A/S BIDJOVAGGE GRUBER
ASPRO PROSPEKTERING
GAMLE RINGERIKS VEI 14 POSTB 83 - 1321 STABEKK
MEDLEM AV AKTIESELSKABET SYDVARANGER
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INTERN RAPPORT.

DATO:	RAPPORT NR: 1482	KARTBLAD 1833 IV	Antall sider 8 —"— bilag 9

SAKSBEARBEIDER Tormod Lid Larsen

RAPPORT VEDRØRENDE:

Detailed investigations of geochemical Au-anomalies from NGU's stream sediment samples within mapsheet 1833 IV

FORDELING

OSLO:

KIRKENES:

ANDRE:

RESYMÉ:

The detailed investigations included geological mapping and sampling of heavymineral concentrates, ordinary stream sediments, bedrock exposures and mineralized boulders. The samples were later analysed for Au by Bondar Clegg.

The results of the analyses were generally negative, and did not correlate with the Au-anomalies from NGU's stream sediment sampling.

Only two analyses, both on heavy mineral concentrates, had values exceeding 1ppm Au. These concentrates were sampled from creeks in anomalies 2 and 3 B (fig. 2), respectively.

KOMMENTAR:

TLL/rf

INTRODUCTION

This report is concerned about detailed investigations around geochemical Au-anomalies from analysed streamsediment-samples within the map sheet 1833 IV Mållejus, scale 1:50.000. The streamsediment-sampling was carried out by NGU (The Norwegian Geological Survey), and the Au-analyses by Bondar Clegg in Canada. The analyses were then printed out on a combuter-plotter as a geochemical plot-map in the scale of 1:50.000. The plot map on topographic background is shown in fig. 2, appendix 1. This is the basis for the investigations. The investigated anomalous areas are marked on this map and on a map in the scale 1:25.000, fig. 1.

To correlate the numbering of these areas on both these maps, the three northernmost anomalies on the map in fig. 2 is labeled 3A, 3B and 3C. These are all included in area 3 on the map in fig. 1. Area 1 and 2 lies within the Precambrian greenstonebelt striking N-NW from Kautokeino Center. Area 3 (A,B,C) and 4 lies within the late precambrian metasedimentary nappes and the underlying autochtonous Dividal Group.

The detailed investigations included heavy mineral sampling, some streamsediment-sampling to double-check NGU's sampling work, and geological mapping/sampling of bedrock exposures and mineralized boulders in the vicinity of the anomalous creeks and rivers. The main work was heavy mineral sampling with the aid of a Goldhound Concentrating wheel. 0.5-1 kg. samples of streamsediments, sieved down to -1 mm, were collected in the anomalous creeks and rivers (fig. 2 - appendix 1). The samples were then washed through the concentrating wheel, where the heavy mineral fraction, including gold, was seperated out and gathered in a small bucket. The heavy minerals were then dried and examined under a binocular in order to find gold grains. The heavy mineral samples, which were around 10 g of weight, were later analysed for gold by Bondar Clegg.

Nils Isak Bongo and Nils Anders Hætta, both citizens of Kautokeino, were assistants in the field work.

PRECAMBRIAN

Area 1 and 2 both lie in the Precambrian greenstonebelt through Bidjovagge and Njivlujåkka (see fig. 1 and 2).

Areal 1 - Doaresvarri

This area had the highest priority among the investigated detail-areas. It includes a group of 3 closely spaced samples with analyse values between 10 and 20 ppb Au (see fig. 2). This is 3 to 6 times the middle value of 3 ppb. 15 heavy mineral concentrates were sampled and analysed. The results are given on the local map in fig. 3 together with bedrock-exposures in the vicinity of the anomalous creeks. Samples from the bedrock, which also were analysed on gold, are marked with a cross, and the values written beside, if this is $\geqslant$ 1 ppb. This is also valid for the other local maps from the other detail areas. To double-check the streamsediment-analyses from NGU, we also gathered 15 ordinary streamsediment samples, sieved through a 0.18 mm screen, and later analysed for Au. The results are given in fig. 4.

The bedrock exposures reveal the following 3 rock types:

Metadiabase

This is a massive, medium grained dark rock, mainly consisting of hornblende, with irregular mm-thick veins of carbonate and biotite cutting through the rock. These veins are impregnated with Chalcopyrite and Pyrite. The diabase is thoroughly broken up and brecciated by these veins, being strongly altered in the vicinity of these veins.
Au-analysis of this diabase gave 2 ppb Au (fig. 3).

Tuffites / Pelites

These are finegrained schists, varying from planefoliated grey pelites to homogenous fibrous green tuffites. The tuffites are volcanic-derived sediments, while the grey pelites consist of more terrigenous material. The tuffites are slightly impregnated with Py. In the exposure south of Doaresjåkka there is a zone with cm-thick quartz/carbonate-lenses with strong impregnation of Chalcopyrite along the border to the surrounding rock.
Analysis of this part of the rock gave 6 ppb Au.

Tuffs

These are green and plane foliated with a characteristic mm-thick lamination banding which probably represent primary layers of volcanic ash. They are exposed on either side of the tuffite/pelite-zone. Cm to dm -thick layers of sugargrained quartz/carbonate are common. Scattered occurence of irregular

quartz/carbonate-veins cutting the bedding. These are not sulfide-impregnated. One analysis of the tuff gave < 1 ppb Au.

Areal 2 - Sadgejåkka

This area includes anomaly 2 with 4 streamsediment-analyses around 10 ppb Au. 16 heavy mineral concentrates were sampled. Only one of these showed > 10 ppb Au. This was, however, a high value: 1140 ppb Au, over 1 ppm Au (see fig. 5). However, studying the heavy minerals under the binocular, revealed no Au-grain.

3 bedrock-exposures revealed these two rock-types:

Albite / Carbonate-fels

This is a light, felsic, massive rock impregnated with Py and Calcopyrite. 1-3 m thick benches of grey sugargrained carbonate-rich rock interchanges with 2-5 dm thick layers of finegrained grey-white albite-rich rock. The grey white layers inherits a relict banding characteristic of the tuffs at Doaresvarri. 1 cm to 1 dm thick quartz/carbonate-veins cut through the rock at right angle to the layering/benching. These veins contain no sulfide minerals.

Analysis of the sugargrained carbonate-rich rock gave 4 ppb Au and 420 ppm Cu. Analysis of the more finegrained albite-rich layers gave 4 ppm Au and 53 ppm Cu.

Metabasalt

This is a grey finegrained rock with an irregular foliation striking north and dipping steeply to the east. Exact measure of the strike/dip is impossible. The rock is strongly impregnated with 1 mm small octahedral magnetite crystals. It is exposed in two N-S striking ridges west of Sadgevarri. Analyses of this metabasalt gave 1 ppb Au (fig. 5).

Two Py and Chpy -mineralized boulders were analyzed for Au and Cu. One from Sadgejåkka at locality 678.971 (see fig. 5). This held 4 ppb Au and 270 ppm Cu. The other was from a side - creek to Sadgejåkka, directly south of the exposure of the fels, locality 678.989. This held < 1 ppb Au and 570 ppm Cu.

NAPPE ROCKS AND THE DIVIDAL GROUP

Area 3. Spadnuvarri - Sallevarri

Area 3 on fig. 1 includes anomalies 3A, 3B and 3C on fig. 2 - appendix 1. Sub-area 3A includes the highest streamsediment-value on the whole map sheet, which is 118 ppb Au. 8 heavy mineral concentrates were sampled from this sub-area and analysed for Au (fig. 6). The 4 samples from the small anomaly in creeks near Sallevarri all showed $\leqslant$ 10 ppb Au. 4 concentrates were taken upstream from the high-value sample-site in Coal'bmejåkka. The southernmost concentrate-sample showed 15 ppb Au, the other three $\leq$ 10 ppb Au.

The sub-area around anomaly 3B was investigated mainly because rumours told that gold grains were found from ordinary gold washing with a pan at Jårbes-gorsja (fig. 6 - appendix 2), at a site below a riverfall. We found this place and sampled 2 heavy mineral concentrates. One sample was analysed to $\leq$ 10 ppb Au, the other held 1070 ppb Au. The last value should be of some interest.

Sub-area around 3C called on interest not because of the high values of Au in the stream-sediments, but because of the concentration of a group of points distinctly above the middle value of 3 ppb Au. 9 concentrates were sampled from two creeks (fig. 6 - appendix 2), all of them showed $\leq$ 10 ppb Au.
The exposed rocks in area 3 (fig. 1) belong to the allochtonous nappes and the autochtonous Dividal Group.

Meta-arcose/Conglomerate - Nalganas-nappe

This is a light grey feldspar-rich rock grading in grainsize from arenitic (0.2-2 mm in diam.) up to conglomeratic pebbles, 2-3 cm in diameter.
This grainsize gradation can be seen at Bieddjuruvza in the south-west corner of the map in fig. 6. In a 700 m long hillside exposure there is a conglomeratic layer at the bottom, 5-10 m in thickness, with pebbles, 2-3 cm in diam., of quartz, chert and greywacke in a arenitic feldspar-rich groundmass. An analyzed sample of this conglomerate held 2 ppb Au (fig. 6). This is disappointing, in view of the fact that conglomerates is the sedimentary facies where gold is most likely to concentrate. Upward and northward in the hillside the pebbles disappear, and the rock is a simple arenitic arcose.
At locality 611.008 (fig. 6), a 1.5 m thick layer of greywacke lies in the arcose. Analysis of this greywacke gave 1 ppb Au.

Arenitic arcose is also observed in an exposure 300 m SW of Sallejavri at the easternmost part of the map in fig. 6. Analysis here gave 2 ppb Au. The meta-arcose belongs to the Nalganas-nappe.

Tillite - Tierta - nappe

An exposure of tillite is observed in a marsh-environment west of Spadnuvarri (see fig. 6). The till clasts or pebbles are of bimodal composition with a dominating occurence of light sugargrained, dolomitic pebbles, grading in size from mm to dm -scale in diameter. The shape varies from angular to rounded. Scattered appearance of 1-2 cm long ellipsoidic greenstone pebbles. The groundmass is dark and fine to sugargrained. 0.5 m thick pebble-free zones have a distinct schisosity. Analysis of the tillite gave 2 ppb Au. The tillite belongs to the Tierta-nappe (fig. 9).

Shale - Tierta - nappe

This is a finegrained carbonate-holding shale with an irregular foliation. It belongs to the more mature sediments of the Tierta-nappe. It is exposed in a hillside down the west slope of Sallevarri across one of the sampled creeks (fig. 6 - appendix 2). Au-analysis gave 1 ppb Au.

Grey-wacke - Dividal Group

This rock is exposed in an approximately 70 m high riverfall at Jårbesgårsja as steep cliffs of grey, carbonate-rich, homogenous, fine to sugargrained rocks with a conspicious sedimentary layering/banding. Analyses of the rock gave 2 ppb Au. These cliffs belong to the Dividal Group.

Two sulfide mineralized boulders were sampled from the creek Aitevaggi between Sallevarri and Goarvevarri, and analyzed for Au. The analyses showed 6 and 17 ppb Au (see fig. 6.).

Area 4. Njargavarri

Area 4 includes anomaly 4 on fig. 2 - appendix 1, which in turn includes two anomalous streamsediment values, showing 48 and 16 ppb Au respectively (fig. 2).

8 heavy mineral concentrates were sampled from the creek down the western slope of Njargavarri and 6 samples from Njargajåkka (see fig. 7).
The analyses of these samples all showed $\leq$ 10 ppb Au.

To double-check the analyses from NGU's stream-sediment-samples, 4 ordinary stream-sediment-samples were collected from the creek down from Njargavarri. The result are shown in fig. 8. One analysis showed 2 ppb Au, the other three showed < 1 ppb Au, which is not in agreement with 48 ppb Au on NGU's map, but certainly in good agreement with the low results from the heavy mineral concentrates.

The exposed rocks in the area belong to the Nalganas-nappe and the Dividal Group:

Meta-arcose

This is a tectonized variety of the arcosic rocks of the Nalganas-nappe. It is schistose, mediumgrained and otherwise lithologically identical with the arcose observed at Bieddjuruvza and Sallejavri (fig. 6). In the creek down the western slope of Njargavarri, it lies with discordant contact on the underlying schists and sandstones. In a 200 m long exposure along Njargajåkka (fig. 9) one can see a distinct lineation of the quartz/feldspar-minerals, a so-called mullion-lineation. These structures indicate that the rocks here are located at the basal thrust zone of the Nalganas-nappe. The arcosic exposures in the creek down from Njargavarri is strongly jointed with bluish black Mn-painting on the joint-planes. Two analyses from this arcose gave < 1 ppb Au.

Exposed rocks from the Dividal Group:

Quartz - sandstone

This is a fine to sugargrained, homogenous grey-white rock with a distinct flat-lying sedimentary benching. It is a clearly more mature sediment than the arcose of the Nalganas-nappe.

Analysis of a sample gave < 1 ppb Au.

Shale

This is a finegrained, dark grey to brown sediment. It is exposed in two different varieties above and below the quartz-sandstone. Between the sandstone and the Nalganas-nappe, the shale is flat-lying with a fine-laminated sedimentary layering. Analysis of this rock gave < 1 ppb Au. Below the sandstone, the shale is exposed on a SW-bank of Njargajåkka (locality 509.875). This variety is unfoliated and broken up along conchoidal fractures in many different directions.

SUMMARY AND CONCLUSIONS

On the basis of a geochemical plot map comprising map sheet 1833 IV Mållejus and visualizing Au-analyses from NGU's stream sediment sampling, 6 anomalies were selected for detailed investigations.

These investigations included sampling of heavy mineral concentrates through a Goldhound concentrating wheel, ordinary stream sediment sampling, mapping and sampling of exposures and mineralized boulders around the anomalous creeks and rivers.

The results of the detailed investigations and the following analyses are generally negative. None of the analyses of the bedrocks and mineralized boulders exceeds 17 ppb Au. Likewise, the analyses of the stream sediments do not exceed 3 ppb Au. Only two analyses of the heavy mineral concentrate samples exceed 1 ppm Au. These are from area 2, in a side-creek to Sadgejåkka (fig. 5), and area 3, anomaly 3B, at a site below a riverfall in Jårbesgårsja (fig. 6), respectively.

The sample site in area 2 lies 150 m south of the Py and Chpy-impregnated albite/carbonate -fels exposure. Sulfide-mineralized boulders of this rock are frequently found in the creek and the marsh-terrain south of the exposure. There is good reason then to believe that the albite/carbonate -fels underlies this terrain in the southern prolongation of the exposure, and is the source rock for the gold in the analysed sample. Further investigations in the area should concentrate on searching for Au-bearing sulfide-rich zones in the albite/carbonate-fels.

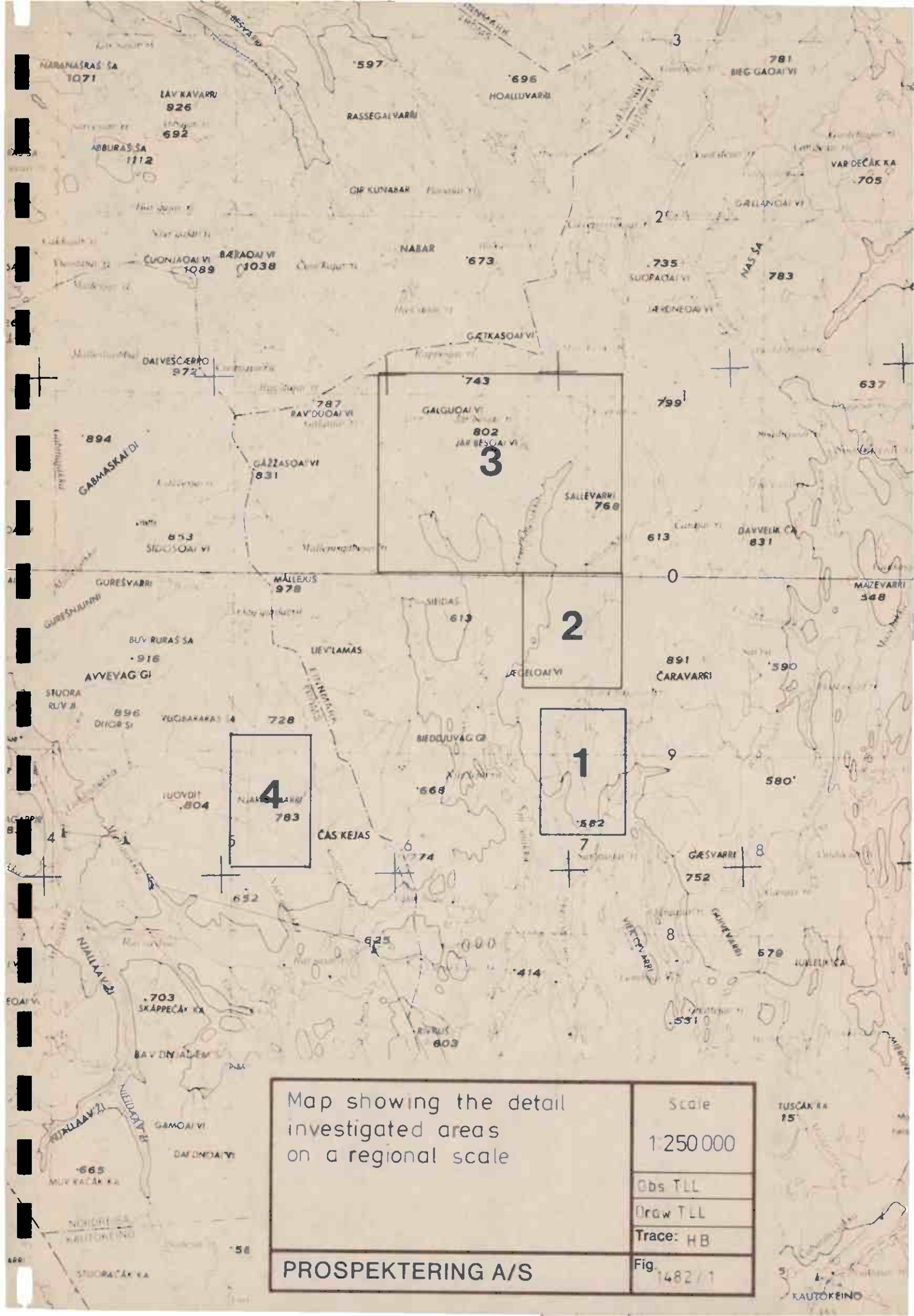
The sample site at Jårbesgårsja lies in the middle of the Dividal Group (see figures 6 and 9), which obviously must be the source rock for the gold in the heavy mineral sample. According to Zwaan, the Dividal Group is autochtonous and includes a basal conglomerate lying conformably on the underlying precambrian rocks, from which it is derived. As can be seen from the geologic map in fig. 9, the greenstonebelt is the dominating underlying basement and thus the source rocks for the Dividal Group in the map sheet area of Mållejus. Since the greenstonebelt includes Cu/Au -deposits, as at Bidjovagge, detrital gold may be washed out and sedimented together with other detritus and terrigenous material of the Dividal Group, derived from the greenstones. The basal conglomerate is, in view of other sedimentary gold deposits, the most favourable sedimentary facies for gold enrichment. The basal conglomerate should thus be the target for Au-prospecting.

There is a strikingly poor correlation between analyses from stream sediments earlier collected by NGU and stream sediments/heavy mineral concentrates collected during the detailed investigations last summer.
This deviating results show that gold analyses of streamsediment-samples is an unreliable tool for gold exploration in this area. The irregular distribution of gold combined with small samples with a generally low gold content is probably the main reason for the poor reproducibility of the results. Unless using gloves, the danger of contamination of samples from sampler's gold rings is also present. However, gold analyses of stream sediments may be useful as a regional tool, when used with great caution.

Stabekk, 28.2.1984

Tormod Lid Larsen

Tormod Lid Larsen



Map showing the detail investigated areas on a regional scale

Scale 1:250 000

Obs TLL

Draw TLL

Trace: HB

PROSPEKTERING A/S

Fig. 1482/1

A/S SYDVARANGER, Prosp.avd.
MON, MAY 2, 1983

AQUA REGIA -løselig
Bekkesedimenter T.L.L. 1982

Mållejus 1833 IV
MÅLESTOKK : 1:50000

3A
3B
3C
2
1
4 Njargavarri

SYMBOL :

UPPER LIMIT : 1 3 6 10 15 22 35 50 100 > 100 PPB **Au**

FREKVENSFORDELINGS-DIAGRAM

KUMULATIV PROSENT

SKALA FOR ESTIMERING AV STANDARDAVVIK

PPB

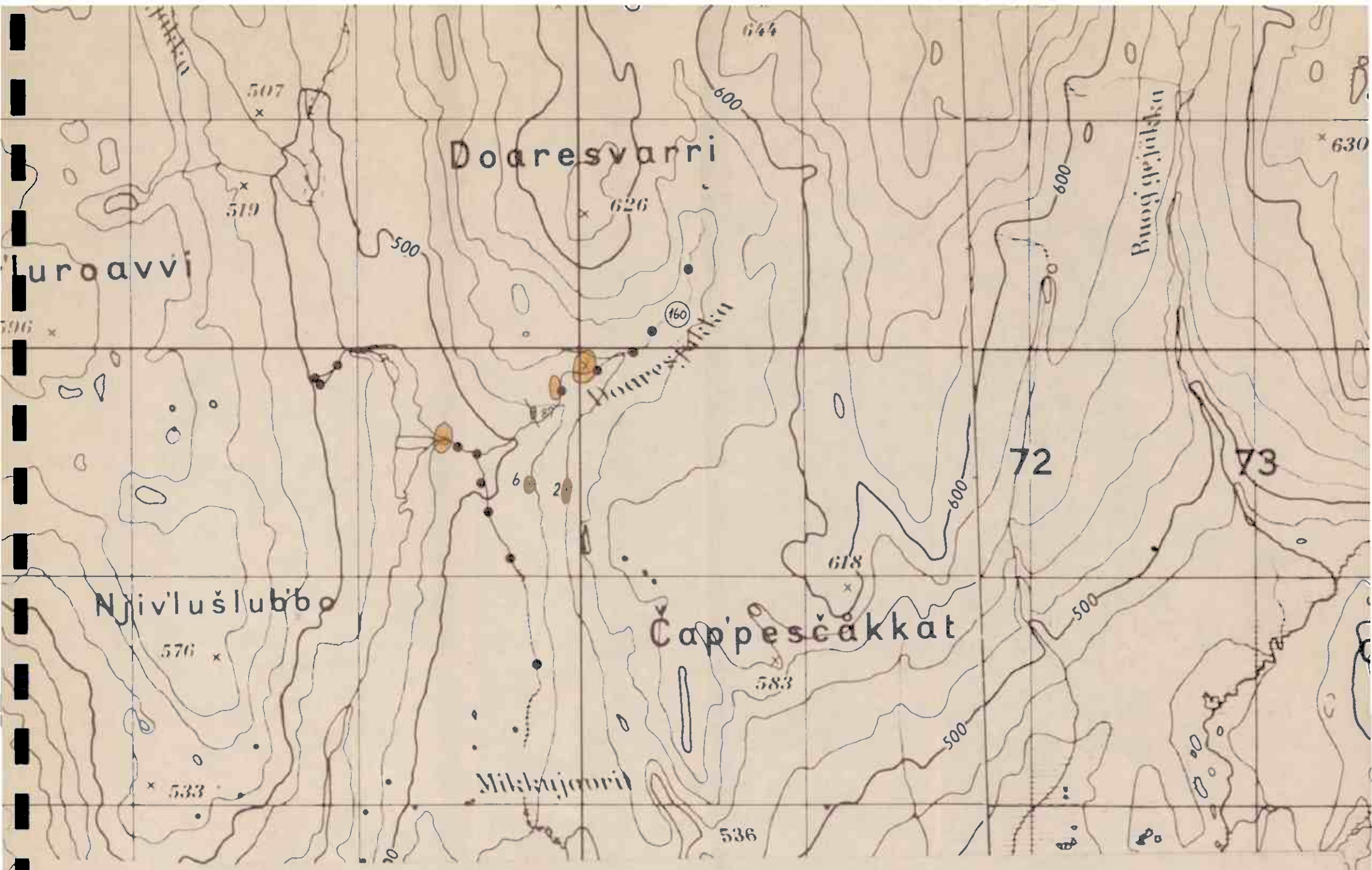
N= 294
MIN= 1
MAX= 118
MIDDEL= 3

MÅLESTOKK : 1 2 3 4 5 Km

APPENDIX 1

Au - analyses on stream - sediment samples	Scale 1 50 000
	Obs TLL
	Draw TLL
	Trace: HB
PROSPEKTERING A/S	Fig. 1482 / 2

A/S BIDJOVAGGE GRUBER



LEGEND

Strike / dip

Bedrock exposure

× Au (ppb) in bedrock
Values ≥ 1 in ppb is written

Rocks

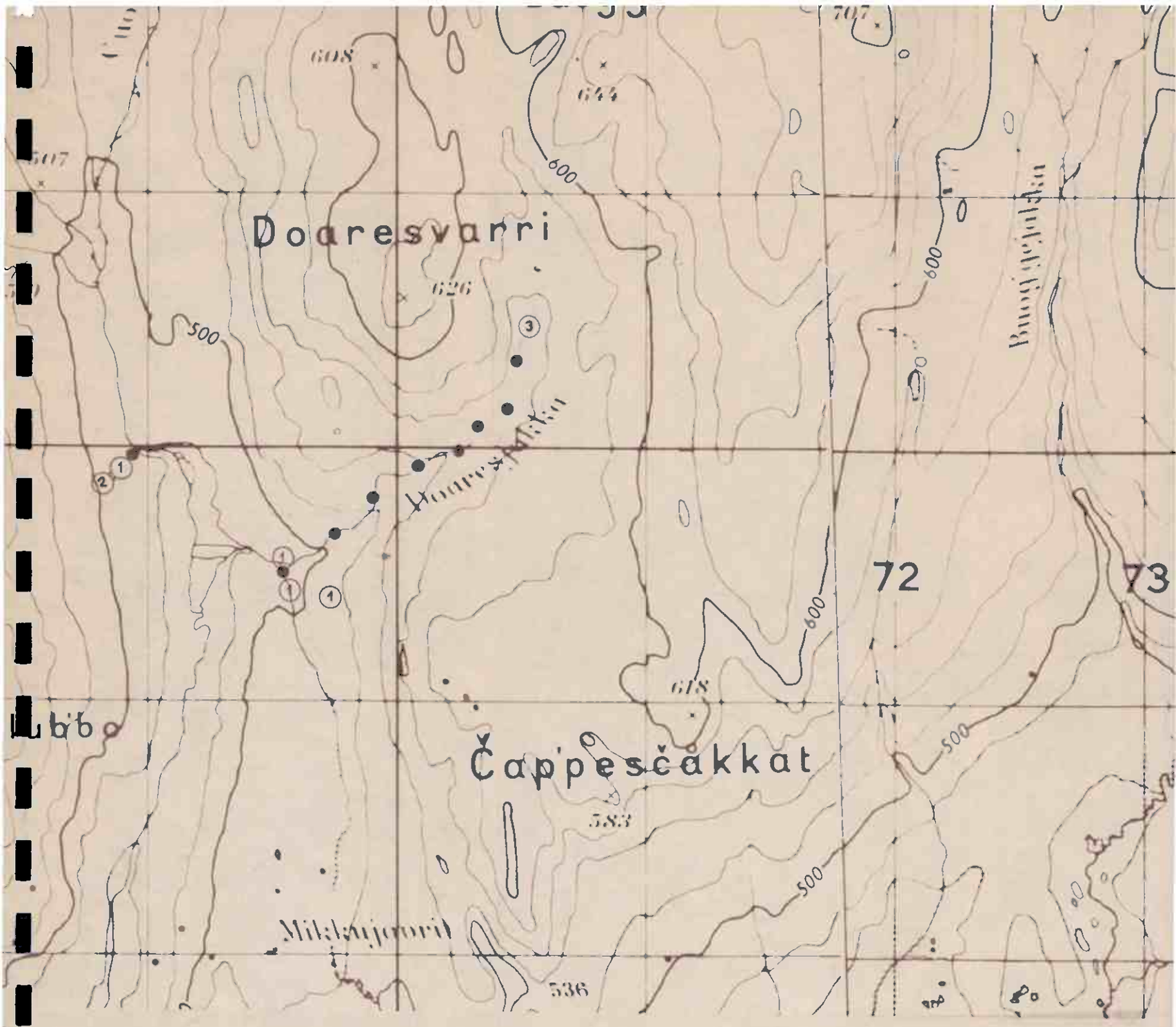
- Metadiabase
- Tuffites / Pelites
- Tuffs

Au (ppb) in heavy mineral concentrates

- o ≤ 10
- ○ 11 - 1000
- ○ 11 - 100
- ◯ > 1000

N

Doaresvarri Au, ppb	Scale 1:20000
	Obs TLL
	Draw TLL
	Trace HB
PROSPEKTERING A/S	Fig. 1482 / 3



LEGEND

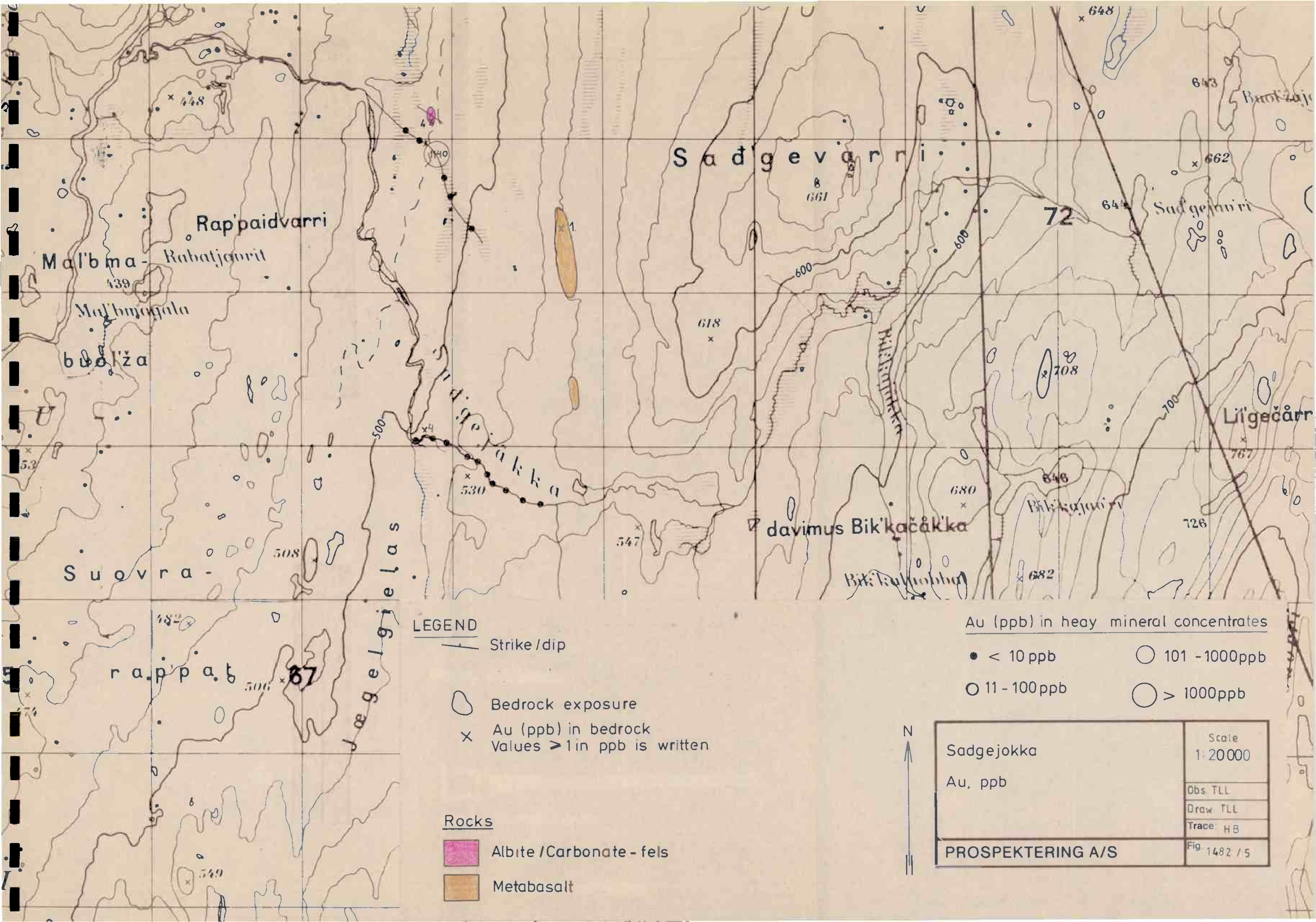
Au in stream sediment samples

● < 1ppb

○ 1 - 3ppb

Doaresvarri. Au in stream sediments	Scale 1:20000
	Obs TLL
	Draw TLL
	Trace: HB
PROSPEKTERING A/S	Fig. 1482 / 4

N


Sađgevárri
Rap'paidvarri
Mal'bma-
buolža
Suovra-
rappat
Jægelgielas
davimus Bik'kačåk'ka
Li'gečårr
72
67
LEGEND
Strike / dip
Bedrock exposure
Au (ppb) in bedrock
Values ≥ 1 in ppb is written
Rocks
Albite / Carbonate - fels
Metabasalt
Au (ppb) in heay mineral concentrates
< 10 ppb
11 - 100 ppb
101 - 1000ppb
> 1000ppb
N
Sadgejokka
Au, ppb
Scale
1: 20000
Obs TLL
Draw TLL
Trace HB
Fig. 1482 / 5
PROSPEKTERING A/S

Spadnuvarri - Sallevarri
Au, ppb

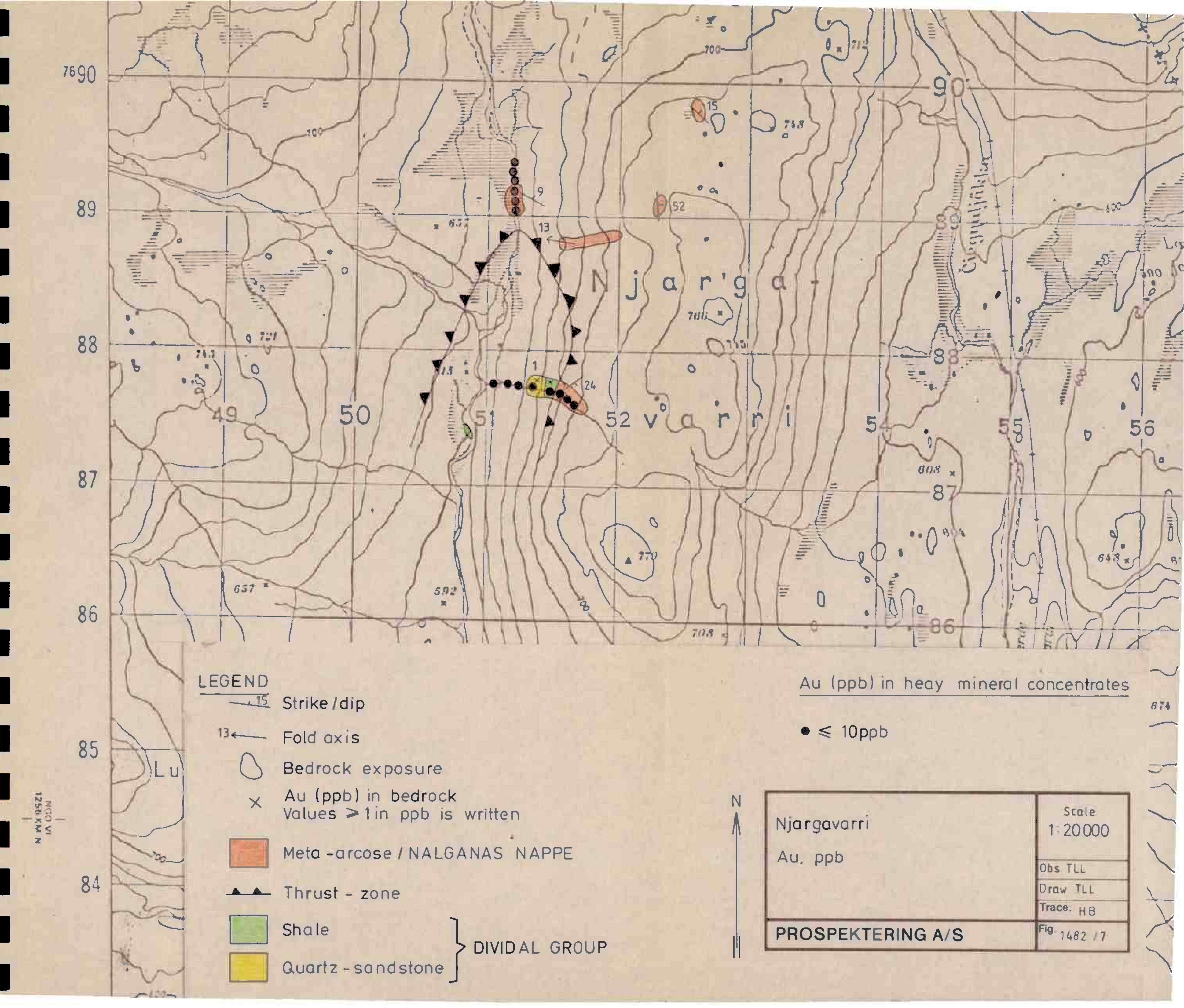
Scale 1: 20000

Obs TLL
Draw TLL
Trace: HB

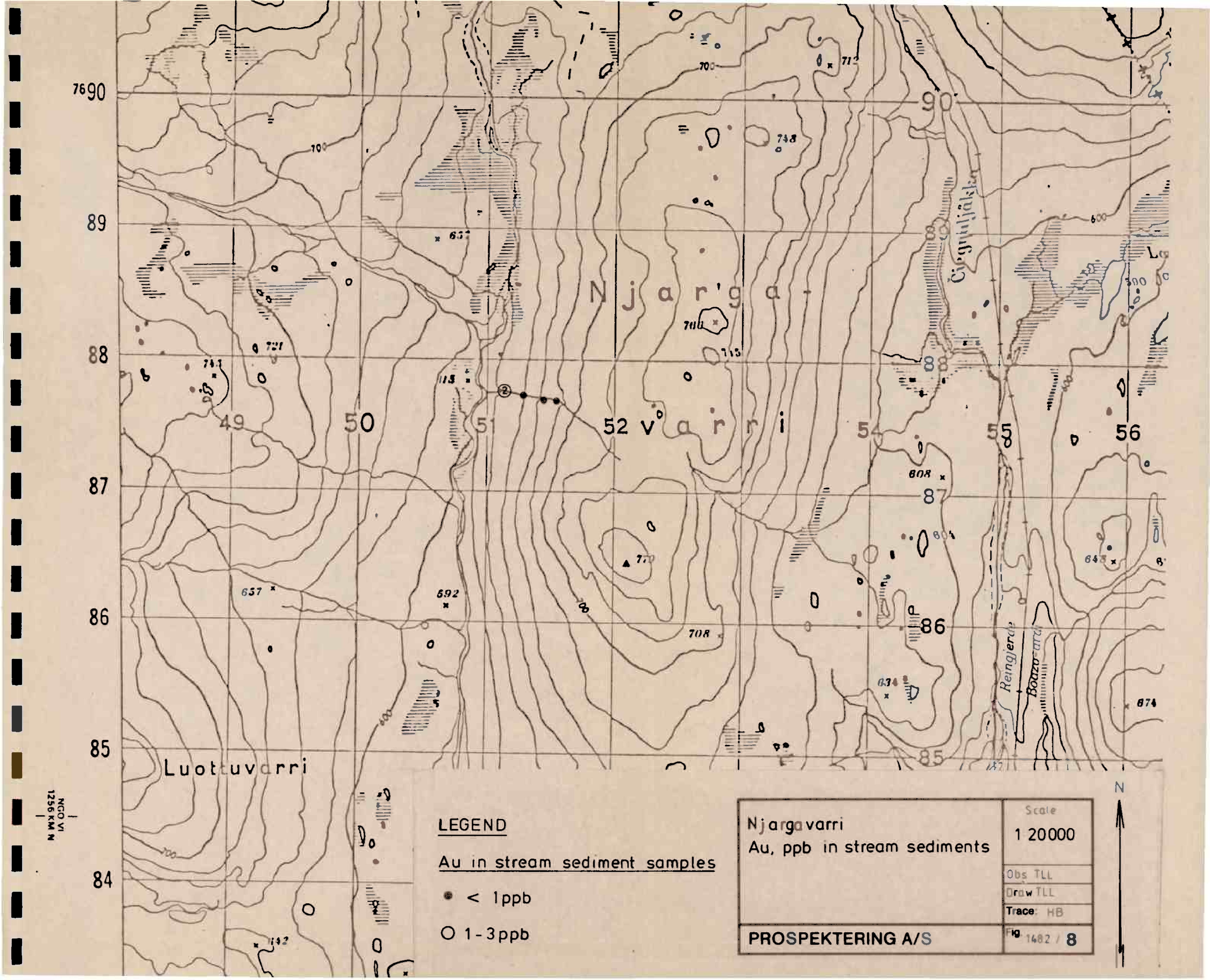
PROSPEKTERING A/S

Fig. 1482 / 6

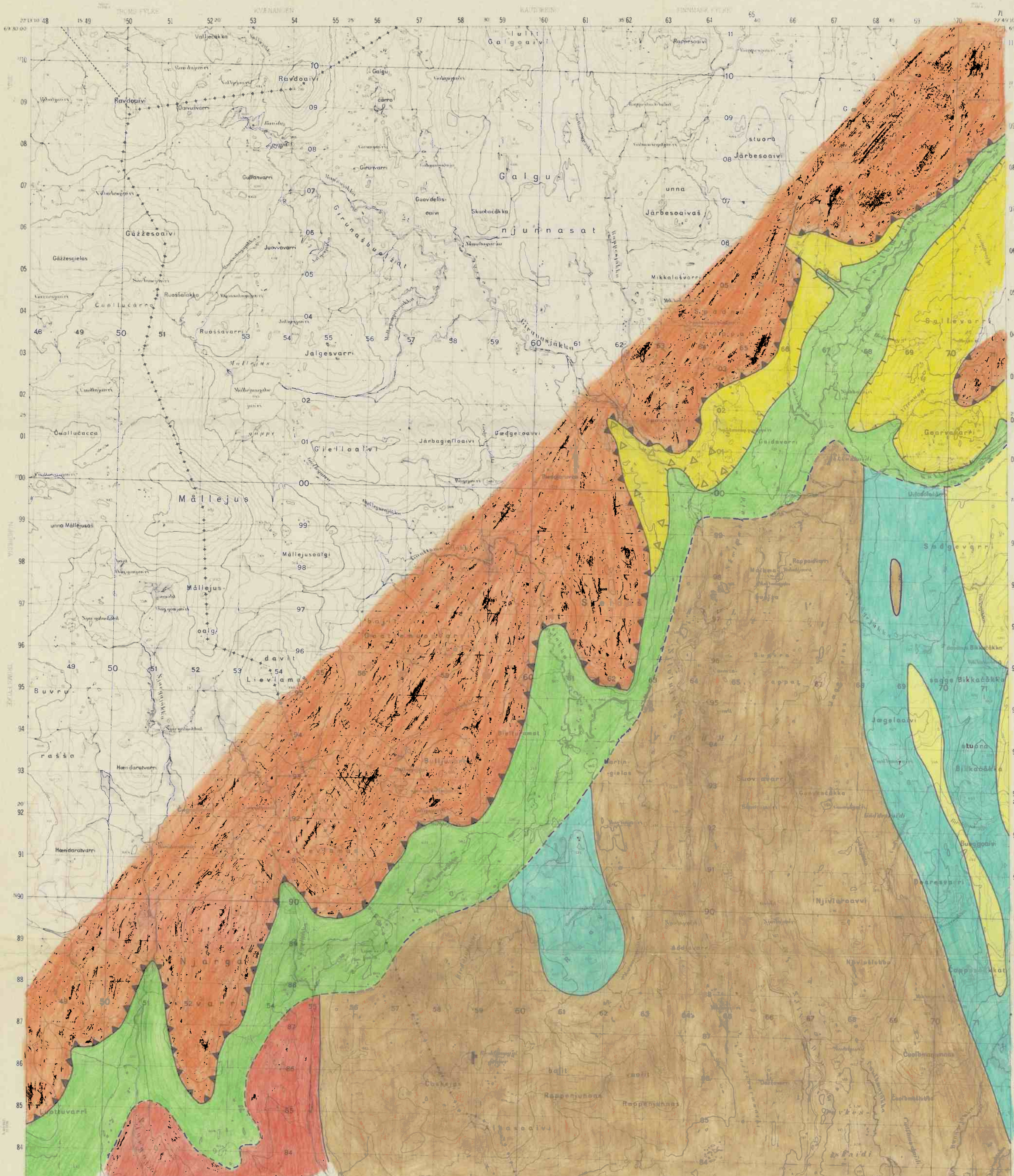
APPENDIX 2



LEGEND
Strike / dip
Fold axis
Bedrock exposure
Au (ppb) in bedrock
Values > 1 in ppb is written
Meta - arcose / NALGANAS NAPPE
Thrust - zone
Shale
Quartz - sandstone
DIVIDAL GROUP
Au (ppb) in heay mineral concentrates
● ≤ 10ppb
N
Njargavarri
Au, ppb
Scale 1: 20 000
Obs TLL
Draw TLL
Trace: HB
PROSPEKTERING A/S
Fig. 1482 / 7
Njar'ga-varri



7690
89
88
87
86
85
84
49
50
51
52
54
55
56
Njar'ga-
varri
Luottuvarri
Čiegŋaljåkka
Reingjerde
Boazo-ăra
90
88
87
86
85
700
600
748
700
715
721
741
632
115
608
604
770
645
657
692
708
634
674
142
NGO VI
1256 KM N
LEGEND
Au in stream sediment samples
< 1ppb
1-3ppb
Njargavarri
Au, ppb in stream sediments
Scale
1 20000
Obs TLL
Draw TLL
Trace: HB
PROSPEKTERING A/S
Fig 1482 / 8
N



GEOLOGY

THE NAPPES

NALGANAS NAPPE	🟧	Meta-arcose / Conglomerate
	▲▲	Thrust zone
TIERTA NAPPE	ΔΔ	Meta-tillite
	┴┴┴	Thrust zone
THE DIVIDAL GROUP	🟩	Shale / Sandstone / Conglomerate
	🟥	Granite
	🟨	Sandstones and quartzites
PRECAMBRIUM	🟦	Metasediments : Shale / Argillite / Tuffite
	🟫	Metavolcanics : Basalt / Diabase / Tuff / Albite - Carbonatefels

APPENDIX 3

N

Geology in map sheet 1833 IV MÅLLEJUS After Zwaan and Sandstad	Scale 1:50 000
	Obs. NGU
	Draw TLL
	Trace: HB
PROSPEKTERING A/S	Fig. 1482 /9