Bergvesenet

Postboks 3021, 7002 Trondheim

Rapportarkivet

Bergvesenet rapport nr	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
BV 4530			Trondheim	**Åpen**
Kommer fra ..arkiv	**Ekstern rapport nr**	**Oversendt fra**	**Fortrolig pga**	**Fortrolig fra dato:**
	NGU 95.079			

Tittel

The Gjedde Lake gold occurrence in Pasvik

Forfatter	Dato	Bedrift
Melezhik, Victor A	25.05 1994	NGU

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Sør-Varanger	Finnmark	Finnmark	23331	Kirkenes

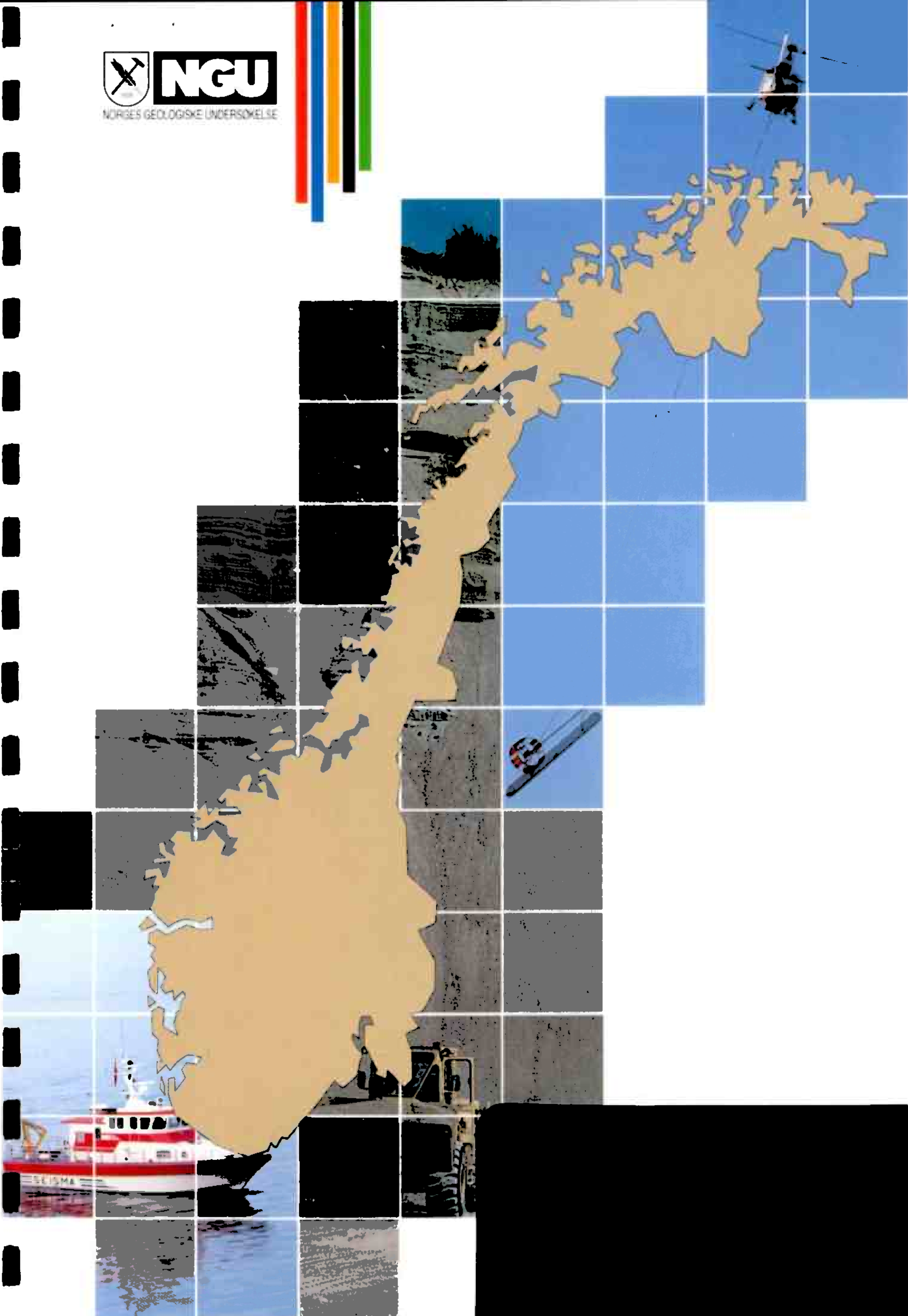
Fagområde	Dokument type	Forekomster
Geologi	Rapport	Oksfjell Gjedde Lake Gjeddevann
Råstofftype	**Emneord**	
Malm/metall	Au	

Sammendrag

The Gjedde Lake gold occurrence was found in the Pasvik Valley during field work in the Summer of 1993.

NGU

NORGES GEOLOGISKE UNDERSØKELSE



NGU REPORT 95.079

The Gjedde Lake gold occurrence in Pasvik

NGU
NORGES GEOLOGISKE UNDERSØKELSE

Postboks 3006 - Lade
7002 TRONDHEIM
Tlf. 73 90 40 11
Telefax 73 92 16 20

RAPPORT

Rapport nr. 95.079	ISSN 0800-3416	Gradering: Open
Tittel: The Gjedde Lake gold occurrence in Pasvik		

Forfatter: Victor A. Melezhik		Oppdragsgiver: NGU	
Fylke: Finnmark		Kommune: Sørvaranger	
Kartbladnavn (M=1:250.000) Kirkenes		Kartbladnr. og -navn (M=1:50.000) 2333 I Vaggatem	
Forekomstens navn og koordinater: Gjedde Lake 35-592300 769800		Sidetall: 25 Pris: 45,- Kartbilag: none	
Feltarbeid utført: June 1993, July 1994	Rapportdato: 25.05.95	Prosjektnr.: 67.6421.02	Ansvarlig: Svein Olerud

Sammendrag:

The Gjedde Lake gold occurrence was found in the Pasvik Valley during field work in the summer of 1993. The area is poorly exposed and this hampered the investigation. The gold mineralisation is related to the upper section of the Early Proterozoic Petsamo Supergroup. The host rocks are represented by cherty quartzites, considered as chemical sediments related to submarine exhalations. The gold mineralisation is associated with the sulphide facies of the cherty quartzites, while the oxidised magnetite-bearing sulphide-free rocks do not contain any gold. The highest gold content is ca. 10 ppm.

Detailed mapping of discovery site outcrops and limited sampling have been done. Further investigations are recommended, including ground geophysical survey (IP) and mapping of boulders and outcrops within an area of 0.5 km². Some trenching and core drilling are needed in this poorly exposed terrain.

Emneord: Malm	Gull	Fagrapport
Geologisk undersøkelse	Proterozoikum	

CONTENTS

1 INTRODUCTION

This report presents the results of a short-term investigation of a gold occurrence that was discovered and studies by Melezhik during field work carried out in the summer of 1993 as a part of activity within two projects: 'Kola Mineral Resource Project' and 'International Map Sheet Kirkenes'. L.-P. Nilsson performed microprobe electone study on three polished sections.

The gold occurrence is located in the Early Proterozoic Pasvik Greenstone Belt, NE Norway, map sheet Vaggatem. The gold occurrence was found on the shore of an unnamed lake, which was later called the Gjedde Lake (Norwegian word 'gjedde' means a pike in English). The gold occurrence has been called the Gjedde Lake gold occurrence because the author was visited by a large pike in a course of an investigation of 'sub-marine' bedrock exposure.

The area of discovery (35-592300.7697800 UTM, Fig. 1) lies in the Pasvik Valley, south of Kirkenes in a narrow strip of Norway wich streches southwards between Russia on one side and Finland on the other. The area is fairly flat and lies approximately 50-100 m over sea level with a few hills over 250 m. It is swampy, with a number of small and large lakes, streams and ponds. Therefore the area has limited bedrock exposure, which hampered the investigations.

Main and trace element analyses were obtained using XRF (borax melt) at the Geological Survey of Norway in Trondheim. Gold analyses were completed using fire assay and ICP/graphite furnace at ACME Analytical Laboratories Ltd. in Vancouver, Canada.

2 THE PASVIK GREENSTONE BELT

Geologically the area is associated with the uppermost section of the Petsamo Supergroup of the Early Proterozoic Pasvik Greenstone Belt (PB, Fig. 2). The PB consists of the Petsamo Supergroup (PS) that is subdivided in the Pasvik Group (PG) and Langvannet Group (LG, Fig. 3). The PG and LG

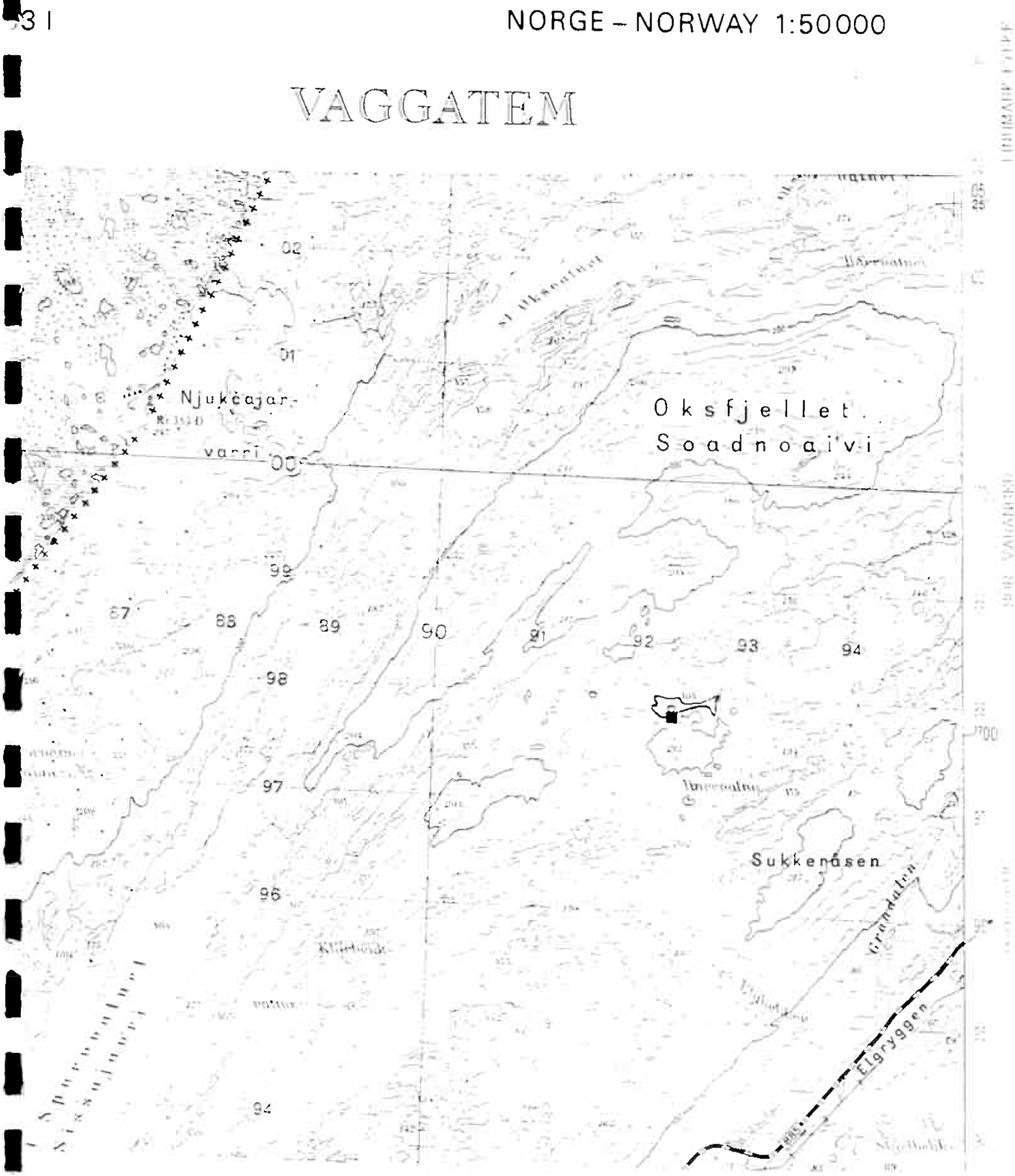


Fig. 1. Location of the Gjedde Lake gold occurrence (UTM 35 592300 7697800) on 1:50 000 topographic map, Vaggatem 2333-I. The occurrence is shown as a black square.

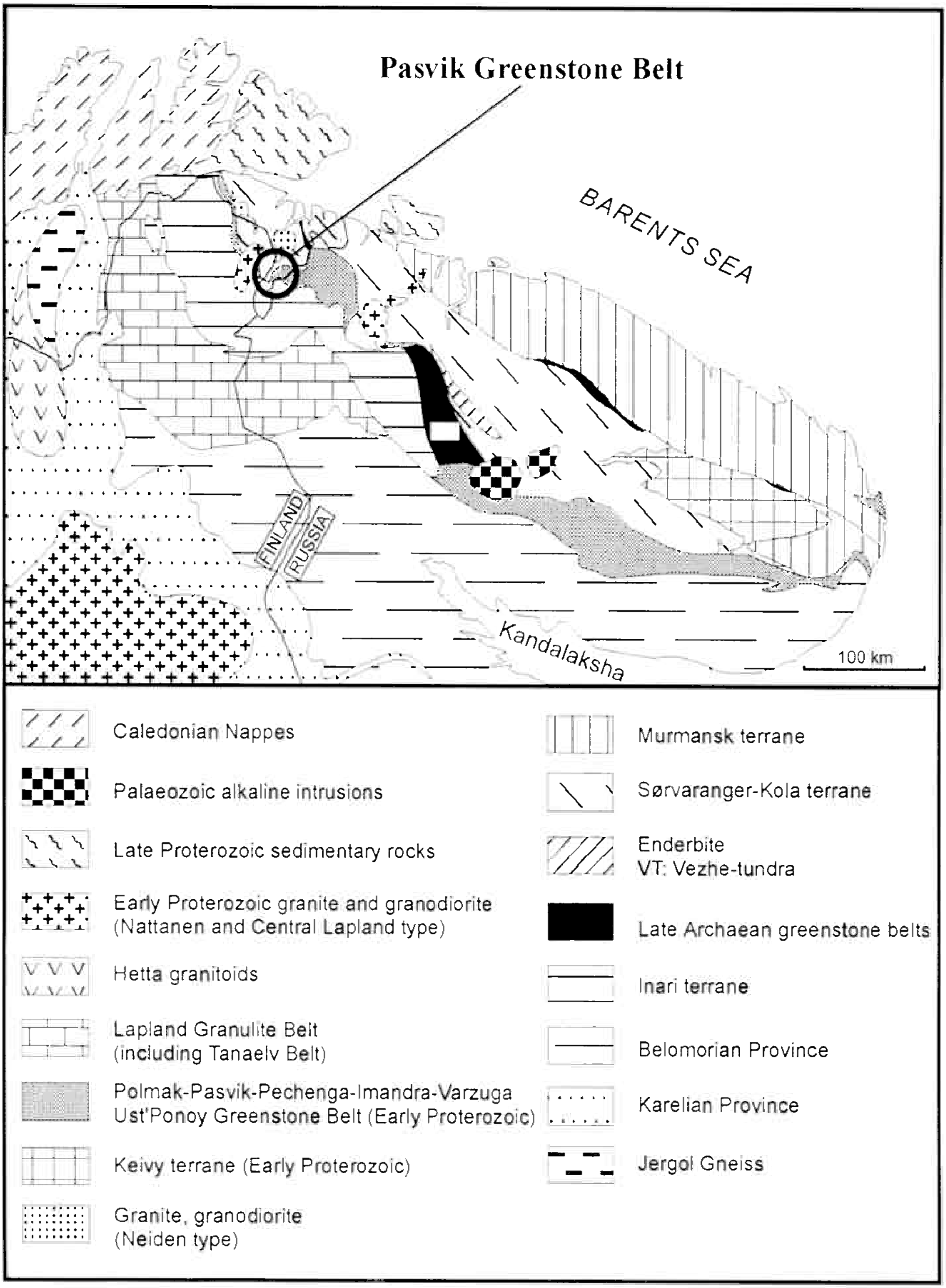


Fig. 2. Location of the Early Proterozoic Pasvik Greenstone Belt

are continuous and can be traced for 34 km across Norway from the Russian border, where they have a total thickness of 9 500 m, to Finland, where the thickness diminishes to 2 100 m. A formal stratigraphy for the PS is summarised in Table 1, and is outlined below.

The lower age limit of the PG can be placed between 2453±42 Ma (Sm-Nd) and 2330±38 Ma (Rb-Sr) (Balashov et al. 1991; Bakushkin et al. 1990). The upper age limit of the LG is younger than 1778±45 Ma (Rb-Sr, Balashov et al. 1991).

2.1 Pasvik Group

The PG lies unconformably on Archaean basement and is composed of four sedimentary-volcanic cycles, each with a basal sedimentary formation overlain by a volcanic formation. The formations are, from oldest to youngest, the Neverskrukk and Båttjørna (cycle 1, Table 1), Koievann and Skogfoss (cyccle 2), Bergvannet and Skjellvannet (cycle 3), and the Stallvannet and Kiltjørn Formations (cycle 4). The rocks have undergone metamorphism ranging from greenschist facies to amphibolite facies.

The Neverskrukk Formation is the basal formation of the PG and unconformably overlies Archaean gneisses and occasional regolith. It is zero to 200 m thick, comprising conglomerates, grit- and sandstones. The formation is considered to represent sedimentation in alluvial channels and related fans (Siedlecka et al. 1985).

The Båttjørna Formation consists of sub-aerial, amygdaloidal basaltic andesites and andesites with subordinate picritic lapilli tuff and thin lenses of volcanoclastic greywacke sandstones. The formation thickness is 50 to 1600 m.

The Koievann Formation comprised of the basal *Quartzite* and upper *Dolomite Members*. Quartzites and dolostones are the main lithologies. The formational thickness varies from 4 m to 50 m.

The Skogfoss Formation consists of haematite- and magnetite-bearing sub-alkaline and alkaline volcanics including alkali-basalts, hawaiites, trachybasalts, trachyandesites and trachyrhyolites. The formation thickness varies from 50 to 1100.

The Bergvannet Formation comprises red, arkosic conglomerates, gritstones and sandstones *(Red Bed Member)* lying on weathered Skogfoss Formation volcanics. Mn-rich carbonate rocks (*Dolostone Member*) overlie these sediments, and pass upwards into carbonate- and sulphide-bearing carbonaceous siltstones and basaltic tuffs (*Black Shale Member*). The thickness of the formation varies from 0 to 100 m.

The Skjellvannet Formation consists of fine-grained tholeiitic basaltic pillowed lavas and tuffs. 1 cm up to 1 m thick horizons of sulphide-bearing carbonaceous siltstones occur discontinuously in the middle part of the formation. The formation is not present at the Russian-Norwegian border but further west, in places, its thickness surpasses 600 m.

The Stallvannet Formation consists of two members. *Member A* ranges in thickness from ca. 1 to 260 m and is represented by sulphide-bearing carbonaceous quartz-rich sandstones, siltstones and basaltic tuffs. *Member B* consists of 1 to 280 m thick sulphide-bearing carbonaceous siltstones siltstones with interbedded greywacke rhythmites. The total formational thickness is from up to 550 m.

The Kiltjorn Formation is composed dominantly of tholeiitic basalts, with minor amounts of ferropicrites (Basalt-Picrite Member), acidic volcanics (Rhyolite Member), and monotonous tholeiitic basalts occurring as massive and pillowed flows and tuffs. Up to three discontinuous black shale horizons are developed at different levels in the volcanic pile. The formational thickness is from a few to 500 m.

2.2 Langvannet Group

The LG is in fault/stratigraphic(?) contact with the PG in the north, and is overthrusted by Archaean gneisses in the south. The total tectonostratigraphic thickness of LGis approximately 4 000 m. Although the LG is very poorly studied, it can be informally subdivided into five lithostratigraphical units (Table 1) with poorly defined contact relationships. Only three units were recognised in the area of gold occurrence which are described below from north to south (Fig. 3).

The first unit, is a ca. zero to 350 m thick 'black shale' formation, represented by sulphide-bearing carbonaceous siltstones siltstones of andesitic volcanoclastic origin. The siltstones contain a number of thin lenses of cherts.

The second unit is represented by andesites, andesitic volcanoclastic sediments and subordinate 'green stones' with the total thickness of 1 500 to 2 000 m.

The Fagermo Formation and 'Green stone' unit are missing in the gold occurrence area, therefore the third unit is represented by andesitic volcanoclastic sediments. Stratigraphically these rocks are located in the uppermost portion of the LG section. The main lithologies are andesitic volcanoclastic sandstones and subordinate siltstones containing amphibole-plagioclase schist and lenses of cherty quartzites and 'black shales'. The total tectonostratigraphic thickness is more than 500 m.

3 THE GOLD OCCURRENCE

The gold occurrence is located in the central part of the PB, 3 km SW of Oksfjell (Fig. 3). Stratigraphically it lies in the middle part of the Langvannet Group although stratigraphic position cannot be precisely defined. Probably it is seated somewhere between the second and the third units (Fig. 3).

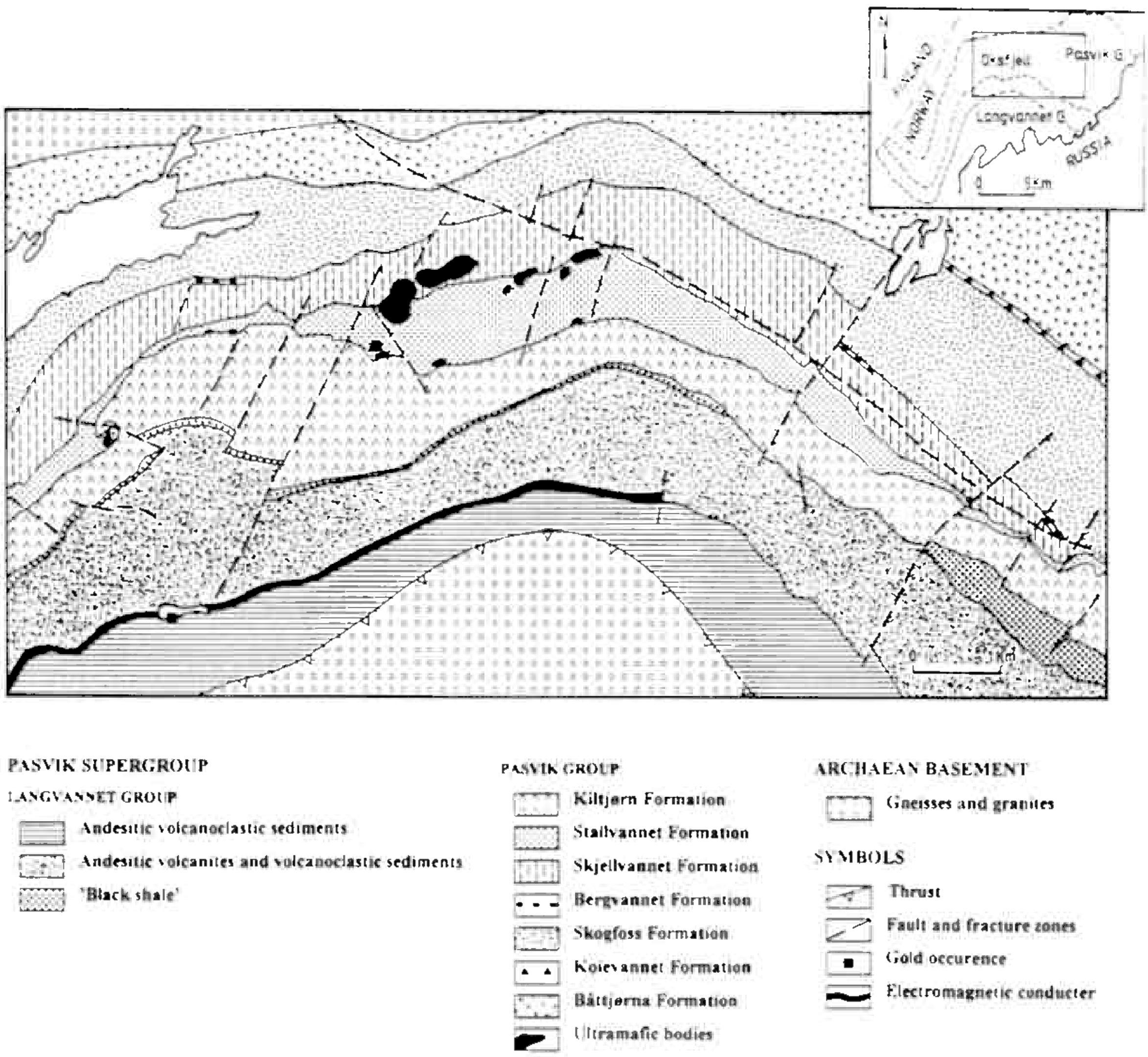


Fig. 3. Geological map of the Oksfjell area, Pasvik Greenstone Belt (Melezhik et al. 1994; Lieungh 1988).

The Gjedde Lake gold occurrence is exposed within a limited area (30 m by 15 m) on the shore of a lake, UTM 35-592300 7697800. Very few exposures are available on the southern bank as well as on the bottom of this lake along the southern shore (Fig. 4). Four different lithologies were found at the occurrence site. The boundaries between them are not exposed. These lithologies are plagioclase-amphibole schists ('garben schiefer', samples SP-34, 93/20, Table 2), cherty sulphide-bearing (samples SP-30, SP-33, 93/1, 93/2, 93/3, 93/4, 93/5, 93/6, 93/6-1, Table 2) and magnetite-bearing (samples 93/13, 93/14, Table 2) quartzites, quartz veins (samples SP-31, SP-31A, Table 2), and fine grained amphibolites. The quartz veins were observed only within the cherty quartzites (Fig. 4).

The gold mineralisation is associated with cherty quartzites. These rocks outcrop in six small-scale exposures (from 0.5 by 0.5 m to 9 by 2 m, Fig. 4). The exposed quartzites have a cumulative visible thickness of ca. 8 m, but there is room for a few tens of metres of these rocks within the lake area. Within the exposed area the cherty quartzites are gold-bearing over a strikelengh of 40 m, but there is almost unlimited space available for an extension of the mineralisation both westwards and eastwards for a distance of a few hundred of metres where no exposures were observed.

The cherty quartzites are grey to dark grey fine-grained rocks either massive or unclearly bedded. They have undergone amphibolite facies metamorphism. The major minerals are quartz (80-95% modal) and actinolite (3-10%) whereas calcite, graphite and plagioclase occur in minor amounts. The quartz forms 0.2-1 mm grains forming a mosaic microtexture. The ore minerals occur as dissemination and include pyrite, pyrrhotite, chalcopyrite, magnetite and arsenopyrite. They together constitute 5-10% of the mode. The 35-65 microne gold grains were detected by microprobe examination of three polished sections (Fig. 5-6). Two different types of cherty quartzites were distinguished. The first one, which yields high gold values, contains sulphides with minor magnetite. The second type is represented by magnetite-bearing and sulphide-free cherty quartzites with low gold contents. These outcrop ca. 500 m east (along strike) of the gold occurrence (Fig. 4). The stratigraphic relationships between these two kinds of quartzites are unknown, since they are separated by an area with no exposures.

The cherty gold-bearing quartzites are intersected by 0.5-1.0 m thick quartz veins which outcrop on the bottom of the lake (Fig. 4). The aqueous environment hampers the investigation. The orientation and

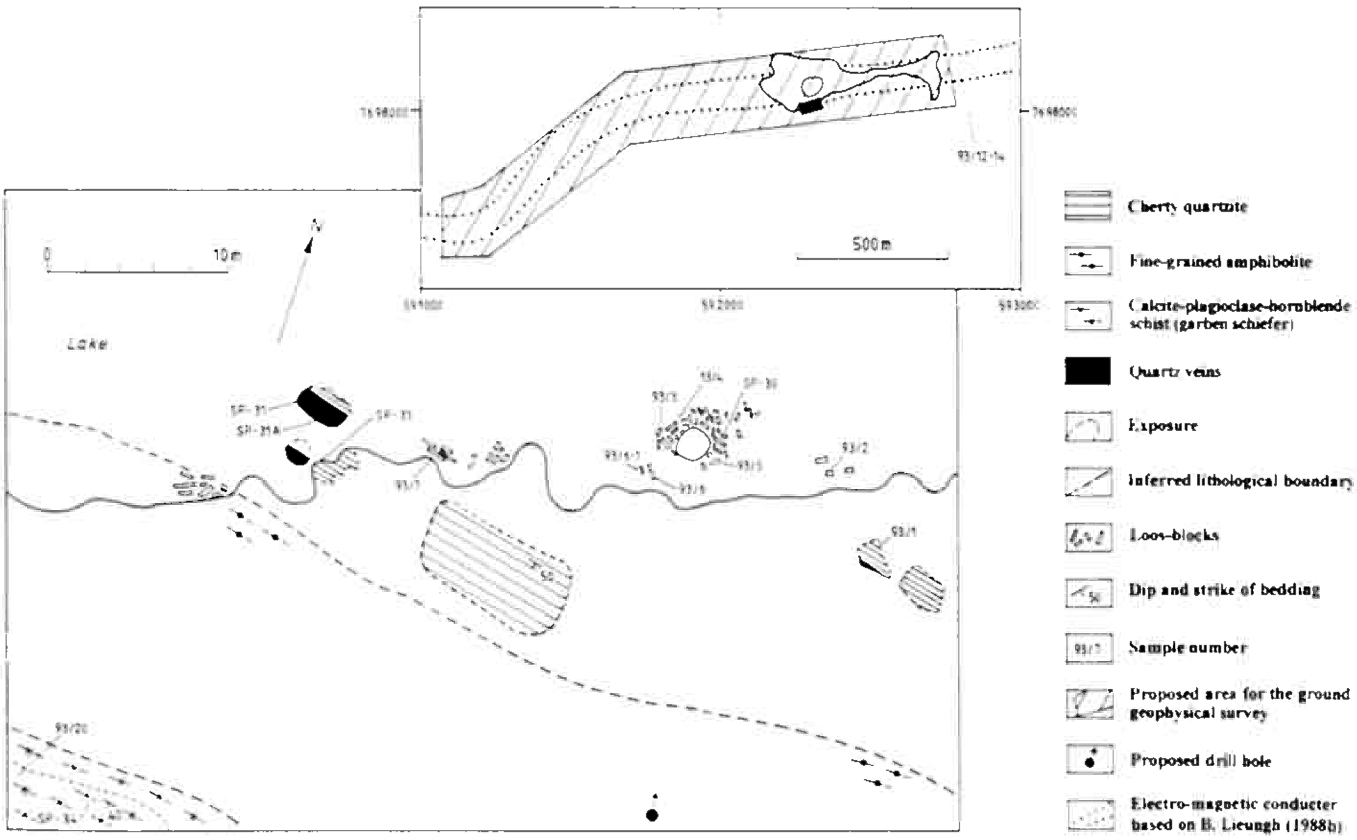


Fig. 4. Geological sketch of the Gjedde Lake gold occurrence.

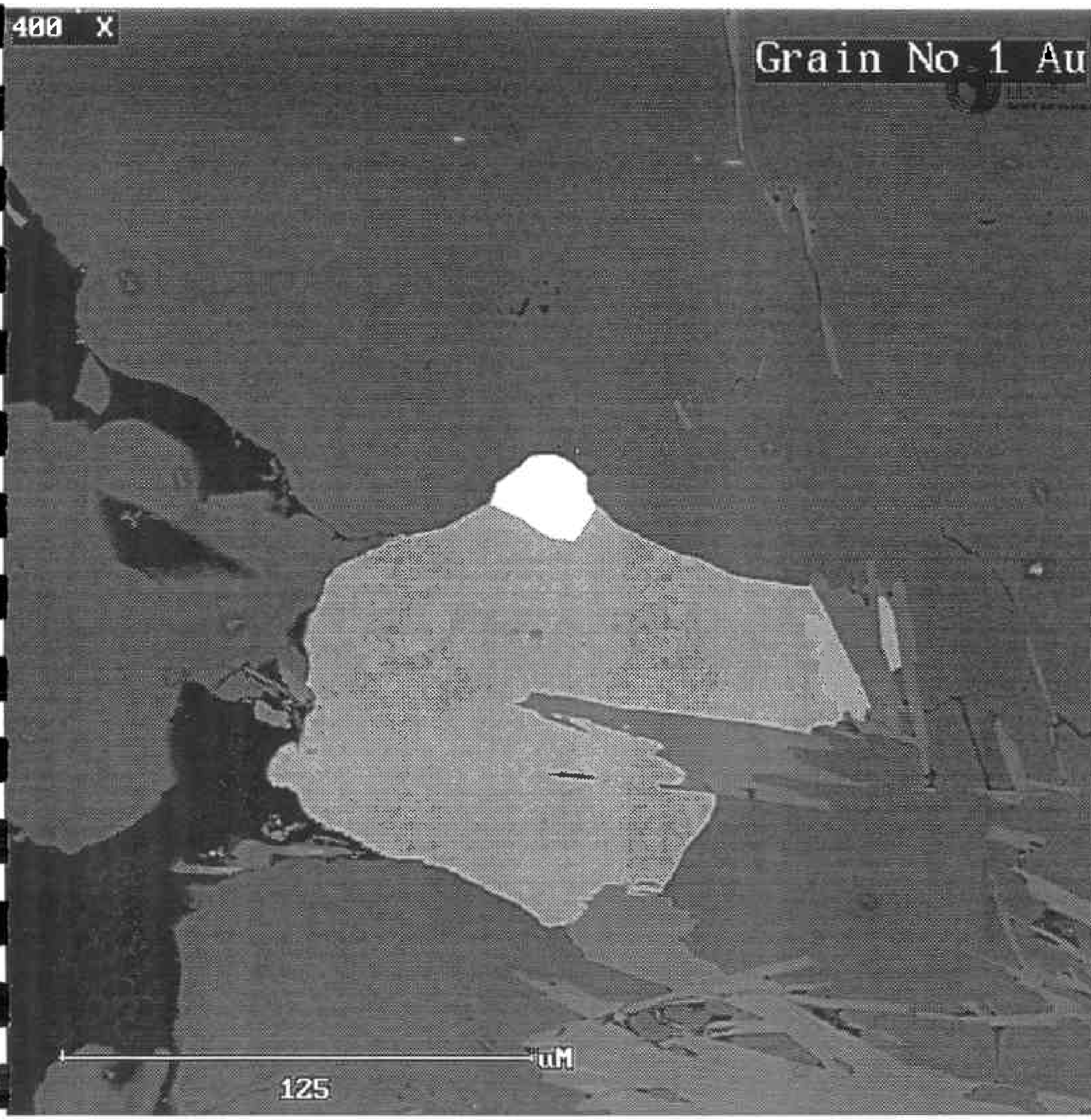


Fig. 5. Electron microscope picture of gold grain.

Fig. 6. Electron microscope picture of gold grain.

dimensions of veins are therefore not clear. The quartz veins consist of milky quartz which is impregnated with large (up to 1 cm) idiomorphic crystals of arsenopyrite and finegrained pyrrhotite and subordinate chalcopyrite.

The chemical composition of the cherty quartzites are very simple. The dominant components are SiO_2 and Fe (Table 2). The latter is mainly confined to the sulphides. The rocks contain very low concentration no of Ti, Na (both are very often not detected) and negligible amount of K. Thus the chemical composition of the studied rocks are fairly normal for chemogenic cherts which are known in the Pechenga-Imandra/Varzuga Greenstone Belt (Melezhik 1979).

The gold contents vary from 0 to 9.6 ppm. The highest values of 4.7 ppm to 9.6 ppm were found in the cherty quartzites that occur as a dense pile of clasts on the bottom of the lake (Fig. 4, samples SP-30, 93/6-1, 93/6, Table 2). The highest gold value obtained from the outcrops is 4.5 ppm (sample 93/1, Table 2). Only sulphide-bearing cherty quartzites are enriched in gold. The sulphide-free quartzites, that are found ca. 500 m east of the gold occurrence, contain virtually no gold (samples 93/13, 93/14, Table 2). Although on the other hand, the S_{tot} versus Au diagram shows a weak positive correlation whereas the Au versus As diagram displays no correlation at all (Fig. 7).

One of the largest quartz veins was examined for gold. The assays show low gold values in both sulphur- and arsenic-rich types (sample SP-31, Table 2) as well as sulphide-free varieties (sample SP-31A, Table 2).

4 PRIMARY NATURE OF THE CHERTY QUARTZITES AND GOLD MINERALISATION.

So far only very limited work has been carried out on the occurrence. Therefore it is not possible to introduce a sophisticated model for the genesis of the gold mineralisation and for the primary origin of the host rocks, namely the cherty quartzites. The bulk composition of the cherty quartzites resembles

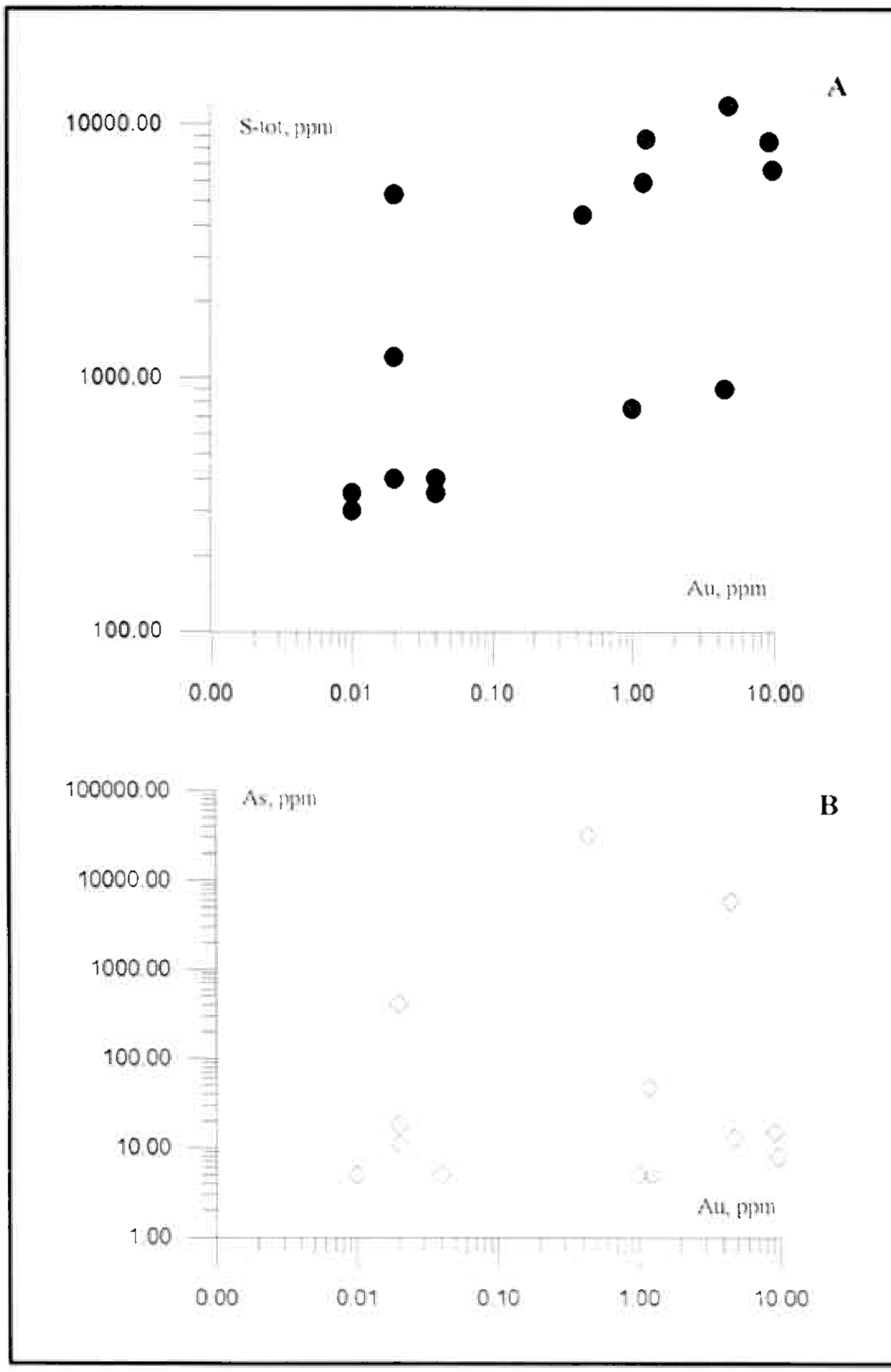


Fig. 7. S-tot versus Au (A) and As versus Au (B) for the Gjedde Lake gold occurrence

chemogenic cherts (lydites or phtanites) as described in a previous study (Melezhik 1979). In principle, a method to distinguish cherts of different origin is available. Strakhov (1976) introduced an exhalative coefficient for modern oceanic sediments

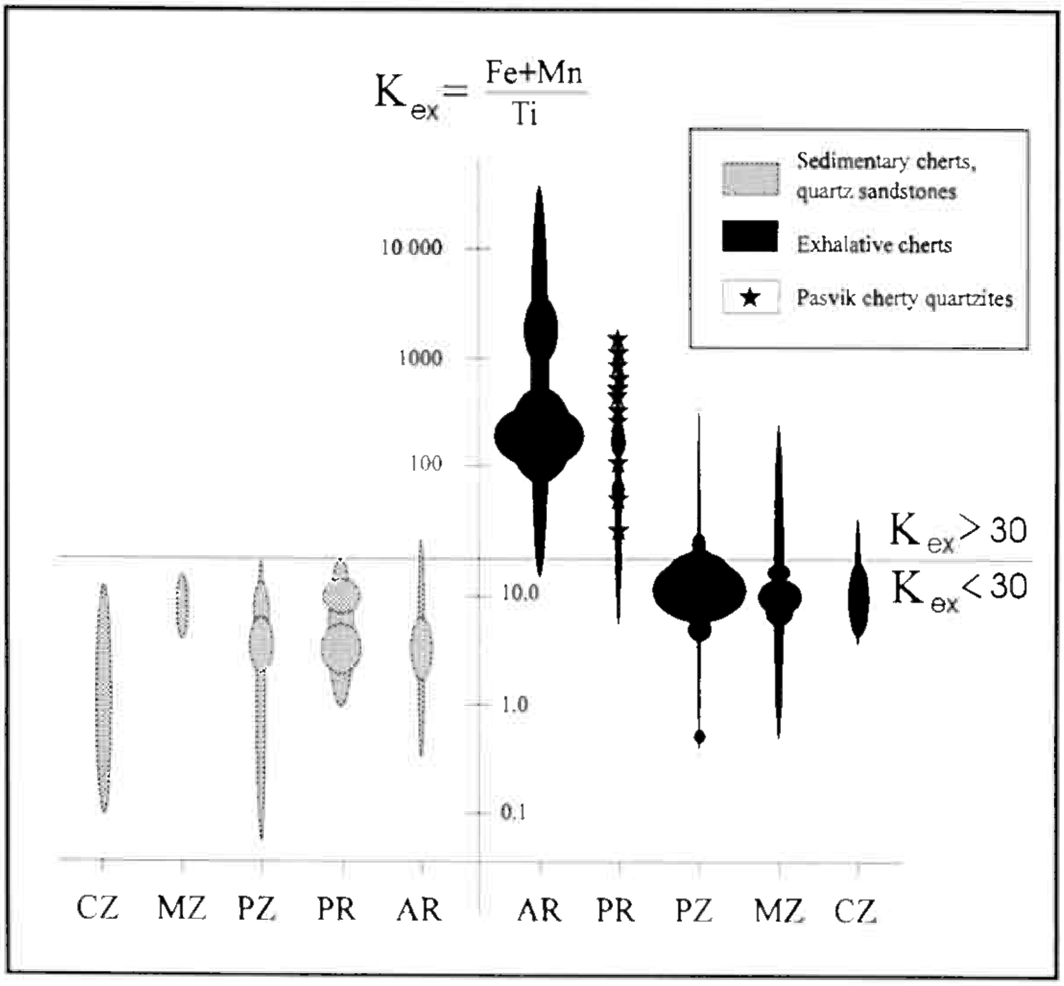
$$K_{ex}=(Fe+Mn)/Ti$$

This coefficient is >>30 for the volcanogenic cherts related to submarine exhalations. In contrast, the chemogeneous cherts which were precipitated from normal sea/lake water, are characterised by K_{ex} of <30. Based on this, Melezhik & Predovsky (1982) produced a diagram which can be applied for the diagnosis between pure sedimentary and exhalative-sedimentary high silica rocks derived from the Archaean and Early Proterozoic (Fig. 8). All cherty quartzites from the Pasvik gold occurrence display values grater then 40. Therefore they can be considered as sedimentary-exhalative rocks.

The origin of the gold mineralisation is even more difficult to interprete due to lack of sufficient geological information. So far the mineralisation is associated with only one type of rock, namely cherty quartzites and no hydrothermal alteration is apparently connected with the gold concentration. Therefore it is assumed the gold was precipitated together with the exhalative cherts. The two types of cherty quartzites, namely the gold-bearing sulphidic and the gold-free magnetitic types are spatially separated and apparently indicate some variation in depositional environments. One can assume that the gold mineralisation was formed under reduced conditions giving rise to sulphide-bearing rocks which were coeval with the precipitation of magnetite-rich cherts under oxidised conditions.

5 CONCLUSIONS AND RECOMMENDATIONS

The further work is needed in order to assess the potential of the Gjedde Lake gold occurrence. A combination of ground geophysical survey (IP) within an area of 0.5 km^2 (Fig. 4), for the detection of sulphide-bearing rocks is suggested, in addition trenching and drilling of a limited number of shallow holes are warranted.



CZ - Cenozoic, MZ - Mesozoic, PZ - Palaeozoic, PR - Proterozoic, AR - Archaean

Fig. 8. Exhalative parameter versus age for high-silica rocks (Melezhik & Predovsky 1982) and cherty quartzites from the gold occurrence.

There are a number of gold showings, at approximately the same stratigraphic level, on the Russian side of the belt. To our knowledge no serious exploration has been carried out on these occurrences. This indicates that there may exist a regional zone of interesting dimension for future prospecting.

REFERENCES

Bakushkin, Ye.M., Zhuravlev, D.Z., Bayanova, T.B. & Balashov, Yu.A., 1990: Mountain General'skaya. In: Mitrofanov, F.P. and Balashov, Yu.A. (eds), *Geochronology and Genesis of Layered Basic Intrusions, Volcanites and Granite-Gneisses of the Kola Peninsula*. Apatity, Kola Sci. Centre, 14-15.

Balashov, Yu.A., Sharkov, I.V., Kvashnin, Yu.A., Ul'yanenko, N.A., Sherstobitova, G.M., Kravchenko, M.P., Sherstennikova, O.G., Fedotov, Zh.A. & Skuf'in, P.K. 1991: Geochronological dating of volcanic and metamorphic processes by Rb/Sr isotopic method in the Pechenga Zone. In: *Abstract volume, Methods of Isotopic Geology*, Zvenigorod, 19-21 (in Russian).

Lieungh B. A. *Forloping berggrunnskart, 1:50 000 Vaggatem 2333I*, Nor. geol. unders., 1988, unpulished.

Melezhik, V.A. 1979: Metacherts of the Imandra/Varzuga Complex. In: *Primary Nature and Geochemistry of the Precambrian Metamorphosed Rocks of the Kola Peninsula*. Apatity, Kola Sci. Centre, 27-38 (in Russian).

Melezhik, V.A., Hudson-Edwards, K.A., Skuf'in, P.K. & Nilsson, L.P. 1994: The Pechenga area, Russia. Part 1: geological setting and comparison with Pasvik, Norway. *Inst. Mining. Metall., Section B, Applied Earth Science 103*, 129-145.

Melezhik, V.A. & Predovsky, A.A., 1982. *Geochemistry of Early Proterozoic Lithogenesis (On the Example of the Northern-Eastern Part of the Baltic Shield)*. Leningrad, Nauka, 208 pp. (in Russian).

Melezhik, V.A. & Sturt, B.A. 1994: General geology and evolutionary history of the early Proterozoic Polmak-Pasvik-Pechenga-Imandra/Varzuga-Ust'Ponoy Greenstone Belt in the northeastern Baltic Shield. *Earth-Sci. Rev. 36*, 205-241.

Siedlecka, A., Iversen, E., Krill, A.G., Lieungh, B., Often, M., Sandstad, J.S. & Solli, A. 1985: Lithostratigraphy and correlation of the Archean and Early Proterozoic rocks of Finnmarksvidda and the Sørvaranger district. *Nor. geol. unders. Bull. 403*, 7-36.

Strakhov, N.M. *Problems of Geochemistry of Recent Oceanic Lithogenesis*. Moscow, Nauka, 300 pp. (in Russian).

Table 1. Lithostratigraphic subdivision of the Pasvik Greenstone Belt.

P A S V I K (*Melezhik et al. 1994a, Melezhik & Sturt 1994*)			
ARCHAEAN			
EARLY PROTEROZOIC THRUST			
PETSAMO SUPER-GROUP	?	Andesitic volcanoclastic sediments	Sandstone Mem.
			Siltstone Mem.
			Conglomerate Mem.
	MID PETSAMO OROGENIC UNCONFORMITY?		
	Langvannet Group	'Green stones'	
		Fagermo Fm.	
		Andesitic volcanites and volcanoclastic sediments	
		'Black shales'	
	TECTONIC CONTACT		
	Pasvik Group	Kiltjørn Fm.	Upper Basalt Mem.
			Rhyolite Mem.
			Basalt-Picrite Mem.
		Stallvannet Fm.	B Mem.
			A Mem.
		Skjellvannet Fm.	
		Bergvannet Fm.	Black Shale Mem.
			Dolostone Mem.
			Red Bed Mem.
		WEATHERING CRUST	
		Skogfoss Fm.	
		Koievannet Fm.	Dolostone Mem.
			Quartzite Mem.
		Båttjørna Fm.	
		Neverskrukk Fm.	
	REGOLITH		
	FIRST-ORDER UNCONFORMITY		
ARCHAEAN			

Table 2. Chemical composition of the rocks from the Gjedde Lake gold occurrence.

Components	SP-30	93/6-1	93/1	93/6	93/3	93/4	93/5	SP-33
SiO_2, %	88.07	86.51	87.53	86.24	90.15	95.08	83.34	84.08
TiO_2	0.01	-	-	0.01	-	-	-	-
Al_2O_3	0.37	0.19	0.21	0.21	0.27	0.09	0.13	0.17
Fe_2O_3	7.33	9.60	7.48	9.01	6.98	2.68	8.09	6.24
MgO	0.52	0.50	0.61	0.37	0.30	0.14	0.58	0.85
CaO	0.47	0.43	0.11	0.09	0.13	0.20	4.26	1.19
Na_2O	-	-	-	-	-	-	-	-
K_2O	0.04	0.03	0.01	0.03	0.01	-	0.01	0.02
MnO	0.02	0.03	0.01	0.02	0.01	-	0.06	0.02
P_2O_5	0.02	0.02	0.02	0.02	0.01	-	0.03	0.01
LOI	0.91	1.10	2.27	2.37	1.45	1.32	2.20	3.46
Total	97.76	98.41	98.25	98.37	99.31	99.51	98.70	96.04
Mo, ppm	-	-	-	-	-	-	-	-
Nb	-	-	-	-	-	-	-	-
Zr	7	-	6	6	7	6	6	6
Y	-	-	-	-	-	-	-	-
Sr	-	5	-	-	-	-	52	11
Rb	-	-	-	-	-	-	-	55
U	-	-	-	-	-	-	-	-
Th	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-
Cr	10	6	16	-	-	7	11	17
V	28	21	17	26	13	9	13	11
As	8	15	13	5842	-	48	-	31500
Sc	-	-	-	-	-	-	-	-
S	6600	8500	11800	900	8700	5900	750	4400
Cl	-	-	-	-	-	-	-	-
F	-	-	-	-	-	-	-	-
Au	9.63	9.10	4.74	4.49	1.25	1.20	1.00	0.44

SP-30, 93/6-1, 93/1, 93/6, 93/3, 93/4, 93/5, SP-33 - sulphide-bearing cherty quartzites.
- not detected

Table 2. (continuation)

Components	93/2	93/12	93/7	SP-31	SP-31A	93/13	93/14	SP-34	93/20
SiO_2, %	89.20	88.59	81.50	97.82	97.08	87.19	82.55	44.29	44.23
TiO_2	-	-	0.01	-	-	0.01	-	1.49	3.36
Al_2O_3	0.63	0.08	0.33	0.04	0.13	0.05	0.06	11.51	11.91
Fe_2O_3	6.39	8.97	15.10	0.77	1.26	11.07	13.53	14.20	14.92
MgO	0.62	0.39	2.72	-	0.13	0.19	1.25	5.71	5.42
CaO	1.01	0.27	0.19	0.02	0.07	0.04	0.95	13.42	9.13
Na_2O	-	-		-	-	-	-	2.15	2.25
K_2O	0.02	0.02	0.03	-	0.01	-	-	0.12	0.76
MnO	0.03	0.02	0.09	-	-	0.01	0.07	0.31	0.24
P_2O_5	0.01	0.01	0.02	-	-	0.03	0.02	0.20	0.44
LOI	0.93	-0.19	-0.33	0.32	0.54	-0.12	-0.19	5.46	6.52
Total	98.84	98.16	99.66	98.97	99.22	98.47	98.24	98.86	99.18
Mo, ppm	-	-	-	-	-	-	-	-	
Nb	-	-	-	-	-	-	-	-	14
Zr	8	-	9	6	-	9	6	97	217
Y	-	-	-	-	-	-		42	45
Sr	13	-	-	-	-	-	14	215	202
Rb	-	-	-	-	-	-	-	-	12
U	-	-	-	-	-	-	-	13	-
Th	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	-
Cr	7	7	-	15	-	-	-	103	36
V	21	8	24	5	9	26	7	319	386
As	11	-	18	-	414	-	-	63	-
Sc		-	-	-	-	-	-	37	37
S	5300	-	-	-	1200	-	-	-	-
Cl		-	-	-	-	-	-	-	-
F		-	-	-	-	-	-	2500	1500
Au	0.02	-	0.02	0.04	0.02	0.01	0.04	0.01	-

93/2, 93/12 - cherty quartzites; 93/7 - amphibole-bearing cherty quartzite; SP-31, SP-31A - quartz veins;
93/13, 93/14 - magnetite-bearing cherty quartzites; SP-34, 93/20 - calcite-plagioclase-hornblende schist ('garben schiefer').
- not detected

NORGES GEOLOGISKE UNDERSØKELSE

Leiv Eirikssons vei 39
Postboks 3006, Lade
7002 Trondheim
Tlf.: 73 90 40 11
Telefax: 73 92 16 20
Telex: 55417 NGU N

Trykkerihuset Skipnes