ARCO Norway, Inc.

Hard Minerals Section

Report No. 84-670-19

The Rombaken Project Area, North Norway

Summary of work done 1983 and work programme proposal for 1984

Boye Flood

Oslo, April 27, 1984
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ARCO Norway, Inc.
Wergelandsveien 7
0167 OSLO 1
Tlf: (02) 42 28 38

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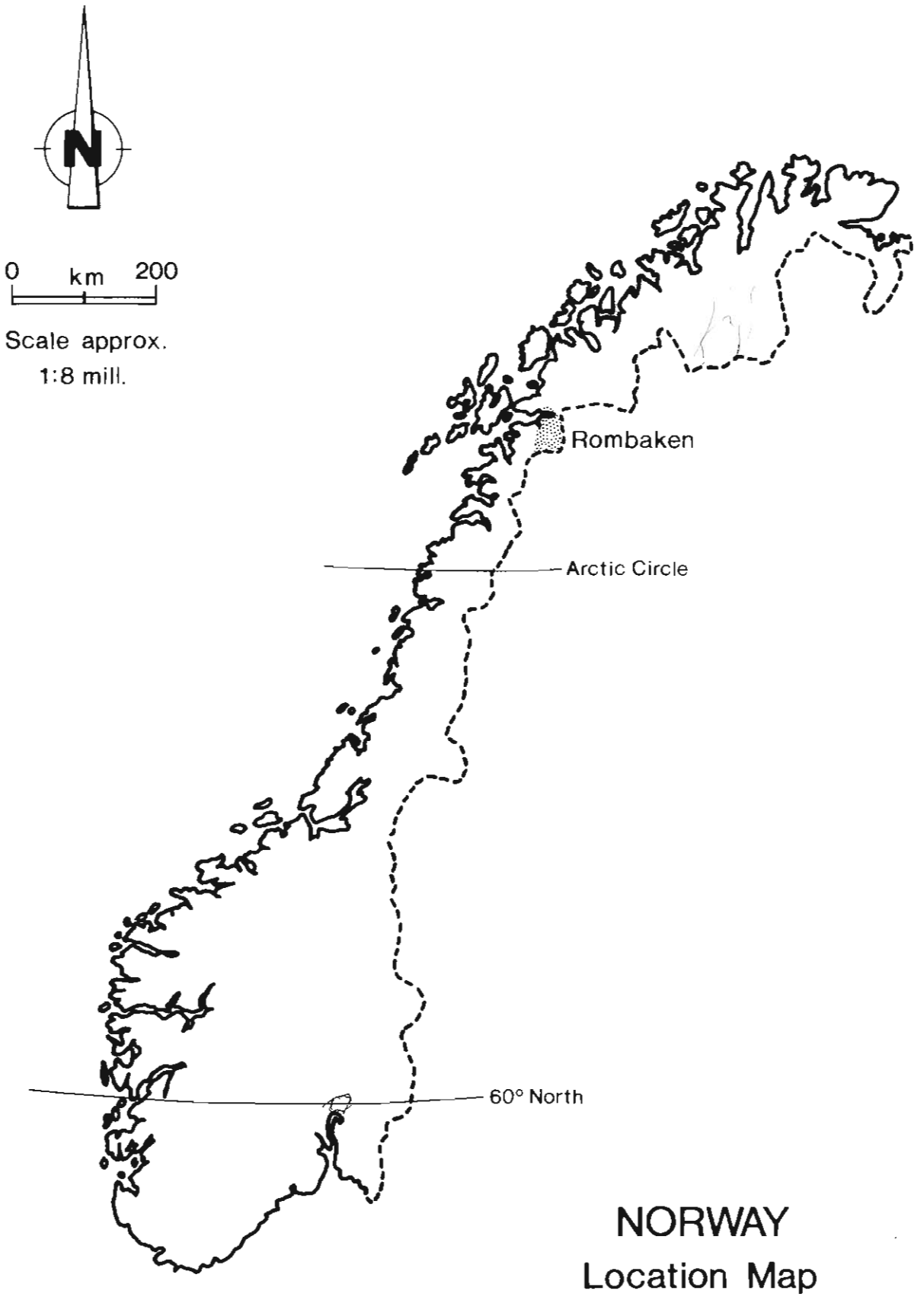
THE ROMBAKEN PROJECT AREA, NORTH NORWAY.

SUMMARY OF WORK DONE 1983 AND WORK PROGRAMME PROPOSAL FOR 1984

List of Figures



NORWAY
Location Map

Fig. 0 1

1. INTRODUCTION

1.1 General

The Rombaken project area is situated within a Precambrian window of Lower Proterozoic and possibly Archean age. Expected targets within the window are massive Cu-Pb-Zn-Ag mineralization with Au credit in a volcano-sedimentary environment, BIF hosted Au-As deposits and possible vein Au-mineralization in granite.

This report is a summary of the following three reports from the 1983 program as well as the work proposal for 1984.

Author(s)	Title	Oslo Report No.
P. Abildgaard, O. Skaldebø, B. Flood:	"Ground magnetic orientation survey and heavy fraction stream sampling. The Rombaken Project 1983, North Norway"	83-670-5
G. Dalen, M. Martinsen:	Geological field-report 1983. The Precambrian Rombaken window	83-670-6
B. Flood:	Stream sediment and rock geochemistry, Rombaken Project, North Norway 1983	83-670-7

1.2 Locality

The Rombaken Precambrian window is located in Nordland fylke (county) northern Norway. It is centered at 68°15'N, 17°45'E approximately 30 km southeast of Narvik. Its eastern and southern boundaries are determined by the border with Sweden, to the west and north it borders Caledonian nappes. Total area is around 1000 km^2, see Fig. 1.

1.3 Physiography

The topography is steep, with relief ranging from sea level to 1800 m. Within the high central part of the area (Klubbvatn-Losivatn) the ground is heavily covered by small glaciers, moraines and scree. Except for this area and the deepest valleys exposure is good. Soil is mainly thin or absent and vegetation sparse and dominated by heather, birch and pine. Most of the area is above timber- line, see Fig. 6-9.

Mean temperature for January at sea level is -2,2°C and for June 10,5°C. Mean precipitation for January is 52mm and for June 50mm.

1.4 Access

Four roads and one railroad (Narvik-Kiruna along Rombaksbotn) intersect the project area. Most of the roads were built due to extensive damming of lakes and rivers for hydroelectric purposes. In between the roads access is either by walking or by the use of helicopters.

1.5 Objective

The general area and potential targets were indicated to us by literature review and subsequent reconnaissance during late spring 1983.

The objective with the 1983 work was to obtain a better understanding of general geology and the extension of potential units through geological mapping. The stream sediment program attempted to focus in on mineralized ground in a time-efficient way; the concurrent rock geochemistry was conducted to obtain background values for different rock units and to reveal mineralization.

Minor programs, such as heavy fraction stream sampling and ground magnetic profiles, were mainly conducted as orientation surveys to supply information for planning for 19884.

2. PREVIOUS WORK

The earliest records from the Rombaken window are reports from the Kjørisvatn Au-As mineralization, 1917, and reports on Pb-Zn mineralization at Katterat and Haugfjellet dated 1929. The latter report offers no proper location and the workings have been wrongly positioned on subsequent geological maps.

A geological map 1:100.000 Narvik, covering the northern part of the window was issued by NGU (T. Vogt, 1950) and later included a short description.

> Gustavson, M., 1974: Narvik, Beskrivelse til det berggrunnsgeologiske gradteigskart N9-1:100.000, NGU Nr. 308.

In 1976 the sheet Skjomen 1:100.000 covering the southern part was issued by NGU (T. Birkeland).

These two sheets were included in the 1:250.000 sheet Narvik, published with explanatory notes by NGU (M. Gustavson) in 1974. The same year the 1:250.000 aero-magnetic map was issued. But as this was flown at 1500m altitude and with 2000 m line spacing, it has not been of much use during our work.

During the late 70's and early 80's, NGU has carried out various work of a more prospecting nature, mainly in the southern area.

1976 A VLF and SP survey on Sildvikskaret Pb-Zn mineralization. NGU Report 1430/4B

1976-78 Geological mapping and rock chip sampling of Katterat. Pb-Zn mineralization. NGU Report 1430/5A

1977 Helicopterborne magnetic and radiometric profiles were flown across the window south of Losiv. NGU Report 1416/16

1980 A geochemical stream sediment survey was conducted in the southern part of the window, mainly south of a line Norddalen - Cunojavri, see Fig. 3. The results were released last March and included in our report no. 83-670-7. NGU Report 1800/5B

1981 Another helicopterborne survey including VLF-EM-magnetometer and spectrometer was flown in the south westernmost part of the window, mainly covering the granites. This was due to reported high U-background in the granites. NGU Report 1836.

1982-83 NGU carried out a geological mapping program in the southern part, mainly on the Unit 1 inlier. Results are on open file.

During the 70's, A/S Sulfidmalm conducted an exploration program along the easternmost part of the window. This was directed towards possible Ni-mineralization in gabbroic intrusives, see Fig. 3.

3. TITLE SITUATION

The pre-claim licenses (mutings) applied for by ARCO Norway Mineraler are shown in Fig 2.

Based on field observations 1983 and later interpretation of results during the winter 1983-84, a number of muting blocks were applied for. These amount to 938 mutings covering a total area of 234.5 km^2. 301 of the mutings were pegged and subsequently granted during the 1983 field season.

A Norwegian muting is 0.25 km^2 and has to be marked in the field. The pegging, particularly in rough terrain as at Rombaken, is time consuming and costly.

The law regarding this is under amendment. ARCO Norway has therefore applied for a postponement of further pegging until the new law has been passed. The mutings are then expected to be granted without being pegged.

In addition to ARCO, the following companies and institutions have claimed smaller areas within the Rombaken window.

Norsk Hydro/BP	8 mutings
Folldal Verk	95 "
Norwegian Geological Survey (NGU)	101 "

These are situated either in the southernmost part, or around our mutings close to the Swedish border at Rosokkatoppen. ARCO has applied to lease 48 NGU mutings in the latter area. The application has been recommended by NGU and forwarded to the Department of Industry for approval.

A few additional mutings belonging to a private company and individuals occur in the region.

4. ARCO'S EXPLORATION PROGRAM 1983

The fieldwork at Rombaken was carried out between July 1 and September 20.

The personnel varied through the season with:

1-2 geologists for mapping and supervision
2-3 field assistants for stream and rock-chip sampling as well as pegging of claims (mutinger)
1 geophysicist with assistant for a limited period doing the magnetic orientation survey.

The project leader from Oslo visited the area at regular intervals, and at the initial phase was accompanied by Anaconda personnel.

A summary of the work program is listed below:

1. Geological compilation and mapping in scale 1:50 000 covering around 700 km^2.

2. Stream sediment sampling of an area 600-700 km^2 totalling some 800 samples.

3. 56 stream heavy fraction samples within areas selected from stream sediment results.

4. 229 rock samples collected during reconnaissance, mapping and chip sampling of sulphide rich horizons.

5. Ground magnetic test profiles totalling approx. 22 line km^2.

6. 938 muting applications covering an area of 234,5 km^2. 301 mutings pegged and granted. The rest pending until passing of new law.

4.1 Geological compilation and mapping

The main geological features of the Rombaken window are outlined on the published 1:100 000 maps which are simplified in fig. 3.

During the compilation and mapping, all information was plotted on maps scale 1:50 000 because this is the scale of the available topographical maps which were used as basemaps for the geochemical programs.

Most of the Precambrian window is underlain by granitoids dominated by coarse porphyric (Rombak) and fine-grained (Sildvik) granites. To the south and south-east, syenitic intrusions occur. Dating of the granitoides by Rb/Sr method gives an age of 1707 ±40 and 1780 ±85 Ma. Close to and virtually parallel with the Swedish north-south border, there occurs a number of gabbroic intrusives with minor ultramafics occuring to the far south. One small Ni-Cu mineralization occurs within the gabbro just east of Rombaksbotn.

Within the granitoids there occurs a large number of metasupracrustal inliers ranging in size from xenolith scale up to 35 km x <5 km.

The contact relationship between granitoids and inliers is partly intrusive, partly tectonic. In places, probable granitization contacts occur.

The inliers have tentatively been divided into four different units with the following characteristics.

Unit 1: Located between Losivatn and the Swedish border to the south-west. This unit is characterized by a variety of volcanic rocks. Fine-grained mafic and intermediate volcanic rocks occur, partly with some amygdaloidal texture. Intermediate feldspar porphyries dominate with saussuritized plagioclase phenocrysts (<20mm). Silicic volcanic rocks also occur, partly as

quartz porphyries. Sericite quartzites are probably also of volcanic origin. Otherwise, metasediments as greywackes, mica-schists and quartzite are found interbedded with the volcanics. A few occurrences of fragmentals of uncertain origin were recorded.

A minor magnetite-chalcopyrite mineralization is known from this unit. It occurs together with quartz, epidote and fluorspar in 1/2 m wide epidotized zone within a banded intermediate tuff. Selected specimens assayed:

1.62% Cu, 0.195 ppm Au, 20 ppm Ag, 27.1% Fe with negligible Pb and Zn.

Unit 2: Occurring 10 km south-east of Losiv. This is completely dominated by silicic volcanic rocks, mainly as quartz or quartz-feldspar porphyries. Frequently, thin dark magnetite rich bands <2mm occur. A fragmental horizon, probably an agglomerate, contains fragments of magnetite-rich bands at least 10 mm thick. No mineralization is known, but gold anomalies both in the heavy fraction and the stream sediments occur in the vicinity. The unit may extend to the north.

Unit 3: This is the most extensive unit and consists of two major inliers running along the central part of the window. Fine grained greywackes with disseminated graphite and in places minor cabonate dominate.

Within the greywackes, graphite schist beds from 1/2 m to several m thick and extensive horizons of quartz-biotite schist are common. Along ned. Jernvatnet and Rombaksbotn, beautiful graded, convolute and cross bedding was observed in the greywackes.

South of Losivatn the package shows greater variation with porphyric andesites similar to Unit 1, and possible silicic volcanic rocks. The latter are texturally different from those described above and

have partly been mapped as fine grained granites. This will have to be checked the coming season. Along the southern part of Haugfjellet, enclosed in the greywackes, there occurs a banded amphibolite up to 1000 m wide, probably a mafic to intermediate meta-tuff.

The most striking feature of Unit 3 is the high content of pyrite and/or pyrrhotite, mainly within the greywackes. These zones or beds stand out due to their rusty appearance and can be spotted kilometers away, see fig. 6 and 7.

Intensively rusty zones may be in the order of 1 km long and 200 m wide while less rusty zones may extend for several kilometers. Sulfide content may vary from just a few % up to an estimated 20% locally.

Small but interesting base metal and gold occurrences are hosted within these zones, and base metal and arsenic background values are remarkably high, see below. Assays from old workings gave:

Sildvikskaret: (Selected specimens)	51 ppm Cu, 3.25% Pb, 3.0% Zn, 0.135 ppm Au, 68 ppm Ag, 25 ppm As
Haugfjellet: (Selected specimens)	2.18% Cu, 7.87% Pb, 19.4% Zn, 1.33 ppm Au, 420 ppm Ag, 56 ppm As
Raudtinden: (10 m chip)	130 ppm Cu, 145 ppm Pb, 195 ppm Zn, 3.37 ppm Au, 1 ppm Ag

Unit 4: This is found to the south and along the Swedish border. It is the only inlier which contains carbonate horizons. These are essentially limestones which may reach several meters in thickness. Greywackes, mica-schist (in places graphitic), and fine-grained chloritic rocks (essentially mafic or intermediate metatuff) are important constituents of Unit 4. Fragments, probably agglomerates, as well as low An plagioclase banded rocks (exhalites?) also occur.

Rusty horizons occur frequently also within this unit, and are largely confined to schists and meta tuffs.

Associated with the carbonates there occurs a small mineralization of gold-arsenic (Kjørisvatn) as well as copper and magnetite (Gautelisvatn and Shangli). Lead, zinc mineralization occurs within graphitic mica schist at Cunojavri. Selected speciments from banded arsenopyrite at Kjørisvatn and sphalerite-galena mineralization in graphitic schist at Cunojavri assay:

Kjørisvatn: 41 ppm Cu, 23 ppm Pb, 61 ppm Zn, 10.9 ppm Au, 1.0 ppm Ag, 4.41% As

Cunojavri: 266 ppm Cu, 0.77% Pb, 13.6% Zn, 0.027 ppm Au, 22.2 ppm Ag, 0.14% As, 0.16% Co.

- -

The internal relationship between these four units is not clear. There are several lithological resemblances between them, particularly regarding Unit 1 and 3. Well-preserved silicic volcanic rocks dominate Unit 2 and also constitute part of Unit 1. The volcanic origin of some fine-grained silicic rocks within the southern most part of Unit 3 is disputable. Well-bedded silicic volcanic rocks are reported from the south side of Rombaksbotn, but have not been observed by us. Hence there is the possibility that only a north-south facies change distinguishes Units 1-3; volcanic activity dominated in the south with some activity also to the north while the central part was dominated by sedimentary rocks.

The carbonates in Unit 4 indicate a different depositional environment. But as dating of the supracrustal packages is lacking, it is not known whether all units still could correlate temporalily.

With the detailed mapping program planned for the '84 season, it is expected that some of these problems will be resolved.

Metamorphic grade: The metamorphic grade varies from greenschist facies for the well preserved greywackes at south-west Rombaksbotn and ned. Jernvatnet to amphibolite facies rocks to the south and east.

Structure: The contacts between the Precambrian window and the overlying Caledonian rock is mainly tectonic in the form of thrust planes. Autochthonous basal conglomerates and quartzites of assumed Lower Cambrian age also occur with a clear discordance to the underlying rocks. Hence, the main folding of the Precambrian is of pre-Caledonian age. The effect of the Caledonian event on the window rocks is unclear.

The strike of the Precambrian rocks is mainly northerly, but towards the northwest at west Haugfjellet and Rombaksbotn and towards the northeast at Sørdalen. Within Unit 4 the lithologies also strike east-west. Dip is mainly moderate to steep, while dips as low as 30^{o} were observed within greenschist facies greywackes at Rombaksbotn.

The general fold pattern is not fully understood, partly due to lack of observations and partly due to the monotony of the package and absence of good key horizons. A working hypothesis is indicated in Fig. 3, with a major antiform axis trending north northwest through central Rombaksbotn and a parallel synform axis through eastern Haugfjellet. The observed plunge of a fold axis within Unit 3 is to the north or northwest.

Hence the southern part of the window may represent a deeper stratigraphic level, explaining both the lithological difference and higher metamorphic grade.

4.2 Geochemical surveys

4.2.1 Stream sampling survey

The sampling was carried out during July, August and the first half of September.

The samples were wet sieved (Aluminium sieve with nylon cloth) in the field to either -80M (0.18mm) or +80M, -32M (0.5mm), dependent on fraction available in the creek. Altogether some 800 samples were collected over an area of around 700 km^2 which gives an average sample density of ca. 1.1 sample/km^2.

Due to extreme topographical conditions and a very uneven drainage pattern, considerable variation in the sample density occurs throughout the area.

Extremely wet and cold weather prevailed during the summer, causing flooding of the creeks during most of the field season.

The samples were semi-dried and sent to Tucson Lab. for assays on

Au, Ag, As, Cu, Pb, Zn, Co, Fe, Mn.

Assay results were returned to Oslo for immediate evaluation; resampling of anomalous areas was then implemented if required.

The results were also sent to Denver where they have been subjected to data processing. Separate sample location and anomaly maps, scale 1:50 000, have been issued for the +80M and -80M samples.

Statistics and correlation coefficients have been calculated for the whole of Rombaken, the Rombaken area excluding Haugfjellet and for Haugfjellet alone. A summary of all mean, standard deviation and 90th percentile values is listed in Table I.

These results show small variations in mean and standard deviation from the different screen fractions; the 90th percentile values are roughly the same for the combined results as for the individual fractions. See column: Rombaken in Table I.

Anomalies based on combined results are encircled for the elements Cu, Pb, Zn, As, Co and Au in Fig. 4.

From Table I a difference between Haugfjellet and the rest of the area is apparent. The mean, standard deviation and 90th percentile values for Pb, Zn and As are much higher at Haugfjellet, and the same elements display a marked difference in results between the two fractions. This may partly be due to a difference in topography; more gentle slopes and slower streams occur at Haugfjellet.

Table I Selected statistics stream sediment data

	Rombaken			Rombaken excl. Haugfjellet			Haugfjellet		
	Combined			+80			-80		
	Mean	St.Dev.	90%	Mean	St.Dev.	90%	Mean	St.Dev.	90%
Cu	23.05	23.34	49	22.38	22.54	45.0	26.08	26.98	59.7
Pb	37.29	78.92	65	29.64	39.61	56.2	65.13	148.72	146.6
Zn	94.14	96.71	184	81.82	69.92	154.3	134.38	146.83	285.8
Co	8.10	9.46	20.7	8.05	9.45	20.0	8.28	9.52	23.0
As	16.98	55.68	36	9.27	25.84	23.2	43.82	105.67	98.0
Au	0.079	1.78	0.015	0.016	0.21	0.015	0.27	3.59	0.0166
Fe	37340	14112	50680	31804	15004	50820	34469	14263	49830
Mn	699	421	1210	715	456	1236	657	286	1101
	+80 Mesh								
	19.64	20.27	46.0	19.86	19.67	40.9	19.45	21.72	57.0
	30.18	39.42	59.4	27.30	28.32	59	37.42	57.76	70.8
	89.05	97.53	186.5	81.68	80.51	154.5	107.98	128.57	237.2
	7.83	9.87	21.0	7.87	10.10	21.0	7.82	9.42	22.5
	21.04	73.76	39.5	10.61	23.58	26.9	45.57	128.08	70.9
	0.18	2.93	0.014	0.007	0.038	0.012	0.58	5.35	0.015
	30962	14674	50000	30497	14776	50000	32436	14406	49700
	702	498	1241	727	553	1262	653	333	1180
	-80 Mesh								
	24.98	24.80	51.0	23.62	23.83	45	31.52	29.69	64.2
	41.34	94.41	67.3	30.91	44.37	56	87.10	191.12	194.4
	96.69	96.34	182.2	81.70	64.10	153.6	154.68	157.93	319.8
	8.21	9.25	20.0	8.08	9.13	20.0	8.60	9.66	23.6
	14.72	42.12	33.0	8.59	27.0	22.4	42.80	84.26	111.8
	0.020	0.245	0.017	0.021	0.268	0.018	0.017	0.12	0.017
	33003	14450	51660	32426	15130	52279	36017	14036	49980
	696	371	1179	707	398	1218	657	242	1022

By far the best and most even sample density is aquired on Haugfjellet due to its plateau-like topography. Further south between Rombaken and Losivatn, sampling is patchy and anomalies like Klubbvatn and Leirvatn may partly be due to being areas of access and having suitable streams. Very few localities were sampled between the Klubbvatn, Leirvatn and Losivatn anomalies because there are few suitable sites.

The multi-element feature of most anomalies within Unit 3 and a change in element trend from north to south is characteristic. Arsenic is very pronounced north of Rombaksbotn, copper dominates at Leirvatn, and gold is the main anomalous element at Losivatn.

To the southeast at Cunojavri a gold-copper anomaly occurs, but within a different lithological unit than the anomalies described above.

Southwest of Rombaksbotn a number of copper-cobalt anomalies occurs along the Caledonian nappes, probably related to these. Otherwise, cobolt anomalous results are mainly in single points with some exception at Haugfjellet and Cunojavri.

Gold, mainly single point anomalies, occurs frequently within the granitoids; this may partly be due to the scattered sample localities. The highest values, however, are found in the granitoids with up to 49.7 ppm at a three point anomaly west of Haugfjellet, and 5.2 ppm at Sildvikskaret.

Generally the iron and manganese anomalies are well spread and small. There is some concentration at Haugfjellet and with the cobolt anomalies southwest of Rombaksbotn and at Cunojavri. A general, iron-manganese scavanging does not seem to be the reason for the basemetal anomalies.

The NGU survey showed elevated basemetal results mainly at scattered localities. Two discrete arsenic anomalies, however, occur partly associated with ARCO gold anomalies between Losivatn and Cunojavri, see Fig. 4.

4.2.2 Rock geochemistry

Altogether 229 rock samples have been collected within the Narvik and Skjomdalen mapsheets for geochemical purposes. This does not include samples collected for thin sectioning and petrographic description.

All samples were sent to Tucson for assays on Cu, Pb, Zn, Au, Ag and As. The majority were also assayed for Co, Mn, Fe, and early reconnaissance samples had additional assays on Ni, Cr, Mo, W, V, Bi and Sb.

Besides the actual Au-As workings at Kjørisvann and surrounding lithologies, the initial interest for the Rombaken window was reinforced by the occurrence of the extensive and strongly rusty

horizons within the greywackes. During the field program the interest for these horizons increased as it was shown that they contain disseminated to massive basemetal mineralization with Au-Ag credits. Hence, most of the rock samples have been collected within the rusty parts of the Unit 3. Mainly, the rust can be ascribed to dissemination of pyrite and/or pyrrhotite.

148 samples, including systematic profile chip sampling, come from this unit, excluding samples from workings and mineralization with any basemetal value >0.5%. Max. min. and mean values for Cu, Pb, Zn and As are given in Table II below:

TABLE II

	Max.	Min.	Mean	Comments:	Krauskopf: Average shale
Cu (ppm)	548	10	90		57
Pb "	2885	<10	91	(22 samples <10 ppm calculated as 5 ppm)	20
Zn "	2489	25	253		80
As "	1285	<10	40	(68 samples <10 ppm calculated as 5 ppm)	6.6
As "	416	<10	80	(7 samples from workings)	

The most important information from this table is that a significant amount of metal occurs in the system, - high stream sediment values have to be expected when drained from the greywackes particularly those with abundant rust horizons. High arsenic may signify basemetal concentration as indicated by the bottom horizontal column in the table. These samples represent workings or other localities with high Pb, Zn, (Cu) values. But the column is based only on seven samples and not conclusive.

4.2.3 Stream heavy fraction

Altogether 56 samples were collected. One or two samples were taken from streams which had returned elevated gold values in earlier stream sediment samples. Each anomalous

area has from 1 to 15 sample sites. The samples were sieved (-1 mm) and panned in the field and later ran on a Goldhound 18" concentrating wheel.

The heavy fraction material was weighed, subjected to an UV lamp and examined under a binocular microscope after magnetite had been separated by a hand magnet. Most of the heavy fraction material weighs around 1 g but varies from 0,044 g to 27,7192 g, mainly due to a strong variation in the magnetite, ilmenite and garnet content.

Free gold was found in 4 samples as one to eight grains measuring between 0,1 and 0,2 mm. Three of the samples came from Klubbvann, see Fig. 4 and the fourth from west of Cunojavri.

After visual examination, all the samples were sent to Tucson lab for assays on Au and Ag. As a control, assays were also done for Au, Ag, As, Cu, Pb, Zn, Cr, Co, Mo, Sn and W in the unconcentrated (sieved and panned) material.

Assays on concentrated material are not regarded reliable when done on <0.5 g. Still the observed gold was confirmed by the assays ranging from 0.118 ppm to 0.891 ppm Au. Another five samples returned gold values within the same range or higher. One of these came from Klubbvann, two from west of Cunojavri, one from Losivann and one from west of Raudtind.

The two highest gold values from the assays on un-concentrated material are from a sample from Klubbvann and one from Losivann. Otherwise, the assays on this material confirmed the anomalies on Haugfjellet, Klubbvann and along the Caledonian nappe SSW of Rombaksbotn. No indication on W or Sn above the detection limits of 10 ppm and 30 ppm were shown.

4.3 Ground magnetic orientation profiles

Location of the profiles are listed below together with length and bearing.

Two EDA proton-magnetometers, type ppm-375 and ppm-350, were used. During the magnetic survey, susceptibility was measured with a Scintrex SM-5.

Profile No's	Location	Map	Length	Bearing
1,10,11, 12,13,15	Norddalen	1431 III	5.0 km	along road and 110°
8,9	Losihytten, Norddalen	1431 III	4.9 km	90°
2,3	N of Gautelisvatnet	1431 III	1.1 km	110°
4,5,6	Sørdalen	1431 III	4.7 km	along road and 110°
7	Haugfjellet	1431 IV	3.3 km	mainly E-W
16,17	Sildvikskardet	1431 IV	0.8 km	approx. 30°

The profiles which were run across a variety of lithologies, rock contracts and mineralization and indicated the following:

The volcanic units within the Rombaken windown have a higher magnetic background and show a much stronger variation in the magnetic field than other rock types.

Part of the granites, particularly their contact zones, as well as the gabbroic bodies are detectable on the magnetic profiles because of their generally higher magnetic background and a more varied magnetic expression relative to the sedimentary package.

The large areas of sedimentary rocks, mainly meta-greywackes, show an extraordinary magnetic stability, in itself a diagnostic feature. The weaker pyrite-pyrrhotite dissemination and the thin discrete base metal sulphide zones do not have a magnetic contrast. However, some of the richer iron sulphide zones, for instance at Haugfjellet, show weak magnetic anomalies probably due to a high FeS/FeS_2 ratio.

5. COST 1983 PROGRAMME

A cost estimate for last years programme is given in Table III below.

Table III: Project Rombaken

Cost figure for 1983

	1000 NOK
Wages and Salaries	268
Accommodation and Travel Expenses	245
Transport: Car hire and Helicopter	169
Equipment	20
Assays incl. freight	177
Geochemical data processing	42
Mutings - application and fees	198
15% overhead including drafting - typing and Denver consultants	168
Total	1.287
Approx.	185.000 US$

6. CONCLUSION

The exploration programme executed last season has demonstrated the presence of an extensive and varied package of volcano-sedimentary rocks.

Large portions of this package, particularly within Unit 3, contain conspicious amounts of iron sulphides. Coincident, high backgrounds of base metals, gold and arsenic have been established by the rock chip sampling programme. A number of old workings located and sampled last season show that a concentration of metals to ore grade exist within the mineralized units. Whether a sufficient volume can be found is the problem to be dealt with in the programmes ahead of us.

The stream sediment sampling outlined a number of multi-element anomalies within Unit 3 as well as gold, gold-copper and gold-arsenic anomalies elsewhere. Some of these anomalies have been confirmed by free gold in stream heavy fraction samples.

Several anomalies like Haugfjellet S., Leirvatnet and Cunojavri As-Au anomaly have very limited geological control. This renders them very exciting targets as we know that the Haugfjellet N anomaly is at least partly associated with a small but rich mineralization.

The limited stream heavy fraction programme has helped in grading the different anomalies and the programme should be extended.

The magnetic profiles have indicated the method useful as a mapping tool and it should be included in any air-borne and ground geophysical survey. Its value in detecting economic mineralization is still dubious.

7. WORK PROGRAMME 1984

Modern exploration in the form of intergrated geological, geophysical and geochemical work has not been applied at Rombaken prior to the '83 season.

The potential units and mineralized zones extend over an area which is very heterogenous in respect to topography, drainage pattern and overburden.

Hence it is necessary to apply different methods to obtain maximum information in both two and three dimensions.

The part of the window where an airborne survey is feasible will be flown by Dighem in May, see Fig. 5.

Infilling stream sediment geochemistry will be completed and a heavy fraction survey will be extended to anomalous areas of potential free gold.

Well defined geochem anomalies will be followed up by systematic grid chip-sampling and detailed mapping.

General mapping of all potential areas in scale 1:20 000 will be started.

A summary of the program with a time frame and estimated cost figure is listed below.

Work Program

Rombaken 1984

Time	Work	Cost 1000 NKr.
May	Dighem Helicopter borne EM-mag survey over 550 ln. km.	415
<June 12th	Establishing 8 km baseline on Haugfj.	
June 12th - July 6th	Establish camp. Follow up of Haugfjellet SS geochem. anomalies and surrounding smaller anomalies by mapping 1:5000 and rock chip sampling on grid. Stream heavy fraction program and mapping 1:20 000 commences and will be continued towards the south.	
July 6th - July 20th	Follow up of Klubbv. and Leirv. geochem. anomalies by detailed mapping and rock chip sampling. 1:20 000 mapping and heavy fraction program continues. Fill in geochem. stream sediment sampling. Follow up of Dighem anomalies with one or several of the following methods: Detailed geol., rock chip., VLF and Mag.	
July 20th - August 13th	Follow up of Losiv., Cunojavri and selected small geochem. anomalies. Continue follow up of Dighem anomalies. 1:20 000 mapping continues.	
August 13th	Project review in Narvik Objective: Select drill target	
August 13th - Sept. 1st	Ground EM follow up to confirm location of potential drill targets. Continuation of general follow up work and 1:20 000 mapping.	
Sept. 1st	Drilling starts at Haugfjellet.	

Work Program

Rombaken 1984

Time	Work	Cost 1000 NKr.
		c.f. 415
Sept. 1st - Sept. 30th	Detailed and general follow up continues. Mapping continues. Follow up of new stream sediment and heavy fraction anomalies commences.	
Sept. 30th - Dec. 31st	Drilling[1] continues. Evaluation of results and reporting.	1.134*
	Dighem, fieldwork, evaluation, reporting	1.549
	+ Capital expenditure	100
	+ Muting fees	150
		1.799
	+ 10% Contingency	179
	Total	1.978
		= 264.000,- US$

* Drill cost not included. Re. breakup of figure, see below.

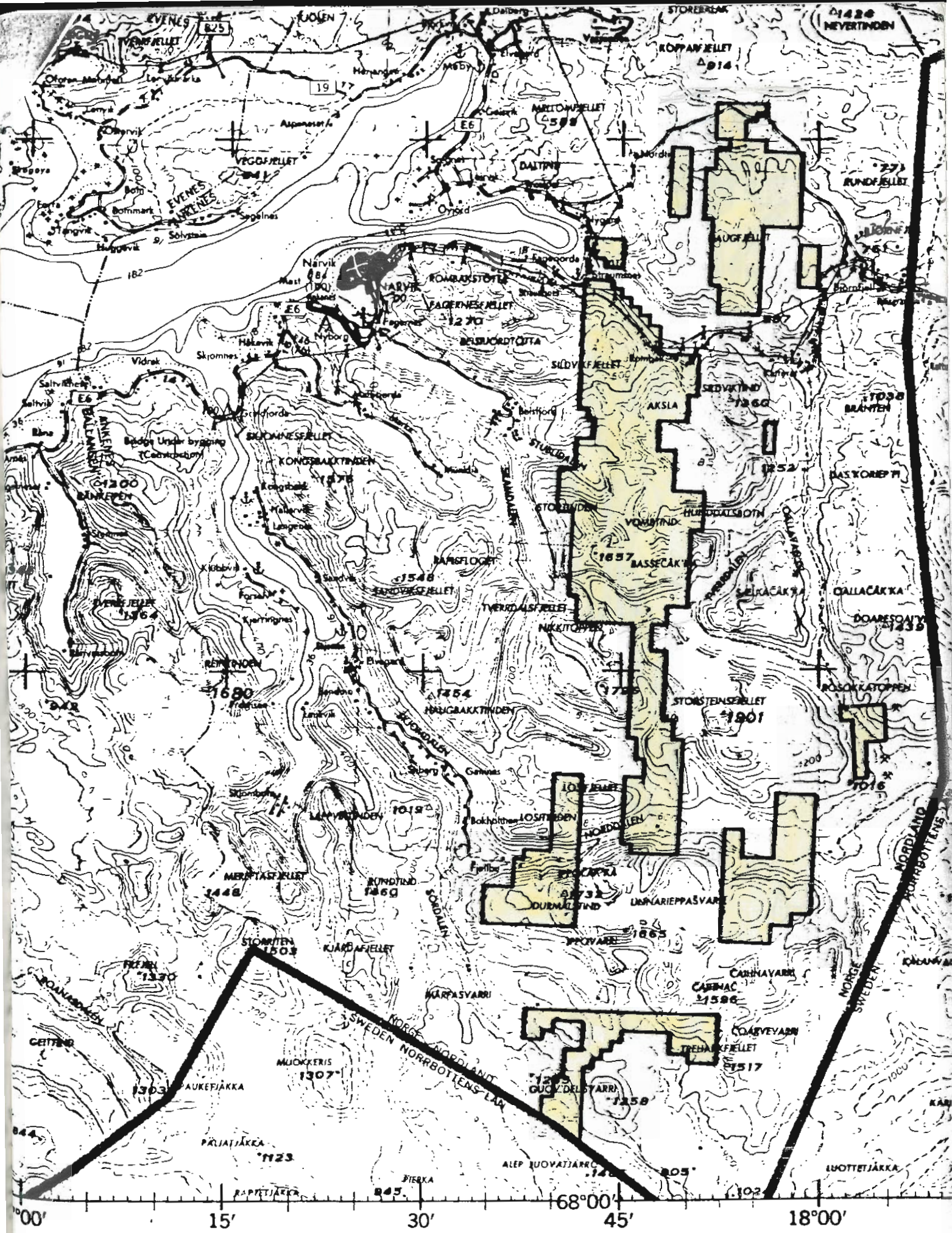
Cost estimate field work, evaluation, reporting.

	1000 NKr
Personnel cost	548
Travel and transport	265
Assays (incl. cost for sample freight) and data processing	167
Contractors and equipment hire	118
	1.134
	= 152.000,- US$

1) Drilling program 1/9-31/12 5 holes. Total 1000 m at 600,- Kr. 600

= 80.000,- US$

RPTSH2/15*



ROMBAKEN AREA

Land Positions by March '84

Fig. 02

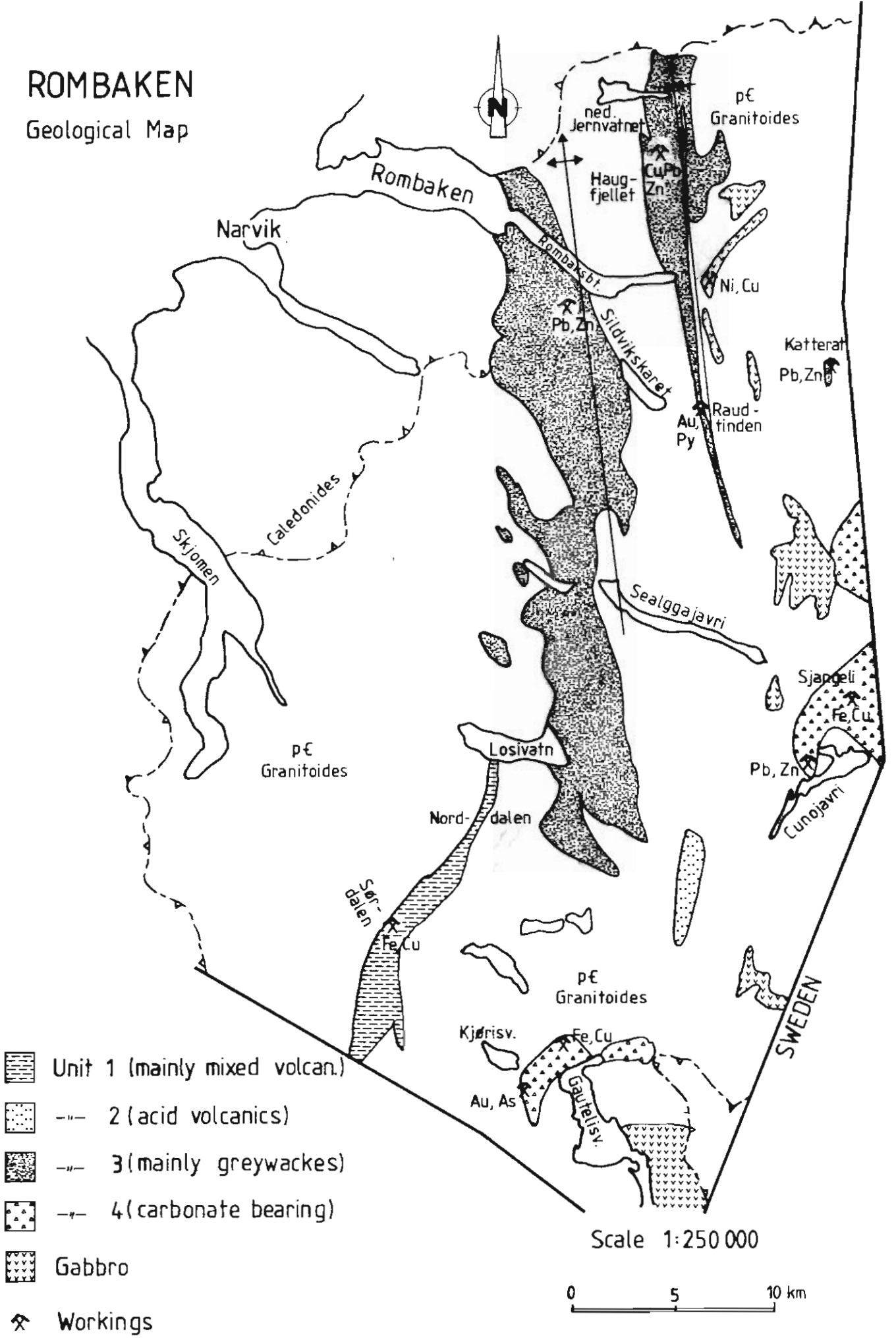

ROMBAKEN
Geological Map
N
Rombaken
Narvik
ned. Jernvatnet
Haug-fjellet
Cu Pb Zn
p€ Granitoides
Rombaksbt.
Pb, Zn
Sildvikskaret
Ni, Cu
Katterat
Pb, Zn
Raud-tinden
Au, Py
Caledonides
Skjomen
Sealggajavri
Sjangeli
Fe, Cu
Pb, Zn
Cunojavri
Losivatn
Nord-dalen
Sør-dalen
Fe, Cu
Kjørisv.
Fe, Cu
Au, As
Gaulelisv.
SWEDEN
Unit 1 (mainly mixed volcan.)
2 (acid volcanics)
3 (mainly greywackes)
4 (carbonate bearing)
Gabbro
Workings
Scale 1:250 000
0
5
10 km

Fig. 03

ROMBAKEN

Stream sediment anomalies

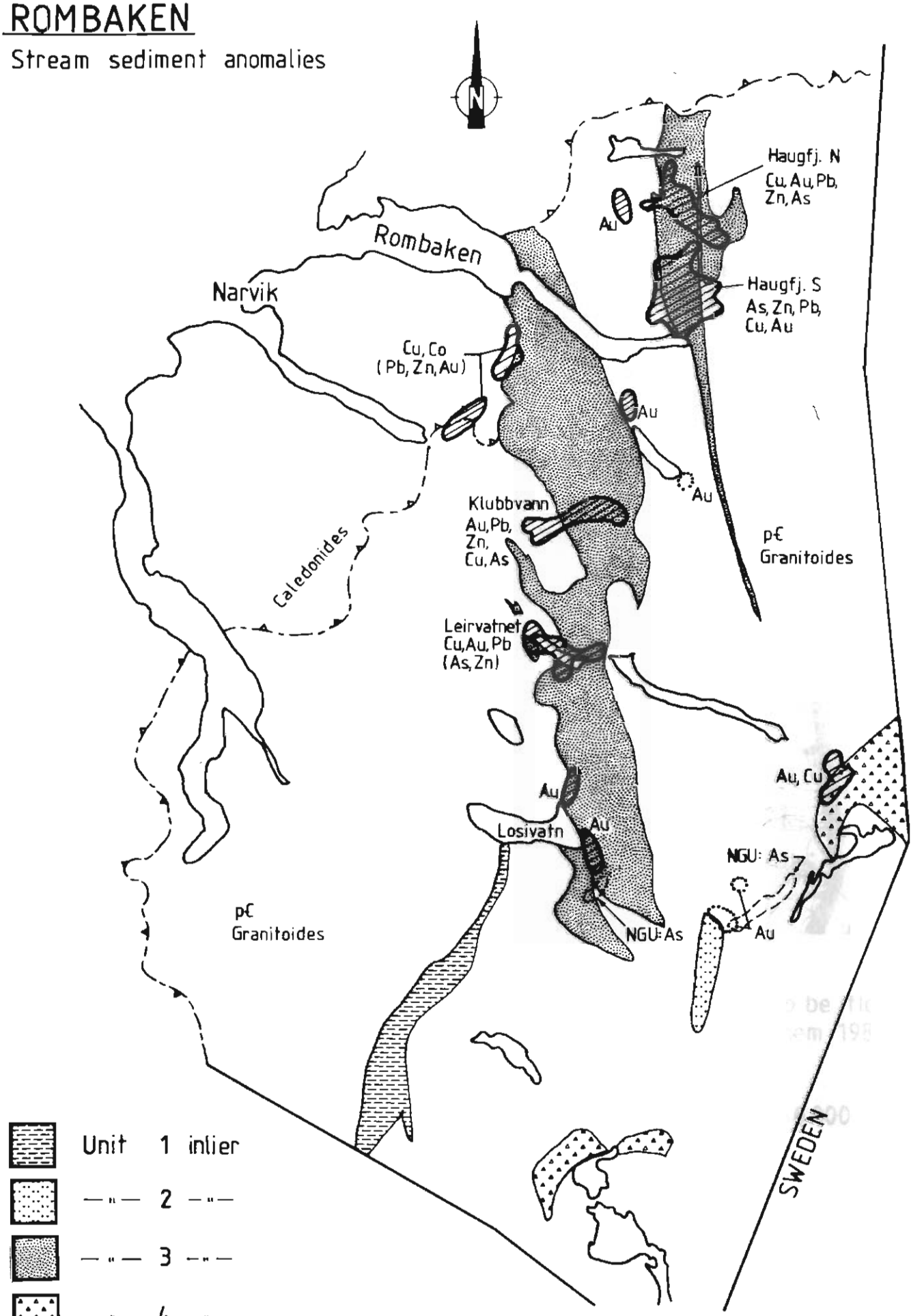


Fig. 04

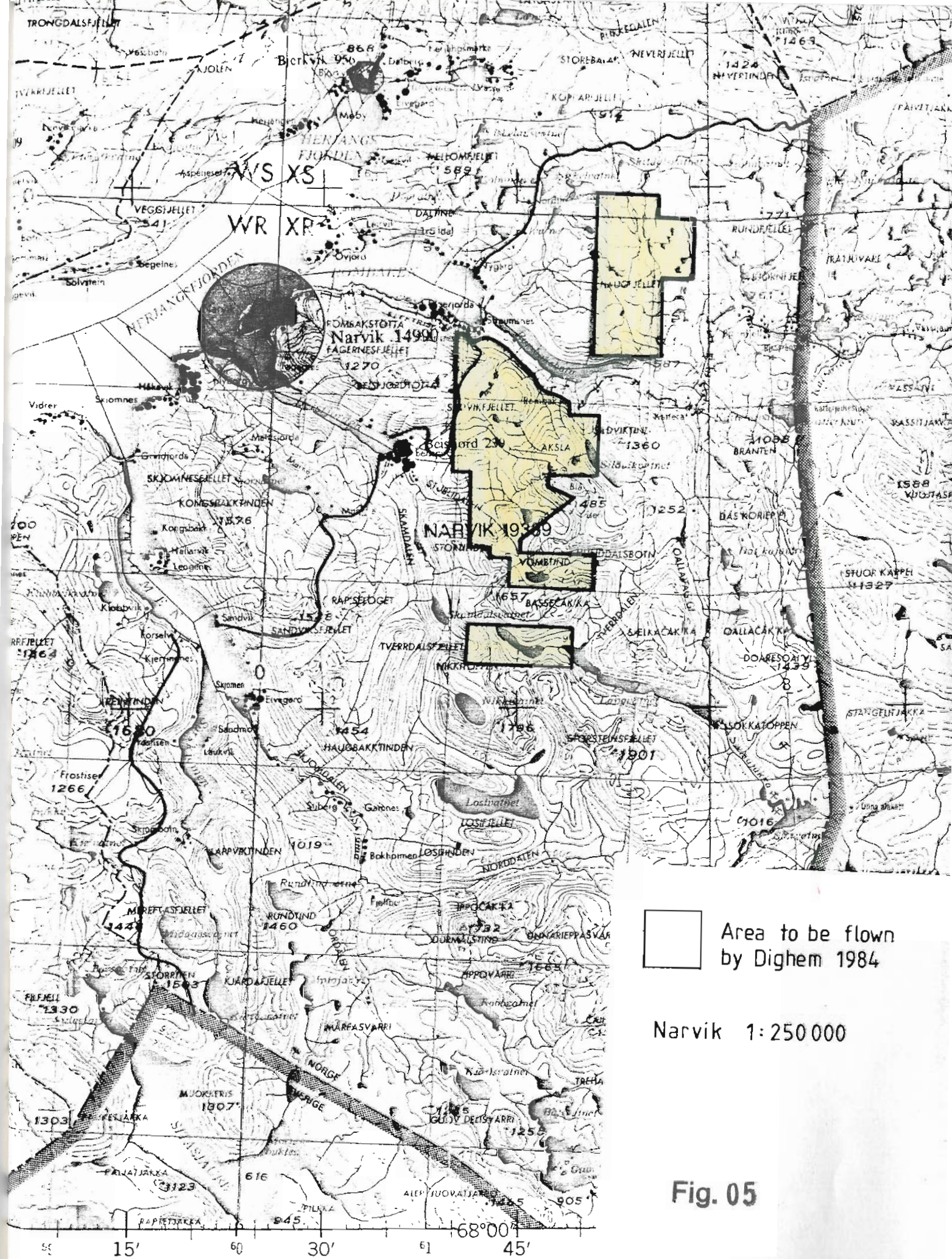


Fig. 05

33,34-11 (Utg 1) og NR 33,34-12 (Utg 1).
Sentralbyrå på grunnlag av Folketelling 1/11 1980.
1970

Fig. 6: Haugfjellet inlier Unit 3 seen twoards NE.
⚒ = Haugfjellet Cu, Pb, Zn working. A = intensively rusty horizon also seen in Fig. 7.

Fig. 7: Haugfjellet inlier Unit 3
See towards SE. A = intensively rusty horizon also see in Fig.6.

Fig. 8: Sealggajavri (lake) seen towards the E.

Fig. 9: Looking S from Norddalen toward glacier S of Losivatn.