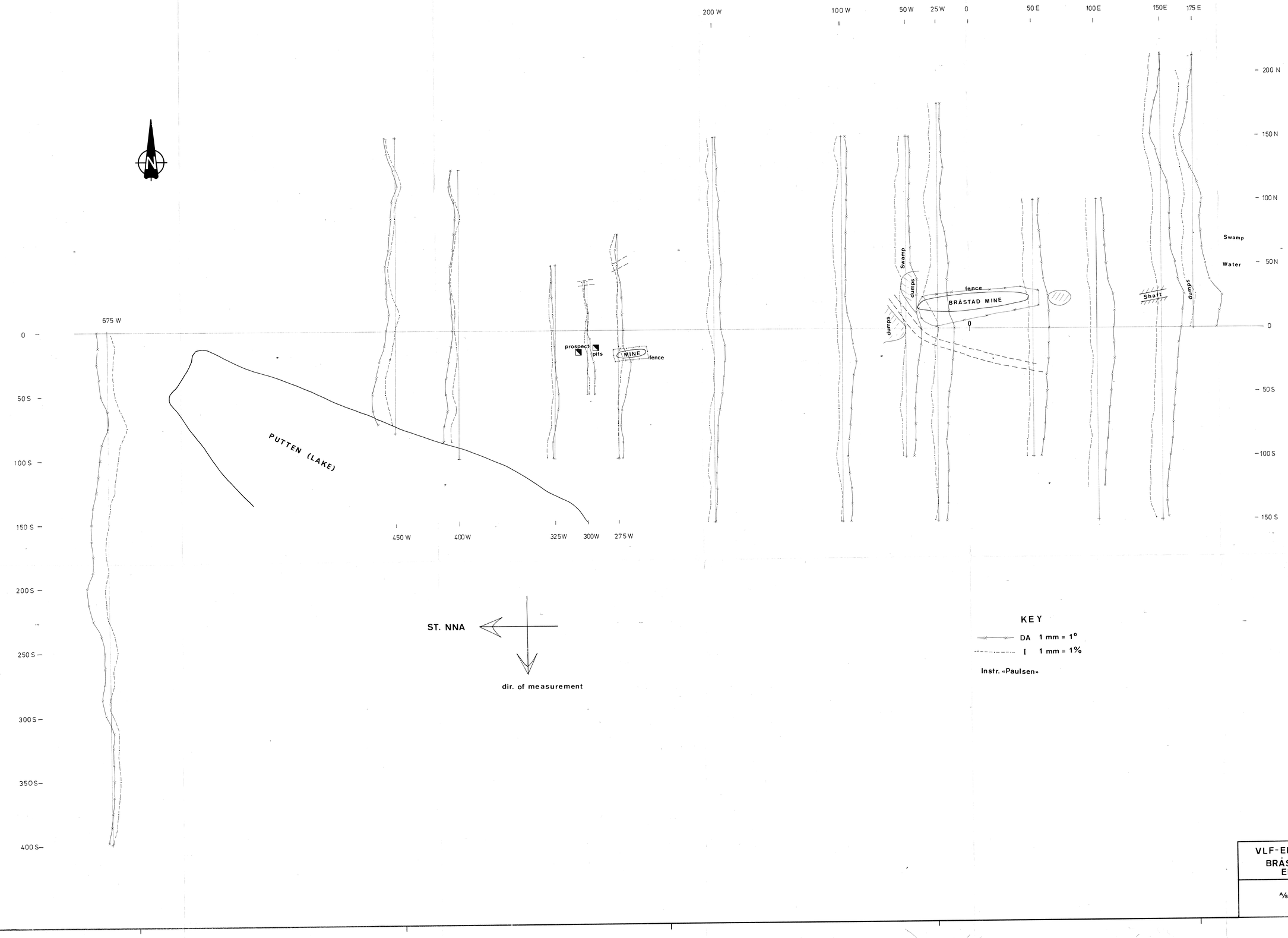


A/S SULFIDMALM

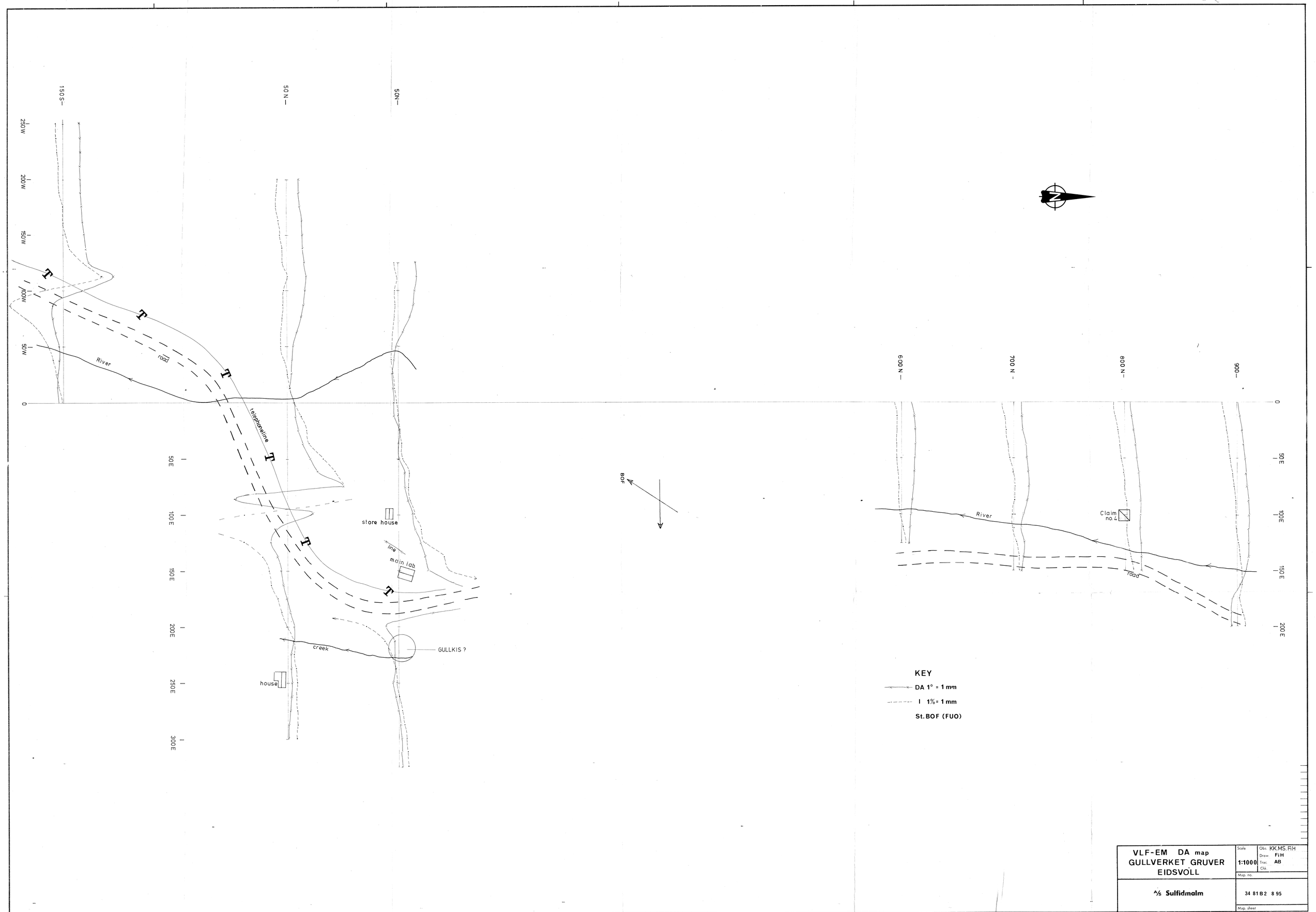
Eidsvoll (GULLVERKET)

SCALE 1 : 50000	DRAWN K K
DATE 29/10 - 81	TRACED K K


Raudvatnet
436,5
Brøstadgruva
34,5
Putten
448
Lönntjernet
416,5
Nordre
Holsjö
LEGEND
Augen/granitic gneiss
Banded micaceous gneiss
Diorite/quartz diorite
Greenstone/keratophyre
Gabbroic gneiss
Brecciated zone
Dip/strike of planar structures
Mine-dumps
Mine-shafts Au-Cu
N
A/S SULFIDMALM
BRØSTAD GRUVE
EIDSVOLL
SCALE 1:5000
DRAWN m.s.



VLF-EM - measurements BRÅSTAD MINE EIDSVOLL	Scale 1:1000	Obs. KK.M.S.FIH Draw. FIH Trac. AB Chk.
	Map. no.	
A/S Sulfidmalm	34 81 B1 8 96	
	Map. sheet	



KEY

DA 1° = 1 mm

I 1%= 1 mm

St.BOF (FUO)

VLF-EM DA map GULLVERKET GRUVER EIDSVOLL	Scale 1:1000	Obs. KK.MS.FI.H Draw. FI.H Trac AB Chk.
	Map. no.	
⅘ Sulfidmalm	34 81 B2 8 95	
	Map. sheet	

PERMIAN. IGNEOUS ROCKS

EOCAMBRIAN-SILURIAN SEDIMENTS

PRE CAMBRIAN ROCKS

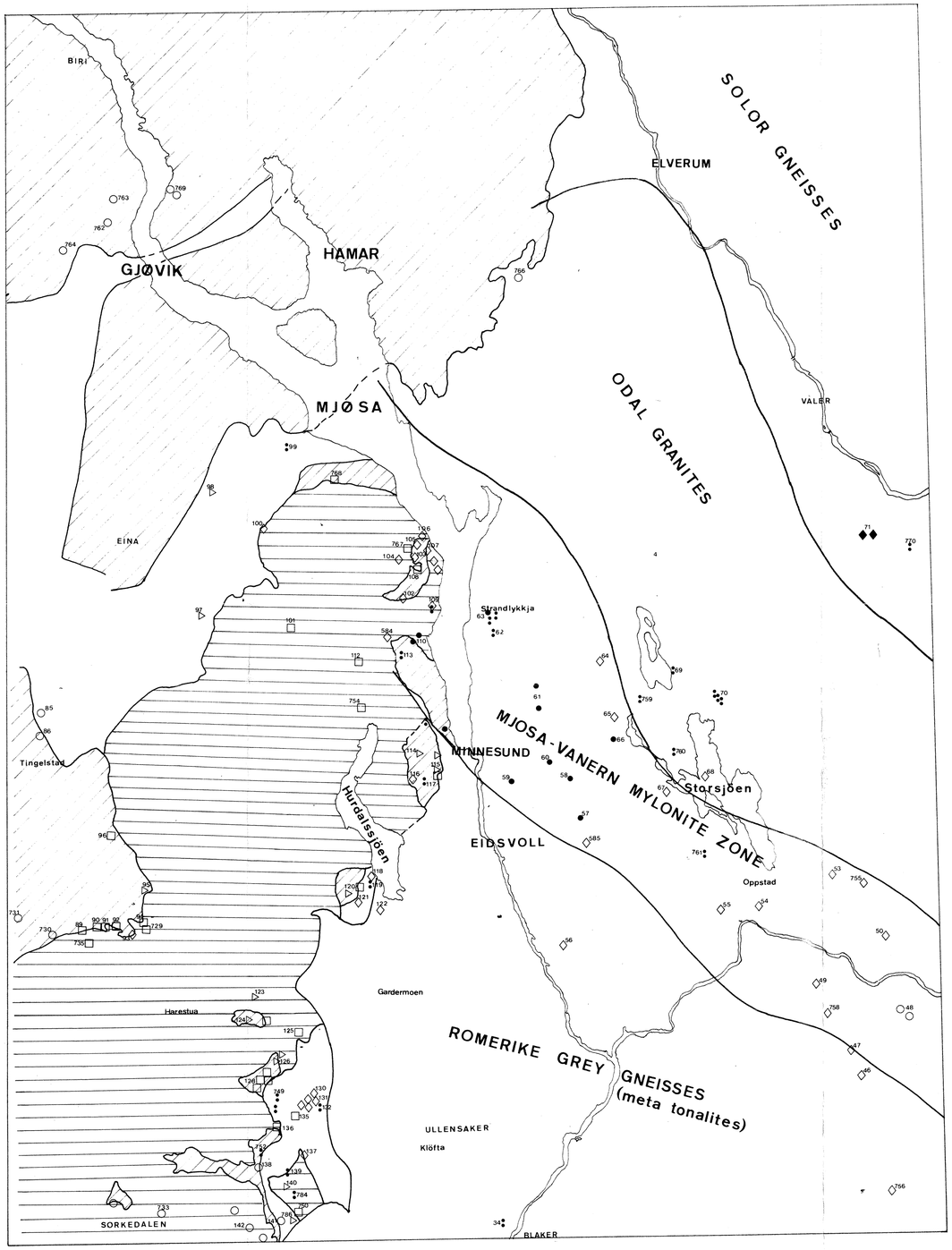
GOLD SHOWING

COPPER SILVER

COPPER

MAGNETITE

LEAD-ZINK



34	Borgen	108a	Langgård
46	Josefberget	108b	Raumyr
47	Havmyr	110	Skreia
48	Spetalen	110	Bertelscia
49	Bjørnberg	112	Ødemark
50	Svarttjern	113	Put
53	Valstad	114	Rødskjerpene
54	Tupperud	114	Trandum
55	Bagli	115	Stensby
56	Pluter	115	Mistberget
57	Utsjø	116	Lykken
58	Græsli	116	Oppsal
59	Sander	117	Rødknatten
60	Gullkis	118	Tangen
61	Brustad	119	Tangen
61	Eidsvoll	120	Toftner seter
62a	Ertsmyr	120	Åskampen
62b	Bruddhaug	121	Åmundrud
63a	Moestue	122	Dal
63b	Bruddhaug	125	Vardeås
64	Treft	126	Erpestadvangen
65	Fusker	128	Toketjern
66	Bjørnstad	130	Kjerstad
66	Haugen	131	Dal
67	Hanord	132	Trollsnes
68	Storsjøen	135	Myr
69	Antoinette	136	Spenningsby
70	Rud	136	Ravndalskollen
70	Rud	138	Rotnes
71	Langåsen	139	Haug
85	Teslo	140	Gaustad
86	Bjerke	141	Rudskogen
89	Vikerhaug	142	Bjørndalsmyr
89	Lunnerseter	142	Sørskogen
90	Kjørvenseter	142	Movann
91	Skjerpemyr	584	Almli
92	Mutta	729	Lunnes
93	Grua	729	Milstein
94a	Nyseter	730	Smålen
94b	Grua	731	Olimb
95	Håkenstadseter	733	Kobberhaugen
96	Ensrud	735	Flatta
97	Molstadseter	749	Halfdan
98	Kolbu	750	Lønsvoll
99	Balkeås	752	Strøm
99	Kjølset	754	Hurdal
100	Fotstadvollen	755	Granberget
101	Rognli	756	Løvlia
102	Flesvig	756	Pusengen
102	Skreia	759	Holt
103	Put	760	Krattebøl
104	Langtjern	761	Suterud
105	Paul	762	Bråstad
105	Stor	763	Kasta
105	Stiger	766	Ådalsbruk
106	Salomon	767	Svenskeskjerpet
106	Nord	768	Toten
107	Brekke	769	Refling
		770	Li
		784	Holterkollen
		786	Glosli

REGIONAL GEOLOGY AND MINERALIZATION
EIDSVOLL AREA

SULFIDMALM

SCALE	OBS.		
1:250.000	DRAW.		
	TRAC.		
	CHK.		

MAP NO.
34 81 A 2 10 A 14

MAP SHEET

A.s Tørrkopi. 2000. A 1. E 9 gl. 10-71. Sentrum Trykkeri.