

FOLLDAL PROJECT (N-81-1)

FOLLDAL VERK A/S - AMOCO NORWAY OIL COMPANY

DECEMBER 1984

Submitted by:
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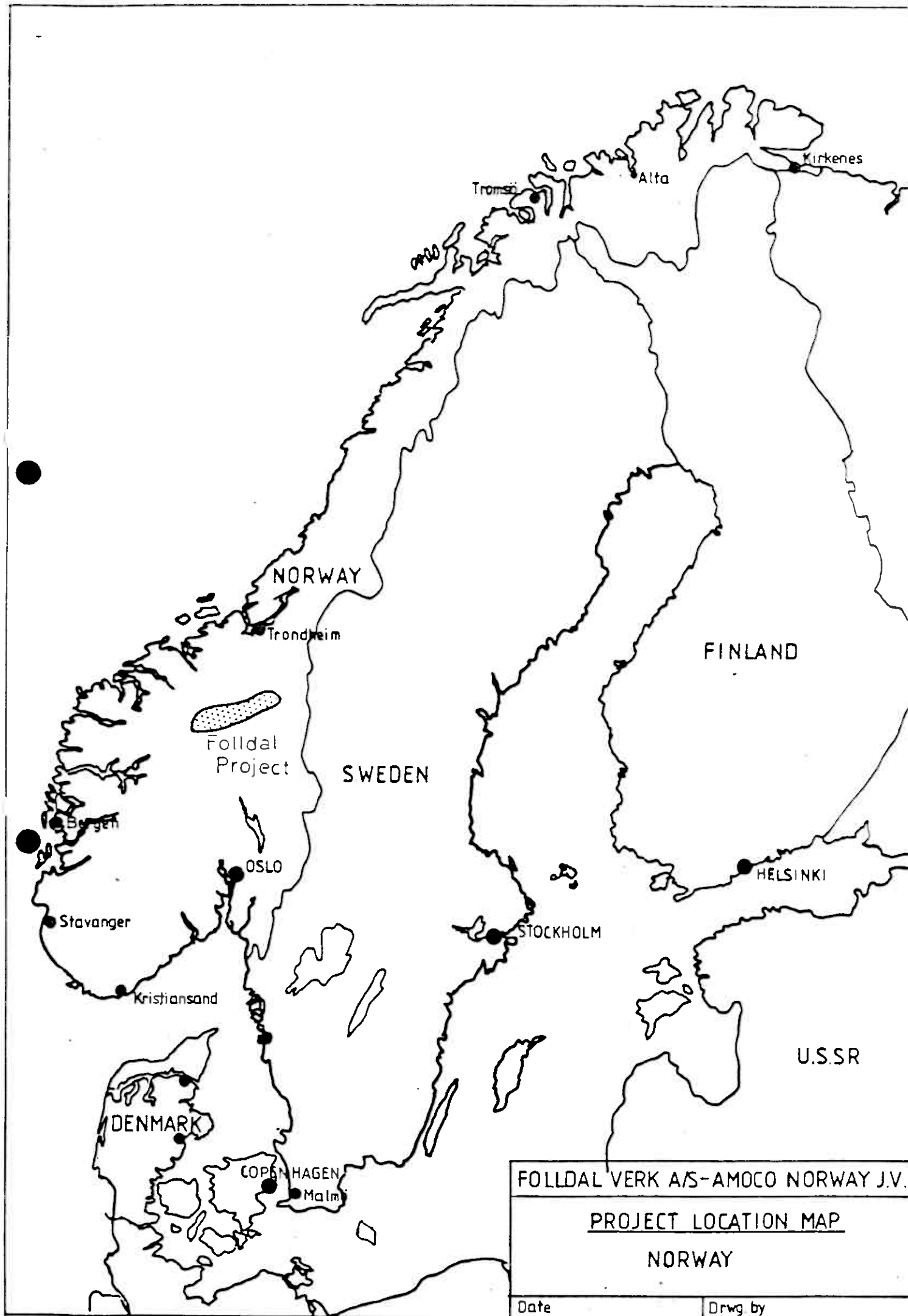
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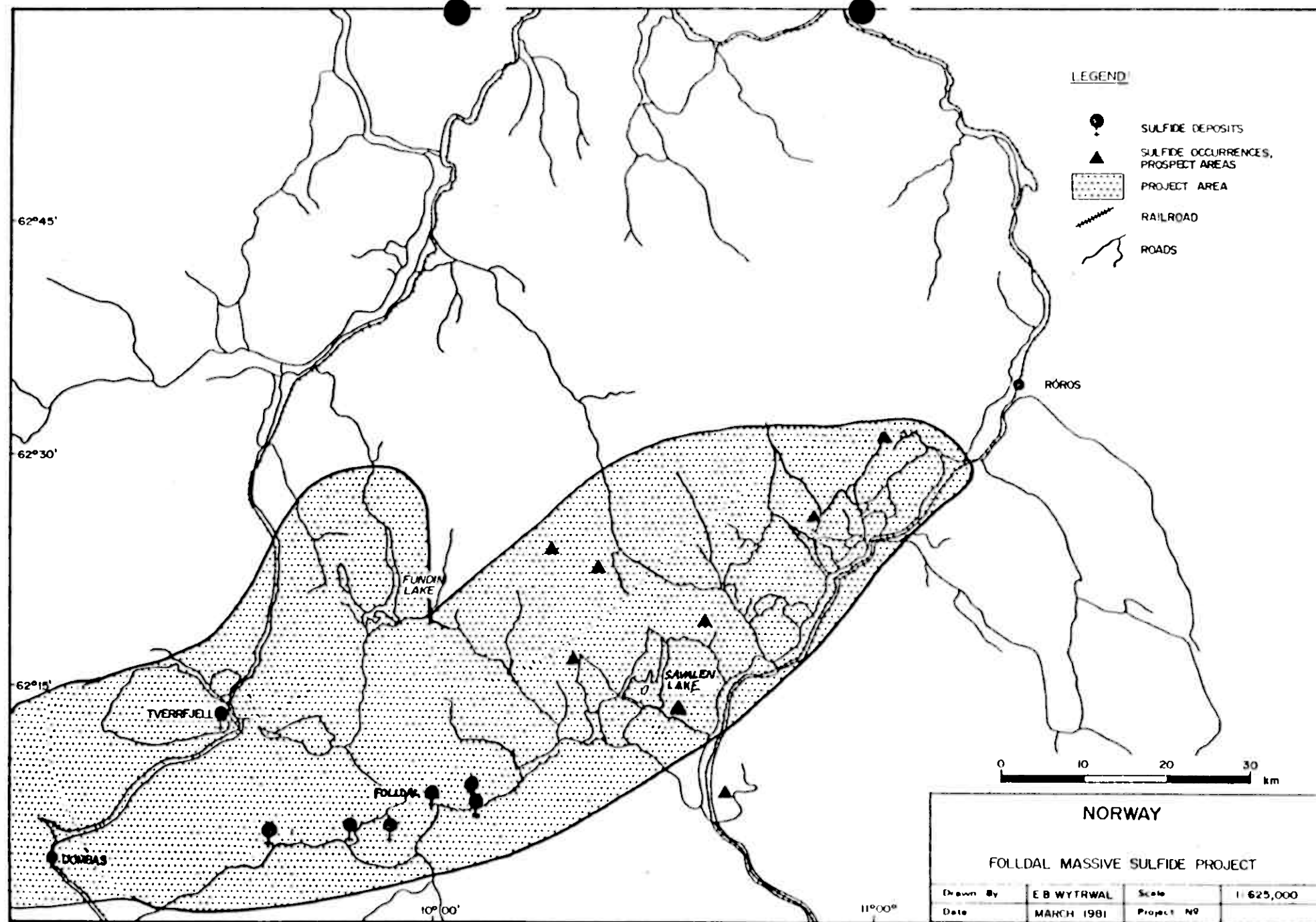
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SUMMARY AND CONCLUSION

Folldal Verk A/S and Amoco Norway Oil Company entered in 1981 into a joint venture agreement to explore for Cu - Zn massive sulphide deposits in the Folldal area of south central Norway.

The Folldal project started in the summer of 1981 with airborne survey over the Savalen/Tynset area. In addition the Tolga/Os and Folldal areas were flown with geophysics in 1982.

Field work started in 1981 and continued in 1982, 1983 and 1984. Follow-up work have included ground geophysics (VLF, shootback, magnetometer and minor Apex max-min and IP - RP), geochemical sampling and geological investigation on anomalous areas located by airborne surveys. During the last four years over seventy individual grids were run this way. In 1984 follow-up work continued in grids from previous years in addition to seven new established grids.

Follow-up work also include work on previously found anomalous gold stream sediment samples (Lesja and Hausta). In 1984 no work are done at Lesja, due to budget reductions, but include follow-up drilling at Hausta in two grids.

39 drill holes totalling 5.300 meters were drilled in the 1982/83 seasons, and another 17 holes totalling 1.400 meters in 1984. No economic zones have so far been intersected. Most of the anomalies drilled to date have been caused by either graphite with pyrrhotite and pyrite, or by stringers and massive sections of pyrrhotite and pyrite. Minor chalcopyrite and sphalerite occur in several drill holes.

The problem with separating the economical basemetal conductors from graphite, with associated metals, before drilling, still remains unsolved.

Even combined with geochemical methods the fingerprints of metalconductors and graphiterelated conductors can look very

much the same, although soil sampling is assumed to be the best method for anomaly discrimination.

During these four years of follow-up the majority, at least the most promising, of conductors given by the airborne survey, are checked - from Folldal in south to Os in north. Some conductors from the airborne still remain open, and some of the new grids require drill testing - so even with a continued use of the same prospecting philosophy that we have used until now - continued follow-up (fullfillment of it) can be advocated and is even necessary. Some examples are drilltargets in new grids in Folldal area and Vingelen area, or a deeper drillhole (ca. 400 m) to test the Vingelen deposit at depth (already one drillhole in 1983).

We might however change our "prospecting philosophy": It is assumed that near to all surface exposures of sulphides have been found. (Testing of slightly covered conductors could effectively and cheaper be done by trenching, with diamond drilling on the remaining anomalies of interest).

Then to look for deeper deposits - that are more timedemanding and ask for higher demands of the equipment - one could take more offer of geology and known hostrock associations from known deposits. The anomaly map from the airborne survey is very useful, but can in no way pick up all conductors. To diminish the chance of loosing the one of importance one can explore along favcuravle geological horizons (that we already do in a greater scale by restricting surveying mainly to the main volcanic Hersjø fm.), f.ex. along mafic/felsic contacts, or close to graphite horizons that are known to be associates of deposits in the Folldal area - and not be restricted to airborne detected anomalies, that can be masked, near these horizons. (The map from the airborne is useful to outline these horizons.)

Then we can limit the area and concentrate exploring in the most favourable environment. An aim for this should also be studies of alterations, folding etc..

An example of this thought is described in connection to the Ørnhovda grid in Grimsdalen.

In addition to the associations of massive sulphide deposits to mafic/felsic contacts and graphite horizons, one should have in mind the close relationship of exhalative quartz/bedded cherts of good strike length to ore deposits. Corresponding to this is the close association of iron formations to ore deposits in the Gula group. Another favourable guide to ore is in the Røros and Hummelfjell formations: Known ore deposits in sediments close to gabbros/ultramafics (f.ex. the Røros deposits, Oscar II, Baugsberget).

Another point: The proximity of (proximal) deposits to volcanic (read exhalative) centers. Indicative of local centers of volcanic activity are accumulations of felsic volcanics, specially rhyolite flows, that often can be seen to exist in close association to zinc-rich horizons (Sivilvangen and Nonsvola).

SUMMARY OF THE FOLLDAL PROJECT (1981-84)

Separate areas:	Line kilometers with ground geophysics:						Number of geochem. samples	
	Σ geo-physics	VLF	CEM	Mag.	Apex	IP-RP	Soil-samples	stream sediments:
Folldal	350	30	80	120	70		2400	400
Lesja	86	43	0	43	0		2500	
Hausta	106	46	13	42	5		800	
Savalen	483	120	135	175	53		2300	
Tynset	401	110	130	133	28	2	2500	
Os	204	41	85	78	0	1	1300	

Diamond drilling:

1981 -	921 meters	-	5 holes
1982 -	2016 meters	-	13 holes
1983 -	3290 meters	-	25 holes
1984 -	1398 meters	-	17 holes

Σ =	7625 meters	-	60 holes
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Approximate

number of	1981 + 82:	1983:	1984:	Σ 1981-84:
drill core				
samples	200	250	400	850
rock samples	350	100	50	500

RECOMMENDATIONS

The survey area this year is divided into 4 separate areas, one in which gold is the potential metal.

A. Folldal area.

Follow-up work are continued in three grids from 1983, and two new grids are established.

This area require continued attention in the future. At present ground geophysics take place in the Streitmyra grid, and will probably require future drilling.

The fact that the grids Sveen, Streitmyra and Nygruvhøgda all are in (stratigraphic) vicinity to known, small deposits, make them attractive targets. One should not drop any outlined conductor here without thorough testing.

Extention of the Ørnhovda grid is required. Similar with the earlier worked Knutshovda grid, that has missed the target.

B. Hausta area.

This area is not covered by the airborne survey. Targets are outlined from gold stream sediments. Gold anomalies is generally coincident with the ultramafic belt, which is a lower horizon than the main sequence of volcanics.

The two most promising grids were followed up this year, and included diamond drilling. Drillcore analyses showed very low gold values, and further drilling are not recommended in this state. Geochemical deep-moraine sampling is considered to be most convinient in future follow-up.

C. Tynset area.

The Tynset area, with the Vingelen accumulation of felsic volcanics and frequented trondhjemites, require more work next year - including ground geophysics, geology and probably diamond drilling. It is recommended to concentrate in the Vard-tjern - Nonsvola area, with known high-grade Cu - Zn mineralization, Cu-bearing trondhjemite intrusions and tectonically influenced geology (marked turn in strike direction).

One should also draw attention to the Vingelen deposit to the north. It is still open to the depth. One drill hole in 1983 intersected the ore: 0,81 % Cu and 2,35 % Zn over 1,7 m.

D. Os area.

Follow-up work this year include drilling in three grids. No more work are recommended here.

Recommended work from 1983 that remains, include the Nyås grid: to carry through the ground geophysics and soil sampling. More drilling are proposed at Storfloen that assayed up to 900 ppb Au in a graphite argillite hosted by a talc schist, from a 1983 drill hole.

LOCATION AND ACCESS

The Folldal Project is located between latitudes $60^{\circ}00'$ and $62^{\circ}35'$, and longitudes $8^{\circ}50'$ and $11^{\circ}15'$ east, trending generally in a northeast - southwest direction. The area is approximately 300 km north of Oslo and is serviced by major paved roads both in eastern and western sections. Secondary roads can be found throughout.

Two major rail lines, both of which connect Oslo and Trondheim, service the project area. The western line runs through the villages of Dombås and Hjerkin, while the eastern lines has stations at Alvdal, Tynset and Os. The major supply centers are Dombås, Folldal, Alvdal and Tynset.

LAND STATUS.

Folldal Verk currently holds claims throughout the project area, at Grimsdalen, Tronfjell, Sivilvangen, Rødalen, Fådalen, Vingelen, Os and the old producers around the Folldal area.

History and previous work.

The Folldal project area includes many various sized (up to 19mm tonnes) massive and disseminated copper zinc- sulphide mines that can be dated back as early as 1748 with the first production from a copper mine in the town of Folldal (Hovedgruve). This mine was worked intermittently until 1940. During this time other mines were put into production in the vicinity of the Folldal camp, namely Nordgruve, Søndregruve and Nygruve.

Other small showings had limited production in the Fådalen, Rødalen and Sivilvangen area from 1722 although these were small scale operations.

To the north of the project, Vingelen, Foss gruve and Oskar II were small but important massive sulphide copper zinc mines. These old showings are approx. 15 to 25 km south west of the Røros massive sulphide camp and are within the same volcanic belt. Many small diggings and adits can be found throughout the area, and most if not all surface exposures of sulphide have been found.

Presently, the only producing copper zinc mine in the area is Folldal Verk's Tverrfjellet mine in the western section of the project area. It is one of Norway's largest massive sulphide type deposits. (19mm tonnes).

Previous work by Folldal Verk A/S in the project area has included ground geophysics, stream sediment surveys, and diamond drilling, basically in the vicinity of the old workings.

SOME PAST AND PRESENT MASSIVE SULPHIDE MINES (AND PROSPECTS).

N A M E :	PRODUCTION:	TONNAGE (MM TONNES)	% Cu:	% Zn:	% Pb:	Ag (ppm)	Au (ppm)	% S
Tverrfjellet	1968	19,0	1,0	1,2	0,06	18	0,2	36
Folldal Hovedgruve	1738-1940 (discontinuous)	3	1,5	3,0	0,3			35
Nordre Geitryggen	1936-1970	2,5	1,3	3,2	0,2	31	0,2	34
Søndre Geitryggen	1950-1965	0,5						
Nygruva	1940-1952	0,3						
Grimsdalsgruva	No production	3,0	0,8	1,2	0,008			32
Grimsdalen (prospect)	No production	10,0	0,3	2,8	0,15	10-15		25-35
Sivilvangen	1915-1917	0,001	1,5-2,5	> 06,0				
Fådalen	1722-1788 (discontinuous)	0,1						
Rødalen	1751-1810 +1911-1914	0,4						
Røstvangen	1908-1921	0,4	2,6	1		10-80	0,3-2,0	43

REGIONAL GEOLOGY

The Caledonian fold belt of Central Norway is composed of sedimentary, igneous and metamorphic rocks of Precambrian to Middle Devonian age, the Lower Paleozoic part of which is mainly allochthonous and derives from a primary location to the south-west of the present Atlantic seaboard.

The Cambro-silurian rocks of the Folldal-Røros district make up the south-eastern limb of the large and complexly folded synformal structure composing the Trondheim Region. The Folldal project area lies within the southeastern section of the Trondheim greenstone belt and includes rock types of both sedimentary and volcanic origin. These rocks were deposited in the extensive Caledonian geosyncline during Cambro-Silurian times and can be seen to extend almost the total length of Norway's west coast. The east and west section of the Trondheim greenstone belt show definite rock type co-relation, especially with the main volcanic units, although depositional environment was very different. The western section of the belt, which includes Folldal Verk's large Tverrfjellet mine (19 mm tonnes) and even the bigger mine Løkken gruber (30 mm tonnes), is generally thought to be closely associated with ocean floor volcanic activity, and includes rocks of more tholeiitic composition. The eastern limb of the geosyncline can be seen to include a much more differentiated rock type, perhaps indicating island arc deposition.

The 1984 field season was restricted to the eastern limb of the syncline, and the following describes the associated rock units. The base of the belt is underlain by a thick succession of sparagmite (feldspathic arkose) and augen gneiss (turbidite sequence) of Eocambrian age. Overlaying the Eocambrian rocks is the Hummelfjell formation. It includes generally a sedimentary sequence of quartzites, qtz. mica schists and graphite schists, with minor associated mafic tuffs. The upper part of the Hummelfjell fm. constitutes chromite-bearing serpentinites that make up a distinct soapstone horizon from Folldal to Røros.

LEGEND

-  GULA GROUP
-  HERSJØ FM.
-  SULÅMO GROUP
-  RØROS FM.
-  HUMMELFJELL FM.
-  AUGEN GNEISS
-  SPARAGMITE
-  GABBRO
-  SERPENTINITE
-  TRONDHJEMITE

* Cu - Zn MINES,
PAST AND PRESENT

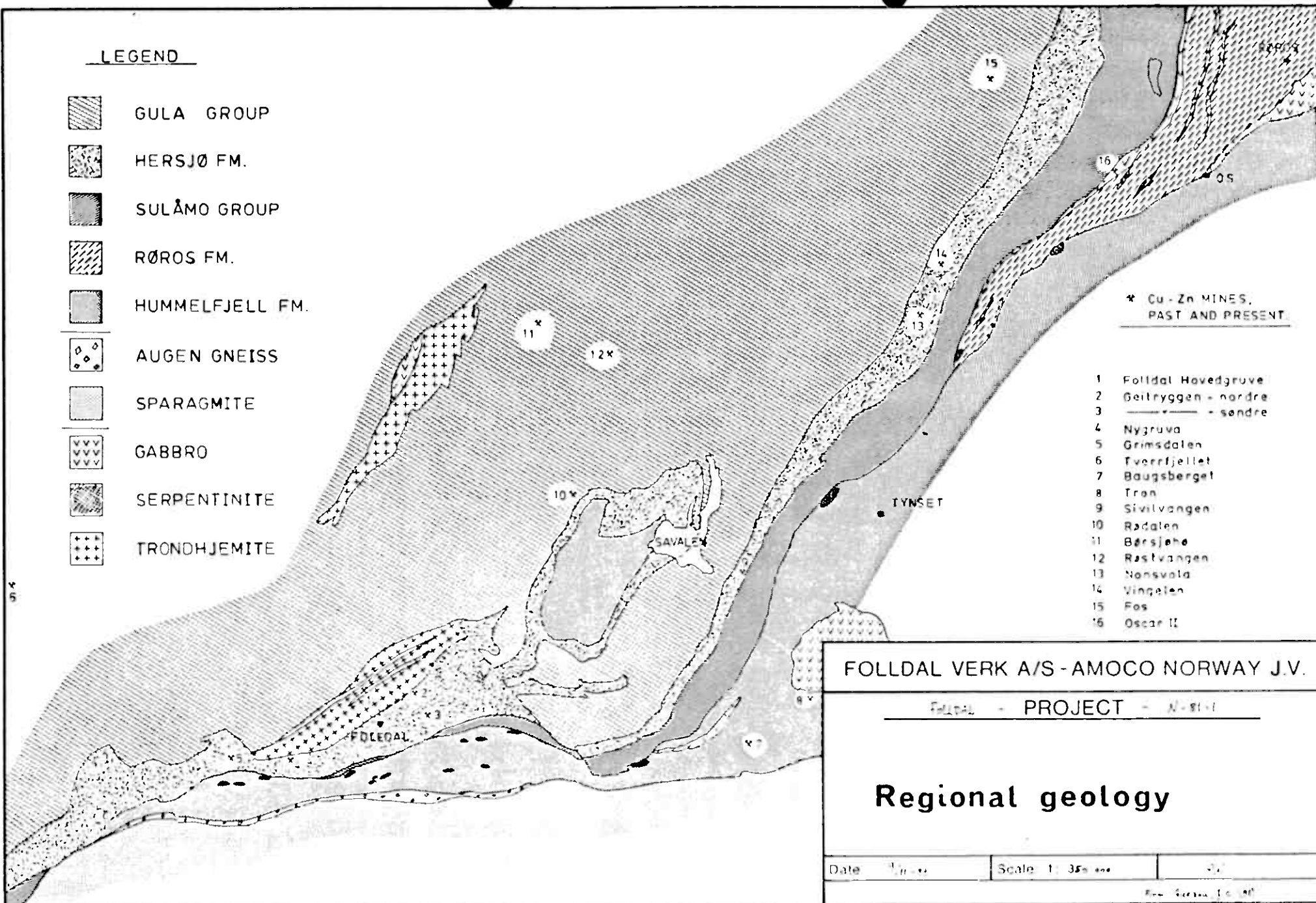
- 1 Follidal Hovedgruve
- 2 Geitryggen - nordre
- 3 " " - søndre
- 4 Nygruva
- 5 Grimsdalen
- 6 Tverrfjellet
- 7 Baugsberget
- 8 Trøn
- 9 Siviltvangen
- 10 Rødalen
- 11 Børsjøen
- 12 Rastvangen
- 13 Nonsvold
- 14 Vingelen
- 15 Fos
- 16 Oscar II

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Regional geology

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Overlying the Hummelfjell group is the Røros formation, which has associated ultramafics (dunites, serpentinites), quartz biotite schists, greenstone, and minor graphite schists + conglomerates, and intruded gabbroes. The Røros schist formation thin out southwards and dissappears.

Overlying the Røros fm. is the Sulåmo group with meta arenites and thins beds of greenstone and keratophyre.

The Hersjø formation is the next in succession and is considered the main volcanic belt of the eastern limb of the syncline. The volcanics include a differentiated sequence of greenstones, mafic tuffs, felsic tuffs (keratophyre) and minor rhyolitic flows - and minor dacite and graphite horizons.

The Gula group which caps the whole greenstone belt, includes a large succession of sediments with minor thin beds of mafic volcanics (amphibolites), may be in faulted contact with the underlying Hersjø fm., and exact age of the group is highly controversial. The Gula group has been considered to represent the oldest, assumed Late Precambrian/Cambrian member of the partly inverted stratigraphical succession, pre-dating the volcanogene Hersjø fm. of probable Lower Ordovician age.

It is possible, though not proved, that the rocks of the Gula group in the central Trondheim area have been overturned and belong to a large recumbent nappe with roots far in the west. The rocks of the Folldal - Røros area, which dip westwards, may be overturned, the Røros schist and Hummelfjell fm. thus representing the highest sediments and the Gula group the lowest.

Alternative opinions on the age of the Gula group, based on geotectonic considerations, have been put forward in later years.

STRATIGRAPHY OF THE EASTERN SUCCESSION OF THE TRONDHEIM REGION
(FOLLDAL-RØROS AREA)

Rock associations	Group/formation	Ore deposits
Mete-greywacke, mainly calcareous/calcareous micaschist. Amphibolite and greenstone. Limestone. Cgl. Graphitic phyllites, Trondhjemite and gabbro.	Singsås fm.) Gula- Åsli fm) group	Rødalen, Røstvangen, Bøsjøhø, Fos , Kvikne
Greenstone, keratophyre. Interlayers of pyroclastics and green sediments, siliceous banded sediments. Cgl. Layered gabbro and trondhjemite. Meta dolerite sills and dykes.	Hersjø fm. (Fundsjo gr. to the north)	Folldal mines, Sivil- vangen, Vingelen, Killing- dal, Hersjø.
Mica-arenites and polymict cgl. Mica- and graphite schists. Thin beds of greenstone and Keratophyre.	Fjellsjø-) Sulåmo Kjurudal fm.) group (Setersjø fm. to the north)	Hesjedal
Calcareous mica schist with thin intercalations of greenschist. Serpentinite. Thin strata of graphite schist and marble. Meta dolerite sills and dykes. Meta-gabbro.	Røros fm. (incl. Røsjø fm.)	All the Røros deposits + Feragen chromite.
Feldspathic quartzites. Qtz mica schists. Amphibolite. Marble. Gabbro. Diabase dykes or sills. Serpentinite.	Hummefjell fm.	Baugberget, Tron
Augen gneiss Sparagmite	Eocambrian	

General strike direction of the units is north easterly, dipping steeply to the north west. Highly folded areas exist throughout and can be found in association with sulphide mineralization.

Faulting is not readily apparent although low angle thrust zones have been mapped within almost every geological unit and consequently a great deal of imagination must be used for interpretation.

Intrusive rocks of Caledonian age varying from acidic to ultra-basic composition occur throughout the region, although they are of insignificant areal extent.

MASSIVE SULPHIDE DEPOSITS

The deposits are fairly typical massive sulphide volcanogenic deposits, being predominantly pyrite, chalcopyrite, and sphalerite with variable amounts of magnetite. Alteration zones are generally chloritization, sericitization, silicification and albitization. The deposits can be divided into two slightly different types however, with those in the western more mafic belt being more closely related to sulphide-oxide iron formations, and higher in total tonnage, but lower in grade than those in the eastern belt. The deposits in the eastern belt belong to a more differentiated sequence of volcanics which include considerable felsic flows, tuffs, and pyroclastics. They are generally smaller in size, but higher grade than those in the western belt.

The sulphide deposits which occur in the underlying mica schists are generally small tonnage, high grade copper deposits. Those in the overlying Gula schists are also generally fairly small but can be quite high grade copper and have appreciable Ag - Au contents.

Most sulphide occurrences are in close association with one of five geological units as follows:

1. The Hummelfjell formation in close proximity to gabbroic intrusives.
2. The Røros formation in close proximity to gabbroic intrusives.
3. The Hersjø formation volcanics.
4. The Gula group-contact Singsås formation/Åsli formation.
5. The Gula greenstone.

DISCUSSION OF RESULTS WITH RECOMMENDATIONS FOR FUTURE INVESTIGATIONS

A. Folldal area (Map 1519 II)

Only three grids are followed up from 1983 with continued work: Ørnhovda, Nygruvhøgda and Solbakken.

Two new grids are established: Sveen and Streitmyra.

Work include: Shootback, VLF, magnetometer, Apex max-min, soil sampling and diamond drilling.

The follow-up grids from 1984 are:

- A.1 Sveen
- A.2 Streitmyra
- A.3 Nygruvhøgda
- A.4 Ørnhovda
- A.5 Solbakken

A.1 Sveen

Baseline: 1500 W - 0 EW

Profile length: 400 N - 500 S

1984-work: VLF, mag, shoot-back,
soil, geology

The Sveen grid is situated between Nordre Geitryggen and Nygruva mines - and covers the same stratigraphy: The Folldal-Knutshovda trondhjemite, and below tuffaceous greenschists with minor quartz keratophyres.

The picture of the conductive zones are: Two extensive conductors related to graphite horizons run through the grid. One at about 200 N is not exposed, but rusty water coming out in a creek, and partly following mag anomaly indicates pyrrhotite-bearing graphite.

This graphite horizon can be seen from the airborne survey map to stretch from Nygruva to Nordre Geitryggen deposits (where the horizon stratigraphically overlies the deposits). Therefore the most interesting anomaly picked up by the ground geophysics a weak (to intermediate) conductor just north of the baseline between 1000 W and 600 W.

Most of the bedrock between the graphite horizons are covered, but it's interpreted as mainly greenschists with minor felsic tuff intercalations. The Nygruva deposit 2 km to the west are hosted by a narrow qtz keratophyre that very likely is a host for also this conductor in the Sveen grid.

Soil is only slightly anomalous over the zone, but unfortunately samplepoints over the best part of the conductor are missing - and it should be possible to take appropriate samples here before dropping this conductor.

The second graphite horizon runs through the grid at about 300 S, and continues to the east where it overlies the Søndre Geitryggen deposit. It is seen to occur at the boundary between greenschist and a keratophyre unit.

The lower contact of this keratophyre to a new greenschist unit is also accompanied by a conductor, probably related to graphite. The keratophyre unit is about 75 m wide.

The two profiles 1200 W and 1300 W also give an EM-anomaly at 425 S. This anomaly is probably caused by a graphite horizon at the bottom of another lower keratophyre unit. This is assumed

to be the same graphite horizon that is exposed in the Nygruva-grid. But these two last mentioned conductors should be checked by soil sampling.

Recommendations: Cover the three mentioned conductors with soil sampling.

A.2 Streitmyra

Baseline: 1500 W - 200 E

Profile length: 800 S - 400 N

1984 work: VLF, mag, geology.

Work is just started in this grid, and VLF, mag, shootback, and if possible soil sampling (mostly swampy terrain) will be carried through, partly this winter.

This grid covers the continuation 300 m westwards from Nygruva, but the two areas are possibly divided by a thrust.

The Streitmyra grid covers at least 6 - 7 conductors detected by the airborne survey.

A.3 Nygruvhøgda.

Baseline: 1000 W - 200 E

Profile length: 500 N - 500 S

1984-work: Geology

This grid is established to cover an interesting, highly conductive and relatively short conductor from the airborne survey.

The ground geophysics pick out no such conductor, but VLF and partly shootback show one weak conductor from 300 W, 200 S to 100 E, 100 S that most likely correspond with the conductor from the airborne. This conductor is accompanied by anomalous Cu in soil downstream on three profiles. The anomaly cause can however not be explained in the relatively well exposed bedrock.

Another, nearly parallel, weak conductor nearby, just north of the baseline, show up on shootback but not on VLF. This also could be the one from the airborne. It is however not accompanied by positive soil sample values - but mineralization are found at OEW, 25 N: A narrow zone of white, partly sugargrained, pyrite disseminated, quartzite (volcanic quartz) occur in the amphibolite schist - with mineralization near the contact: euhedral magnetite and pyrite (most frequently in bands in the amphibolite schist) assaying 9 ppb Au, 400 ppm Cu, 0.3 % Zn, < 0.5 ppm Ag and 8 ppm Pb. This might cause a very weak conductor.

Mineralization also occur at 150 W-175 W, 10 N - but probably with no connection along strike from the one at OEW, 25 N. Here a pyrite and pyrrhotite mineralized felsic tuff (narrow band at 150 W) grades into a pyrite disseminated (bands) amphibolite schist (175 W). This is beleaved to give enough conductivity for the weak CEM anomaly.

Tight meso-folds are seen frequently in this area, and folding could have given repetition of mineralized zones - with a possible concentration at depth that are picked up by the airborne geophysics. Apex max-min with wide spacing should be used over this zones to pick up an eventual deeper conductor.

Another interesting geological feature is a thin dark chert horizon in the SE part of the grid - 1 - 2 m thick, rusty from dusty pyrite and in places with graphite coating on schistosity planes. Above this horizon is a thin unit of coarsegrained amphibolite-gneiss with visible traces of chalcopryite. The chert horizon can be followed along strike at least 800 m eastwards from the grid.

Such quartz-pyrite rocks are known as laterale facies equivalents of massive sulphide deposits.

The conductor in the northern part of the grid showed to be graphite along a felsic/mafic contact.

In brief the geological environment in the grid area mainly consist of mafic tuffs and minor flows with thinner units of felsic volcanics, cherts and graphite horizons (a VLF anomaly at 400 W, 500 N is related to graphite at the contact to the quartz keratophyre from the Sveen grid.)

Recommendations: Cover the eastern part of the grid around the baseline with Apex max-min (long cable) and preferably with magnetometer. The chert horizon and continuation should be followed along strike with VLF and some soil samples.

A.4 Ørnhovda.

Baseline (B.L.2): 200 W-800 E

Profile length: 250 N - 500 S

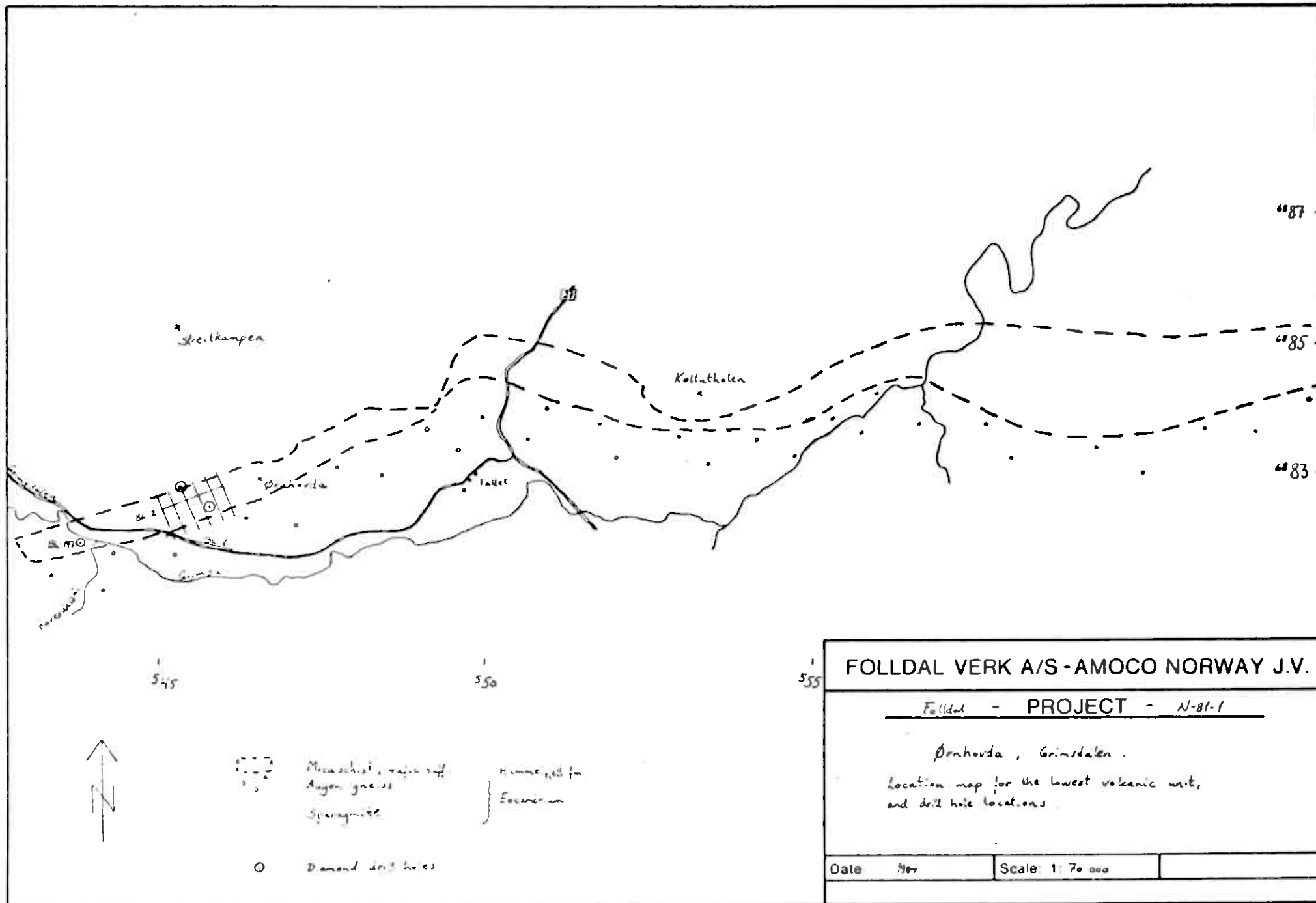
1984-work: VLF, APEX, geology,
soil samples, drilling.

This grid in Grimsdalen is established outside the airborne covered area, based on anomalous copper in sediments from a creek draining from the grid area. This years partly resampled soil show a weak copper anomaly downstream from an extensive EM-conductor just above where the creek starts. This conductor was drilltested, and intersected graphite schist (assumed to be the same graphite bearing mica schist as intersected in drillhole no. 197 (1970) - see map on following page.)

Two edged but quite small mineralized floats, interpreted as local weathering materiale, were found just above the conductor in the hillside: micaschist with banded (< 1 cm) chalcopryite mineralization assaying 2.0 % Cu and 0.08 % Zn.

In Grimsdalen the overburden can be very thick and consists of moraine materiale and glacial lake sediments in terraces. In the hillsides outside the terraces and in higher areas the overburden is thin (just like where the mineralized floats are found), and consists mainly of ablasionsmoraine mixed with local weathering materiale. The main direction of transport was north-northwesterly. The materiale that occur in the overburden is not longtransported (the main glaciers center was just south of Grimsdalen).

The second drillhole did not intersect any conductor (weak indication on EM), except weak sulphide impregnation and galena and hematite in quartz-feldspar-calcite veins. Young pegmatite veins with sulphide mineralization are reported earlier within the Trondheim Nappe. (At Dølvad (in the Gula group north of Folldal) a system



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Ønehovda, Grimsdalen.

Location map for the lowest volcanic unit, and drill hole locations.

Date 1981

Scale 1:70,000

of steeply inclined joint fillings of coarse grained quartz and calcite, each about 50 cm in thickness, follows a NW-SE trend. Pyrite and galena are found as coarse grained aggregates in the pegmatite).

Recommendations: The Ørnhovda grid should be extended - the anomalous stream sediments and soil in addition to the mineralized floats demands for further interest. The extension of this volcanic related horizon should be followed eastwards against Alvdal with geological mapping supplemented by some VLF profiles (the grid is outside the airborne covered areas) - with regard to sulphide mineralizations.

A.5 Solbakken.

Baseline: 0 EW - 800 E

Profile length: 300 N - 300 S

1984-work: Geology, soil
sampling.

Geologically this grid covers a part of the south eastern flank of the updoming Savalen - Einumfjell anticline - in which the Hummelfjell formation are exposed. The entire bedrock in the grid corresponds to the Hummelfjell fm.'s rocks - phyllites and micaschist.

One of two interesting conductors is exposed in a creek, and showed to be graphitic phyllite with associated pyrrhotite dissemination. The other neighbouring is assumed to be the same.

This is examples of graphite related anomalies that hardly can be discriminated from ore related anomaly patterns. The lowest conductor is followed by VLF with overlapping mag. Both VLF and mag. indicate a "splitting" into two conductors against east. The conductor is followed by anomalous (Cu, Zn, Pb) soil slightly downstream. A corresponding anomaly pattern follows the other conductor.

Recommendations: The area should be dropped.

B. Hausta area.

B.1 Hausta II

Baseline: 400 S - 500 N
Profile length: 550 W - 500 E
1984-work: VLF, CEM, geology ,
drilling.

B.2 Hausta IV

Baseline: 600 N - 2600 N
Profile length: 350 W - 300 E
1984-work: VLF, CEM, APEX,
geology, drilling

Geologically the area belong to the Sulámo group with micaschists, greywackes, graphite schists and minor volcanics - with a ultramafic (serpentinite) horizon and intruded gabbros.

Our target in this area is gold associated with altered ultramafics. Follow-up work are based on stream sediment geochemistry. Regional stream geochemistry has indicated that parts of the ultramafic horizon are anomalous in gold.

Favourable environment for gold are known to be serpentinitized and talc-carbonate altered ultramafics.

This year we continued work in two grids with high Au content in soil. Two drill holes in each grid have tested combined geophysical and geochemical anomalies.

When we went for geophysical anomalies as drilling targets, it was for the hope that there would be sufficient pyrite and chalcopyrite present (together with Au) to give a geophysical anomaly.

Gold exploration require intensive geological survey with detailed rock and soil geochemistry. This is impossible in this area, with thick overburden. One drillhole showed 15 - 20 m overburden (glacial lake terrace, with following gold anomaly), and the encouraging anomalous gold in soil samples are consequently of little value. Glacial soils may well mask, and give false geochemical anomalies.

Drillcore analyses showed surprisingly low Au-values, with a maximum of 32 ppb (less than 10 times the average content of Au in the upper lithosphere (0.004 ppm in ultrabasic rocks)). Two holes (Hausta IV) are drilled in a sulphide impregnated gabbro (up to 0.3 % Cu over 1 m), one hole intersected a serpentinite conglomerate and in the last graphite.

Interesting results (useful for further exploration) from otherwise discouraging results are:

The ultrabasic serpentinite conglomerate has talc-carbonate matrix. Intersected quartz veins (very few) do not increase the gold assays. Gold are enriched at the lower contact of both the gabbro and the serpentinite - to a carbonaceous mafic tuff.

Where talc is observed, gold is enriched.

High Au can to a certain degree be seen to follow high Cu, but not vice versa.

Gold are enriched in graphite schist.

Rock samples taken from a digging (Hausta IV, 1700 N-0 EW) in a pyrite disseminated greenschist give up to 32 ppb Au. Two other localities are rocksampled this year:

	Au (oz/ton)
Digging, pyrrhotite mineralized gabbro (Hausta IV, 830 N - 550 E)	NIL
Pyrite mineralized felsic volcanic (Hausta II, 200 S - 50 W)	NIL

Recommendations: From this years follow-up it seems like the Hausta area has little potential for gold, but since the cause for the stream and soil gold anomalies are not found, continuation of the project can be advocated.

The most convinient method in our case is considered to be deep moraine sampling around the assumed sources for the stream anomalies and the new soil anomalies. A small hammer drill (+ a jack) can be operated by two persons (20 - 30 samples a day). Samples should be taken from the moraine at the contact to bedrock. It also should be possible to bring up a plugg of the bedrock for analyzing (and to improve the geological picture). Then the assays for the bedrock and the imidiate moraine could be compared, to get a picture of the dispersion of Au in the area.

C. Tynset area.

This years work include mainly drilling in grids from previous years - and follow-up work in five new-established grids from this year.

C.1 Tallsjøen

Baseline: 0 NS - 400 N

Profile length: 200 W - 200 E

1984-work: VLF, CEM, mag,
geology, soil samples.

This grid is established to check a short airborne anomaly, situated in the Røros schists close to the upper boundary, and in the vicinity of gabbroes. This environment has shown to be favourable for the Røros-type deposits (all the old mines at Røros, and the Oscar II mine just north of Tallsjøen.) The Røros deposits were group of once important but now exhausted mines, occurring in the Røros schists underneath the Hestkletten metagabbro. Hestkletten and Christianus Quintus mines occur just below the gabbro- and Stortvart, the most important mine, and Kronprins Olav in the same horizon lie 60 - 80 m below the metagabbro. Also several deposits in the lower Hummelfjell formation are phyllite hosted and close to gabbros (Tron and Baugsberget).

Three conductors are picked out by EM: One are caused by an electric line. Two profiles were extended to cover the graphite horizon (also overlying the Oscar II mine), indicated at 350 W. The interesting anomaly show up on VLF and CEM between 100 N, 50 E and 400 N, 35 W. It is indicated as a very strong and wide conductor on one profile, with less conductive and narrower ends. Flanking mag. follows the conductor, and are strongly enhanced at the conductor ends (0 NS and 400 N). Along the conductor high mag. follow low conductivity. One possible interpretation is two thin magnetic ultrabasic/gabbro bodies (seen just north of the grid) with lenseshaped graphite schist (very high conductivity) or massive ore (?) inbetween.

Proper soil sampling are impossible with the situation of the conductor beneath a lake, but soil from the lake shore give rather

high (anomalous) both Cu, Zn and specially Pb values.

Recommendations: To test this anomaly it is necessary to drill, that is recommended by the geological position and environment. It is possible to drill from the shore at 200 N.

C.2 Milskifte

Baseline: 0 NS - 600 N

Profile length: 200 W - 200 E

1984-work: VLF, CEM, Mag,
soil samples.

To cover a relatively short anomaly from the airborne survey, this grid was established as an extension south of the Bakkvollen grid. Stratigraphically the rocks belong to the bottom sequence of the main volcanic belt (Hersjø fm.).

CEM and VLF pick out the conductor from 600 N, close to B.L., southwards with the strike bending more to the east, to 300 N, 75 E. Or in fact the turn of the strike can be explained by two conductor zones, indicated by CEM at 300 N, and by mag that partly flanks the whole conductor. The high mag area widens out at 300 N.

No outcrop can be seen in the area, but the conductor is likely graphite related. Geophysics show very strong conductivity. Soil samples give slightly anomalous Zn and Pb over the zone. At Bakkvollen, just to the north, graphite schist gave similar Zn - Pb anomalies. This is probably due to a small basemetal content and the graphiteschists poor weathering resistance. At Milskifte pyrrhotite too is thought to accompany the graphite schist (enhanced mag following the conductor).

Recommendations: The conductor is assumed to be graphite related, and therefore dropped.

C.3 Granmo

Baseline: 0 NS - 700 N

Profile length: 200 W - 200 E

1984-work: VLF, CEM, mag.,
soil samples.

This grid covers a single anomaly (from the airborne) in the Røros schist unit. The conductor runs along baseline from 700 N to 400 N (300 N - profile is disturbed by powerlines).

Bedrock is entirely covered. Interpretation: EM shows strong conductivity, typical for graphite. Mag is slightly depressed in a wide area around the conductor, with slightly higher mag over the conductor. This indicate pyrrhotite dissemination. Soil shows enhanced Zn and Pb (no Cu) content over the conductor (like at Milskifte).

Recommendations: The conductor is probably due to graphite schist and further work should be stopped.

C. 4 Motun

Baseline: 0 NS - 100 S

Profile length: 200 W - 200 E

1984-work: VLF, CEM, mag.

This geological situation in the Hersjø volcanics is interesting. It is within the lower keratophyre sequence - same as Vardtjern/Knappåsen to the south (the upper sequence hosts the Nonsvola area/Vingelen mine).

Airborne survey pick up one single anomaly, that is verified in the ground geophysics. The situation in the middle of Vingelen centrum, entirely on farmland, allow only two profiles far enough from the frequented powerlines and fences. The conductor, occuring just east of the baseline, is strong. Mag. is not coincident with the conductor, but has one high-area on each side of the EM-anomaly.

Recommendations: The geological situation should demand for further interest, but the cultural situation makes it difficult. Av even-tuality before possible drilling is to take deep-moraine soil samples (close to bedrock), to avoid agricultural contamination.

C. 5 Nyvangåsen

Baseline: 1300 S - 0 NS
Profile length: 200 W - 200 E
1984-work: VLF, CEM, mag.,
soil samples.

This grid is the southern continuation of the Vardtjern grid, covering the same main graphite horizon. The interesting anomalies occur below the graphite horizon (ground - EM outlined two parallel graphite horizons). Ground geophysics show an extensive conductor all through the grid (weakens to the north) between 1300 S, 100 E and at least to 400 S, 140 E. The conductivity is variable, from strong to weak. Mag. is also variable along strike, but generally high mag flank the whole conductor.

Soil showed constant low assays, with a few scattered highs not coincident with the conductive zones. No outcrop are found.

Recommendations: After the negative geochem., further work (drilling) are not recommended.

C. 6 Åsvangen.

Baseline: 500 S - 1500 N
Profile length: 400 W - 300 E
1984-work: Geology, soil samples.

This grid covers the extensive graphite horizon from Nonsvola, and it runs through the grid close to the baseline. Even if it is a very weak anomaly to be graphite schist, it proved to be at one outcrop (rusty graphite schist). At 1300 N a NW - SE fault cuts through the grid and the northern continuation of the graphite schist is off-set 100 m to the east. The graphite horizon follows the boundary between a quartz keratophyre and an overlying carbonaceous greenschist. Another conductor caps the upper boundary of this greenschist between 500 N and 1200 N (125 W). This too is probably graphite-related (more conductive than the verified graphite). Two soil-sampled profiles are however Cu - Zn (-Pb) anomalous over this conductor. Magnetic highs overlapping the conductor indicate pyrrhotite dissemination. The greenschist is highly chloritic below the conductor.

A third strong conductor occur at 1500 N, 250 E and is related to pyrite-impregnation in a quartz keratophyre. This impregnation is however not assumed to give such strong response on EM. Associated graphite aside could be the reason.

Recommendations: The most interesting anomaly (500 N-1200 N, 125W) should be checked, although the chances for graphite are considerable. Instead of drilling, the easiest way is to trench in the northern part where the overburden is thin.

C. 7 Stormyra.

Baseline: 0 NS - 1000 N

Profile length: 300 W - 500 E

1984-work: Soil samples.

This grid covers the main graphite horizon from Nonsvola and Åsvangen. Interesting anomalies aside of it are shown at the airborne survey. Shootback (100 m spacing) separate three near conductors, (at least at lines 500 N and 600 N) although it is difficult to interpret.

The main graphite horizon may in fact be two: The strongest run through the grid at 150 E - 200 E, hosted by quartz keratophyre, and overlapped by mag (probably pyrrhotite impregnated). The other follow along the border between the quartz keratophyre and overlying green phyllite (75 - 100 E). The cause for the third anomaly at 500 N and 600 N in the same quartz keratophyre is unknown. The few (because of swamp) soil samples give one high Cu over the western conductor, and one high Zn over the eastern most.

Recommendations: Another geophysical method should be used for better separation of the conductors: Apex max - min or even VLF.

C. 8 Vardtjern/Knappåsen

Baseline: 1200 S - 2050 N

Profile length: 700 W - 800 E

1984-work: VLF, CEM, mag,
soil samples, geology,
drilling.

At Vardtjern encouraging results from specially soil samples, together with geological features and the presence of several resented Zn - Cu - Pb diggings, have led to extensive work.

The baseline is situated between two main graphite horizons that runs from the south and dies out in the northern part of the grid. Some shorter (and weaker) EM-conductors, occurring inbetween, also turn out to be graphite related. EM over the diggings gave no (or very weak) response - explained by the weakly conductive association sphalerite - disseminated pyrite.

The rocks in the grid area consists of mafic and felsic volcanics (flows and tuffs) with minor intercalations of phyllite and graphite schists. Lenses of trondhjemite occur throughout, specially in the northern part.

The main feature is a thick sequence of felsic volcanics (quartz keratophyre) in the northern part - and mafic volcanics to the south. This change along strike is quite sudden around 600 N, and might be caused by a fault - or by a facies transition from felsic to mafic volcanics to the south.

The geochemical features fits the geology very well: associated with the mafic volcanics (south of 600 N) are high Cu-values in the soil - and north of 600 N, in the quartz keratophyre, soil are generally very Zn - Pb rich. This is explained by the Zn - Pb - Cu mineralizations in the felsic volcanics.

One sample from the digging at 710 N, 100 E assays 0.9 % Pb, 0,5 % Zn, 0.05 % Cu and 4 ppm Ag - otherwise Zn generally dominate over Pb.

The mainly felsic volcanics north of 600 N are intruded by trondhjemite sills in different levels. The sulphide mineralizations also occur in different levels - always hosted by felsic volcanics, and some close to trondhjemite sills (also the case with the sulphide occurrence detected this year - see later).

Four drillholes, two this year, are drilled south of 600 N in the mafic volcanics. Two intersected graphite, the other two disseminated sulphides.

This year the grid was extended north to cover the continuation of highly anomalous Zn - Pb in soil along the baseline. Explanation for this is found as massive pyrite - sphalerite - chalcopyrite ore in a small digging at 1720 N, 10 W. The ore consists of thin alternating, (different mineralogy) concordant bands of massive sulphides which parallels the schistosity of the enclosing wall rocks. It is often high-grade Zn - Cu mineralization in contact with quartz boudins.

Two rock samples from the ore assay respectively:

1. 10.4% Cu, 32.0% Zn, 0.08% Pb, 68 ppm Ag, 550 ppb Au
2. 3.8% Cu, 29.2% Zn, 0.2% Pb, 40 ppm Ag, 120 ppb Au
(sample no 2. include quartz from the host rock.)

A third sulphide mineralization type occur outside the massive bands: Pyrite impregnation (up to 10 mm euhedral pyrite) in the keratophyre. The enclosing wall rocks are highly sericite altered, and south of the digging, along strike, the keratophyre contains euhedral magnetite.

This mineralization is probably small. VLF gives only weak response. Conductivity is stronger along strike to the north, where only pyrite impregnation are found. This mineralization may be connected to the pyrite impregnation (up to 15 mm euhedral pyrite) at 1300 N, 100 W, which is close to a trondhjemite sill, and hosted by exhalative quartz and a thin chlorite schist.

Other weak VLF anomalies are found in the vicinity of the sphalerite-related anomaly, and may have a similar cause.

At Knappåsen 1.5 km north of the Vardtjern grid several trondhjemite bodies occur in alternating felsic/mafic volcanics. One of them is mineralized(intense dissemination, chalcopyrite - pyrite - pyrrhotite - magnetite). The wall-rock greenschist is pyrite impregnated. The contacts between the Trondhjemite (including dykes and veins rooted in it) and the greenschist are generally sharp, but locally it is irregular trondhjemite-segregations in the greenschist (assimilation).

Assays from the trondhjemite:

	<u>Au(ppb)</u>	<u>Cu(ppm)</u>	<u>Zn(ppm)</u>	<u>Pb(ppm)</u>	<u>Ag(ppm)</u>
1	9	4886	382	119	1,5
2	5	2900	88	6	1,0
3	4	1400	65	8	1,0

Recommendations: Further work should be concentrated in the northern part of the grid, although it is not indicated any conductors in a wide area from the airborne survey.

In the Knappåsen area, airborne outline some high mag areas. One of them is coincident with the mineralized trondhjemite - so the others could be due to such sulphide bearing trondhjemite bodies, or gabbros (a few dioritic/gabbroic lenses are found at the margins of the mineralized trondhjemite).

The strike of the surrounding rocks is very variable in the Knappåsen area (turning around the trondhjemites).

The snow prevented more work (geological investigation) in the area, but it should be continued and extended next year to tie the Vardtjern and Nonsvola areas.

More object directed work should include IP for better outlining of the base metal conductor at 1700 N, 10 W and its continuation - and the other weak conductors around. Some soil samples north of 1500 N could be useful - lead is considered most reliable.

C. 9 Nonsvola

Baseline: 0 NS - 1500 N

Profile length: 300 W - 300 E

1984-work: VLF, drilling

The Nonsvola area is regarded as one of the most encouraging, situated in the same stratigraphical position as the Vingelen mine, with a thick quartz keratophyre horizon and an intrusive trondhjemite body, indications of local volcanic activity.

Geophysics combined with a high degree of outcrop, give following picture: Main rock-type is quartz keratophyre, together with chloritic greenschists, mixed tuffs and intercalated sediments (siltstone and phyllite). The lower mixed tuffs (with greenschists and chlorite schists) are overlain by felsic tuffs and rhyolite flows that grade into graphitic, felsic siltstones with minor

phyllites and graphite schists. This upper sequence is intruded by trondhjemite sills. Two parallel graphite horizons (the same that cap the Vingelen deposit) runs through the grid at respectively 100 W and 200 W. The easternmost seem to thin out and disappear to the south, with continuing sulphide (Py and Po) dissemination southwards (indicated by a drill hole, and outcrops).

Another conductor runs along baseline. It is most probably the same that is cut by two drill holes at 700 N and 1200 N: disseminated pyrite and pyrrhotite with intermixed graphite, poor in basemetals. Weaker pyrite (minor pyrrhotite) - dissemination occur throughout in the quartz keratophyre.

East of the baseline only weak EM-conductors occur - but it is here the diggings are situated. Drill holes in this part of the grid intersect sphalerite - impregnated rocks. This Zn-mineralization explain the generally very high Zn in soil.

The best section is in drill hole 84-02, with 0.6 % Zn over 4 meters. But associated Cu and Pb are very low in this intersected quartz keratophyre.

Higher Cu-assays are found associated with a more mafic (chloritic) rock (mixed felsic/mafic tuff) than the mentioned quartz keratophyre, and lower down. Rock samples from an old digging at 1090 N, 175 E assay 1) 10.2 % Cu, 1.9 % Zn, 33 ppm Ag and 2) 1.8 % Cu, 10.6 % Zn, 5 ppm Ag.

A weak shootback anomaly continues north from the digging, and this is drilltested at 1200 N, 155 E, with no results except of weak sulphide (Py and Po) impregnation. Another hole tested the digging, and showed that the mineralization weakens to depth. The best section gave 0.45 % Zn and 0.05 % Cu over 2 meters.

Assays and rock samples show that high Zn generally accompany high Cu, while high Zn often occur without high Cu. While sphalerite-mineralization generally are restricted to thin mm bands along bedding planes (and also scattered, together with chalcopyrite)-chalcopyrite are more irregularly distributed in clusters and disseminations.

Some small floats with massive sphalerite are found in a creek in the south-western part of the grid. As they were assumed to be local, a drill hole was set to test the nearby conductors. It intersected a graphitic schist with associated pyrrhotite, and a lower pyrrhotite - impregnated horizon. The source for the floats is not yet found.

Recommendations: Although this grid is extensively prospected, all the positive signs (close relationship to volcanic center, Zn-anomalous soil, scattered Zn - Cu occurrences, Zn-floats) demands further investigation.

This area should include in the earlier proposed Vardtjern - Knappåsen survey-area. An IP survey could be helpful to pick up weak-conductive zinc-mineralizations here, as in the Vardtjern grid.

C.10 Sivildalen.

Baseline (1984): 1900 S - 2100 S
Profile length: 400 W - 900 W
1984-work: VLF, CEM, mag, soil
samples.

Work was started in this grid in 1981. This years geophysics covered a small area that indicated anomalous soil from the 1981 survey. This area is just north of some old diggings (massive pyrrhotite).

This years EM show three parallel, near conductors - best separated by VLF. All three are overlapped by mag. anomalies. It seems to be the middlemost (or probably the easternmost) conductor that exhibits the geochem highs. From outcrop to the south it seem to be this anomaly that is related to rusty graphite schist, with the pyrrhotite conductor above (to the west).

Since the profiles have distance errors, it is difficult to follow the conductors, and to extend them south to the considered area. Swampy terrain prevent proper soil sampling.

Recommendations: The conductors are probably related to graphite schist and pyrrhotite mineralization, shown south of the grid - but to ensure the connection to the showings, VLF measurements should be extended south some profiles (2200 S - 2500 S).

C. 11 Tonnvola.

Baseline: 0 NS - 1600 N

Profile length: 500 W - 500 E

1984-work: drilling

This area is the continuation of conductors found along the Sivilvangen (Sivildalen) and Fådalen II grids. VLF, CEM, mag, soil sampling, geological mapping, and small amounts of Apex max-min (on - 200 N) were run in 1982.

The geology comprise of alternating sections of greenschist and quartz keratophyre overlain by a long trondhjemite unit, again capped by phyllite and micaschist. The alternation of greenschist and quartz keratophyre, with repeated graphite schist at the contact of the greenschist to the keratophyre, is probably due to isoclinal folding.

Apex over a digging at 100 N, 400 W (pyrite, minor sphalerite and chalcopryrite) picked up three neighbouring conductors (the easternmost weakens to the north). This years drill hole (800 N, 150 W) intersected two of these conductors: One meter graphite schist with 10 % Po and Py overlying a two meter section with pyrite (minor Po) impregnation (10 % sulphides). Basemetals assayed very low.

Recommendations: Further work are not recommended.

D. Os area.

This years follow-up in this northern part of the project area is restricted to three grids, including four drill holes that do not demand for further follow-up.

Last years drill hole at Storfloen intersected talc schist and underlying graphite argillites assaying up to 900 ppb Au. This should be given highest priority in future work. The Nyås grid just north of the Gruvåsen mine is just started, and should be continued with ground geophysics and soil sampling.

D.1 Nordervollen.

Baseline: 0 NS - 4000 N

Profile length: 800 W - 500 E

1984-work: VLF, CEM, mag, soil samples, drilling.

One drill hole intersected sulphide bearing graphite schist together with fuchsite bearing volcanics - with gold assays lower than 36 ppb.

At 1100 N - 1300 N and 400 W - 600 W gold and basemetals are anomalous in soil, possibly related to some disconnected, weak shootback anomalies.

Recommendations: If more work in this area, VLF should be tried for better outlining of this possible conductor(s).

D.2 Oscar.

Baseline: 1000 N - 1800 S and
3500 S - 4200 S

Profile length: 500 W - 200 E

1984-work: VLF, CEM, mag, soil samples, drilling.

This years work are concentrated between 1300 S and 1800 S, concluding with two drill holes at 1400 S, testing two parallel conductors 1400 m south of Oscar II mine, where the sulphidebody is hosted by phyllites in vicinity of gabbro and ultrabasite.

Both intersected conductors are thin massive pyrrhotite mineralizations in sulphide bearing greenschist. Also intersected is a metaleucogabbro, and a serpentinite with talcveining and pyrite. Gold assays from this show very low values. This is the same ultramafic horizon as at Hausta.

Recommendations: No more work are recommended.

D. 3 Djupsjøen.

Baseline: 0 NS - 1400 N

Profile length: 300 W - 400 E

1984-work: Drilling

The EM-anomaly accompanied by anomalous Pb is drilltested and showed to be related to graphite schist with associated pyrrhotite stringers and traces of pyrite and chalcopyrite.

Recommendations: This grid should be dropped.

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Mars

Includes all surveys performed on each grid for the 1984 field season. Maps with results from earlier years' work on the concerned grids, are not contained here, but referred to earlier year(s).

Box 1 of 2 : FOLLDAL and HAUSTA.

Grid location map

Legend for the geological maps

Geological maps with grid locations, Follidal

Sveen.....VLF, CEM, mag, geochem, geology

Streitmyra.....mag

Nygruvhøgda.....geology, +1983: VLF, CEM, mag, geochem

Örnhovda.....VLF, Apex, geochem, geology, drill profiles,
correlation map between old and new grid,
+1983: VLF, CEM, mag, geochem

Solbakken.....geochem, geology, +1983: VLF, CEM, mag, Apex

Hausta II.....VLF, CEM, drill profiles, geology, +1983:
VLF, mag, geology, +1982: geochem

Hausta IV.....VLF, CEM, Apex, geology, drill profiles,
+1983: VLF, mag, geochem

Box 2 of 2 : TYNSET and OS.

Tallsjöen.....VLF, CEM, mag, geochem, geology

Milskifte.....VLF, CEM, mag, geochem

Granmo.....VLF, CEM, mag, geochem

Motun.....VLF, CEM, mag

Nyvangåsen.....VLF, CEM, mag, geochem

Åsvangen.....geochem, geology, +1983: VLF, CEM, mag

Stormyra.....geochem, +1983: CEM, mag, geology

Vardtjern/Knappåsen..VLF, CEM, mag, ^{IP-RP,} geochem, geology, drill profiles, +1983:
VLF, CEM, mag, geochem, geology, IP-RP,
drill profiles

Nonsvola.....VLF, drill profiles, geological profiles,
+1983: CEM, mag, geochem, geology, drill prof.

Sivildalen.....VLF, CEM, mag, geochem, +1983: VLF, CEM, mag,
 Apex, geochem, drill profiles, +1982: VLF,
 CEM, mag, Apex, geochem, geology, +1981: VLF,
 CEM, mag, Apex, geochem, geology
 Tonnvola.....geology, drill profile, +1982: VLF, CEM, mag,
 Apex, geochem, geology
 Nordervollen.....VLF, CEM, mag, geochem, drill profile, +1983:
 VLF, CEM, mag, geochem, geology, IP-RF,
 drill profile
 Oscar.....VLF, CEM, mag, geochem, geology, drill prof.,
 +1983: CEM, geochem, geology, +1982: VLF,
 CEM, mag
 Djupsjøen.....drill profile, +1983: CEM, mag, geochem,
 geology

GRID NAME ABBREVIATIONS 1984.

Folldal area

Ørnhovde Ør
Nygruvhøgda Ngh

Hausta area

Hausta II Ha II
Hausta IV Ha IV

Tynset area

Vardtjern Va
Nonsvola Non
Sivildalen S
Tonnvola T

Os area

Nordervollen Nov
Djupsjøen Ds
Oscar Osk

Diamond drill logs 1984.

A) Folldal area :

1. Ørnhovda 1
2. Ørnhovda 2

B) Hausta area :

3. Hausta IV 1
4. Hausta IV 2
5. Hausta II 3
6. Hausta II 4

C) Tynset area :

7. Nonsvola 1
8. Nonsvola 2
9. Nonsvola 3
10. Nonsvola 4
11. Tonnvola
12. Vardtjern 1
13. Vardtjern 2

D) Os area :

14. Nordervollen
15. Djupsjøen
16. Oscar 1
17. Oscar 2

+ One drill log from 1983 :

18. Bakkvollen

drill logs

Diamond drill logs

1984



DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE 2

[illegible]

DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE 1

D.D.H. No.	0r - 84 - 2	Azimuth	Started	18.09.84	Directional surveys					
Property	Ernhovda	Angle	Finished	21.09.84	Depth	Azim.	Dip	Depth	Azim.	Dip
Co-ord.	B.L.2 : 200E, 220N	Depth	Logged by	RW						
		84.50 m								

From	To	Description	Interval		Assays					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
0.00	1.60	Overburden								
1.60	84.50	<u>Volcanic pyroclastite (minor mafic flow sections)</u> <u>with heterogene composition. Basic component</u> <u>dominates. Carbonaceous.</u> Banded (cm - few dm) green - light green - purple - white, finegrained rock. These different coloured bands contains respectively chlorite, hornblende and spotted epidote (green) - epidote dominate in the light green bands - microcline and quartz, minor chlorite and hbl. (purple bands) - quartz and feldspar (white bands). These heterogene and alternating bands sometimes pass into more homogeneous sections, like a feldspar-porphyrific, calcareous greenstone at 13.60 - 14.40, 26.70 - 28.00, 41.80 - 42.30, and thicker and more massive sections from 52.00 to 71.00. Another example is locally quite homogeneous, relative								

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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From	To	Description Ør-84-2	Interval		Assays					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
		massive, light green-grey rock, sometimes with								
		porphyritic hbl.needles. The light sections sometimes								
		resemble quartz keratophyre assemblage with hbl.								
		porphyroblasts up to a few mm to the bottom of hole.								
		Banding are getting more coarse to the bottom of hole.								
		Hole ends with a 4 meter section of quite massive								
		greenstone.								
		Occurrence of biotite rich bands, up to 2 cm.								
		Red microcline is found as spots, lenses and bands								
		throughout.								
		White and green bands are sometimes interfingering.								
		Locally pygmatic bands of quartz and feldspar in the								
		green bands.								
		Very thin (<1mm) hematite bands and -veins follow the								
		schistosity / banding, and do also occur discordant.								
		A later cracking with quartz and CaCO ₃ -filling,								
		≈ perpendicular to banding has offset the banding								
		and the hematite veins. Some quartz veins (ca. 50° to								
		C.A. and perpendicular to banding), rimmed with CaCO ₃ ,								
		carry minor pyrite.								

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DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE 1.

D.D.H. No.	Ha IV-84-01	Azimuth		Started	11.05.	Directional surveys					
Property	Hausta IV	Angle	45° E.	Finished	14.05.	Depth	Azim.	Dip	Depth	Azim.	Dip.
Co-ord.	830 N, 50 W	Depth	98,00 m	Logged by	R. Wilberg						

From	To	Description	Interval		Assays						
			From	To	Cu	Mo	Pb	Zn	Au	Ag	
0	6,80	Overburden	7,00	8,00	97,0		2	40,0	< 2		
			8,00	9,00	87,0		2	47,0	< 2		
6,80	98,00	Gabbro	9,00	10,00	14,00		2	32,0	< 2		
			10,00	11,00	48,0		4	30,0	< 2		
			11,00	12,00	29,0		4	29,0	< 2		
		Light green (leucogabbro) and altered. Variable grain	12,00	12,40	42,0				< 2		
			12,40	13,40	37,0		2	54,0	< 2		
		size. Often irregular limited fine grained parts and veins	13,40	14,40	13,0		4	38,0	< 2		
			14,40	15,60	53,0		4	46,0	< 2		
		in the coarsegrained gabbro. Grainsize up to 1 - 1,5 cm.	15,60	16,60	55,0				< 2		
			16,60	17,00	2,5		2	30,0	< 2		
		Changing zones with dark and light minerals - some minor	17,00	18,00	68,0		2	38,0	< 2		
			18,00	19,00	20,0		2	11,0	< 2		
		dioritic zones. Hornblendeneedles can be seen. Feldspar	19,00	20,00	110				< 2		
			20,00	21,00	9,0				< 2		
			21,00	22,00	120.				< 2		
		in places altered to a grey-green epidote (?).	22,00	23,00	430.				< 2		
			23,00	24,00	120				< 2		
		In places "slike and slides" with chlorite, biotite and minor talc.	24,00	25,00	24,0				< 2		
			25,00	26,00	38,0				4		
			26,00	27,00	77,0				< 2		
		The gabbro is often foliated in connection with this "slick and	27,00	28,00	4,5		4	22,0	< 1		
			28,00	29,00	7,0		4	24,00	< 2		
		slides". In places carbonate as yellow-white spots and veins	29,00	30,00	30,0		2	32,0	< 2		
			30,00	31,00	190.				< 2		
			31,00	32,00	59,0		2	30,0	< 2		
		- and feldspar + carbonate in irregular veins. Some quartz	32,00	32,50	59,0		4	50,0	< 2		
			32,50	33,50	94,0				< 2		
		segregations. At 86,50: Narrow qtz veins with "cavities"	33,50	34,50	65,0		4	37,0	< 2		
			34,50	35,50	90,0		4	58,0	< 2		
		MIN: Traces of pyrrhotite and chalcopyrite - visible at:	35,50	36,50	40,0		2	22,0	< 2		
			36,50	37,50	170,				< 2		
			37,50	38,50	330.				< 2		
		12,10, 16,00 - 16,50, 19,80,, 20,80 - 21,50, 22,30 - 24,00,	38,50	39,00	4,5		< 2	15,0	< 2		
			39,00	40,00	4,0		2	13,0	< 2		
			40,00	41,10	5,5		2	11,0	< 2		
		25,80 - 26,70, 30,30, 32,90, 36,90 - 38,20, 44,80, 45,90,	41,10	41,40	7,0				< 2		
			41,60	42,60	1,5		2	13,0	< 2		
		47,60, 48,80 - 50,20, 58,90 - 60,00, 63,00, 63,90 - 64,20,	42,60	43,60	9,5		2	13,0	< 2		
			43,60	44,30	92,0		2	16,0	4		

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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From	To	Description	Interval		Assays						
			From	To	Cu	Mo	Pb	Zn	Au	Ag	
		67,10 - 70,10, 74,00 - 74,70, 76,20 - 76,90, 80,60 ,	44,30	45,30	150.				< 2		
			45,30	46,30	89,0				< 2		
		83,80, 88,40 - 89,00.	46,40	47,00	91,0		2	21,0	< 2		
			47,00	47,50	100.				< 2		
		At 92,20, a 10 cm zone with 2 % Cpy and 8 - 10 % Po.	47,50	48,60	63,0		2	19,0	< 2		
			48,60	49,60	260.				< 2		
			49,60	50,60	280.				< 2		
			50,60	51,60	6,0		< 2	12,0	< 2		
	98,00	E.O.H.	51,60	52,60	1,0		< 2	8,5	< 2		
			52,60	53,60	74,0		2	10,0	< 2		
			53,60	54,60	2,0		< 2	9,5	< 2		
			54,60	55,60	4,0		< 2	14,0	< 2		
			55,60	56,60	8,0		< 2	12,0	< 2		
			56,60	57,60	2,5		2	8,5	< 2		
			57,60	58,50	37,0		2	15,0	< 2		
			58,50	59,50	100.				< 2		
			59,50	60,50	52,0				< 2		
			60,50	61,50	110.		4	24,0	< 2		
			61,50	62,50	100.				< 2		
			62,50	63,50	140.				< 2		
			63,50	64,00	4,0		< 2	10,0	< 2		
			64,00	65,00	23,0		< 2	23,0	< 2		
			65,00	66,00	120.		< 2	10,0	< 2		
			66,00	67,00	3,5		2	15,0	< 2		
			67,00	68,00	130.				< 2		
			68,00	69,00	76,0				< 2		
			69,00	70,00	93,0				< 2		
			70,00	71,00	56,0				< 2		
			71,00	72,00	29,0		4	17,0	< 2		
			72,00	73,00	2,0		2	13,0	< 2		
			73,00	74,05	3,00		4	14,0	< 2		
			74,05	75,05	41,0				< 2		
			75,05	76,05	5,0				< 2		
			76,05	77,05	25,0				< 2		
			77,05	78,00	62,0		4	23,0	< 2		
			78,00	79,00	63,0		4	25,0	< 2		
			79,00	80,00	38,0		4	19,0	< 2		
			80,00	80,40	250.		4	34,0	< 2		
			80,40	81,40	330.				< 2		
			81,40	82,20	260.		2	24,0	< 2		
			82,20	82,50	38,0				< 2		
			82,50	83,50	120.		4	22,0	< 2		
			83,50	84,50	260.				< 2		
			84,50	85,60	7,0		2	17,0	< 2		
			85,60	86,30	120.		4	30,0	< 2		
			86,30	86,70	70,0				< 2		
			86,70	87,00	1,5		< 2	9,0	< 2		
			87,00	88,00	91,0		4	15,0	< 2		

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D.D.H. No.		Azimuth		Started		Directional surveys					
Ha IV-84-02				22.05.		Depth	Azim.	Dip.	Depth	Azim.	Dip.
Property		Angle		Finished							
Hausta IV		45°E		23.05.							
Co-ord.		Depth		Logged by							
2400 N, 0 EW		86,90 m		R. Wilberg							
From	To	Description	Interval		Assays						
			From	To	Cu	Mo	Pb	Zn	Au	Ag	
0	6,00	Overburden.	6,00	6,30	5,0		2	20,0	< 2		
6,00	39,50	Gabbro	6,30	7,30	51,0				< 2		
		with some qtz (+ carbonate) segregations and ass. biotite-	7,30	8,30	43,0				< 2		
			8,30	9,40	45,0		6	12,0	< 2		
		seggr. Very inhomogeneous: The medium-coarse grained gabbro	9,40	10,40	89,0				< 2		
			10,40	11,40	170,0				< 2		
		has features of finegrained sections (diabase dykes ?) with	11,40	12,40	200,0				< 2		
			12,40	13,00	27,0		2	17,0	< 2		
		both sharp and transitional boundaries - and also very	13,00	14,00	60,0		4	23,0	< 2		
			14,00	15,00	220,0		4	17,0	< 2		
		coarse-grained, dark sections (pegmatitic).	15,00	15,60	49,0		2	32,0	< 2		
			15,60	16,60	140,0				< 2		
			16,60	17,60	44,0		4	16,0	< 2		
		Finegrained sections at 6,00 - 8,00, 9,40 - 11,30, 18,35 -	17,60	18,50	100,0		4	12,0	< 2		
			18,50	19,00	49,0				< 2		
		19,30, 20,15 - 21,90, 22,65 - 22,70, 23,15 - 24,65, 25,25 -	19,00	19,20	110,0		6	14,0	16		
			19,20	20,00	46,0				< 2		
		28,70, 32,20 - 34,30, 36,40 - 36,45, and 37,95 - 38,00.	20,00	21,00	47,0		6	17,0	< 2		
			21,00	22,00	43,0		6	19,0	< 2		
		This rock varies from dense, green, with pygmatic feldspar -	22,00	23,00	180,0		6	19,0	< 2		
			23,00	23,50	240,0		6	20,0	3		
		and carbonate veins - to a more medium grained white-green	23,50	24,50	87,0				< 2		
			24,50	25,50	61,0				< 2		
		spotted rock. In places segregations and veins of epidote	25,50	26,00	72,0		4	21,0	< 2		
			26,00	27,00	160,0				< 2		
			27,00	28,00	180,0				< 2		
		that gives the rock an irregular texture - with frequented	28,00	29,00	190,0				< 2		
			29,00	30,00	7,0		6	15,0	< 2		
		associated sulphides in veins, stringers and segregations.	30,00	31,00	68,0		6	19,0	8		
			31,00	32,20	9,0		8	28,0	< 2		
		MIN: Never visible in the "normal" gabbro - but in the darker fine	32,20	33,20	58,0				< 2		
			33,20	34,30	62,0		6	32,0	< 2		
		grained (diabase ?) - and in the dark coarse grained sections,	34,30	35,30	88,0				< 2		
			35,30	36,30	98,0				< 2		
		and specially ass. with the epidote - irregular textured rock	36,30	37,00	46,0		6	33,0	< 2		
			37,00	38,00	71,0				< 2		
			38,00	39,00	77,0		8	16,0	19		
			39,00	40,00	110,0		10	19,0	14		

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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From	To	Description	Interval		Assays					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
		No sharp boundary, but a transitional zone, a bit talcy, to a:	40,00	40,50	81,0				< 2	
39,50	86,90	<u>Carbonaceous mafic tuff.</u>	40,50	41,50	95,0			8	25,0	3
			41,50	42,50	120,0			14	40,0	2
			42,50	43,50	110,0			14	31,0	< 2
		Chloritic, with felsic fragments. Carbonate bands and - lenses.	43,50	44,50	420,0			16	55,0	9
			44,50	45,50	95,0			22	32,0	< 2
		Some talc zones.	45,50	46,50	94,0			16	48,0	2
			46,50	47,50	76,0			20	39,0	< 2
			47,50	48,50	160,0					< 2
		Talc schist (with Py) at 58,50 - 59,60 and 63,20 - 63,50.	48,50	49,50	170,0					< 2
			49,50	50,00	430,0			10	83,0	< 2
		Some qtz segregations (45,05 - 45,15). Tr. of Po, Py and Cpy.	50,00	50,50	550,0					3
			50,50	51,50	250					< 2
		A more felsic section from 54,95 - 55,85, with qtz, hbl,	51,50	52,50	190					< 2
			52,50	53,50	170					< 2
			53,50	54,50	250					< 2
		biotite. Richer in sulphides: Po and Cpy in flasers.	54,50	55,50	640					< 2
			55,50	56,50	300					< 2
		Beneath which the mafic schist is more chloritic and contains	56,50	57,50	280					3
			57,50	58,50	130					< 2
		euohedral Py up to 2 - 3 mm.	58,50	59,50	540					18
			59,50	60,50	170					4
			60,50	61,50	270					9
		Schistosity 70 - 80° to C.A.	61,50	62,50	250					10
			62,50	63,50	180					9
	86,90	E.O.H.	63,50	64,50	140					13
			64,50	65,50	100					5
			65,50	66,50	110				< 2	
			66,50	67,50	130					3
			67,50	68,50	130					4
			68,50	69,50	150				< 2	
			69,50	70,50	150				< 2	
			70,50	71,50	190				< 2	
			71,50	72,50	130				< 2	
			72,50	73,50	140					2
			73,50	74,50	140					9
			74,50	75,50	100					3
			75,50	76,50	190					5
			76,50	77,50	210					3
			77,50	78,50	160					7
			78,50	79,50	160					5
			79,50	80,50	170					3
			80,50	81,50	200				< 2	
			81,50	82,50	210					6
			82,50	83,50	180					6
			83,50	84,50	140					3
			84,50	85,50	84					3
			85,50	86,50	170					11
			86,50	86,90	120					9

DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE 1

D.D.H. No		Azimuth		Started		Directional surveys					
Ha II-84-03				24.05.		Depth	Azim.	Dip.	Depth	Azim.	Dip.
Property		Angle		Finished							
Hausta II		45° E		29.05.							
Co-ord.		Depth		Logged by							
0 NS 325 W		88.25 m		B. Wilberg							
From	To	Description	Interval		Assays						
			From	To	Cu	Mo	Pb	Zn	Au	Ag	
0	19,50	Overburden	20,00	21,00	6,5		10	6,0	< 2		
			21,00	22,00	1,0		12	6,0	< 2		
19,50	40,70	Serpentinite "conglomerate".	22,00	23,00	15,0		26	6,0	< 2		
			23,00	24,00	3,5		18	5,5	< 2		
		Well rounded serpentinite pebbles in talc - calcite -	24,00	25,00	2,5		14	5,0	< 2		
			25,00	26,00	2,5		18	5,5	< 2		
		magnesite matrix. In places magnetite crystals.	26,00	27,00	3,0		16	5,5	< 2		
			27,00	28,00	1,0		18	4,5	< 2		
		The pebbles are in places elongated, and gives a foliation	28,00	29,00	3,0		18	5,0	< 2		
			29,00	30,00	2,0		18	5,0	< 2		
		60 - 80° to C.A. . No sharp border to a:	30,00	31,00	1,5		18	4,5	< 2		
			31,00	32,00	6,0		12	4,5	5		
40,70	51,40	Carbonaceous greenschist (mafic tuff),	32,00	33,00	2,5		12	5,0	< 2		
			33,00	34,00	1,5		10	5,5	< 2		
		with bands and lenses of feldspar, qtz (+ qtz eyes) and	34,00	35,00	1,5		10	6,5	< 2		
			35,00	36,00	2,5		14	6,0	< 2		
		carbonate. In places talc rich. Small joints and dis-	36,00	37,00	1,0		18	6,0	< 2		
			37,00	37,50	0,5		16	5,5	< 2		
		cordances. Tr. of Po, Py and Cpy as flasers and crystals (Py),	37,50	38,50					< 2		
			38,50	39,50					< 2		
		and as coating on joints.	39,50	40,50					8		
			40,50	41,50					32		
		Schistosity 45° to C.A.	41,50	42,50					< 2		
			42,50	43,50					< 2		
		The boundary to next section is marked by a 10 cm qtz	43,50	44,50					< 2		
			44,50	45,50					< 2		
		segregation.	45,50	46,50					< 2		
			46,50	47,50					< 2		
51,40	88,25	Black (graphiterich) phyllite, with qtz, and feldspar	47,50	48,50					< 2		
			49,50	50,50					< 2		
		as bands and lenses (mm - cm scale), and greater qtz	50,50	51,50					< 2		
			51,50	52,50					< 2		
		segregations.	52,50	53,50					< 2		
			53,50	54,50					< 2		
			54,50	55,50					< 2		
			55,50	56,50					< 2		
			56,50	57,50					< 2		
			57,50	58,50					6		

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FOLLDAL VERK A/S

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DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE

D.D.H. No.	Ha II-84-04	Azimuth		Started	30.05.	Directional surveys					
Property	Hausta II	Angle	45° E	Finished	05.06.	Depth	Azim.	Dip.	Depth	Azim.	Dip.
Co-ord.	400 N, 360 W	Depth	51,15 m	Logged by	R. Wilberg						

From	To	Description	Interval		Assays					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
0	17,50	Overburden								
17,50	34,90	Phyllite	27,60	28,60	25,0		610	29,0	< 2	
		Silvercoloured. Bands (often pygmatic) of feldspar, qtz	34,90	35,90	740		410	360.	11	
		and carbonate. In places weak greenish colour and content	35,90	36,90	460		66	230	3	
		of small hornblende needles. Schistosity, 70 - 80° to	36,90	37,90	42,0		40	200	< 2	
		C.A.	48,30	49,30	74,0		18	55,0	< 2	
		No mineralization.	49,30	50,30	99,0		18	57,0	3	
		Qtz segregations at 27,65 - 27,80, 28,05 - 28,60, 31,90 -	50,30	51,10	42,0		18	58,0	4	
		31,95, 37,30 - 37,80, 44,90 - 44,95, 44,00 - 44,05 and 48,45 -								
		48,50 (with Tr. of Cpy).								
34,90	35,95	Graphite schist.								
		In places garnets.								
		MIN.: 10-15 % Po in stringers and Tr of Cpy.								
35,95	37,05	Ironformation with qtz segregations.								
		Garnets (up to 2 mm), stringers of Po, biotite segregations.								
		Some green (chlorite) bands. Highly irregular texture.								
37,05	51,15	Phyllite (same as above)								
	51,15	E.O.H.								

Nonsvda

DIAMOND DRILL LOG

FOLLDAL VERK A/S

PAGE 1

D.D.H. No.		Azimuth		Started		Directional surveys											
Non-84-01				13.06.84		Depth		Azim.		Dip.		Depth		Azim.		Dip.	
Property		Angle		Finished													
Nonsvola		45° E		18.06.84													
Co-ord.		Depth		Logged by													
700 N, 50 W		65,65 m		RW													
From	To	Description	Interval		Assays												
			From	To	Cu	Zn	Pb		Au	Ag							
0,00	6,00	Overburden															
6,00	19,50	<u>Felsic sericite schist. (Mostly felsic tuff - some thin</u>	8,70	9,20	80	135	 120 ppm 										
		<u>sections even rhyolitic flows).</u>	12,00	12,50	53	158											
		Colour varies from white to darker grey.	19,50	20,00	44	184											
		Schistosity are also variable - mostly schisty with angle	41,00	42,00	85	125											
		to C.A. at 90° (at the top) to 70°, but in places more homo-	42,00	43,00	73	134											
		genuous, with flowstructure - like textures.	43,00	44,00	87	110											
		Some qtz seggregations.	44,00	45,00	59	77											
		MIN: Po in flasers and seldom in stringers, and Py as	45,00	46,00	59	100											
		scattered idiomorphic crystals. (Py and Po < 1 %). Also	47,60	48,30	56	136											
		secondary mineralization on joints.															
19,50	65,65	<u>Banded greenschist (mafic tuff).</u>															
		Frequently small-folded. In places lacking the qtz - feldspar															
		bands: more homogenous.															
		Schistosity 70° to C.A.															
		Felsic sericite schist at 24,00 - 24,15 m and 30,25 - 30,45 m.															

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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D.D.H. No.		Non-84-2		Azimuth		Started		19.06.84		Geological surveys							
Property		Nonsvola		Angle		45° E		Finished		27.06.84.		Depth		Azim.		Dip	
Co-ord.		1200N, 25 W		Depth		178,65 m		Logged by		RW.							
From		To		Description		Interval				Assays							
						From		To		Cu		Zn		Pb		Ag	
0,00		7,00		Overburden													
7,00		146,40		Quartz - feldspar - sericite schist (Qtz keratophyre)		23,00		24,00		18		150					
				Light grey to white, finegrained, schistous to massive, with		51,50		52,50		132		130					
				minor flow structures (rhyolite flows) - but mainly tuffa-		64,50		65,00		126		304					
				ceous. Some qtz-segregations.		65,00		66,00		109		257					
				Schistosity 70° to C.A.		80,00		81,00		417		9297		< 120 ppm		1	
				Intermixing of clay and silt give the rock a darker color (silt-		81,00		82,00		537		9080					
				stonelike schist). This is most frequented at the bottom of		82,00		83,00		146		2273				1	
				the section. Some sections are graphiterich.		83,00		84,00		93		3116				1	
				MIN: Disseminated Py and Po as patches and stringers through out		84,00		85,00		79		359					
				whole section (1 - 3 % sulphides) Tr. of Clpy. Some bands		85,40		86,40		124		350					
				are richer, mainly in Py - up to 10 %.		87,00		88,00		42		159					
				At 51,70: 5 cm of massive pyrrhotite ore.		92,00		93,00		308		959					
				Between 64,50 and 65,60: 10 - 15 % Po (and minor Py) in a		93,00		94,00		279		583					
				graphiterich schist.		94,00		95,00		252		2236				1	
				Between 80,40 and 82,00: Scattered subhedral Py, up to 6 - 7 mm		95,00		96,00		453		1248					
				in size, and disseminated sphalerite.		96,00		97,00		152		355					
146,40		171,70		Greenschist.		97,00		98,00		16		191					

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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D.D. -	Non-84-3	Azimuth	Started	Directional surveys						
			29.06.84.	Depth	Azim.	Dip.	Depth	Azim.	Dip.	
Property	Nonsvola	Angle	Finished							
		45° E	02.07.84.							
Co-ord.	1080N, 150 E	Depth	Logged by							
		35,35 m	HW							
From	To	Description	Interval		Assays					
			From	To	Cu	Zn	Pb		Au	Ag
0,00	5,80	Overburden	16,00	17,00	126	395				
5,80	15,50	Chlorite schist.	17,00	18,00	546	4772				1
		Dark green, highly chloritic (and talcy (?)), very soft and	18,00	19,00	554	4064				1
		soapy. Minor zones with feldspar and qtz - bands and spots,	19,00	20,00	122	724	^ 120 ppm			
		and some qtz (+ carbonate) segregations.	22,00	23,00	202	1015				
		MIN: Py disseminated through hole section, but concentrated	23,00	24,00	63	169				
		in bands often bound to thin (mm-scale) felsic (feldspar + qtz)	24,00	25,00	839	1892				
		bands. At 11,75: 3 cm of 30 - 40 % Py and nearly 1 % Cpy.	28,00	29,00	1337	982				
		Schistosity 70° to C.A.	34,00	35,00	221	1922				1
		Becomes more felsic/less chloritic at the end of section with								
		transition to a								
15,50	19,60	Quartz - feldspar - chlorite schist (Mixed felsic/mafic tuff (?),								
		felsic dominant). Fine grained, light grey (white)-green.								
		Chlorite and sulphides in layers and in places round visible								
		felsic fragments and lenses.								
		MIN: Py-impregnation, and bands (average 1 mm thick) of Sl and								
		associated Cpy-diss (Cpy > Sl). Sl-mineralization is best in								

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Tonnola

DIAMOND DRILL LOG

FOLLDAL VERK A/S

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D.D.H. No.		Azimuth		Started		Directional surveys					
T-84-1				14.06.84		Depth	Azim.	Dip.	Depth	Azim.	Dip.
Property		Angle		Finished							
Tonnvola		45°E		18.06.84							
Co-ord.		Depth		Logged by							
800 N, 150 W		74,50 m		RW							
From	To	Description	Interval		Assays						
			From	To	Cu	Zn	Pb		Au	Ag	
0,00	2,50	Overburden	44,00	45,00	178	247	 120 ppm 				
2,50	44,00	<u>Banded chloriterich, carbonatebearing mafic tuff.</u>	45,00	46,00	161	137					
		Qtz-, fldsp.-, and carb.bands (45° to C.A.) and qtz-seggr..	46,00	47,00	97	169					
		In places characteristic spotted appearance of small horn-	47,60	48,10	107	127					
		blende needles. Some epidoterich bands. Minor thin felsic	65,00	66,00	61	158					
		sections with biotite. Irregular, talcrich section from	66,00	67,00	44	211					
		38,00 - 42,00 m.	67,00	68,00	45	111					
			68,00	69,00	60	153					
		MIN: Tr. of Py and Po. In places idiomorphic Py crystals up	69,00	70,00	47	110					
		to 5 mm, and flasers of Po.	70,00	71,00	62	187					
44,00	45,00	<u>Graphiteschist.</u>									
		with about 10 % Po and Py.									
45,00	74,50	<u>Felsic sericite schist (felsic tuff) with minor mafic tuff</u>									
		<u>and some very qtz. rich dark sections.</u>									
		57,15 - 57,95: Qtz. segregation.									
		MIN: Tr. of Py and Po throughout.									
		65,80 - 67,40: About 10 % Py as idiomorphic crystals and seggr.									
		up to 3 - 4 cm - and not so much Po.									

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Vardtjern

DIAMOND DRILL LOG

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D.D.H. No		Va-84-01		Azimuth		40 W		Started		Jan / 84		Directional surveys															
Property		Vardtjørna		Angle		45° E		Finished				Depth		Azim.		Dip.		Depth		Azim.		Dip.					
Co-ord.		L - O NS		Depth		100.00 m		Logged by		FDP R. Wilberg																	
From		To		Description								Interval		Assays (ppm)													
												From		To		Cu		Mo		Pb		Zn		Au		Ag	
0.00m		7.65		Overburden								7.00		8.00		153						122					
												8.00		9.00		261						108					
7.65		11.40		<u>Carbonaceous chlorite schist.</u>								9.00		10.00		87						96					
				(Supposedly basaltic lapilli tuff).								10.00		11.00		92						86					
				Dark green-grey. Mostly fine grained. Mostly well-								11.00		12.00		167						82					
				bedded by carbonate or cherty materials. In places								12.00		13.00		29						110					
				stringer textures or flasers.								13.00		14.00		74				E		121					
				- Min: Some spots (lenses) of Py throughout (<1%).								14.00		15.00		58				P		82					
				Banding 80° to C.A.								15.00		16.00		47				120		109					
												16.00		17.00		76				11		110					
11.40		11.70		<u>Keratophyre.</u>								17.00		18.00		61						96					
				Light grey, mostly finegrained. Wellayered.								18.00		19.00		32						108					
				Orientated amphiboles (chlorite + biotite). Some								19.00		20.00		96						87					
				epidot alteration in places. Sometimes irregular								20.00		21.00		149						104					
				texture with lenselike qtz - which may point to								21.00		22.00		78						172					
				agglomerate.								22.00		23.00		48						94					
				- Min: Some spots of Py (fine dissemination), (<1%).								23.00		24.00		174						86					

DIAMOND DRILL LOG

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From	To	Description	Interval		Assays (ppm)					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
11.70	20.40	Carbonaceous chlorite schist.	24.00	25.00	112			173		
		Similar to 7.65 - 11.40. Interbedded some dm-	25.00	26.00	139			129		
		sections of fine grained greenstone.	26.00	27.00	206			112		
		19.10 - 19.45 interbedded some felsic to intermed.	27.00	28.00	161			131		
		volcanic materiale as mm- to cm-bands or lenses.	28.00	29.00	127			140		
		Some epidot alteration.	29.00	30.00	63			118		
20.40	21.36		30.00	31.00	63			92		
		Epidot - amphibol - chlorite schist.	31.00	32.00	78			88		
		Medium to dark green, medium - coarse grained.	32.00	33.00	156		11	592		
		Irregular texture between amphibole needles (bouches)	33.00	34.00	328		120	167		
		and chlorite - epidot accumulates. Sometimes stringers	34.00	35.00	312		120	176		
		or feeders or even smaller bands, and mm-spots of	52.70	53.70	153		120	145		
		carbonates. Lenses of felsic volcanic materiale,	53.70	54.70	72			209		
		often qtz-rich, with rich disseminations of Py.	54.70	55.70	173			252		
		Sharp footwall boundary and hanging wall boundary.	55.70	56.70	338			140		
		- Min: Traces of Py.	56.70	57.70	161			152		
			57.70	58.70	99			151		
21.36	25.90	Greenschist / greenstone.	58.70	59.70	428			191		
		Green-grey. Fine grained. Massive to schistose.	59.70	60.70	1799			277		
		Some lenses / stringers / mm-bands of carbonate.	60.70	61.70	155			113		

DIAMOND DRILL LOG

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From	To	Description	Interval		Assays					
			From	To	Cu	Mo	Pb	Zn	Au	Ag
		Some places small disseminations of Py.	61.70	62.70	158		≤ 120 ppm	169		
		21.72 - 21.85 : Same as 20.40 - 21.36, but more fine-grained. Sharp boundaries. Py-diss. <1%.	62.70	63.70	188			111		
		23.16 - 23.62 : Highly epidotic biotite - amphibol - chlorite - qtz schist. Sometimes idiomorphic Py up to 1 vol% in sections. More felsic than 20.40 - 21.36.	84.00	85.00	424			147		
		Big lenses of qtz - carbonate.								
		24.40 - 25.45 : Stringers / lenses / irregular spots of epidot within massive to schistose greenstone.								
		Sometimes gradial changes to medium grained varieties.								
		- Min : In places rich in Py - diss., but <1%.								
		Big lens of qtz - carbonate rimmed with epidot (sutured boundaries) at 25.20 - 25.40, (maybe bomb of felsic volcanic materiale).								
25.90	33.40	Carbonatebearing chloriteschist (basaltic tuff).								
		Colour varies with the content of carbonate, from dark green to light green. Fine - medium grained.								
		Sometimes epidot and a little Py-diss. (<1%) all over.								
		Irregular lenses and accumulates of qtz and carbonate - supposedly lapilli tuff.								

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D.D.H. No.		Azimuth		Started		Directional surveys					
Va-84-02				19.06.84		Depth	Azim.	Dip.	Depth	Azim.	Dip.
Property		Angle		Finished							
Vardtjern		45° E		26.06.84							
Co-ord.		Depth		Logged by							
300 N, 225 W		80,00 m		RW							
From	To	Description	Interval		Assays						
			From	To	Cu	Zn	Pb		Au	Ag	
0,00	4,40	Overburden									
4,40	72,25	Carbonaceous mafic tuff.									
		With ptynatic bands of feldspar, carbonate, qtz, (+ qtz.									
		seggr.) Grainsize varies from fine, dense (with ptvg. bands)									
		to more coarsegrained (spotted appearance). In places									
		irregular texture, in places schisty (70-80° to C.A) or even									
		smallfolded. Chlorite content variable, but chlorite is an									
		abundant mineral. Also a few occurrences of epidote.									
		More felsic-mixed sections at 60,00 - 61,60 and 70,00 -									
		72,25 m.									
		MIN: In places traces of Po, Py and CPy (< 1 %).									
72,25	79,55	Qtz. - feldsp.- graphite schist.	22,60	22,90	450	88	< 120 ppm				
		Schistosity 80° to C.A.	24,70	24,80	89	67					
		In places with some small (< 1 mm) garnets.	30,00	30,50	163	67					
		MIN: Tr. of Po and Py (< 1 %)	38,90	39,40	339	80					
		Core loss at 79,45 - 79,55									
79,55	80,00	Carbonaceous mafic tuff.									
		(Same as 4,40 - 72,25 m)									
	80,00	E.O.H.									

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Djupsjøen

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Oscar

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D.D.H. No.		Azimuth	Started	Directional surveys					
OSK-84-2			18.07.84	Depth	Azim.	Dip.	Depth	Azim.	Dip.
Property	Oscar	Angle	Finished						
		45° E	19.07.84						
Co-ord.	1400 S, 70 W	Depth	Logged by						
		39,75 m	RW						
From	To	Description	Interval		Assays				
			From	To	Cu	Mo	Pb	Zn	Au
0,00	5,50	Overburden							
5,50	38,05	Greenschist. Light green, med. grained. In places quite chloritic, while other parts (specially the bottom sections last meters) are rather felsic (even as 5-10 cm bands of greenish keratophyre). In places porphyritic (feldsp. >> qtz), specially between 24,20 and 26,70 where it's quite massive. Some small qtz + biotite, and epidote segregations. Schistosity varies from 60 - 80° to C.A. In places small folds are observed.							
		MIN: Poor in sulphides except of flasers and stringers of Po (5-10 % Po) bound to thin dark bands at 12,75 - 12,90, 14,57 - 14,60 and 1 ex. at 20,50.							
		Some of the qtz-segregations carry small amounts (traces) of Py and Po. At 16,00 - 16,05, thin bands of Py and traces of Sl. At 35,60 small subhedral grains of Py on a joint-plane (20° to C.A.)							

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Bakkvollen

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D.D.H. No.	B-83-1	Azimuth		Started	1983.	Directional surveys					
Property	Bakkvollen	Angle	45° E	Finished		Depth	Azim.	Dip.	Depth	Azim.	Dip.
Co-ord.	700 N - 25 W	Depth	78,15 m	Logged by	R. Wilberg						

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