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		Crew Norway AS		

Tittel
Exploration in Tydal Area and Fløttum Mine in Gauldal and Vingelen Mine in Tolga, Røros, Norway

Forfatter	Dato	År	Bedrift (Oppdragsgiver og/eller oppdragstaker)
Rosholt, Bernt Wilberg, Rune		2001	Crew Norway AS

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Tydal Midtre Gauldal Tolga	Sør-Trøndelag		17213 16204 16191	Trondheim Røros

Fagområde	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt)
Geologi Geofysikk Geokjemi		Vingelen Fløttum Langdalsvollen Melsognastupet Måltoppen
Råstoffgruppe	**Råstofftype**	
Malm/metall	Zn Cu	

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Detailed survey only from Tydal area inkluding Langdalsvollen Melsognastupet and Måltoppen prospects.
Follow up work like DOB sampling and trenching are recomended for Langdalsvollen Melsognastupet and Måltoppen prospects

EXPLORATION IN

Tydal area, and Fløttum Mine in Gauldal and Vingelen Mine in Tolga, RØROS

NORWAY

2001 Bernt Røsholt,
Rune Wilberg

Contents

Røros-Meråker District

Fig. 1A

Sediment- and Volcanic-hosted Zinc-Copper Deposits in the Tydal district, and the Vingelen and Fløttum Deposits.

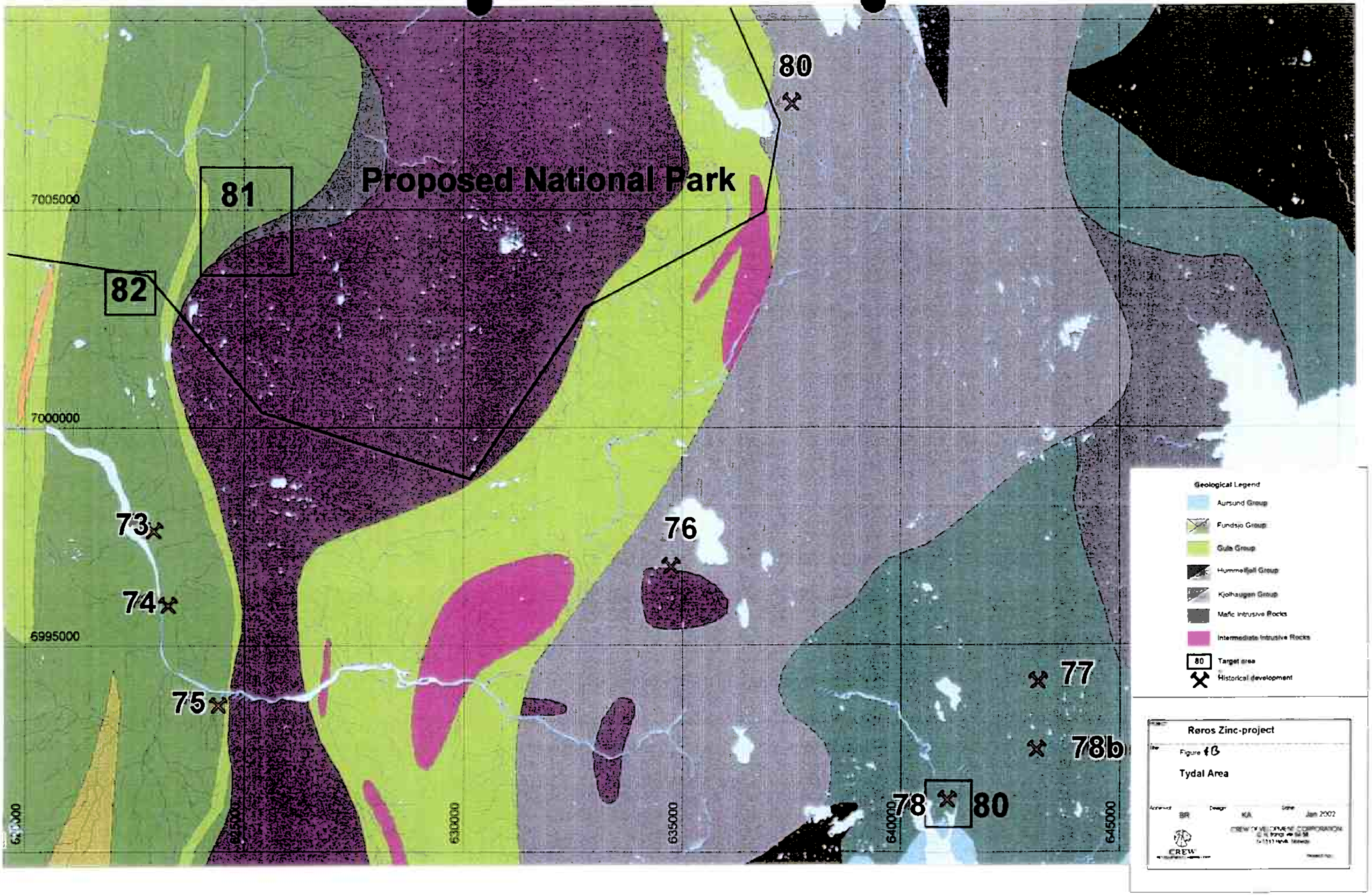
The Tydal district is located between two major Norwegian mining fields, those of Røros-Kjøli (S) and Meråker (N), and is underlain by the same, mixed volcanics and clastic sediments of Cambrian to Silurian age, hosting stratiform, Zn-rich massive sulfides (fig. 1A). Contained in this presentation are also the Fløttum deposit (104) UTM location 0587382E/6975507N about 50 km SW of Gressli Mine (75) near Tydal, and the Vingelen deposit (105) UTM location 0596450E/6924750N about 40 km SW of Røros. See below, fig 1B 1C and enclosure no 1.

History.
The most significant Zn-mineralization known in Tydal is that of Gressli, no 75 at fig 1B. The volcanic-hosted Py-Sl-Cpy(-Ga) deposit was discovered in 1792. Until 1868 the mine was worked on a small scale over 3 periods for a total of approx. 24 years. During this period the mineralization, which was at that time considered to be of low quality due to its high Zn content, was worked to a depth of 30 m down dip. There are no records of ore tonnages extracted. The mineralization is known along a NW-SE strike length of approx. 130 m, dipping 45-55° SW, and being 2-3.5 m in thickness. 3 diamond-drillholes were sunk into the deposit in 1916. Zinc was only analyzed for in one hole, where a 2.3 m intersection yielded 7.48 % Zn and 1.12 % Cu. At the same time channel sampling of the five old workings revealed an average of 15.4 % Zn over approx. 2 m. In the 1970`s 17 additional holes were drilled, and probable tonnage calculated at 78 000 tons grading 5.5 % Zn and 0.9 % Cu.

In 1983 BP / Norsk Hydro covered an area in Tydal with airborne geophysics (Questor fixed wing INPUT survey), and did some ground follow-up, before pulling out because of strategic reasons in 1985.

The Fløttum deposit (104), fig 1C hosted in the Gula Group sediments, was found in 1883 by a local farmer, and acquired by Røros Kobberverk in 1888. The company conducted test mining during the periods 1888-92, 1904-10 and 1915-17. The deposit is followed with underground mining over a strike length of about 200 m, and down to 68 m depth. A total amount of 2650 m was drilled between 1890 and 1953. Juhava (1991) calculated total probable reserves at 350 000 tons grading 4.76 % Zn, 0.96 % Cu and 29 ppm Ag.

The Vingelen deposit (105), fig 1C hosted in the Fundsjø Group / Hersjø Formation volcanics, is plotted on a map from 1723, and was exploited periodically up to 1835 by different owners. During this period a number of interconnected shafts and an adit was drifted. The deepest shaft was 70 m deep, and total drifted meters about 600 m. Totally about 30 000 tons of crude ore averaging 1.3 % Cu and 27 %S was extracted. The mine was abandoned until 1915, when test mining until 1920 included extension to 118 m depth and drifting of a 400 m long adit, now with focus on pyrite. Core drilling in 1917 proved the massive sulfide sheet down to 215 m depth, and proved tonnage was calculated at 200 000 tons grading 1.5 % Cu, 3 % Zn and 35 % S. More resent (1970-80`s) exploration include ground geophysics and one diamond drill hole which intersected the mineralization at 210 m depth.


Proposed National Park
80
81
82
7005000
7000000
6995000
73
74
75
76
77
78b
78
80
630000
635000
640000
645000
Geological Legend
Aursund Group
Fundsjo Group
Gula Group
Hummelfjell Group
Kjolhaugen Group
Mafic Intrusive Rocks
Intermediate Intrusive Rocks
Target area
Historical development
Røros Zinc-project
Figure 1B
Tydal Area
BR
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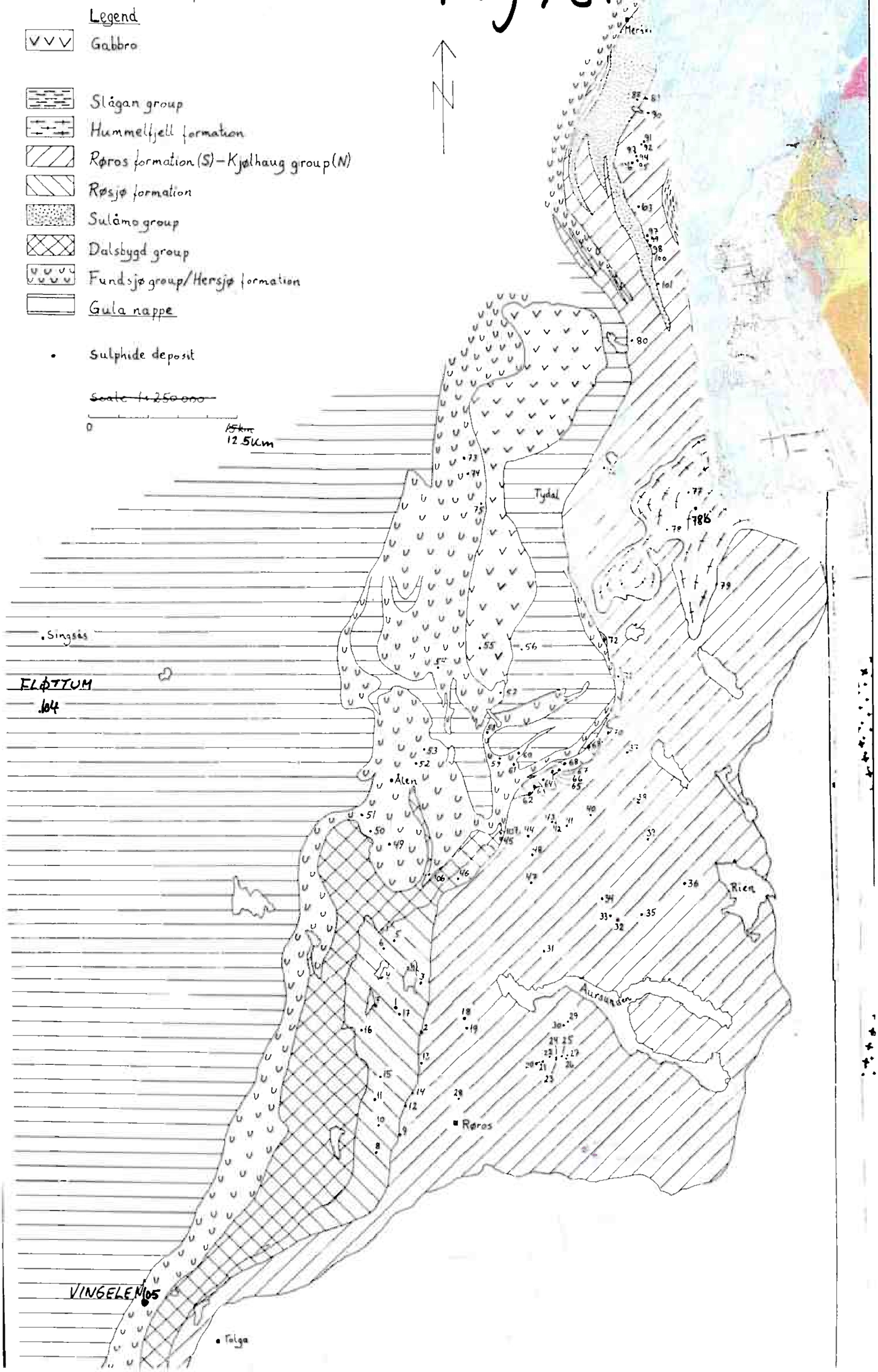
CREW DEVELOPMENT CORPORATION
CREW

Fig 1B

Geological map Røros – Meråker / Fig 1c.



Regional Geology.

The Cambro-Silurian rocks of the Røros-Meråker district make up the southeastern limb of a large and complexly folded synformal structure composing the Trondheim Region. The rocks belong to the Upper Allochton of the Scandinavian Caledonides.

The geology is characterized by a series of low-angle thrusts, or nappes, which dip gently towards the west. Lithologically, the rocks represent a lateral transition from epiclastic rocks along the former margin of the Baltic Shield to the east, through calcareous-pelitic shelf sediments, to predominantly volcanogenic rocks of the Iapetus Ocean in the west. During the Caledonian Orogeny in Silurian times, this lateral facies-transition piled up into a series of major nappe sheets, which roughly placed the various lithofacies on top of each other.

The Røros district is bordered to the west by a major thrust, the Tydal Thrust, which separates rocks of predominantly volcanogenic origin in the west from the primarily sedimentary rocks in the east.

The Lowermost nappe sequence consists of a thick succession of epiclastic sediments (sparagmites) and augen gneisses. Overlying these Eocambrian rocks is the *Hummelfjell Formation*, which includes a generally sedimentary sequence of quartzites, quartz mica schists, and graphite schists, with minor associated mafic tuffs. Wolff (1978) correlated the Hummelfjell Formation with the *Slågan Group* in the northerly Meråker district.

The Hummelfjell Formation is overlain by the *Røros Formation*, correlated with the *Kjølhaug Group* in the Meråker area, and subsequently by the *Røsjø Formation*, consisting of a thick sequence of calcareous, grey to greenish phyllite and greywacke. The more westerly Røsjø Formation appears a little less calcareous than the Røros Formation, and has a more pronounced banding, with a few interbedded layers of volcanogenic rocks, although the two do not differ much in composition or appearance (Rui & Bakke 1975). These Røros and Røsjø metasediments are locally heavily invaded by pre-metamorphic gabbro sills.

Overlying the Røros and Røsjø formations is the *Dalsbygda Group* in the Røros area, and the *Sulåmo Group* in the Meråker area, which consists of phyllites, metasandstone, marble, conglomerate, and thin beds of greenstones and quartz keratophyre.

The *Hersjø Formation* is the next in succession, and consists mainly of basic volcanogenic rocks (greenstones and greenschists) with minor horizons of acidic volcanic tuffs and flows.

The *Gula Group* (Gula Nappe), which caps the whole greenstone belt, includes a large succession of sediments, with minor thin beds of mafic volcanics (amphibolites). 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 Formation of probable Lower Ordovician age.

It is possible, although not proven, that the rocks of the Gula Group have been overturned, and belongs to a large recumbent nappe with roots far to the west; and thus the Slågan Group and the Hummelfjell Formation represent the youngest members of the supposed inverted succession.

The interpretation of the area has been challenged by work recently started in the Otta area (SW of Røros). Papers by Sturt et al. (1991 and 1995) and Bjerkgård & Bjørlykke (1994) suggest a major reinterpretation of the stratigraphy of the whole area. Rather than forming part of an isolated nappe, the Hummelfjell unit is now correlated with the Heidal series of the Otta area, and both are regarded as equivalents of the lower part of the Gula Group. The rocks outcropping between the Gula and the Hummelfjell are considered metasediments of Ordovician age. The Dalsbygda, Fundsjø (Hersjø Formation) and Aursund (Røros and Røsjø formations) groups plus the upper Åsli Formation (Gula Group) are now grouped together into the Sel Group. This is a single package of Ordovician sediments and volcanics, lying in the core of a major fold structure of Scandian age. The three thrust planes lying between the Gula and the Hummelfjell units are not recognized. The tectono-stratigraphy of the area thereby is greatly simplified.

Most of the rocks in the area are metamorphosed in greenschist facies. Contact metamorphic rocks surrounding gabbro intrusives include hornfelses as well as cordierite- and andalucite-bearing rocks.

The structural geology and deformation history is treated separately in a report by Witt-Nilsson (1998).

Local Geology.

Sulfide mineralizations in the Tydal area are known to occur in both the Fundsjø Group, Kjølhaug Group, and Hummelfjell Formation. The Fløttum deposit is hosted in the Gula Group sediments, and the Vingelen deposit in the Fundsjø Group / Hersjø Formation.

Description of the lithological groups, in decreasing age, from west to east:

<u>The Gula Group</u> consists mainly of biotite schists and phyllites. A two-fold division of the Gula Group was proposed by Rui (1972), a lower psammitic unit (the Singsås Formation) and an upper pelitic unit (the Åsli Formation). Thin horizons of mafic metavolcanics, the Gula greenstone, occur within the Singsås Formation and separate the psammitic unit from the pelitic unit. The psammitic and pelitic units of the Gula Group include more or less continuous horizons of metavolcanics, crystalline limestones, conglomerates, black schists and quartzites.

The Fløttum deposit and other deposits classified as the Budal type (Nilsen 1978) are characterized by their association with bituminous phyllites and quartzites of the Gula Group.

<u>The Hersjø Formation</u> is the principal volcanogenic rock unit of the eastern part of the southern Trondheim region, and represent the southern continuation of the <u>Fundsjø Group</u> in the Meråker district. This unit consists of volcanics with subordinate sediments (graphitic phyllites and siliceous, banded sediments). The volcanics include a differentiated, bimodal sequence of mafic flows (greenstone and hornblende schist), mafic and felsic tuffs, and subordinate rhyolite flows. The greenstone-belt also contains sills and dykes of diorite, porphyrite and trondhjemite, representing shallow intrusions. In the Tydal area the Fundsjø Group has been intruded by the large Fongen-Hyllingen layered gabbro complex.

Extensive areas east of the Fundsjø Group are underlain by the Røros Formation / Kjølhaug Group which is a series of calcareous, argillaceous to subarenaceous mica schists, earlier named "Røros skifer" (Rui & Bakke 1975). More rarely, the beds pass into more massive arenaceous types.

The Røros Formation often exhibits a weak to distinct compositional banding related to variations essentially in the quartz and carbonate contents. The individual beds usually range from about 0.5-10 cm in thickness, though several-meter thick massive layers may occur. The colors of the rocks usually vary from grey to light grey, or greyish green. In addition to quartz and biotite, the ordinary Røros schists usually carry abundant, though variable amounts of muscovite, chlorits, and carbonate, and lesser amounts of sodic plagioclase and epidote minerals. Biotite, hornblende and garnet are frequently developed as larger porphyroblasts, e.g. in the typical biotite-porphyroblast-bearing "Stuedals-skifer" and the hornblende garben schist.

Conformable sheets and lenses of fine- to coarse-grained saussuritic gabbros are frequently intruded into the Røros Formation, and bodies of serpentinite and other ultramafic rocks occur along its base.

The Kjølhaug Group in the Meråker-Tydal area is correlated with the Røros Formation to the south, and comprise a thick sequence of grey-green phyllites, phyllitic greywackes and greywackes (often banded), partly conglomeratic, and less calcareous than the Røros Formation to the south. Intrusions of gabbro sills are frequent.

The Hummelfjell Formation comprises the uppermost part of the supposed inverted lithological succession. The rocks are largely composed of rather massive feldspathic quartzites. Impure marbles, mica schists, graphitic schists, mafic tuffs and quartzitic beds are more conspicuous towards the contact with the Røros Formation. This contact is locally strongly mylonitized.

Ore deposits. How do they occur, and where to look for new ones?

In the Tydal area Zn-Cu mineralizations are found in both the Fundsjø Group, Kjølhaug Group and Hummelfjell Formation.

Fundsjø Group: The Gressli mineralization (75) is immediately hosted by a cherty lithology with Py-Sl dissemination (known locally as "mine quartzite", which has been reported to contain up to 20-30 vol% sillimanite), this probably representing a siliceous tuffaceous sediment, possibly also having been silicified. Massive dark amphibolite extrusives host the mine package, these being also accompanied by more acid lithologies in the immediate hanging wall, which are locally impregnated with galena and elevated Au and Ag (assays up to 2.3 ppm Au and 134 ppm Ag). At least at the eastern end of the workings, the host amphibolites contain numerous fine Cpy-filled veinlets. Further into the hanging wall, the amphibolites have flattened pillow structures and, likewise further into the footwall, are intruded by numerous basic feldspar-porphyry dykes.

From the Gressli area and northwards the massive to pillowed amphibolitic lavas, which otherwise dominate the Fundsjø Group west of the gabbro complex, are accompanied by marked piles of acid extrusives, probably representing several eruptive centres. These piles have individual characters, ranging from finegrained silicic tuffaceous with common well-dispersed Py-dissemination, through coarsegrained garnet-amphibole-sphene-staurolite-bearing assemblages, to agglomerates. The Gressli mineralization is associated with, and occurs at the northern extremity of a horizon of the former type. Approx. 12 km north of Gressli, at Måltoppfjellet, 3 occurrences of Py-Sl-Cpy mineralization appear associated with a centre of similar mineralogy, but also with sericitization and minor iron formations (black magnetite chert) lying structurally below (probably stratigraphically above) the old Selbu copper mine (Gammelsætergruben), which is itself related more to a zone of chloritization in the amphibolites.

Between Gressli and Måltoppfjellet, the apparently insignificant occurrenses Nea (74) and Sæterå (73) are hosted in the above mentioned acidic garnet-amphibole quartzo-feldsphatic assemblage. The Sæterå Sl-Ga-Cpy mineralization assayd 2-6 ppm Au and 70-85 ppm Ag. Also north of Måltoppfjellet, in the valley of Roltdalen, Zn-mineralizations are known to occur.

Kjølhaug Group: Only two sulfide occurrences are known in the Kjølhaug Group of the Tydal area, the Cu-dominated Ramsjø prospect (80) and the Zn-dominated Våråviken prospect (76). The Våråviken area consists of Stuedal schist intruded by several small gabbroic bodies. The Våråviken Po-Py-Sl-Ga-Cpy mineralization (also enriched in As, Ag and Au) lies on the eastern flank of one of the largest (approx. 2 x 0.5 km2) gabbro bodies in the area.

The considerable area underlain by the Kjølhaug Group between the mining fields of Kjøli and Meråker is conspicuously sulfide-barren in comparison. Thick overburden in this area may be an explanation for this.

The Hummelfjell Formation is largely composed of calcareous sediments. In the structurally upper levels of this sequence, around Vessingsjøen, thick amphibolites with relatively minor acid extrusives become predominant. Along the western shores of Vessingsjøen appear scattered concentrations of thin (< 1 m) Cpy-Py-Po-Sl mineralizations in a quartz(-carbonate) host. The most interesting prospect occur in garnet-amphibolite at Langdalsvollen (78).

At *Fløttum* (104) the main ore body is surrounded by several parallel-oriented satellites at the hinge-zone of a parasitic fold at the border between bituminous quartzite and the surrounding calcareous biotite schist of the Singsås Formation. The deposit has a complex morphology, and consist roughly of 4 ore lenses, with axis plunging towards SE, in one (or more) impregnation zone(s). The A- and B-lenses are confined to one level, C two levels, and D to a hanging-level, plus a footwall mineralization consisting of several sulfide-bearing zones. The sulfide mineralizations of the Budal type have a simple mineralogy with the exception of the Fløttum deposit, which exhibits a rather complex mineral paragenesis. Major components are Py, Po, Sl and Cpy, with minor Ga and a variety of trace minerals, a.o. Ag-minerals. In the inclined shaft, the mineralization is described as an upper Py-Sl ore zone, and a lower Po-Cpy-Sl(-Ga-Apy-fahlerts) ore zone. It is not clear if this zonation has general applicability. The metasedimentary wallrocks consist of light grey, carbonaceous quartz-biotite schist and graphite-quartzite / banded quartzite. The sulfide lenses are enveloped in alteration rocks of muscovite-bearing quartz-sericite schist.

The deposits of the Budal type (e.g. Fløttum), frequently encountered in the Soknedal-Fordalen districts, are characterized by their association with bituminous phyllites, schists and quartzites of the Gula Group (Åsli Formation). The mineralizations are confined to highly tectonized, black, often garnetiferous biotite quartzites. Along the strike extension most of the massive-sulfide bodies continue as sulfide-disseminations within quartzitic bands in black metasediments.

The mineralizations of the Budal type bear no apparent affiliation to the Gula greenstone, which is frequently encountered as discontinuous and contorted layers within the different bituminous assemblages. Sulphide mineralizations associated with the Gula greenstone and/or their adjacent oxide/silicate iron formations, are classified as the Kvikne type (Nilsen 1978). They have appreciable Ag-Au contents.

Among the numerous Zn-Cu occurrences bound to the bimodal volcanic Hersjø Formation between Røros and the 20 mill. tonnes Tverrfjellet deposit to the SW, the Vingelen and Hersjø deposits are the most significant in the northern part of this belt.

The *Vingelen* deposit (105) consists of two concordant, parallel sulfide plates with 10 m separation. The dip changes from almost vertical at surface to 65-70° west at depth. The northernmost, structurally upper plate, which has been objected to exploitation, has a thickness from <1 m to 3-4 m; while the lower plate (not outcropping) is probably somewhat thinner. The deposit is considered open to depth. A drill hole from 1917 intersected 1.25 m massive sulfides at 215 m depth with 9 m dissemination below. Bjerkgård (1989) maintains that the two plates represent each limb of an isoclinal fold, with the hinge at depth, plunging 15-20° SW.

The massive mineralization is dominated by finegrained, banded Py-Sl-Cpy(±Mt) ore, where Py is dominant, with very Zn-rich bands, and minor Cpy and Mt enriched in bands. The ore is very carbonate-rich, as matrix mineral and nodules. A minor type is Po-dominated ore with Py, Cpy and Mt enriched in thin bands. Disseminated mineralization consists mainly of Py-disseminated chlorite schist.

The ore body is emplaced in the structurally upper level of a 190 m thick unit of a light, banded tuffitic chlorite schist. 5-10 m above the mineralization appears a 40 m thick banded amphibolite schist. The immediate hanging-wall rock to the upper ore plate is quartz-chlorite-sericite schist, grading into disseminated Py mineralization, which has sharp contact to the massive mineralization.

Considering the numerous Zn-Cu prospects in the Hersjø Formation between the significant, low-grade Hersjø deposit in the north and the long term producing Folldal and Tverrfjellet mines in the south, the ore potential is obvious. The Hersjø deposit occurs in an area almost totally dominated by basic volcanites with only minor felsic dykes found near the sulfide horizons. The sulfide occurrences here are dominantly massive Cu-Zn pyritic, with minor Po-rich units occurring. The greenstone belt becomes more felsic to the south, with the greatest concentration of felsic volcanites occurring around the Vingelen-Nonsvola deposit area. Further south the volcanite complex becomes more irregularly mixed; basic-felsic tuffs with much intercalations of phyllite and graphitic phyllites in the south near the Zn-rich Sivilvangen deposit, south of which the greenstone belt thins markedly.

1998 Exploration Campaign.

In 1998 Mindex ASA (which in December 1999 merged with Crew Development Corporation) carried out an exploration campaign in the whole Røros-Meråker region as well as Fløttum mine (104) in Gauldalen and Vingelen mine (105) in Tolga, see fig 1C. (Wilberg & Røsholt 1998). All mines and claims were visited, described and sampled. Grab samples of representative ore types were collected and analyzed for 34 elements, and a data base for all visited locations has been made. The table, enclosure no 1, shows results of the selected elements Au, Ag, Cu, Pb, Zn, As and Fe.

Overview of the Exploration in Tydal area, Røros.

The Tydal area is located in the Røros - Meråker ore field. See fig 1A. It is, however, located in an area between the central Røros area and the Meråker area, where the number of historical workings is less than in the ore fields to the north (Meråker), and to the south (Røros). Fig no 1B exhibits the Tydal area with the historical workings no 73 Sæterå prospect, 74 Nea prospect and 75 Gressli mine which are occurring in greenstones and greenschists associated with layers of quartz keratophyres. This rock unit belongs to the Støren or Fundsjø Group, which could be correlated to the Hersjø Formation in the Røros area. Historical workings 76 Våråviken prospect and 80 Ramsjø mines are occurring in grey to green schist with layers of meta-greywacke in Upper Hovin Formation or The Sulåmo Group which could be correlated to the Røros Formation in the Røros area. The historical workings 77 Øyfjellet, 78 Langdalsvollen and 78b Gammelgruvhøgda at **642935E/6992912N** are located in amphibolite with layers of mica-schist in "Other allochthonous rocks" assumed late Precambrian-Silurian age according to F. Wolff 1989. Langdalsvollen and Gammelgruvhøgda claims should be located in the Middle Seve nappe. Re. Krister Sundblad. The Middle Seve Nappe is regarded as a highly fertile unit, which hosts several sulphide deposits: Nea Deposit located approximately at UTM 652000E/6994N, now submerged under the Nesjøen hydro power reservoir and Sylarna deposit located close to the commune border in Åre Kommun about 9 km ENE of Lake Sylsjøen. Enclosure no 1 exhibits the location of and assay results from some samples of the respective claims and mines in the Tydal area and Fløttum and Vingelen deposits..

Target 80. Langdalsvollen. Target area: 634000-635000E/6996000-6997000N.

The Hummelfjell Formation is in the Vessingsjøen area composed of calcareous sediments (biotite – carbonate schists, calc – silicate gneisses, phyllite, biotite – sericite schists and rare marble) with intercalations of fine to coarse clastics (quartzites, arkoses and fine grits). Thick amphibolites with minor acid extrusives are also predominant.

The wallrocks of the finegrained, massive po – sl – cpy – mineralization are quartzite, marble and amphibolite. The mineralization is followed with small pits over an E – W strike length of 25 m, and the extensions are not exposed. Exposures SE – wards from the diggings show amphibolite, quartzite, mica schist and phyllite (see enclosed mag map). One outcrop 35 m NW of the diggings shows quartzite with cpy – diss. (+ malachite) and marble layers.
The regional strike is consistently NNE – SSW with dip 20 - 30° to the ESE. A structural disturbance occurs in the area of the outcropping mineralization, where the

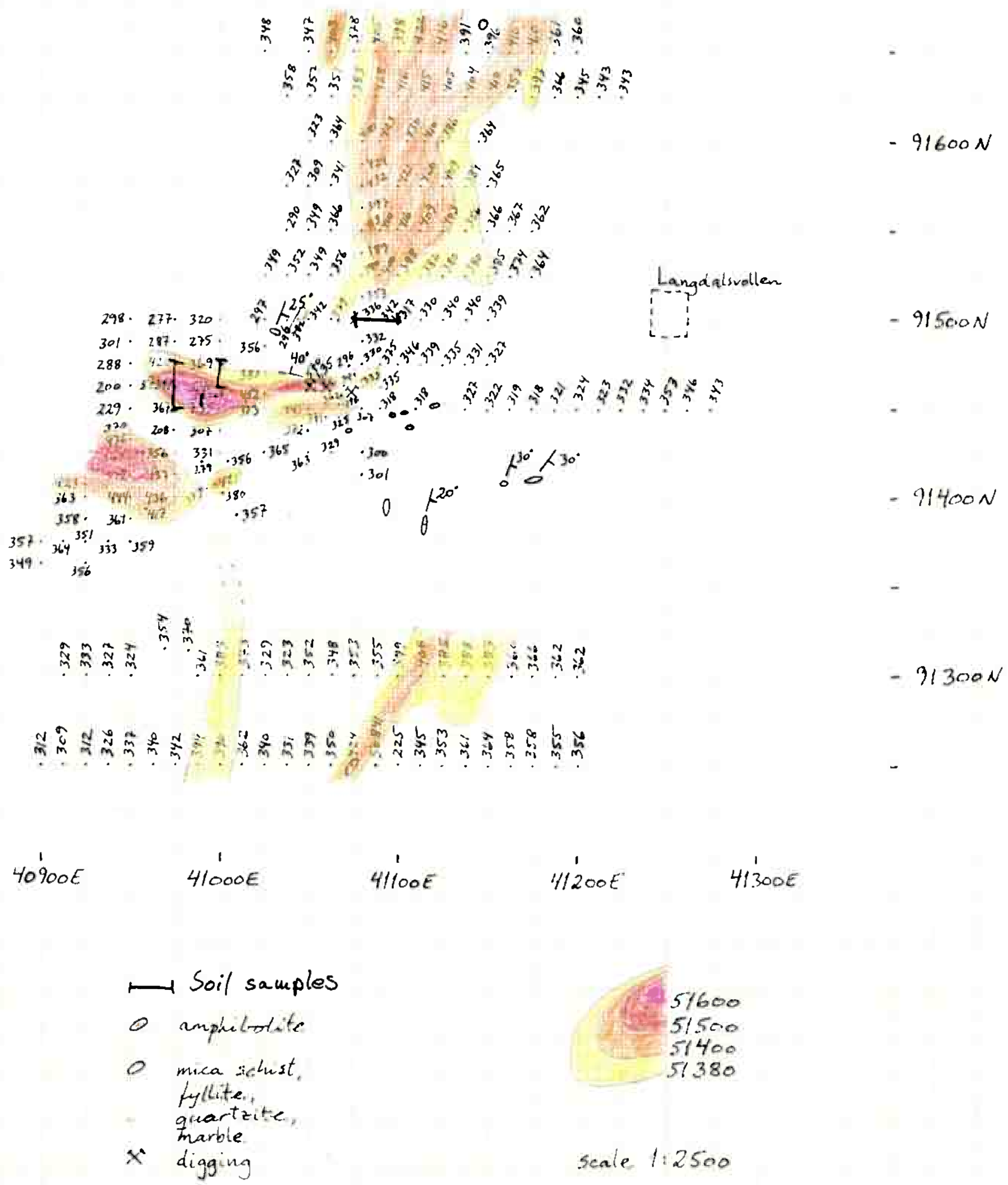
the diggings show amphibolite, quartzite, mica schist and phyllite (see enclosed mag map). One outcrop 35 m NW of the diggings shows quartzite with cpy – diss. (+ malachite) and marble layers.
The regional strike is consistently NNE – SSW with dip 20 - 30° to the ESE. A structural disturbance occurs in the area of the outcropping mineralization, where the strike/dip is 280°/40°. If the mineralization is structurally controlled, such anomalous strike trends should not be overlooked in the area.
The area around the diggings is however covered by swamp with scattered ponds, making difficulties for soil sampling and geophysics.
The po – content in the mineralization influences the mag (see enclosed mag map, fig no 2), and a continuous mag anomaly extends from the diggings 100 m to the west, where it is cut off. 50 m SW from here, another mag high shows up, which has possible connection to the weak mag anomaly in the very wet, swampy area to the south. The swampy area north of the diggings also has mag anomaly. It is possible that the mineralization runs NNE – SSW through the grid (buried in a swampy depression), with an E – W turn in the area around the diggings.
The VLF data partly confirms this, with weak anomalies. See fig no 3. A power line do, however, cause disturbances.
Concerning geochemical screening in this swampy area, only deep overburden sampling is reliable, and should be considered. Assay results of the auger soil samples are presented in enclosure no 2, AB242-AB251. The assay results show no anomalies, so a DOB sampling program will be proposed.

Outcrops:
641048 6991468: quartzite and marble, 280°/40°
641102 6991447: medgr. amphibolite
641119 6991452: medgr. amphibolite (the ridge continues to 641152 6991456)
641115 6991384: quartzite schist, 15°/20°
641094 6991396: finegr., light green rock with weak py – diss. (mylonite?)
641107 6991440: amphibolite, weak py – diss.
641097 6991447: amphibolite, weak py – diss.
641073 6991437: amphibolite
641158 6991408: muscovite – dom. qtz – 2 – mica schist, 20°/30°
641175 6991410: carb – rich phyllite, 35°/30°
641147 6991665: rusty, quartzitic schist, traces of py
641032 6991492: quartzite schist with cpy – diss. and malachite, with marble layers
641075 6991250: quartzite

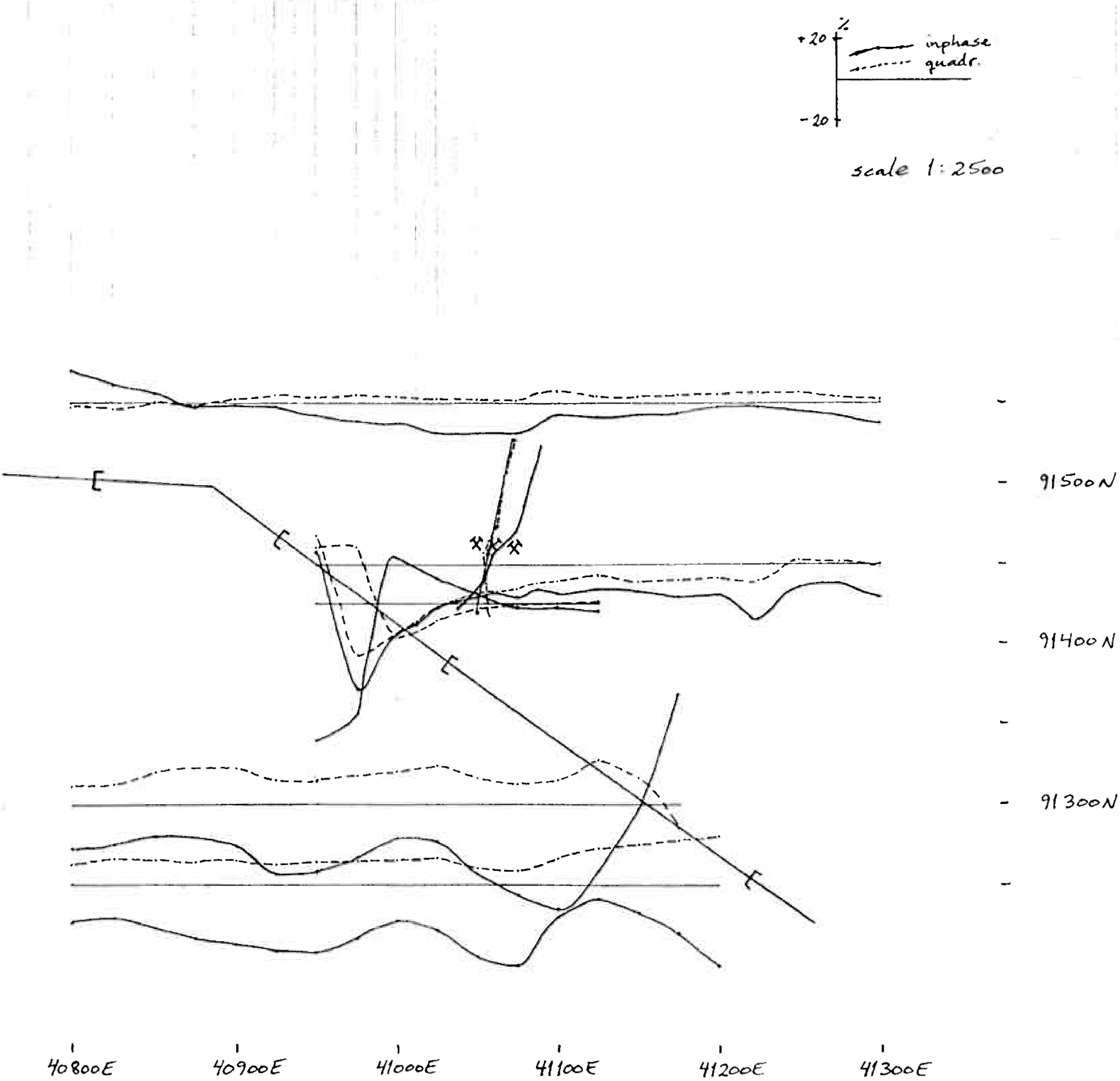
About 2,5km NE of Langdalsvollen, the old prospect of Gammelgruvhøgda, 78b, at 642935E/6992912N was located last summer. Dump volume is estimated at about 60m^3. The mineralization is located in strongly folded chlorite-mica schist similar to Røros schist. The thickness of the mineralization is from 0-0,5m with coarse-grained pyrite, chalcopyrite and sphalerite. Rock sample no 400767 is a typical pyrite rich ore-type. See enclosure no 3.

Follow up work at Langdalsvollen is proposed with DOB sampling of about 30 samples in N-S profiles across the mineralization and to the north and south. The mag anomalies may not have been caused by the mineralization since the measured susceptibility on the ore samples from 1998 showed up to 250 units. If the DOB samples turn out positive, trenching of about 30m of trenching is proposed.

Target 80 Langdalsvollen. Mag Fig 2



Target 80. Langdalsvollen . VLF (7xZ), facing W Fig 3



It is emphasized that the ore from Langdalsvollen is rich and that the area of outcrop is at the same order of size as the Killingdalen ore-body.

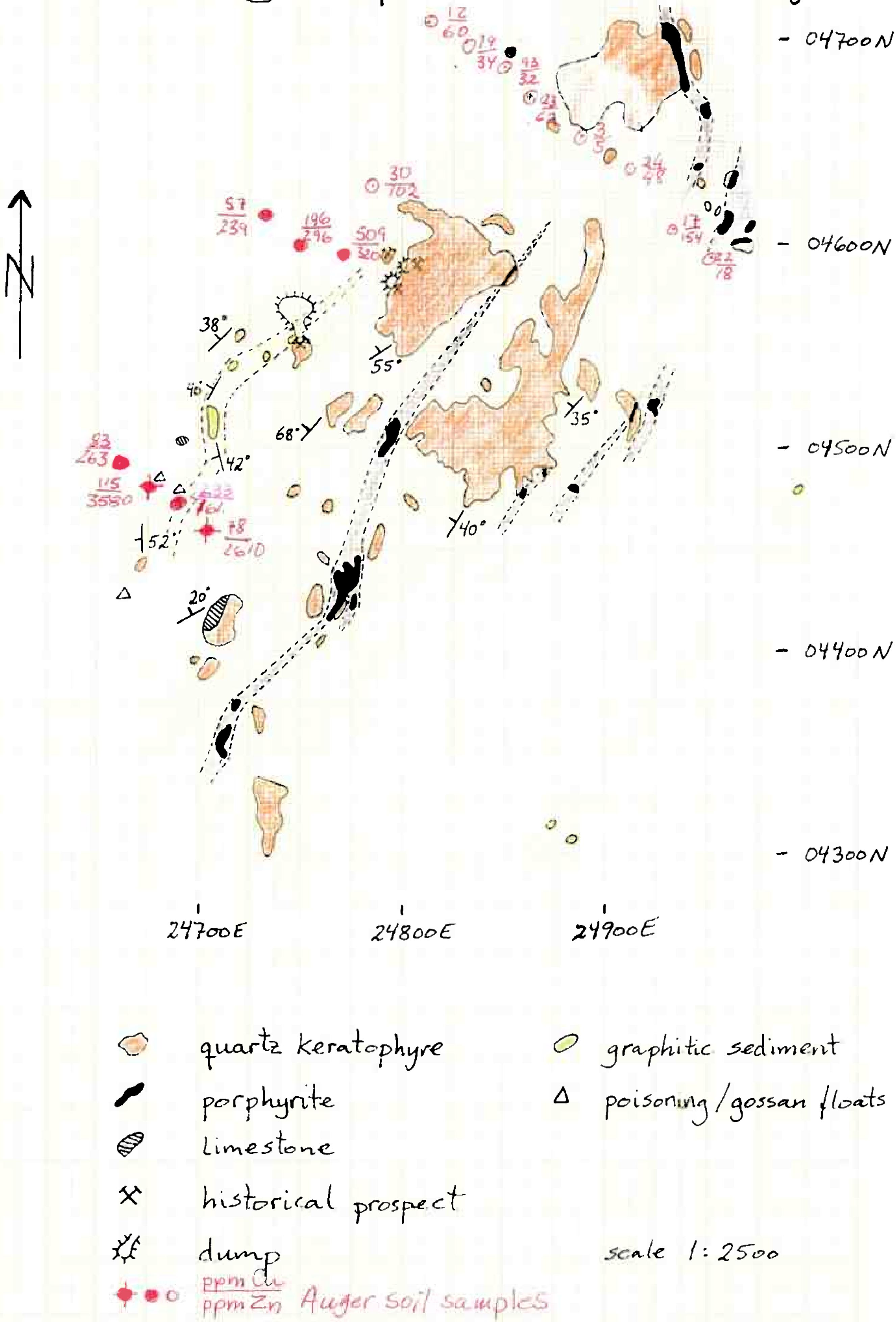
Target 81. Melshognastupet. Target area: 624000-626000E/7004000-7006000N.
This occurrence occur in the Fundsjø Group volcanics just NW of the Fongen – Hyllingen layered Gabbro Complex. The mineralization, which is tested with 4 small pits (< 15 m3 dump), occur in the upper level of a thick unit of quartz keratophyre, which is well exposed along a ridge (see geological map fig 4). This acid volcanic is a quartzo – feldspatic rock, which is frequently rusty from a low content of dispersed pyrite, and in places containing coarse muscovite. The quartz keratophyre unit is intruded by a few, few-m-thick sills or dykes of mafic porphyrite. The four outcrops around 624965 7004610 are less mafic (diorite) in composition, and lack the feldspar porphyres. The volcanics of the Fundsjø Group have west of the Hyllingen Gabbro been intruded by a swarm of these mafic feldspar porphyry dykes / sills.
The exposed part of the keratophyre shows it to be at least 100m thick, the mag data indicates a thickness of 150m. The keratophyre is low in mag (50 600 – 50 900) compared to the rocks above and below (51 100 – 51 400), which is not exposed. Two magnetic horizons (> 52 000) appear above and below the keratophyre unit respectively, which could indicate the keratophyre to be the core in a fold, which repeats the magnetic horizons.
Two VLF anomalies are partly coincident with the SE – ernmost mag anomaly, see figs no 5 and 6, and a short distance SE of the combined anomaly is exposed graphite schist, partly silicified, with cm – thick layers of quartz keratophyre and limestone, and cm – thick layers of semimassive po – py (– cpy) – min. (sample 400776).
A reindeer fence disturb the VLF measurements in the area of the NW – ernmost mag anomaly.
The mineralization in the SW – ernmost digging (UTM 624750 7004550) is dominated by massive sphalerite, in the upper level by almost pure, mediumgrained sphalerite. More common is finegrained sphalerite with variable amount of pyrrhotite, and in places with up to mm – sized pyrite crystals. The content of chalcopyrite is low. Samples 400770 – 400773. Assay results, see below and enclosure no 3:

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	%	ppm	%	ppm	%
L.R.L.	5	0,2	0,01	2	0,01	3	0,01
400770	392	>10	3,14	57	0,12	<3	13,1
400771	153	>10	0,12	487	25,80	69	20,2
400772	262	>10	0,20	64	25,00	47	17,5
400773	230	9,5	0,02	175	39,60	15	7,04

The thickness of the massive mineralization is assumed to be at least 80 cm; the footwall contact is hard to delineate because of gossan in the digging.
Along the hangingwall contact of the ore, appears at least 1 m thick graphite – bearing tuffite with coarse muscovite and weak sulphide – diss. (sample 400777), intermixed with keratophyre layers. Assay results of this sample returned low contents of base metals. The sl – min. is covered outside of the digging, but the graphite horizon can be followed 60 m SW – wards, here rusty and silicified, with finegrained sulphide – diss. and in places cm – sized py crystals. Further SW – wards in the hillside, a few

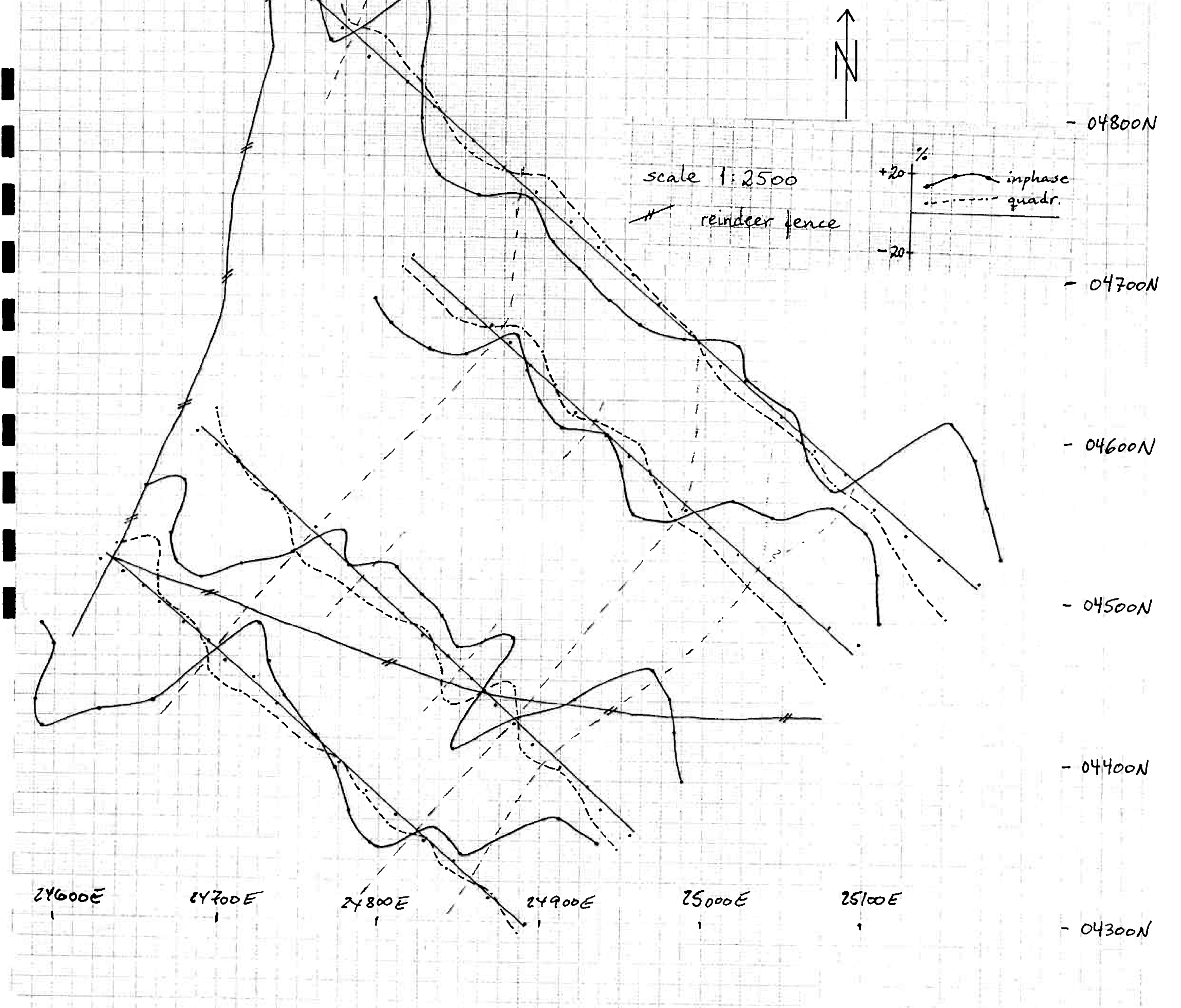
Target 81 Melshognastupet

Fig 4

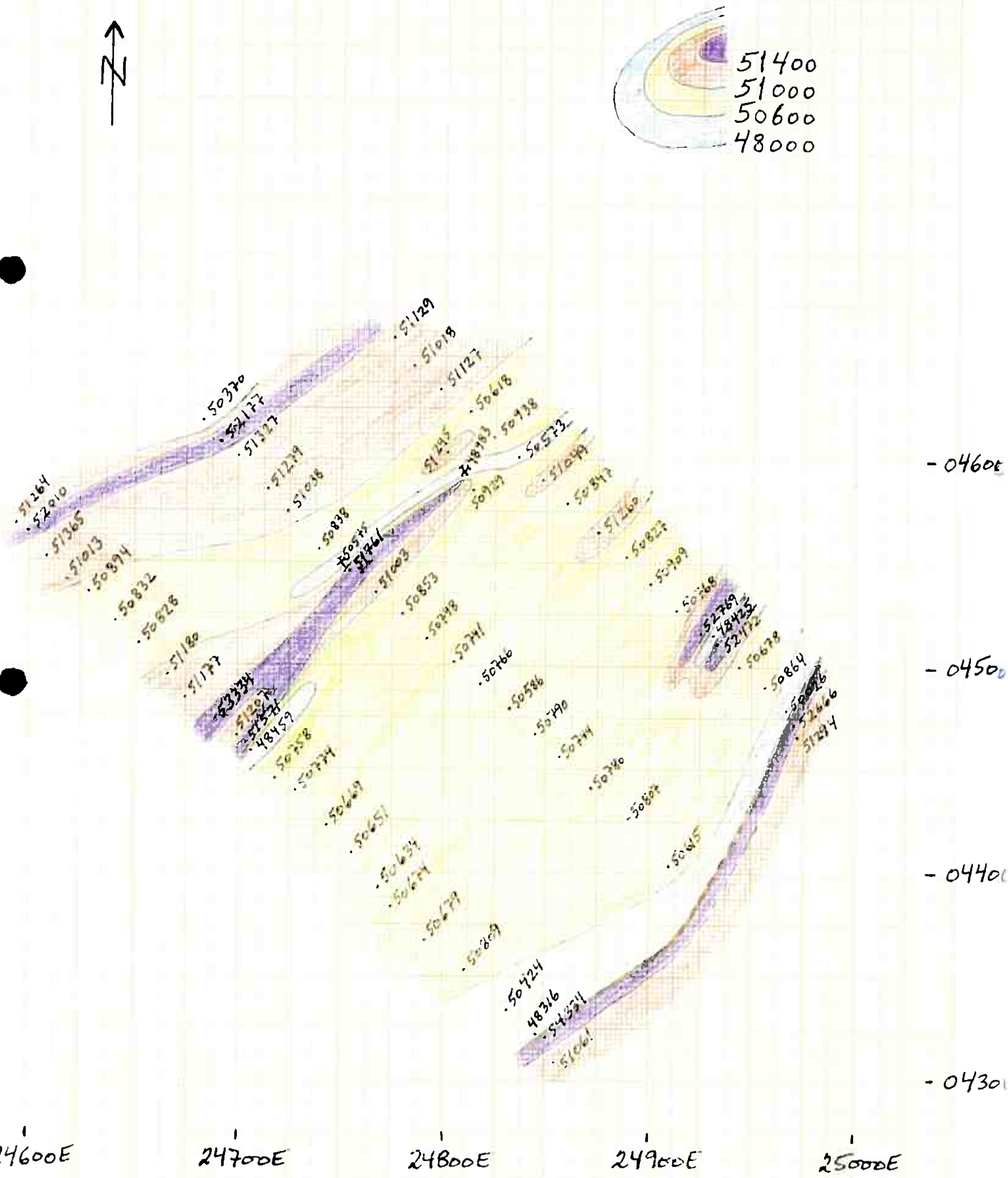


Target 81. Melshognastupet. VLF (7XZ), facing W

Fig 5.



Target 81. Melshognastupet. Mag. Fig 6.



poisoned drainages and gossanous floats in the overburden can be seen. Floats of graphite schist with cpy – py (coarse) – diss. are sampled from one of these poisoned drainages at 624681 7004485 (400775). Base metal content in this sample is only 0,14% Cu, 0,1% Zn and 0,1% Pb.
This mineralization has combined mag and VLF anomaly running through the entire grid, at least 350 m long.
It is hard to predict the extension of the sl – min. from the EM data, as the capping graphite schist mask the mineralization. From observations it seems that the graphite horizon contains little po compared to the massive sl – min., and thus the mag anomaly extending SW – wards out of the grid could prove promising.
Soil sampling of the B – horizon are conducted over this conductor.
In the digging at 624808 7004589 appears a few – dm thick zone where the keratophyre contains semimassive to impregnation of pyrite with a low content of sphalerite (sample 400774).
In the digging at 624995 7004479 is rusty keratophyre with gossan, and graphite can be observed.

The quality of the mineralization and the possible extension in mind, this target holds potential and should not be left. Soil sample results are plotted at fig no 4 and enclosure no 2 AB226-AB241. The NE-most profile exhibits only slightly elevated anomalies like 154ppm Zn and 93ppm Cu. The two other profiles, however, with only seven samples exhibits a very strong anomalous area with Zn and Cu contents up to 3580ppm and 509ppm respectively.

Rock samples from the area exhibit some extremely high-grade samples of Zn contents from 25 to 39,6%. See assay results in table above and enclosure no 3.

700 m SW of the sl – digging, a tiny digging (no dump) was detected. Here, is silicified, graphitic schist with semimassive po (enriched in bands) and traces of cpy (sample 400778 with 0,06% Cu, 0,1% Zn and 0,01% Pb). A rusty ridge continues SSW – wards.

Follow up of target no 81, Melshognastupet.
Mindex/Crew was listed in a hearing about a proposed national park covering the NE part of the Tydal area. See fig no 1B. Crew has submitted a proposal to the "Fylkesmann's office" to exclude 10 km^2 of the area around the mineralization for 8 years from the park area. During this time the company should be able to prove wether an economic deposit is located in the area. The nature of the potential deposit is most likely so that it will be extracted by underground mining and it may be reached from outside the park boundaries.
It is proposed to follow up the target with additional 100 auger soil samples supplemented with 50 DOB samples and digging of around 50m of trenching. The area should also be followed up with further detailed geological mapping.

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Target 82. Måltoppen (Tydal). Target area: 622000-623000E/7002500-7003500N.
In an area of bimodal volcanism, at Måltoppen, a showing of pyrite – sphalerite mineralization, grading 4 % Zn and 1 % Pb, was detected in 1984 during a campaign by BP / Norsk Hydro. According to their description, it is located 1 km south of their grid "Drivvollen", meaning approximately 03200N, 22000 – 23000E. The only

mineralization found in this area was 3 tiny pits along a N – S strike length of 30 m at 622626E / 7003783N. This mineralization consists of a 10 – 15 cm thick massive, fine- to mediumgrained pyrite – horizon (sample 400768 with assay results 0,24% Cu, 0,84% Zn and 0,73% Pb.), surrounded by impregnation of py – po – sl – cpy (sample 400769 with assay results 0,16% Cu, 21,7% Zn and 0,02% Pb). For more detailed assay results see enclosure no 3. The mineralization is hosted in an approximately 20 m thick acid volcanic (quartz keratophyre), associated with an up to 1 m thick silicified horizon (possibly quartz "exhalite"). A lens of mafic porphyrite occur along the hanging-wall contact of the central pit. Schistosity: 8°/80°. Other quartz keratophyre horizons occur in the area, but they thin out southwards to a few meter thickness.
Additional work at target no 82, Måltoppen should be one day auger soil sampling and prospecting during the stay at Melshognastupet.

Estimated cost of proposed follow up work in Tydal area:

Langdalsvollen, target no 80:				
DOB sampling	2 1/2 days	NOK 4000/day	NOK	10000
Trenching	2 1/2 "	" "	"	10000
Geological mapping, sampl.	1 "	" "	"	4000
Melshognastupet, target no 81:				
Helicopter field transp.			"	30000
DOB sampling	5 days	" "	"	20000
Auger soil sampling	3 "	" "	"	12000
Trenching.	5 "	" "	"	20000
Måltoppen, target no 82:				
Auger soil sampling	1 "	" "	"	4000
Assays			"	25000
Shipm, field transp, travel			"	21000
Housing, allowances			"	24000
Total			"	**180000**

Below is a reference list of some relevant literature to the district.

References: Røros-Meråker district

Aasgaard, G., 1927, Gruber og Skjerp i kisdraget Øvre Guldal - Tydal: Norges Geol. Unders. Bull., v. 129, p. 1 - 196.

Aasly, K. 2000, Project work. A geochemical and mineralogical characterization of drillcores from "Nordgruvefeltet" in the Røros Sulphide ore district.

Beard, L. 1999, data aquisition and processing - Helicopter geophysical survey, Røros 1999.

Birkeland, A., Solli, A., Øyvik, M., Sandstad, J.S., Grenne, T. & Erichsen, E. 1996: Malmgeologiske undersøkelser i det østlige Meråkerfelt, Nord-Trøndelag. NGU rep. no. 96.041.

Birkeland, A., 1986, Mineralogiske og geokjemiske undersøkelser av Killingdal gruver, Sør - Trøndelag., Department of Geology, University of Oslo, p. 166.

Birkeland, A., 1996, Malmgeologiske undersøkelser i det østlige Meråkerfelt, Nord - Trøndelag, Norges. Geol. Unders., p. 52.

Birkeland, T. & O. Nilsen 1972, Contact metamorphism associated with gabbros in the Trondheim region. Nor. Geol. Unders. 273, 13-22.

Bjerkgård, T. B., A.., 1994, Geology of the Folldal area, southern Trondheim Region Caledonides, Norway: Norges Geol. Unders. Bull., v. 426, p. 53-76.

Bjerkgård, T. B., A., 1994, The stratabound sulfide deposits in the Folldal area, Southern Trondheim region, Norway: Norsk Geol. Tidskr., v. 74, p. 213-237.

Bjerkgård, T. B., A., 1996, Sulfide Deposits in Folldal, Southern Trondheim Region Caledonides, Norway: Source of Metals and Wall-Rock Alterations Related to Host Rocks.: Econ. Geol., v. 91, p. 676-696.

Bjørlykke, 1993, Lead isotope systematics of Strata-bound sulphide deposits in the Caledonides of Norway.: Econ. Geol., v. 88,, p. 397-417.

Bjørlykke, A. e. a., 1980, A review of Caledonian Stratabound Sulphide deposits in Norway: Geol. Surv. Irl., v. Special Paper no5, p. 29-46.

Bjørlykke, A. S., D.F., 1992, Pb-Zn in Nordland - An evaluation of its potential and recommendations for further work.: Trondheim, Norges Geologiske Undersøkelse.

Brækken, H. 1955 and 1977. NGU/GM Report no 150. Geofysiske undersøkelser 31.3-10.6 1955 omkring Kjøli Gruber, Ålen, Holtålen, Sør-Trøndelag.

Bøckman, 1942, Rørosviddas Malmforekomster, *in* Rørosbokkomiteen, editor, Rørosboka: Trondheim, p. 53-71.

Carson, D, 1999, Mineralogy and predictive metallurgy of samples from six MS Deposits in the Røros area. Crew internal report.

Chaloupsky, 1967, Geology of the western and north-eastern part of the Meråker area.: Norges Geol. Unders., v. 245, p. 9-21.

Craig, J.R. 1980: Stratiform sulfide mineralization in the Central U.S. Appalachians. NGU 360, 295-325.

Cratochvil, M. Et al. 2000. Quantec Geoscience Inc. Geopysical Survey Logistics report. Ground survey Jensåsbekken, Kjøli, Rødalen and Svartbekken grids.

Dalsegg, 1992, Geofysiske undersøkelser, Meråkerfeltet -Øst, Meråker Nord-Trøndelag., Norges Geol. Unders. 93.001.

Dalsegg, E 1999.NGU ground survey in Klinkenberg area Røros.
Dalsegg, E. Et al 2000.NGU ground survey at Tjønnvollmyran, Holtålen.
Dalsegg, E. Et al 2000.NGU ground survey in Klinkenberg area, Røros.
Dalsegg, E. Et al 2000.NGU ground survey in Storskarven area, Røros.
Eidsvik, P. 1968: Geofysiske målinger Pustbakken – Slettmo. NGU rep. no. 769.
Eriksen, K. R., 1975, Aktieselskabet Røros Kobberverk, *in* Valmot, O., editor, Bergverk 1975, Jubileumsskr.: Trondheim, Bergingeniør Foren., p. 114-121.
Finne, 1993, Innhold av 28 grunnstoffer i salpetersyreekstrakt av jordprøver fra Meråker., Norges Geol. Unders.
Foslie, S., 1926, Norges Svovelkisforekomster: Norges Geol. Unders., v. No. 127, p. 122.
Gee, D. G. S., B.A.,, 1985, The Caledonide Orogen - Scandinavia and Related Areas, v. 1 + 2, Wiley & Sons, 1266 p.
Gilmour, P. 1971: Strata-bound massive pyritic sulfide deposits – a review. Econ. Geol. 66, 1239-1249.
Gjestland, T. 1992: Gruvene i Storwartz-feltet. Bergstuderendes Forening / Olavsgruvas Venner.

Gonzales, C, 1998: Geophysical Report from the Røros Area. Crew Internal Report No N98/10, 123pp incl. tables and figs.
Gower, C. F., 1992, The relevance of Baltic Shield Metallogeny to Mineral Exploration in Labrador, Current Research, Newfoundland Dept. of Mines and Energy, p. 331-366.
Grenne, T., 1987, Marginal basin type metavolvanites of the Hersjø Formation, eastern Trondheim District, Central Norwegian Caledonides: Norges Geol. Unders. Bull., v. 412, p. 29-42.
Grenne, T., Hertogen, J., Solli, A., Birkeland, A., Erichsen, E., Sandstad, J.S., 1995, The sequential development of magmatic ore-forming processes in the Fundsjø Group, Meråker district, Central Norway.: Norges Geol. Unders. Bull., v. 427, p. 108-111.
Grytdal, I. 1989: Fløttumsgruva. Singsås Bygdemuseum.
Gvein, Ø., 1976, Boring i Græsli, Tydal, Sør - Trøndelag., Aspro, p. 17.
Haugen, A., 1966, En Malmgeologisk beskrivelswe av Gilså - Dronningen - Lillefjell -området i Meråker., Geology Department, University of Trondheim, p. 110.
Juhava, R. 1991: Ore calculation. Fløttum. Int. rep. Folldal Verk A/S / Outokompo Oy. (Available at Bergmester office.)
Karlstrøm, 1993, Edelmetaller i kisforekomster i Nord-Trøndelag., p. 58.
Krupp, R. K., G., 1985, Geological Setting of the Tverrfjell Copper/Zone Deposit, Central Norway: Geol. Rundsch., v. 74, p. 467-482.
Kumpulainen, R. N., J.P., 1985, Late Proterozoic basin evolution and sedimentation in the westernmost part of Baltoscandia, *in* Gee, D. G. S., B.A., editor, The Caledonide Orogen - Scandinavia and Related Areas, Wiley & Sons, p. 213-232.
Lieungh, B., 1973, Geologiske, petrografiske og malmgeologiske undersøkelser i Nordgruvefeltet, Røros, Geology Department, Blindern: Oslo, University of Oslo, p. 159.
Ljøkjell, P., 1953, Geology of the Fløttum Mine., Department of geology, University of Trondheim, p. 62.
Mogaard, J. O., Blokkum, O, 1993, Geofysiske målinger fra helikopter over Meråkerfeltet, Nord-Trøndelag.

Nilsen, O., 1969, Petrografiske og malmgeologiske undersøkelser i Haltdalen - Kjøliområdet, Department of Geology, University of Oslo, p. 214.
Nilsen, O., 1971, Sulphide mineralization and wall rock alteration at Rødhammeren mine, Sør - Trøndelag, Norway: Norsk Geol. Tidsskr., v. No 53, p. 9.
Nilsen, O., 1988, The Tectonostratigraphic Setting of Stratabound Sulfide Deposits in the southern Trondheim Region, Central Norwegian Caledonides: Norges Geol. Unders. Bull., v. 412, p. 55-66.
Nilsson, L. P., Sturt, B.A., Ramsay, D.M., 1997, Ophiolitic ultramafites in the Follsal-Røros tract, and their Cr-(PGE) mineralization: Norges Geol. Unders. Bull., v. 433, p. 10-11.
Qvale, H. S., J., 1985, Ultramafic rocks in the Scandinavian Caledonides, *in* Gee, D. G. S., B.A., editor, The Caledonide Orogen - Scandinavia and Related Areas, Wiley & Sons, p. 694-715.
Quantec Geoscience Inc. 2000, Geophysical report, Jensåsbekken, Kjøli, Rødalen and Svartbekken at Røros.
Ramsay, D. M. S., B.A., 1998, The Tjørnseter Salient: A cartographic and structural curiosity in the outcrop pattern of the Otta Nappe: Trondheim, Norges Geol. Unders., p. 12.
Riiber, C. C. A., G., 1935, Beskrivelse av kis og kobbergruver og skjerp i Foldal, Dovre, og Alvdal herreder. In Marlow, W. (ed.) Foldal. Beskrivelse til det geologiske rektangelkart.: Norges Geol. unders., v. 145, p. 28. p.68 - 96.
Rolseth, P. O., 1945, Selbo Kobber - Værk., Selbu og Tydal Historielag, 188 p.
Rui, 1998, Sulphide deposits in the nEastern Trondheim Region, Aspro, p. 17.
Rui, I., 1973, Geology and structures of the Røstvangen sulphide deposit in the Kvikne district, Norwegian Caledonides.: Norsk Geol. Tidskr., v. 53, p. 433-442.
Rui, I., 1973, Structural Control and Wall Rock Alteration at Killingdal Mine, Central Norwegian Caledonides: Econ. Geol., v. 68, p. 859-883.
Rui, I., 1990, Nordgrubefeltet ved Røros, Aspro, p. 24.
Rui, I., 1990, Sulfidforekomster i Børsjøhøfeltet, Aspro, p. 12.
Rui, I., 1998, Sulphide Deposits in the Eastern Trondheim Region, Aspro, p. 17.
Rui, I. B., I., 1975, Stratabound sulfide mineralization in the Kjøli area, Røros District, Norwegian Caledonides: Norsk Geol. Tidsskr., v. 55, p. 51-75.
Rui, I. G., G, 1976, Gravimetric indications of basement undulations below the Cambro - SWilurian deposits East of Røros, Southern Norway: Norsk Geol. Tidsskr., v. 56, p. 195 - 202.
Rui, I. J., 1972, Geology of the Røros District, South-eastern Trondheim Region with a special study of the Kjøliskarvene-Holtsjøen area.: Norsk Geol. Tidsskr., v. 52, p. 1-21.
Rui, I. J., 1980, Stratabound Massive Sulfide Deposits in the Røros District of the Trondheim region, Central Norwegian Caledonides: Nor. Geol. Unders. Bull., v. 360, p. 229.
Rui, I. 1984, Killingdal Gruber. Prospektering rundt utgående sommeren 1983. Aspro report 1470. Bergvesenet Report 1711.
Rui, I. m. F., 1990, Deformasjon og remobilisering av malmer., Bergverkenes Landssammenslutning Industrigruppe, Bergforskningen., p. 199.
Rui, I, 1998, Sulphide deposits in the Eastern Trondheim region. Crew internal report.
Sakshaug, G.F. 1941: Slettmo – Pustbakken. GM rep. no. 24.
Sakshaug, G.F. 1961: Elektromagnetisk undersøkelse Kvernenglia. GM rep. no. 274A.

Sakshaug; G.F. 1961: Elektromagnetisk undersøkelse Mugg – Lille Mugg. GM rep.no.274B.
Singsaas, P. & Brækken, H. 1944: Geofysiske undersøkelser Solskinnsfeltet. GM rep. no. 37.
Singsaas, P. 1949: Elektromagnetisk Karlegging over områder ved Killingdalen Gruber, Ålen. BV rep no 1085.
Singsaas, P. & Brækken, H. 1950: Rapport over elektromagnetisk kartlegging over og omkring Klinkenberg gruve og Abrahams gruve. NGU/GM? rep. no. 72.

Singsaas, P. & Brækken, H. 1951: Geofysisk undersøkelse over området ved Storwartz Grube. NGU/GM? rep. no. 82.
Singsaas, P. & Brækken, H. 1952: Geofysisk undersøkelse Fjellsjøfeltet, Glåmos. NGU/GM? rep. no. 85.
Singsaas, P. 1961: Geofysisk undersøkelse Lergrubebakken/Glåmos. NGU/GM? rep. no. 293.
Singsaas, P. 1965: Geofysisk undersøkelse Lobekken. NGU rep. no. 647.
Sawkins, F. S., 1990, Integrated tectonic-genetic model for volcanic-hosted massive sulfide deposits: Geology, v. 18, p. 1061-1064.
Schack-Pedersen, S. A., 1979, Structures and Ore Genesis of the Grimsdalen Sulfide Deposits, Southern Trondheim Region, Norway.: Norges Geol. Unders. Bull., v. 351, p. 77-98.
Shieh, Y. N. R., I.J., 1980, Sulfur and Oxygen Isotope Ratios in Stratabound Ores and Wall Rocks from the Killingdal Mine, Central Norwegian Caledonides.: Nor. Geol. Unders. Bull., v. 360, p. 231.
Stephens, M. B. G. D. G., 1989, Terranes and polyphase accretionary history in the Scandinavian Caledonides: Geol Soc. Am. Spec. Paper, v. 230, p. 17-30.
Stephens, M. B. R., A., 1986, Stratabound sulfide mineralizations in the Central Scandinavian Caledonides, Sveriges Geol. Unders. Ca., p. 67.
Sturt, B. A., Ramsay, D.M., Neuman, R.B., 1991, The Otta Conglomerate, the Vågåmo Ophiolite - further indications of early Ordovician Orogenesis in the Scandinavian Caledonides: Norsk Geol. Tidsskr., v. 71, p. 107-115.
Sturt, B. A., Bøe, R., Ramsay, D.M., Bjerggård, T., 1995, Stratigraphy of the Otta-Vågå tract and regional stratigraphic implications: Norges Geol. Unders. Bull., v. 427, p. 25-28.
Sturt, B. A., Ramsay, D.M., 1997, The Gudbrandsdalen Antiform - a major Late Caledonian structure: Norges Geol. Unders. Bull., v. 433, p. 12-13.
Sturt, B. A., Ramsay, D. M., Bjerkgård, T., 1997, Revisions of the tectonostratigraphy of the Otta-Røros tract: Norges geol. Unders. Bull., v. 433, p. 8-9.
Sturt, B. A. R., D., 1991, Tectonostratigraphic Relationships and Obduction Histories of Scandinavian Ophiolitic Terranes, *in* Tj. Peters et al., editor, Ophiolite Genesis and Evolution of the Oceanic Lithospher, Ministry of Petroleum and Minerals, Sultanate of Oman, p. 745-769.
Sundblad, K. 1980: A tentative "Volcanogenic" Formation Model for the Sediment-hosted Ankarvattnet Zn-Cu-Pb Massive Sulphide Deposit, Central Swedish Caledonides. NGU 360, 211-227.
Sundblad, 1983, Lead isotope systematics of stratabound sulfide deposits in the higher nappe complexes of the Swedish Caledonides.: Econ. geol., v. 78, p. 1090-1107.
Theting, F., 1935, Beskrivelse av Røstvanggruberne. In Marlow, W. (ed.). Foldal. Beskrivelse til det geologiske rektangelkart.: Norges Geol. Unders., v. 145, p. 97 - 109.

Vogt, T. 1949: Forslag til geofysisk malmleting i traktene nord for Aursunden. Bergarkivet rep. no. 2094.

Vokes, F.M. 1968: Regional metamorphism of the Palaeozoic geosynclinal sulphide ore deposits of Norway. Trans. Inst. Mining Met. 77, B53-B59.

Vokes, F.M. 1969: A review of the metamorphism of sulphide deposits. Earth Sci. Rev. 5, 99-143.

Vokes, F.M. 1976: Caledonian massive sulphide deposits in Scandinavia – a comparative review. In Wolf, K.H. (ed.) Handbook of Stratabound and Stratiform ore deposits, 6, 79-127 Elsevier.

Vokes, F. M., 1980, Some Aspects of research into Caledonian Stratabound Sulfide Deposits of Scandinavia: Nor. Geol. Unders. Bull., v. 360, p. 77-93.

Vokes, F. M., 1987, Caledonian Stratabound Sulfide Ores and Factors affecting them.: Geol. Surv. Finland. Spec. paper, v. 1, p. 15-26.

Vokes, F. M., Rundhovde, E., Boyd, R., Grenne, T., Nilsson, L.-P., Pedersen, R.-B., 1991, The metallogeny of early Ordovician ophiolites in the Norwegian Caledonides, *in* Leroy, P., editor, Source, Transport and Deposition of Metals: Rotterdam, Balkema, p. 627-630.

Vokes, F. R., A., 1980, Stratabound Sulfides in the Caledonian-Appalachian orogen, Nor. Geol. Unders., p. 325.

Walker, 1992, A geophysical investigation of Kjølhauggruppen and Sulåmogruppen over two areas near Meråker, Norway., Norges Geol. Unders.

Wilberg, R & Røsholt, B, 1998: Røros Zinc Project, Geological Investigations of Stratiform Sulfide Deposits in the Røros-Meråker Area. Crew Internal Report No. 98/8, 147 pp + maps and tables.

Witt-Nilsson, P, 1999: The Røros-Meråker district mines – a structural assessment. Crew Internal Report. No. N99/1, 99 pp + maps and diagrams.

Wolff, F. C. e. a., 1967, Studies in the Trondheim Region, Central Norwegian Caledonides II: Norges Geol Unders., v. 245, p. 146.

Wolff, F.C. 1973: Beskrivelse til de berggrunnsgeologiske kart 1721 I og 1722 II – 1:50 000. NGU no. 295.

Zachrisson, E., 1980, Aspects of Stratabound base metal Mineralization in the Swedish Caledonides.: Geol. Surv. Irl., v. Special paper no.5, p. 47-61.

Zachrisson, E., 1986, Scandinavian Caledonides Stratabound Sulfide Deposits, Sveriges Geol. Unders.

ENCLOSURES

Encl. 1.

Summary of results of ore samples from Tydal district, Fløttum deposit in Gauldalen and Vingelen in Tolga district:

73. Sæterå prospect (Sæterå) UTM 0622952 6997662

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	Ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399985	2335	68,1	3852	18300	43800	68	> 10.00
399986	6002	84,7	3291	25100	50800	131	8,68
399987	2084	8,9	2756	1295	20100	294	6,17

74. Nea UTM 0623270 6995949

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399988	27	0,6	184	101	274	11	5,39

75. Gressli (Gressli) UTM 0624407 6993665

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399845	97	14,9	18000	68	150900	396	> 10.00
399846	56	10,7	6442	60	168900	311	> 10.00
399847	195	34,3	26000	143	106000	191	> 10.00
399848	48	21	12000	120	106000	245	> 10.00
399849	53	6,9	3498	482	37000	207	21,9
399850	2308	54,4	2468	17500	552	1894	3,38
399873	820	26,1	9102	8172	3154	1012	3,88
399874	407	133,9	114	37400	181	82	2,34
399875	89	6,9	19000	147	32000	186	21,3
399876	75	4,8	7311	193	82000	209	28,6

76. Våråviken (Livollen) UTM 634756 6996866

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399890	363	53,9	30600	20400	94200	565	> 10.00
399891	199	26,9	11200	5691	75800	82	> 10.00
399892	322	82,5	13600	39500	152700	660	> 10.00
399893	831	56	16600	25300	87200	776	> 10.00
399894	448	44,2	5062	19900	69700	410	> 10.00
399895	210	3,9	5075	1195	5445	109	7,16

77. Øifjellet (Gammelgruvhøgda) UTM 0643140 6994210

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399843	18	< 0.2	13	5	90	< 5	3,79
399844	< 5	< 0.2	47	13	141	< 5	4,33

78. Langdalsvollen (Langdalsvollen) UTM 0641073 6991492

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399904	128	5,8	36700	17	113300	58	9,48
399905	54	24,9	216900	41	5689	31	> 10.00
399906	85	1,4	8688	7	4511	54	4,66
399907	71	2,4	16400	10	39900	50	5,55

79. Storvollvola UTM 0644310 6986976

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399889	9	0,4	521	82	328	62	7,7

80. Ramsjø (Ramsjø) UTM 0637532 7007442

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399901	132	0,5	2147	10	545	134	> 10.00
399902	376	0,9	5722	13	3330	127	> 10.00
399903	111	1,7	7435	11	1547	50	> 10.00

Gauldalen:

104. Fløttum (Fløttum) UTM 0587382 6975507

Result of chemical analysis:

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
400011	409	56,9	78500	997	101300	286	> 10.00
400012	64	6,4	6567	110	147700	304	> 10.00
400013	97	28,8	12000	3749	112400	264	> 10.00
400014	87	15,1	874	2934	329500	31	6,17
400015	450	27,9	26600	795	6060	133	8,77
400016	110	7,4	18900	194	99000	40	> 10.00
400017	142	17,4	16600	342	213400	166	> 10.00
400018	96	32,4	762	3652	287000	172	> 10.00

Tolga district:

105. Vingelen (Vingelen) UTM 0596450 6924750
Result of chemical analysis:

Element	Au30	Ag	Cu	Pb	Zn	As	Fe
Units	ppb	ppm	ppm	ppm	ppm	ppm	%
L.R.L.	5	0,2	1	2	1	5	0,01
399787	798	13,8	27000	192	136000	106	23,8
399788	77	5,6	14000	92	34000	155	19,7
399789	28	1,8	2728	47	199	161	> 10.00
399790	25	2,3	4912	63	265	137	> 10.00
399791	48	2,8	7333	70	10000	103	> 10.00
399792	77	9,4	2544	1684	224100	106	21,3
399793	52	1,3	317	81	169400	122	> 10.00

Tydal area, results of Soil Samples 2001

Smpl. ID	UTM E	UTM N	Target	Be	Na	Mg	Al	P	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni
Sch. Code				ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70
An. Unit				ppm	%	%	%	%	%	%	ppm	%	ppm	ppm	ppm	%	ppm	ppm
Det. Lim.				0.5	0.01	0.01	0.01	0.01	0.01	0.01	0.5	0.01	2	1	2	0.01	1	1
AB226	624867	7004671	Melsh.stup	<0.5	<0.01	0.42	0.8	0.04	0.09	0.11	1.4	0.05	14	15	83	0.75	4	7
AB227	624848	7004686	Melsh.stup	<0.5	<0.01	0.93	1.31	0.01	0.03	0.03	5.2	0.08	23	14	242	1.71	3	3
AB228	624833	7004698	Melsh.stup	<0.5	0.01	0.27	1.25	0.06	0.03	0.17	2.3	0.06	26	15	48	1.07	6	5
AB229	624817	7004709	Melsh.stup	<0.5	0.01	0.65	1.12	0.02	0.2	0.06	2.4	0.1	29	17	106	1.29	5	7
AB230	624889	7004653	Melsh.stup	<0.5	<0.01	0.02	0.17	<0.01	0.01	<0.	<0	<0.	3	4	10	0.37	<1	<1
AB231	624914	7004637	Melsh.stup	<0.5	<0.01	0.36	1.02	0.06	0.09	0.18	2	0.04	18	16	88	0.88	3	11
AB232	624930	7004610	Melsh.stup	<0.5	<0.01	0.48	0.99	0.07	0.08	0.2	2.3	0.05	22	22	84	1.03	4	13
AB233	624951	7004590	Melsh.stup	<0.5	<0.01	0.27	0.74	0.01	0.04	0.04	2.5	0.05	20	17	42	0.36	1	6
AB234	624787	7004630	Melsh.stup	<0.5	<0.01	0.35	1.72	0.04	0.04	0.07	2.8	0.11	38	29	91	4.3	6	9
AB235	624771	7004595	Melsh.stup	0.7	<0.01	0.05	0.93	0.07	0.02	0.02	4	0.13	36	49	72	16.9	3	<1
AB236	624748	7004603	Melsh.stup	<0.5	<0.01	0.29	2.05	0.05	0.04	0.09	2.9	0.09	30	25	303	4.85	6	16
AB237	624733	7004617	Melsh.stup	<0.5	<0.01	0.49	1.93	0.06	0.07	0.13	3.6	0.11	39	35	219	4.18	9	17
AB238	624693	7004473	Melsh.stup	<0.5	<0.01	0.08	0.91	0.07	0.02	0.05	0.9	0.07	53	13	35	4.97	1	2
AB239	624703	7004460	Melsh.stup	<0.5	<0.01	0.74	1.49	0.09	0.06	0.28	3	0.07	44	34	377	2.91	10	27
AB240	624677	7004483	Melsh.stup	<0.5	<0.01	0.58	1.2	0.1	0.06	0.27	2.4	0.06	34	25	393	2.04	14	30
AB241	624662	7004496	Melsh.stup	<0.5	<0.01	0.57	1.07	0.09	0.22	0.23	1.5	0.08	33	16	226	2.7	6	11
AB242	640975	6991462	Langd.v.	<0.5	<0.01	0.03	0.23	<0.01	0.01	0.05	1	0.07	15	8	13	0.13	<1	1
AB243	640975	6991475	Langd.v.	<0.5	<0.01	0.15	0.77	0.07	0.02	0.18	2	0.06	22	17	82	1.71	4	7
AB244	640975	6991450	Langd.v.	<0.5	<0.01	0.17	0.61	0.04	0.02	0.29	1.5	0.05	10	12	33	0.39	3	9
AB245	640987	6991460	Langd.v.	<0.5	<0.01	0.12	0.27	0.04	0.02	0.16	1	0.03	7	14	29	0.22	2	7
AB246	640987	6991466	Langd.v.	<0.5	<0.01	0.13	0.39	0.03	0.01	0.15	1	0.03	14	8	32	0.61	3	5
AB247	641000	6991462	Langd.v.	<0.5	<0.01	0.15	0.27	0.06	0.02	0.19	0.9	0.03	7	7	34	0.42	5	7
AB248	641000	6991475	Langd.v.	<0.5	<0.01	0.1	0.3	0.03	0.01	0.18	0.7	0.04	11	6	23	0.42	<1	5
AB249	641100	6991550	Langd.v.	1.1	<0.01	0.03	0.18	<0.01	0.01	0.05	1.9	0.07	13	8	10	0.06	<1	2
AB250	641075	6991550	Langd.v.	<0.5	<0.01	0.4	0.98	0.07	0.03	0.55	3.5	0.12	35	26	49	0.92	3	5
AB251	641105	6991600	Langd.v.	0.5	<0.01	1.27	2.36	0.09	0.61	0.51	1.1	0.22	47	37	462	3.76	14	19

Encl. 2.

Tydal area, results of Soil Samples 2001

	Cu	Zn	As	Sr	Y	Zr	Mo	Ag	Cd	Sn	Sb	Ba	La	W	Pb	Bi	Li
	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	0.5	0.5	3	0.5	0.5	0.5	1	0.2	1	10	5	1	0.5	10	2	5	1
	22.8	61.8	<3	4.1	2.9	1.4	<1	0.8	<1	<10	<5	14	4.7	<10	4	<5	5
	32.4	92.8	<3	1.4	1.7	1	5	1.1	<1	<10	<5	5	2.3	<10	29	<5	7
	14.4	33.5	<3	3.7	4.4	2	<1	<0.2	<1	<10	<5	5	5	<10	7	<5	4
	12.3	60.2	<3	3.5	2.3	1	<1	<0.2	<1	<10	<5	15	3.7	<10	12	<5	5
	3.3	4.6	<3	<0.5	0.7	<0.5	<1	<0.2	<1	<10	<5	<1	1.2	<10	16	<5	<1
	24	47.6	<3	6.9	4.8	1	1	<0.2	<1	<10	<5	12	10.1	<10	6	<5	6
	16.7	154	<3	7	5.3	0.8	2	0.9	<1	<10	<5	21	9.2	<10	40	<5	8
	21.5	17.8	<3	3	4.1	1.8	<1	0.3	<1	<10	<5	9	11	<10	6	<5	4
	29.8	102	<3	3.8	4.5	3.8	2	4.3	<1	<10	<5	7	2.9	<10	33	<5	5
	509	320	<3	0.7	12	10.5	2	6.4	2	<10	<5	2	<0.5	<10	834	11	<1
	196	296	<3	3.3	14.6	3.2	2	0.9	<1	<10	<5	6	10.7	<10	465	<5	4
	56.8	239	<3	4.9	7.3	4.2	2	5.5	<1	<10	<5	8	8.1	<10	96	<5	7
	233	161	46	2.7	4.4	1	15	18.7	<1	<10	<5	5	5.4	<10	132	<5	2
	78.2	2610	27	7.7	7.6	2.8	2	1	<1	<10	<5	10	11.4	<10	727	<5	10
	115	3580	37	8.3	14.5	1.4	2	<0.2	1	<10	<5	12	13.3	<10	94	<5	7
	82.9	263	16	9.6	7.2	2.2	2	0.3	<1	<10	<5	21	11.4	<10	44	<5	6
242	3.4	25.1	<3	2.9	1.7	2.1	<1	0.3	<1	<10	<5	4	3.9	<10	7	<5	<1
	25.2	15.6	<3	6.3	3.9	2.6	<1	<0.2	<1	<10	<5	6	6.2	<10	7	<5	2
	13.4	12	<3	9.4	4.3	2.1	<1	<0.2	<1	<10	<5	8	9.8	<10	6	<5	2
	14.9	8.8	<3	6.5	3.6	1.2	<1	<0.2	<1	<10	<5	6	6.8	<10	3	<5	1
	7.1	8.6	<3	6.3	2.8	1.6	1	<0.2	<1	<10	<5	7	7.5	<10	6	<5	3
	14	13.2	<3	6.7	3.6	1.9	<1	<0.2	<1	<10	<5	5	5.1	<10	<2	<5	2
	3.5	6.9	<3	6.7	2.6	<0.5	<1	<0.2	<1	<10	<5	11	5.2	<10	2	<5	2
	1.6	4.1	<3	3.9	2.5	0.6	<1	<0.2	<1	<10	<5	5	3.6	<10	5	<5	1
	4.2	50.5	<3	13.3	5.5	2	<1	<0.2	<1	<10	<5	11	8.5	<10	8	<5	7
251	29.5	73.7	<3	8.2	4.5	3.3	2	<0.2	<1	<10	<5	34	6.1	<10	2	<5	18

Enclosure 3

Røros Rock Assays 2001
corrected results

Sampl. Id.	Loc	UTM E	UTM N	Description	Au	Be	Na	Mg	Al	P	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni
Sch. Code					FA301	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70
An. Unit					ppb	ppm	%	%	%	%	%	%	ppm	%	ppm	ppm	ppm	%	ppm	ppm
Det. Lim.					1	0.5	0.01	0.01	0.01	0.01	0.01	0.01	0.5	0.01	2	1	2	0.01	1	1
401237	Folldalen	624902	6969700	finegr. amphibolite with py(-po)-diss. + traces of cpy	5	<0.5	0.03	1.31	2.11	0.16	1.61	0.47	8.8	0.21	406	137	377	7.76	44	93
401238	Folldalen	624902	6969700	finegr., dark grey graphitic scist with py(-po-cpy)-bands	21	<0.5	0.13	0.65	1.14	0.1	0.31	0.85	6.4	0.08	110	42	337	3.63	22	19
401239	Folldalen	625303	6969897	amphibole-mica schist with po-bands, traces of cpy	10	<0.5	0.04	1.3	1.34	0.08	0.05	0.38	1.7	0.13	66	133	311	10.8	51	78
401240	Folldalen	625302	6969880	felsic volcanic with py-diss	11	<0.5	0.05	0.57	0.66	0.08	0.22	0.55	5.1	0.13	65	93	211	4.74	21	15
401241	Folldalen	624858	6970308	dark grey, silicyfied phyllitic mica schist with po(-cpy)-diss	26	<0.5	0.04	1.37	2.09	0.07	0.64	0.37	9	0.21	190	111	297	6.37	37	72
401242	Bønsbud	622149	6969899	finegr. amphibolite with semimassive po(-cpy) min	20	1.3	0.02	0.12	0.19	0.03	0.02	0.54	<0.5	0.02	18	19	156	26	746	181
401243	Bønsbud	622142	6969900	amphibolite with semimassive mt	4	1.4	0.06	0.09	0.29	0.02	0.05	0.66	<0.5	0.04	25	32	272	13.9	18	3
401244	Killingdal N	626017	6966430	blackschist with semimassive po(-cpy) min	38	3.1	<0.01	1.39	1.98	0.17	0.26	0.45	4.1	0.06	374	79	876	22.1	83	285
401245	Killingdal N	626017	6966430	blackschist with semimassive po-cpy min	26	2.1	<0.01	1.32	1.7	0.03	0.41	0.07	2	0.04	109	50	617	22.5	74	329
401246	Killingdal N	625683	6966338	light, intermediate tuffitic schist with py(-cpy)-diss. (boulder)	10	<0.5	0.02	1.36	1.47	0.1	0.07	0.24	6.5	0.2	141	159	197	8.78	32	11
401247	Stilbankan	625474	6973222	amphibolite with py-diss.	19	<0.5	0.18	0.26	1	0.04	0.15	1.39	1.5	0.06	20	29	406	4.79	11	6
399506	Væråsvollen	639190	7024874	chlorite schist with cpy-py(-po)-diss	100	<0.5	<0.01	3.49	3.29	0.05	0.08	0.12	0.9	0.05	51	119	825	8.35	24	11
399507	Væråsvollen	639190	7024874	chlorite schist with band of semimassive sl-cpy-min	27	<0.5	<0.01	4.53	4.24	0.06	0.02	0.16	2	0.07	65	140	1030	7.59	20	21
399508	Husmannsb	637998	7023892	massive sl(-py-cpy-ga)-min.	189	<0.5	<0.01	0.13	0.15	<0.01	0.08	0.19	<0.5	0.01	8	36	1000	10.2	14	9
399509	Husmannsb	637663	7023402	qtz-feldspar-mica sch. with py(-cpy)-diss	10	<0.5	<0.01	1.99	2.36	0.05	0.1	0.09	1.3	0.02	33	152	768	6.65	11	21
399510	Husmannsb	637486	7023583	finegr. gabbro with po(-cpy)-diss	6	<0.5	0.01	1.45	1.47	0.12	<0.01	0.5	0.9	0.13	43	65	434	3.89	36	42
400751	Torvbekken	616154	6955259	chlorite-mica schist with cpy-stringers	136	<0.5	<0.01	2.68	3.13	0.06	0.26	0.09	6.5	0.05	91	159	651	10.3	29	36
400752	Torvbekken	616324	6955055	chlorite-amphibole schist and qtz-feldsp-amphibolite with cpy-diss. (floats)	81	<0.5	0.05	0.49	0.87	0.06	0.02	0.49	2.9	0.02	39	64	183	4.81	34	18
400753	Lossius	634510	6938808	qtz exhalite with massive, coarsegr., cataclastic py (dump spl.)	370	1	<0.01	0.17	0.18	<0.01	0.01	<0.01	<0.5	0.01	26	118	89	26	363	58
400754	Lossius	634510	6938808	massive fine - medgr. py(-ga-sl-cpy)-min. (dump spl.)	300	1	<0.01	1.22	1.13	0.01	0.01	0.02	6.2	<0.01	97	145	395	24.1	68	139
400755	Lossius	634510	6938808	qtz exhalite with semimassive (-diss.) py-ga-sl-cpy-min. (dump spl.)	350	0.6	<0.01	0.22	0.23	<0.01	0.03	<0.01	<0.5	<0.01	19	144	129	18.1	136	107
400756	Lossius	634510	6938808	massive py-ga-min. in qtz with wallrock (greenschist) (dump spl.)	356	<0.5	<0.01	1.39	1.46	0.02	0.06	0.05	4.7	0.05	62	126	516	11.1	90	38
400757	Lossius	634510	6938808	qtz exhalite with semimassive py-ga-sl-min. (dump spl.)	240	<0.5	<0.01	1.01	1.18	0.02	0.19	0.08	3	0.07	42	135	372	7.32	40	46
400758	Lossius	634510	6938808	hydrothermal qtz vein with py(-ga)-min.	54	<0.5	<0.01	0.01	0.03	<0.01	0.02	<0.01	<0.5	<0.01	7	99	25	11.1	49	28
400759	Lossius	634491	6938817	semimassive-massive py-ga-sl-cpy-min. in qtz exhalite	316	0.7	<0.01	0.42	0.44	<0.01	0.05	<0.01	<0.5	<0.01	31	147	183	20.9	110	132
400760	Lossius	634455	6938819	massive po-cpy-sl-ga-min.	50	1.3	<0.01	0.1	0.09	<0.01	<0.01	<0.01	<0.5	<0.01	23	41	134	28.1	334	1740
400761	Sara	633777	6939167	semimassive po-cpy-sl-min. (dump spl.)	35	1.1	<0.01	1.35	1.5	0.01	0.02	0.04	7.9	0.03	92	113	629	24.9	196	169
400762	Sara	633734	6939145	semimassive po-sl-cpy-min. in qtz matrix (dump spl.)	21	1	<0.01	0.3	0.34	<0.01	0.01	<0.01	<0.5	<0.01	24	51	290	22.9	245	164
400763	Svartbekken	625614	6964368	graphitic phyllite with po-diss	10	0.5	0.01	1.11	1.24	0.03	0.46	0.05	1.9	0.02	32	150	154	3.43	20	145
400764	Killingdal N	625603	6966509	graphitic phyllite with gnt, qtz, amph + diss.-semimassive py-cpy-min. (loc. floats	4	0.6	<0.01	1.44	2.62	0.19	0.22	0.41	1.4	0.04	297	131	975	9.27	50	130
400765	Killingdal N	625648	6966464	coarsegr. amphibolite with qtz and cpy-py-diss. (loc. floats)	15	<0.5	0.14	0.5	1.19	0.15	0.06	2.31	5.4	0.05	109	89	350	5.23	46	11
400766	Killingdal N	625849	6966362	phyllite with semimassive py-cpy-min. (loc. floats)	4	0.8	<0.01	1.43	2.58	0.15	0.07	0.37	3.1	0.02	188	99	1030	13.1	82	276
400767	Gammelgh.	642935	6992912	chlorite-mica schist, carbonate-rich, with py-cpy-sl-diss	81	1.2	<0.01	0.23	0.3	0.02	0.04	0.05	<0.5	<0.01	47	133	114	26.6	52	18
400768	Måltoppen	622626	7003783	massive, finegr. py	55	0.5	<0.01	0.16	0.26	0.02	0.05	0.04	<0.5	<0.01	25	88	104	15.1	41	29
400769	Måltoppen	622626	7003783	felsic volcanic / qtz "exhalite" with py-po-sl-cpy-diss	102	0.8	<0.01	0.04	0.05	<0.01	0.02	1.97	<0.5	<0.01	20	32	2560	21.6	116	138
400770	Melshognastu	624750	7004550	massive, finegr. sl with pyx and qtz keratophyre inclusions	392	<0.5	<0.01	1.7	2.22	0.03	0.06	0.1	4.7	0.01	92	185	418	13.1	221	112
400771	Melshognast	624750	7004550	massive, finegr. sl(-py)-min	153	0.8	<0.01	0.05	0.09	0.03	0.03	0.74	<0.5	<0.01	21	22	3070	20.2	25	141
400772	Melshognast	624750	7004550	massive, finegr. sl(-py)-min. with qtz keratophyre incl.	262	0.5	<0.01	0.01	0.11	<0.01	<0.01	0.98	<0.5	<0.01	11	29	2580	17.5	16	134
400773	Melshognast	624750	7004550	massive medgr. sl	230	<0.5	<0.01	<0.01	0.04	<0.01	<0.01	0.02	<0.5	<0.01	3	24	2390	7.04	4	18
400774	Melshognast	624808	7004589	qtz exhalite with diss.-semimassive py(-sl)-min	35	<0.5	<0.01	0.01	0.12	<0.01	0.06	0.01	<0.5	<0.01	8	100	112	12.6	6	3
400775	Melshognast	624681	7004485	graphite schist with cpy-py-diss. (float)	187	0.8	<0.01	0.22	0.65	0.75	0.05	2.06	1.6	0.03	378	94	206	12.6	8	124
400776	Melshognast	624883	7004307	silicyfied graphitic sed with semimass bands of po-py(-cpy)-min.	47	1	0.04	0.02	0.59	0.13	0.02	1.05	<0.5	0.07	96	70	533	13.2	57	155
400777	Melshognast	624750	7004550	graphite-muscovite schist with sulfide-diss. (dump spl.)	107	0.6	0.02	0.1	0.34	0.02	0.12	0.09	<0.5	<0.01	29	80	145	14.3	13	129
400778	Melshognast	624222	7004068	silicyfied graphite schist with semimassive po	89	2.3	<0.01	0.43	0.75	0.15	0.03	0.81	<0.5	0.07	797	118	430	26.6	76	307

Tydal

Prepared by Bernt Røsholt 1/22/02

Røros Rock Assays 2001
corrected results

Sampl. Id.	Cu	Zn	Pb	As	Sr	Y	Zr	Mo	Ag	Cd	Sn	Sb	Ba	La	W	Bi	Li	Cu	Pb	Zn
Sch. Code	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICP70	ICAY50	ICAY50	ICAY50
An. Unit	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%
Det. Lim.	0.5	0.5	2	3	0.5	0.5	0.5	1	0.2	1	10	5	1	0.5	10	5	1	0.01	0.01	0.01
401237	350	130	17	221	9.9	14.7	8.8	13	0.3	<1	<10	<5	404	16.2	<10	<5	19	n.a.	n.a.	n.a.
401238	66.8	47.8	24	<3	6.5	7.7	4.1	2	<0.2	<1	<10	<5	82	3.1	<10	<5	6	n.a.	n.a.	n.a.
401239	248	40	10	<3	3.2	4.1	2.9	4	0.3	<1	<10	<5	11	<0.5	<10	<5	8	n.a.	n.a.	n.a.
401240	25.5	27	8	<3	4.1	7.8	7.5	8	0.3	<1	<10	<5	45	7.2	<10	<5	5	n.a.	n.a.	n.a.
401241	175	55.9	12	<3	5.3	11.2	4.9	4	0.4	<1	<10	<5	107	12.8	<10	<5	28	n.a.	n.a.	n.a.
401242	3070	4.3	31	<3	6.1	1.4	8.3	<1	1.5	6	<10	<5	3	0.5	<10	*INF	<1	n.a.	n.a.	n.a.
401243	158	13.4	18	<3	5.9	3.7	11	<1	0.6	<1	<10	<5	11	<0.5	<10	9	1	n.a.	n.a.	n.a.
401244	988	1070	134	<3	11.5	22.3	19.6	30	1.4	10	<10	<5	23	23.2	<10	<5	22	n.a.	n.a.	n.a.
401245	1100	739	99	<3	3.5	10.7	17.2	48	1.9	7	<10	<5	32	<0.5	<10	*INF	19	n.a.	n.a.	n.a.
401246	41.9	70.4	16	<3	4.9	3	4.9	21	0.2	<1	<10	<5	43	<0.5	<10	<5	10	n.a.	n.a.	n.a.
401247	23.7	21.8	3	<3	6.8	4.9	7.3	<1	<0.2	<1	<10	<5	22	24.2	<10	<5	<1	n.a.	n.a.	n.a.
399506	18560	4450	12	<3	3.4	1.2	5.3	22	>10	37	<10	<5	19	<0.5	<10	*INF	9	1.74	n.a.	n.a.
399507	3060	9830	7	<3	5.1	2.9	5.1	12	2.7	82	<10	<5	7	3.6	<10	*INF	12	n.a.	n.a.	n.a.
399508	807	>10000	>10000	<3	4.2	1.2	4.2	117	>10	792	<10	6	8	<0.5	<10	<5	<1	n.a.	4.38	38.4
399509	1350	1740	181	20	1.1	1.8	7.4	3	1.1	3	<10	<5	48	<0.5	<10	*INF	5	n.a.	n.a.	n.a.
399510	314	170	11	<3	3.7	4	1.4	<1	<0.2	<1	<10	<5	<1	<0.5	<10	<5	3	n.a.	n.a.	n.a.
400751	>10000	691	53	<3	5	7	7.8	22	>10	2	<10	<5	152	13	<10	*INF	8	4.25	n.a.	n.a.
400752	23160	256	10	<3	17.9	5	3.1	14	5.2	1	<10	<5	4	6	<10	*INF	4	2.35	n.a.	n.a.
400753	8720	1790	842	487	<0.5	0.6	6.5	<1	>10	9	<10	8	6	<0.5	<10	*INF	1	n.a.	n.a.	n.a.
400754	508	>10000	>10000	324	0.5	0.9	7	<1	>10	39	<10	9	3	<0.5	<10	24	7	n.a.	1.44	1.67
400755	2450	>10000	>10000	385	<0.5	0.6	3.8	<1	>10	58	<10	16	10	<0.5	<10	*INF	2	n.a.	1.77	2.57
400756	3350	>10000	>10000	96	0.7	0.8	3.5	<1	>10	47	<10	14	5	<0.5	<10	*INF	5	n.a.	2.78	1.97
400757	3850	6080	4410	212	1.1	2	2.9	<1	>10	14	<10	<5	22	<0.5	<10	*INF	4	n.a.	n.a.	n.a.
400758	155	166	4560	170	<0.5	<0.5	2.5	<1	6.9	<1	<10	8	8	<0.5	<10	13	<1	n.a.	n.a.	n.a.
400759	2820	>10000	>10000	399	<0.5	1	5.3	<1	>10	57	<10	13	17	<0.5	<10	*INF	4	n.a.	1.6	2.52
400760	12000	>10000	>10000	<3	<0.5	<0.5	6.3	<1	>10	69	<10	25	<1	<0.5	<10	*INF	<1	1.19	5.3	2.69
400761	24250	4740	6040	<3	<0.5	1.4	6.2	<1	>10	21	<10	<5	4	<0.5	<10	*INF	5	2.38	n.a.	n.a.
400762	25210	>10000	2170	<3	<0.5	<0.5	5.5	<1	>10	198	<10	<5	4	<0.5	<10	*INF	1	2.6	n.a.	6.01
400763	263	316	107	<3	2.5	7.7	7.1	6	0.6	<1	<10	<5	37	12.6	<10	<5	17	n.a.	n.a.	n.a.
400764	425	458	169	<3	8.9	5.9	5.6	23	1	<1	<10	<5	42	13	<10	<5	16	n.a.	n.a.	n.a.
400765	487	47.6	15	<3	25	10.2	2.9	1	0.4	<1	<10	<5	11	2.3	<10	<5	4	n.a.	n.a.	n.a.
400766	776	674	37	<3	10.2	10.9	12.5	14	1.4	2	<10	<5	8	30.5	<10	<5	19	n.a.	n.a.	n.a.
400767	560	391	43	<3	1	3.3	12.8	123	2.3	6	<10	<5	2	<0.5	<10	27	2	n.a.	n.a.	n.a.
400768	2370	6350	7310	<3	0.8	2.4	5.4	2	>10	141	<10	<5	1	<0.5	<10	*INF	2	n.a.	n.a.	n.a.
400769	1600	>10000	236	131	6.6	0.5	6	13	>10	907	<10	<5	<1	<0.5	<10	*INF	<1	n.a.	n.a.	2.17
400770	33830	1150	57	<3	1.2	1.2	2.4	16	>10	4	<10	<5	2	<0.5	<10	*INF	13	3.14	n.a.	n.a.
400771	1220	>10000	487	69	2.4	1.2	5.9	22	>10	>1000	11	<5	<1	<0.5	<10	*INF	<1	n.a.	n.a.	25.8
400772	1960	>10000	64	47	4	<0.5	3.9	4	>10	972	<10	<5	<1	<0.5	<10	*INF	<1	n.a.	n.a.	25
400773	220	>10000	175	15	<0.5	<0.5	1.5	<1	9.5	>1000	21	<5	<1	<0.5	<10	<5	<1	n.a.	n.a.	39.6
400774	321	>10000	105	80	1	0.9	19.1	2	41.4	190	<10	<5	17	<0.5	<10	12	<1	n.a.	n.a.	4.56
400775	1440	1050	977	46	16.6	52.6	18	104	>10	7	<10	31	4	0.6	<10	*INF	4	n.a.	n.a.	n.a.
400776	398	208	61	93	34.1	16	9.6	35	1.5	2	<10	<5	2	6.9	<10	<5	<1	n.a.	n.a.	n.a.
400777	1720	830	614	<3	4.2	3.9	20.6	27	>10	3	<10	<5	16	<0.5	<10	*INF	2	n.a.	n.a.	n.a.
400778	582	973	111	<3	3.6	12.2	14.3	84	4.5	17	<10	<5	2	<0.5	<10	14	7	n.a.	n.a.	n.a.