CHAPTER 4 MINERALIZATION

4-1 GENERAL OUTLINE

The major mineralized zones in the survey area are the Pagar Gunung West deposit, Pagar Gunung East deposit, and Barute - Patahajang mineralized zone, and additionally there are indications of chalcopyrite and molybdenite existing in Simpang Pining. Also, there is extensive silicification disseminating pyrite of muscovite granodiorite in the northern area of Pagar Gunnan Deposit (Fig. II-3-6).

4-2 MINERALIZATION

4-2-1 Pagar Gunung West Ore Deposit

The Pagar Gunung West ore deposit is situated in the neighborhood of the ridge at the A. Sambak, upstream about 1,100 m altitude. Access by car is possible for 4 km from Kotanpan to Simpang Tolang, and then the 9 km mountain path up to the Pagar Gunung deposit must be travelled on foot.

As reported in the First Phase Survey, five adits have already been opened for the prospecting within 200 m from east to west of the Pagar Gunung West ore deposit. The inhabitants in the area say that a survey was conducted and some quantity of the ore was mined in 1942 to 1944, but the details are not clear. At pass to K. Pagar Gunung, there remain some ore boulders from the mining. The survey results of each adit are as follows (Fig. II-3-9 - 10).

(1) Adit No. 1

There is an adit 2.5 m long in the N 70° W direction. At the adit face, the deposit containing dissemination of pyrite, sphalerite and galena in a width of 0.40 m is embedded in black pelitic limestone in the strike of N 25° E and dip of 30° SE, and a massive deposit of 0.20 m wide is recognized as a part. A dissemination vein of 0.90 m wide is recognized in outcrop at the adit entrance. Through microscopic observation, the massive ore (KR43) consists of mainly sphalerite, galena and pyrite, some chalcopyrite and a very small quantity of covelline. The chalcopyrite in paragenesis with other ores is most cases but it is also included in the sphalerite as exsolution dot or lamella. Most of the gangues are quartz and calcite. Also, siderite has been detected through an X-ray analysis. The grade of the ores are shown below.

	Width m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
Disseminated ore (average)	1.15	0.2	40.1	0.17	2.70	2.82
Massive ore	0.20	0.4	147.4	0.68	15.30	17.60

(2) Adit No. 2

The Adit No. 2 is situated about 4 m north of the first tunnel and it was prospected lower by one step than Adit No. 1. The Adit entrance has collapsed, but pyrite-sphalerite-galena massive ore crops out, with both sides being cut by a fault and south part continues to dissemination deposits of the Adit No. 1. Under microscopic observation, the massive ores (KR37 and KR38) contain sphalerite, galena, pyrite, chalcopyrite and a small quantity of covelline, as well as massive deposit in Adit No. 1. The analysis results of the ores collected from the massive deposit and dissemination deposit of the outcrop of Adit No. 2 are as follows.

	Width m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
Massive ore (average)	1.80	0.3	127.2	0.61	14.01	14.63
Disseminated ore	0.85	0.3	81.9	0.31	6.49	5.38

(3) Adit No. 3

Adit No. 3 is situated 60 m east of Adit No. 2, and the deposit here is a thin vein (10 cm) embedded in gray limestone (strike N 90° E and dip 30° N). The strike of vein is also N 90° E and dip 30° N, and the analysis results of massive ore sampled at the adit entrance indicate that the grade is Au 0.2 g/t, Ag 64.8 g/t, Cu 0.29%, Pb 7.90% and Zn 0.84%, and 10 cm in width.

(4) Adit No. 6

Adit No. 6 is situated 160 m east of Adit No. 1. The outcrop is 8 m long in the east-west strike and there is a collapsed old tunnel at the east end. The ore deposit is embedded in the mudstone and limestone and consists of a massive deposit (0.90 m wide) at the foot wall, dissemination deposit (1.00 m wide) and a zone of veinlets (1.00 m wide) at the hunging side. The analysis results are as follows.

	Width m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
Veinlet zone	1.00	0.1	24.7	0.14	1.42	1.18
Dissemination ore (average)	1.00	1.5	94.2	0.13	6.87	6.03
Massive ore (average)	0.90	3.4	143.6	0.16	10.07	9.92
Average	2.90	1.6	85.6	0.14	5.97	5.56

The east end of the ore deposit is cut by a fault of N 70° W strike and 80° S dip. A notable point on this outcrop is the high gold content grade as compared with that of Adit No. 1 and Adit No. 2. The strike and dip of this deposit are N 65° W and 30° S.

Microscopic observation shows that the main ore minerals of this deposit are sphalerite, galena and pyrrhotite and some chalcopyrite, and the gangue minerals are quartz and calcite.

(5) Adit No. 5

Adit No. 5 is situated 20 m up along the river from Adit No. 6. Black phyllitic mudstone in this area is disturbed by a fault (N 70° W strike, 70° S dip and 0.40° m wide), but the deposit is a dissemination type embedded in the fault, and it seems that the ore is dragged ore in the fault. The ore contains sphalerite and galena, and the analysis grade of the good ore part is a 0.40 m vein in width, Au 0.3 g/t, Ag 89.1 g/t, Cu 0.1%, Pb 7.76% and Zn 5.14%.

To summarize the survey results of the Pagar Gunung West deposit, although the deposit changes from thick to thin, it extends 200 m in the east-wet strike. The ore deposit is a metasomatic deposit consisting of massive and disseminated silver-bearing sphalerite-galena emplaced in calcareous mudstone, and contains a small amount of chalcopyrite. The massive part of the deposit has a width of 0.10 m to 1.80 m, Ag 100 g/t to 150 g/t, Pb 10% to 15%, Zn 10 to 17%, while the disseminated part of the deposit has width of 0.40 m - 2.00 m Ag of 40 g/t to 50 g/t, Pb 2.5% to 10%, and Zn 2.5% to 9.0%. The average grade of Au content in the ore deposit is around 0.3 g/t, but it is high in the outcrop of Adit No. 6 especially, indicating 1 to 3 g/t.

4-2-2 Pagar Gunung East Ore Deposit

The outcrop of the ore deposit is situated upstream about 800 m from the A. Palelo, a tributary of A. Sambak. There are two outcrops (Outcrop A and Outcrop B). Outcrop A is a massive to banded pyrite deposit, located along the A. Palelo, and Outcrop B is a massive ore deposit containing sphalerite, galena and skarn minerals, located about 100 m (climbing) to the southwest along a branch river of the A. Palelo.

The Pagar Gunung East deposit can be reached by walking along a mountain path from the Pagar Gunung West deposit (Fig. II-3-11 - 14).

(1) Outcrop A

The outcrop is mostly pyrite disseminated mineralization of 20 m in width, embedded in siliceous rock (originally being dacitic taffaceous rock) and there are two massive and bedded pyrite parts in the mineralization zone.

In one part (L139 - L143) (Fig. II-3-12) of these two, a pyrite ore deposit forming several massive bedded to banded layers is recognized with a width of 4.50 m. The country rock has strongly been silicified and it is difficult to clarify the original rock. However, based on the microscopic observation of a rock sample (L154) on which the silicification is relatively weak, it is a dacitic tuffaceous sandstone which is, made up of dacite, quartz and plagioclase fragments embedded in a matrix of quartz, plagioclase, epidote and clay minerals. The deposit strikes and dips N 30° W, 77° NE to N 85° E, 40° S, indicating an flexure. Microscopic observation of massive pyrite ores (L139, L140, L142, L145 and L146) revealed that they are mainly composed of coarse-grained cubic pyrite (1 mm or larger) and very small amounts of sphalerite and chalcopyrite fill in the spacing among the pyrite. Most of the gangues are quartz, chlorite and some are calcite and epidote. Samples obtained from three places of the bedded or banded form are chemically analyzed as follows. These ores are low grade in the copper, lead and zinc.

	Width m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
L139 - L143 (average)	4.50	0.1	8.0	0.17	0.02	0.03
L145	0.80	0.2	4.1	0.18	0.01	0.10
L146	0.80	<0.1	0.7	0.10	0.01	0.38

(2) Outcrop B

Outcrop B is situated about 100 m southwest (climbing) along a branch river of the A. Palelo starting at the pyrite deposit. This is a gold and silver-bearing copper-lead-zinc deposit, with both the hunging wall and foot wall being black phyllitic mudstone. While the deposit is a massive deposit, it is accompanied by green skarn of clinopryoxene and epidote at the hunging side and it has formed a banded skarn deposit in which spahalerite, galena and chalcopyrite has replaced along banded calcareous seams.

As observed through a microscope, the skarn mineral (ZH3.5) that accompanies the deposit mainly consists of clinepyroxene with a small amount of quartz and epidote. The quartz and ore minerals replaced the clinopyroxene. The epidote is very fine grained and is included in the quartz.

Table II-3-3 shows the analysis results of chemical compounds of clinoproxene by means of an X-ray micro-analyzer (EPMA). When the clinopyroxene accompanying the skarn of the Pagar Gunung East deposit is shown in the composition system of diopside (Di), hedenbergite (Hd) and johannsenite (Jo), it can be described as ($Di_{55.6}$ $Hd_{34.9}$ $Jo_{9.5}$) and ($Di_{58.0}$ $Hd_{30.5}$ $Jo_{11.5}$). When these values are projected into the Di-Hd-Jo triangular diagram and the result is compared with the triangular diagram of composition of clinopyroxene accompanying skarn deposits of various ore deposits, investigated by Finaudi et al (1982), the composition of clinopyroxene of the Pagar Gunung deposit is projected close to the area of clinopyroxene obtained from a lead-zinc skarn type deposit (Fig. II-3-15). Since it is generally said that the clinopyroxene that accompanies a lead-zinc skarn deposit has a compositon ranging Hd_{30-90} Jo_{10-40}, (Finaudi et al, 1982), the clinopyroxene of the Pagar Gunung East deposit is similar to the type contained in a lead-zinc deposit. The epidote contained in the deposit associated together with the clinopyroxene is a pistacite containing much iron (e.g. pistacite 24%), and the sphalerite ($Zn_{0.73}$, $Fe_{0.27}$)S, indicates that the sphalerite has a high ratio of zinc content. The pyrrhotite has been detected to be a monoclinic pyrrhotite through an X-ray analysis. The grades of outcrop are as shown below.

	Width m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
Massive ore	1.20	0.4	146.7	0.97	13.40	12.60
Banded skarn ore	0.10	0.5	69.3	0.73	5.45	7.84

(3) Comparison between outcrops A and B

Table II-3-5 shows the comparison of characteristics between outcrops A and B of the Pagar Gunung East deposit. The country rock is dacitic tuffaceous sandstone on outcrop A and that of outcrop B is black mudstone and limestone, thus it seems that this difference of the country rock lead to the difference of mineraliation.

Table II-3-5 Comparison of Character between Outcrop A and Outcrop B Pagar Gunung East Ore Deposit

	Outcrop A	Outcrop B
Country rock	Dacitic tuff (silicified)	Calcareous rock and black mudstone
Ore mineral	Pyrite and small amount of chalcopyrite and sphalerite	Pyrrhotite, sphalerite, and galena. A small amount of chalcopyrite and pyrite.
Alteration	Silicification, minor mount of epidote. No skarn mineral.	Skarnization. Clinopyroxene (Di $_{55.9}$ Hd $_{34.9}$ Jo $_{9.5}$) banded texture of skarn band and non-skarn band.

In the northern area of the Pagar Gunung lead and zinc deposit, muscovite granodiorite and tuffaceous sandstone are silicified in a extensive area, accompanied by pyrite dissemination and veinlets. It seems that the pyrite deposit of Outcrop A belongs to this type of mineralization and contains partially bedded or banded pyrite.

The results of plotting the copper, lead and zinc analysis grades of the Pagar Gunung West deposit, Pagar Gunung East deposit and Barute deposit (described later) into the copper-lead-zinc triangular diagram (Fig. II-3-16) indicate that the Pagar Gunung West and East deposits have a low copper content and they both contain mainly lead and zinc, belonging to the same skarn type lead and zinc deposit, accompanying limestone.

4-2-3 Barute Outcrop

The Barute outcrop is situated 60 m upstream of the A. Barute (a tributary of A. Pungkut) in the neighborhood of K. Simangambat, 1 km north of K. Patahajang (Fig. II-3-17). Because of gossan, the outcrop, 3 m high and

10 m long, has been oxidized to limonite, showing a brown color, but a green copper stain of malachite is recognized partially. In this outcrop there is a white part without limonite within a part of 1 m x 2 m, and in it sulphide minerals are scattered. Under microscopic observation of this ore (KR1), sphalerite and a small amount of pyrite and chalcopyrite are recognized. The chalcopyrite is contained in the sphalerite in the form of fine dots or lamella, in the same manner as the ores of the Pagar Gunung deposit. Most of the gangues are chlorite and some are quartz, epidote and calcite. Since much chlorite has been detected through X-ray analysis, the original rock seems to be andesite.

In the cutting of road between K. Patahajong and K. Simangambat along A. Pungkut, silicification and argillization with disseminating pyrite are distributed. Through an X-ray analysis of this alteration, clay minerals of chlorite (K1) and sericite (K4) are detected as well as pyrite. The analysis results of ores from the Barute outcrop are as follows.

	Au g/t	Ag g/t	Cu %	Pb %	Zn %	
KR1	0.1	2.1	0.21	0.02	3.65	
KR2	0.3	47.3	0.29	0.90	7.94	
KR3	0.1	6.2	3.60	1.54	2.06	(including malachite)

(Grab sampling, Refer to Fig. II-3-17).

Based on the analysis results and microscopic observation, it is concluded that the Barute deposit contains zinc ore.

4-2-4 Other Mineralizations

(1) Sambak pyrite dissemination zone

The muscovite granodiorite and tuffaceous sandstone that are distributed in the northern Pagar Gunung mineralized zone in the area from A. Sambak to A. Karlan has been silicified in an extensive region, accompanied by pyrite dissemination and an occasional pyrite-bearing quartz veinlet (Fig. II-3-6). There are several places (KR22, KR34, L136, etc.) where the muscovite granodiorite has undergone argillization such as white clay in the tributaries of the A. Sambak and A. Palelo. An X-ray analysis of these clay minerals detected quartz, sericite and some chlorite or montmorillonite.

(2) Simpang pining mineral indication

(a) A. Tambang Buluh

In the upstream area of A. Tambang Buluh, a tributary of A. Sabul, from K. Simpang Pining, the mudstone stratum has been silicified and accompanied by disseminated pyrite. Molybdenite was observed in a quartz veinlet of 1 cm width which was found in an andesite boulder.

(b) A. Bararan

Upstream of A. Bararan (parallel stream at the west of A. Tambang Buluh), a tributary of A. Sabul, mudstone and andesite are silicified in a broad range and pyrites are scattered in the region. Along the hornblende andesite dike striking N 30° W and existing in the branch river at 1,030 m elevation, there is a quartz vein (L54 and L55) of 10 cm width accompanying a small amount of chalcopyrite.

4-3 CONCLUSION OF MINERALIZATION

The Pagar Gunung West deposit associates with muddy limestone and it is a massive or disseminated silver-bearing lead-zinc deposit which has replaced the muddy limestone. The deposit contains galena, sphalerite, pyrite (Pyrrhotite) as well as chalcopyrite as ore minerals and skarn minerals such as clinopyroxene, calcite and siderite as gangue minerals. The massive deposit has the grades of vein width 0.10 to 1.80 m, Ag 100 to 150 g/t, Pb 10 to 15%, and Zn 10 to 17%, while the dissemination deposit has the grades of vein width 0.40 to 2.00 m, Ag 40 to 85 g/t, Pb 2.5 to 10% and Zn 2.5 to 9%. The deposit changes from thick to thin in width along its extension, but have a total strike length of about 200 m. The strike and dip of the deposit change, but roughly they are N 80° S and 30° to 60° S. The maximum gold content is ordinarily 0.3 g/t, but the outcrop of Adit No. 6 shows a higher gold content of 1 to 3 g/t.

The Pagar Gunung East deposit (Outcrop B), which is a silver-bearing lead-zinc deposit, is located along a tributary of the A. Palelo about 650 m east of the Pagar Gunung West deposit. In addition to the ore minerals of galena, sphalerite and chalcopyrite, this deposit contains such skarn minerals as clinopyroxene (Di_{55-58} Hd_{35-30} Jo_{10-12}), epidote and calcite, from which it is assumed that it is the same type deposit, namely copper-lead-zinc skarn deposit, and a deposit that is embedded in the same horizon, of Pagar Gunung

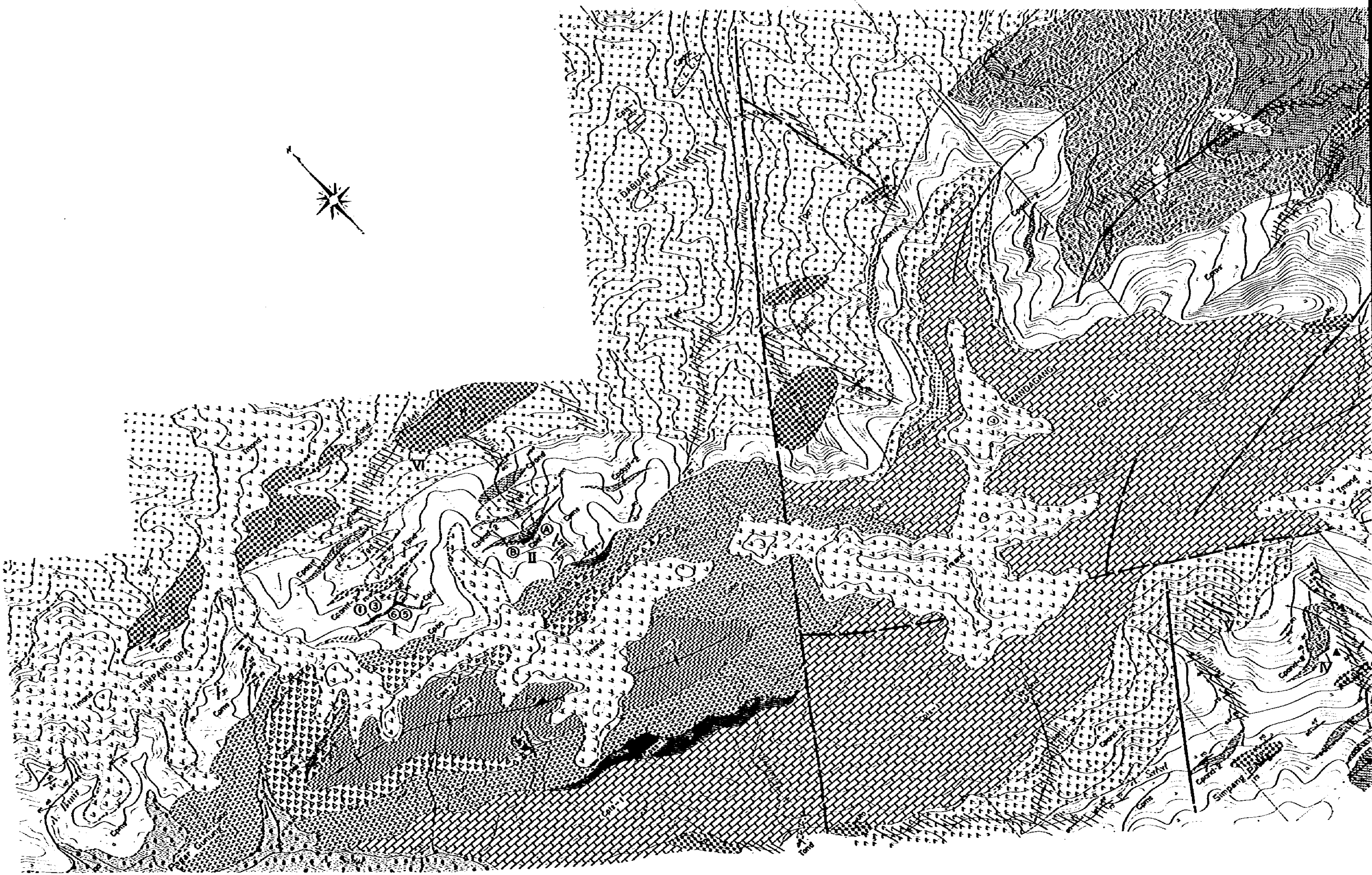
West deposit. However, since the area between the two deposits has poor exposure and the summit is covered by the Neogene volcanic rock, the continuity of the two deposits has not been clarified through this geological survey.

There is dissemination, banded and bedded pyrite deposit emplaced in dacitic tuffaceous sandstone in the foot wall of Pagar Gunung East lead and zinc deposit. Also, a pyrite dissemination exists extensively in the muscotive granodiorite (mylonite) that is distributed in the A. Sambok area in the north part.

In the Patahajang to Barute mineralized areas in the east part of the survey area, there is a Barute outcrop that is accompanied by sphalerite dissemination, malachite, and limonite and Patuhajang alteration zone that is accompanied by silicification and argillization.

Stocks and dikes of Jurassic tonalite and quartz diorite are distributed in the north margin of Pagar Gunung, Patahajang-Barute mineralization zone and along A. Sabul that through K. Simpan Pining, and silicification and pyrite dissemination are commonly associated in the rocks adjacent to these stocks and it seems that the stocks and dikes of tonalite and quartz diorite have brought the mineralization in the Area.

The Pagar Gunung deposit zone and Patahajang - Barute mineralization zones are emplaced in an alternated Member of clastic rock and Volcanic rock. In order to trace the silver-bearing lead-zinc skarn deposit, which is most promising for further exploration in the Area, between the Pagar Gunung deposit and Barute mineralization zone, tracing of the combination zone, consisting of tonalite and quartz diorite which seem to have brought the mineralization and alternative Member of Clastic rock and volcanic rock that emplace the deposit is effective.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MANDAGANG

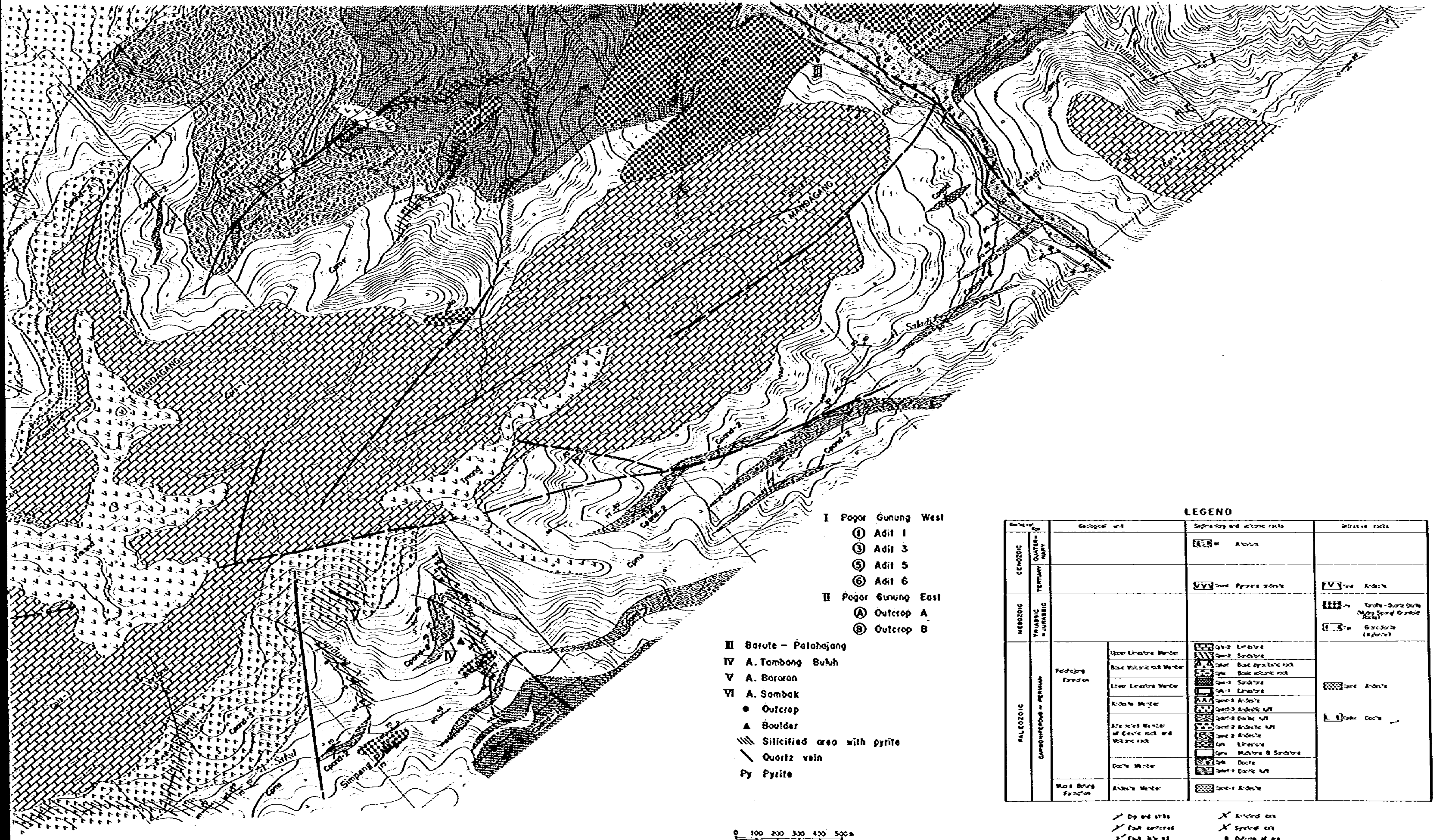


Fig. II-3-6 Map of Mineralizations in Muara Sipongi Area B

LEGEND

Geological Age		Geological unit		Sedimentary and volcanic rocks		Intrusive rocks	
CENOZOIC	QUATER-NARY			qa	Alluvium		
CENOZOIC	TERTIARY			Tmand	Pyroxene andesite	Tand	Andesite
MESOZOIC	TRIASSIC ~ JURASSIC					JTo	Tonalite ~ Quartz Diorite (Muara Siponai Granitoid Rocks)
						Tgo	Granodiorite (mylonite)
PALEOZOIC	CARBONIFEROUS ~ PERMIAN	Patahajang Formation	Upper Limestone Member	Cpls-2	Limestone		
				Cpss-2	Sandstone		
			Basic Volcanic rock Member	Cpbtf	Basic pyroclastic rock		
				Cpba	Basic volcanic rock		
			Lower Limestone Member	Cpss-1	Sandstone	Cpand	Andesite
				Cpls-1	Limestone		
			Andesite Member	Cpand-3	Andesite		
				Cpantf-3	Andesitic tuff		
			Alternated Member of Clastic rock and Volcanic rock	Cpdtf-2	Dacitic tuff	Cpdac	Dacite
				Cpantf-2	Andesitic tuff		
				Cpand-2	Andesite		
				Cpls	Limestone		
				Cpms	Mudstone & Sandstone		
			Dacite Member	Cpda	Dacite		
				Cpdtf-1	Dacitic tuff		
		Muara Batung Formation	Andesite Member	Cpand-1	Andesite		

Dip and strike	Anticlinal axis
Fault confirmed	Synclinal axis
Fault inferred	Outcrop of ore

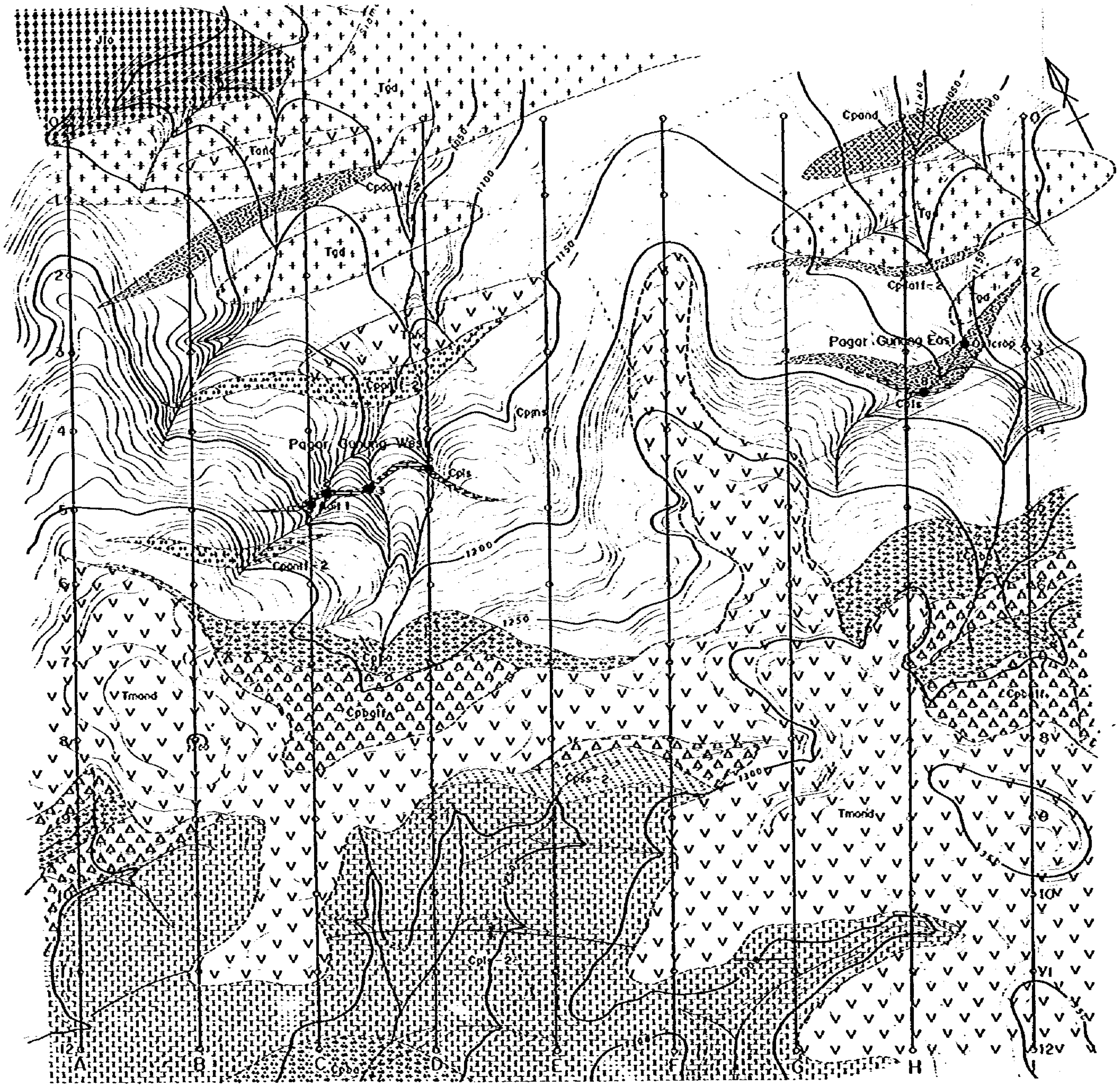
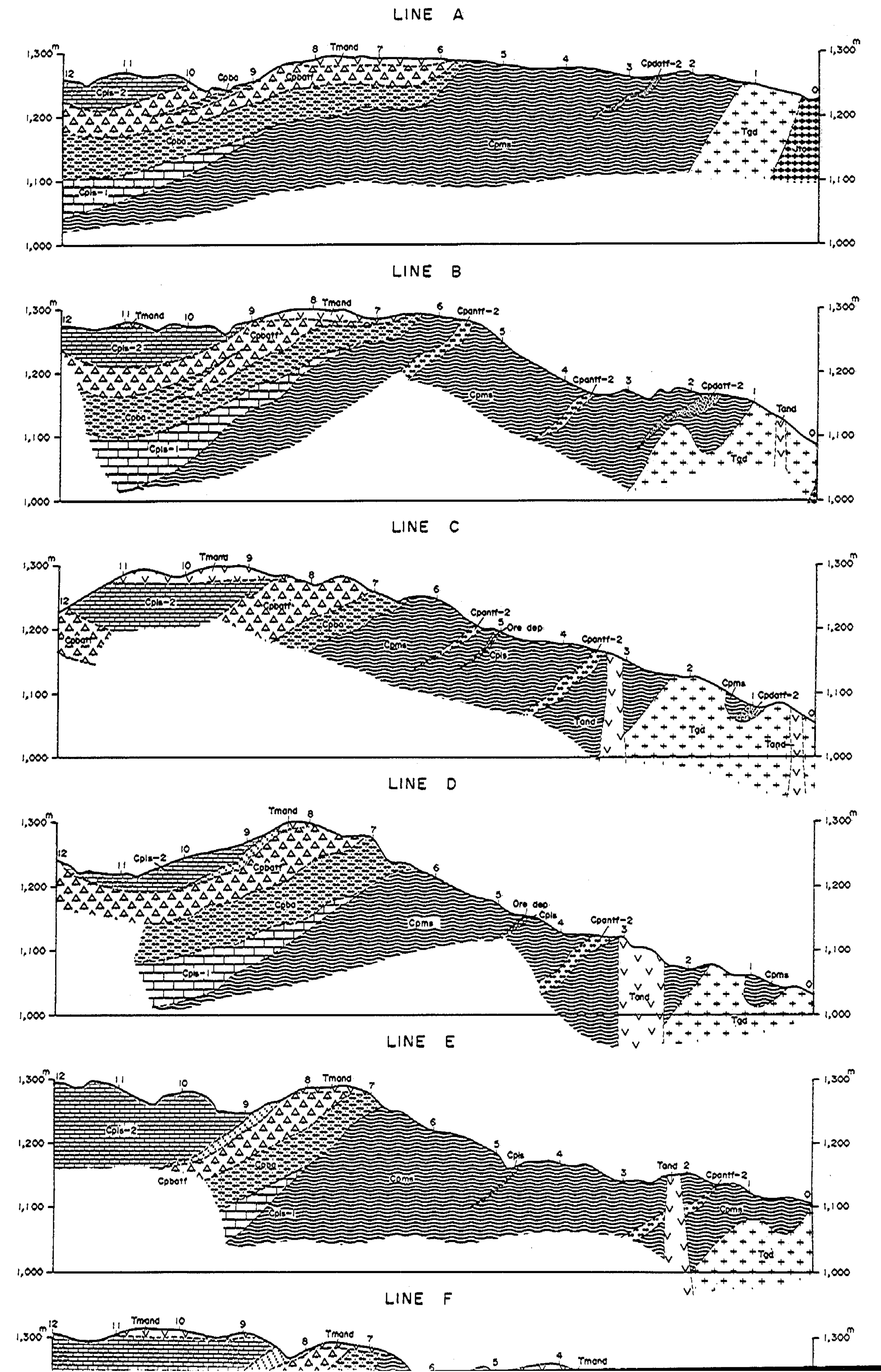


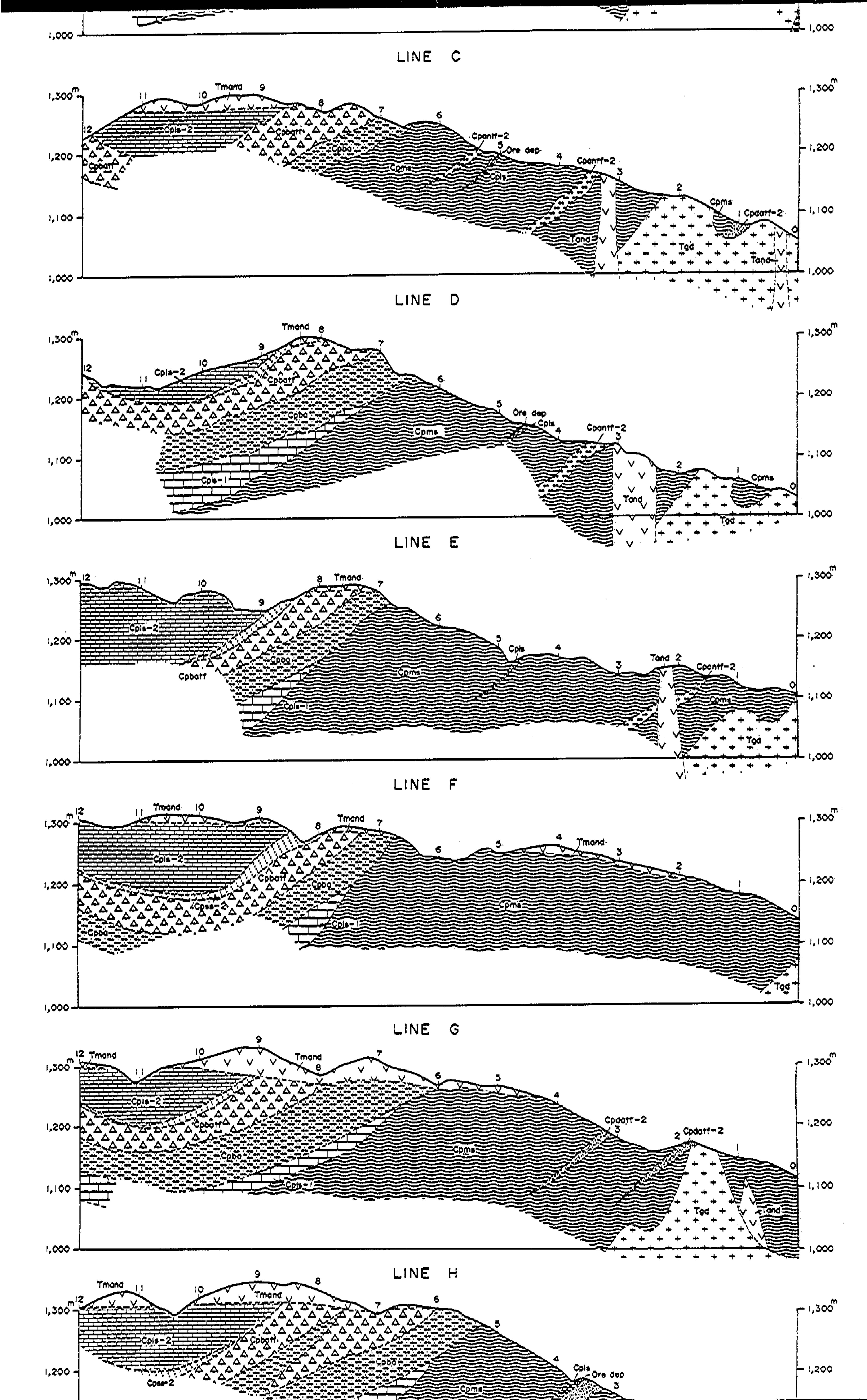
Fig. II-3-7 Geological Map of Pagar Gunung Ore Deposit Area, Muara Sipongi Area B

Scale 1:5,000

0 100 200 300 400m



LINE A
LINE B
LINE C
LINE D
LINE E
LINE F
1,300 m
1,200
1,100
1,000
Tmand
Tand
Tgd
Cpbatf
Cpba
Cpms
Cpls-2
Cpls-1
Cpdatf-2
Cpantf-2
Ore dep
Cpls


LINE C
LINE D
LINE E
LINE F
LINE G
LINE H
1,300 m
1,200
1,100
1,000
Tmand
Cpls-2
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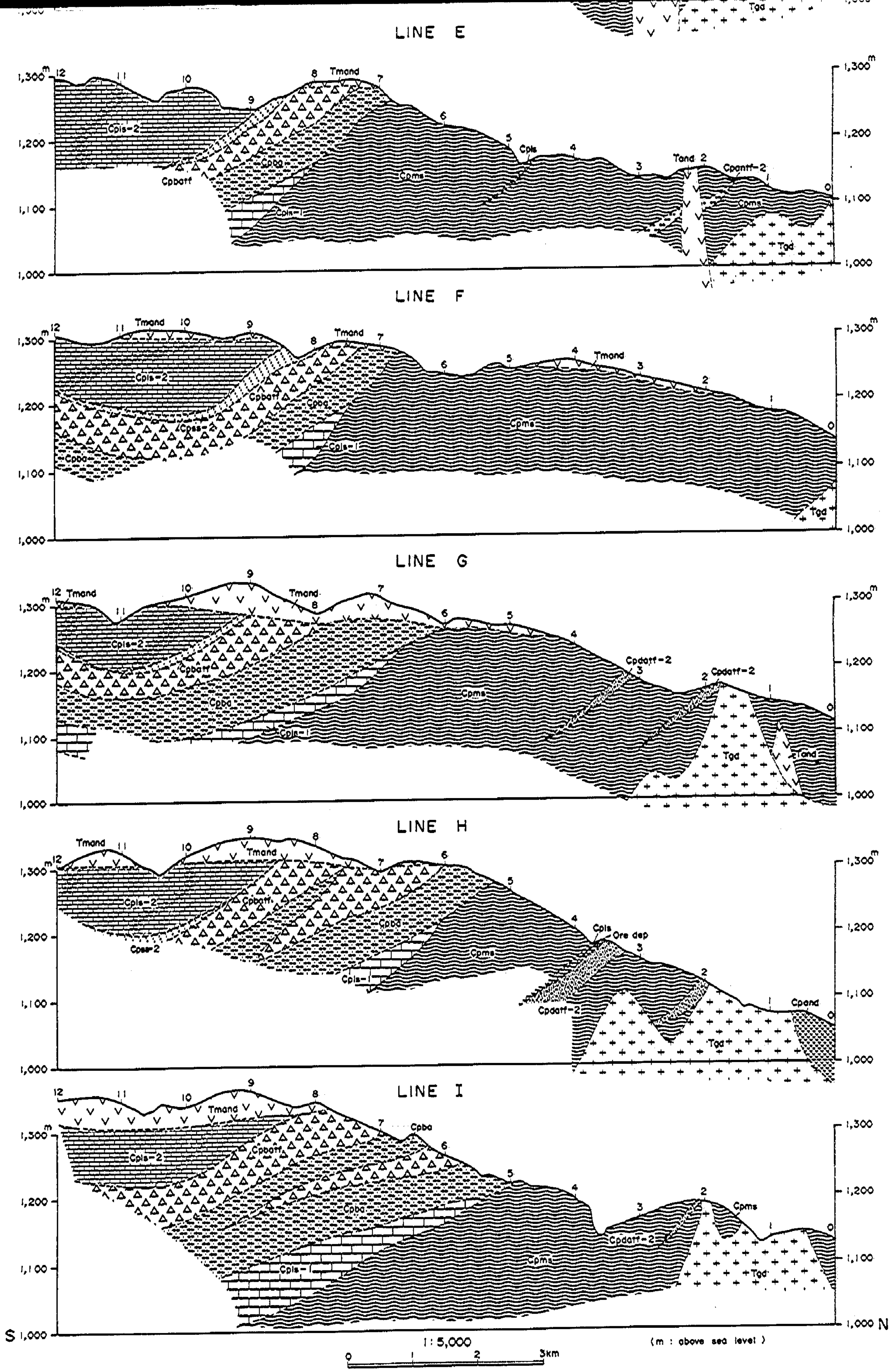


Fig. II-3-8 Geological Profile of Pagar Gunung Ore Deposit Area, Muara Sipongi Area B

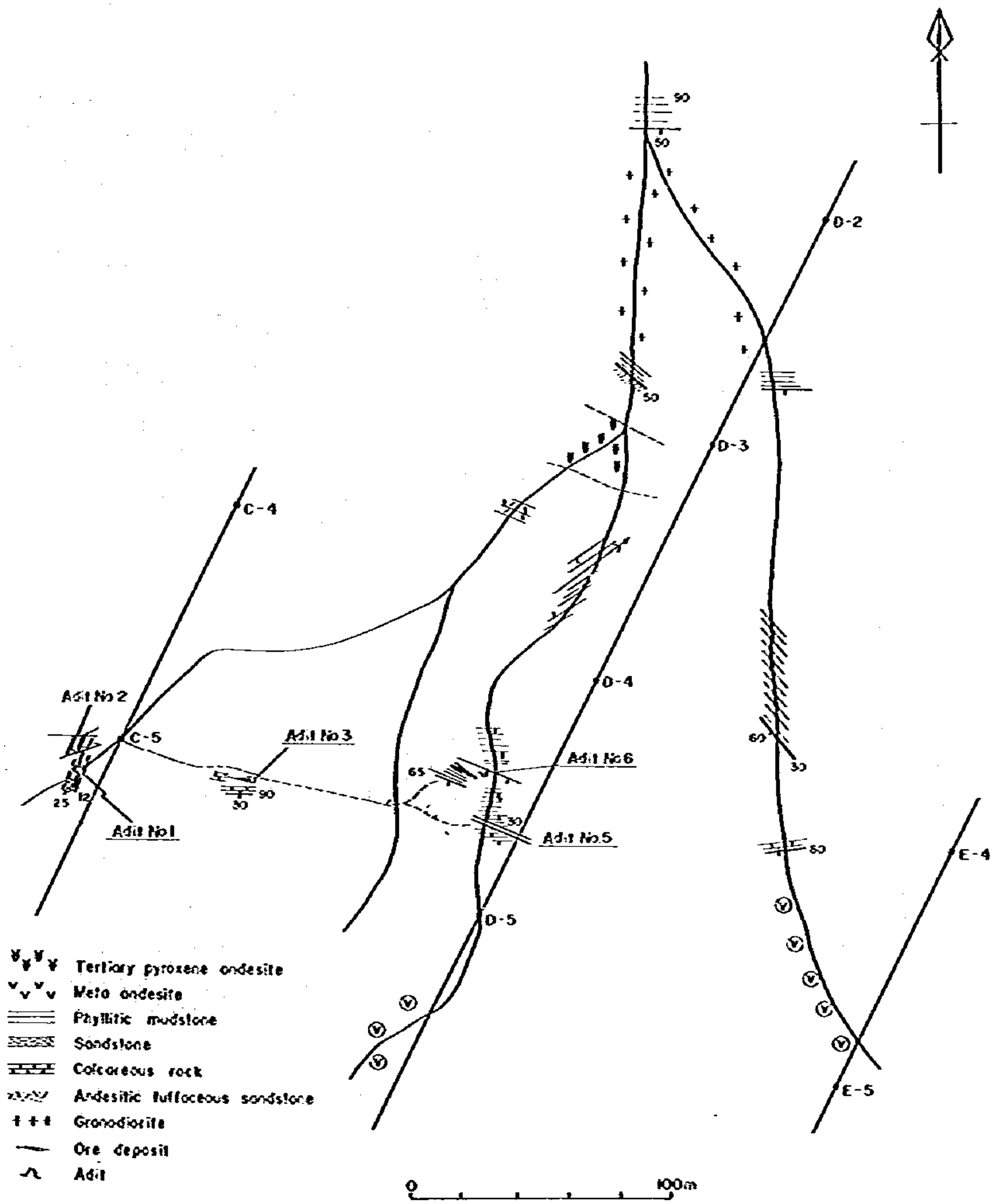
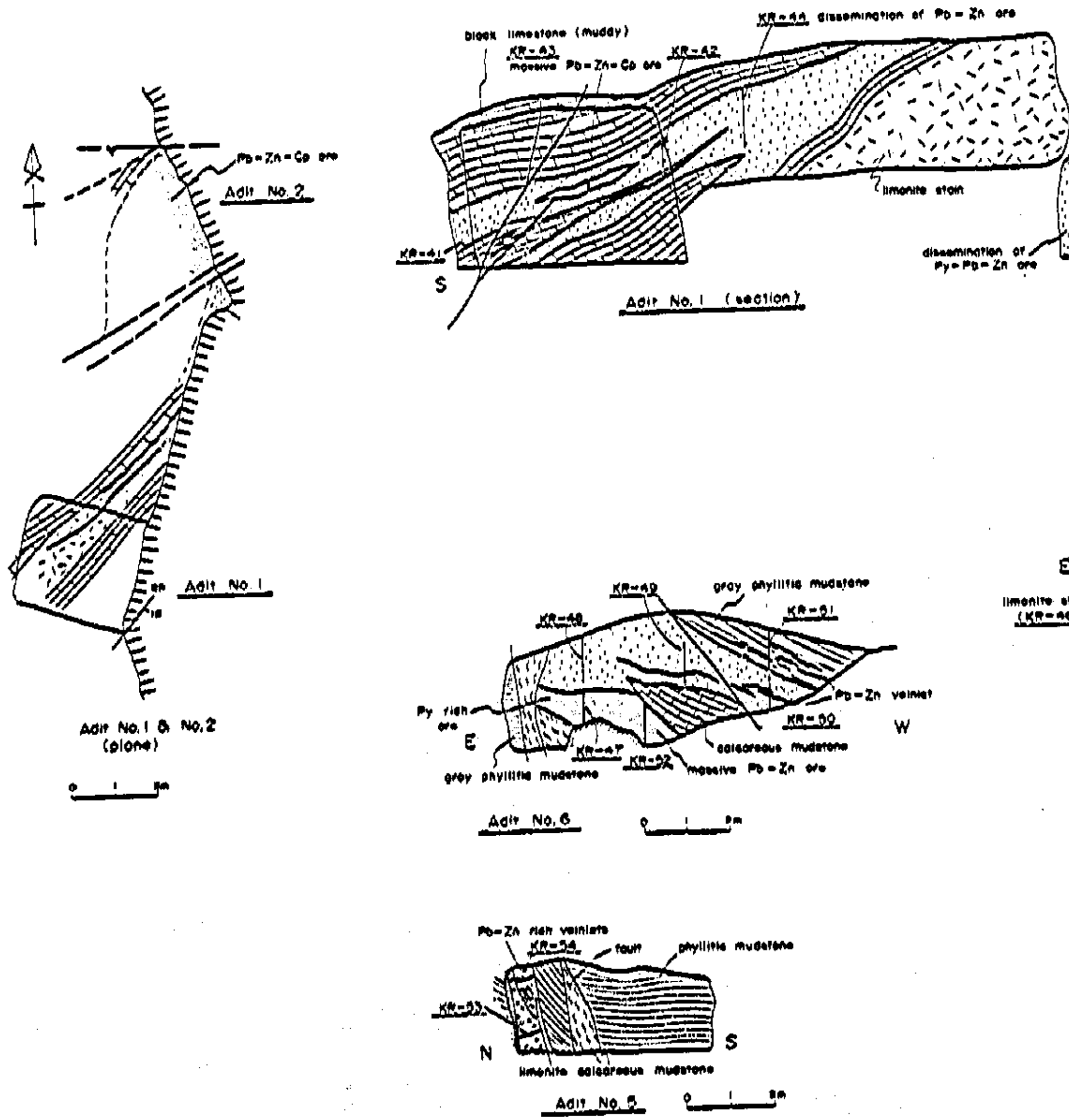
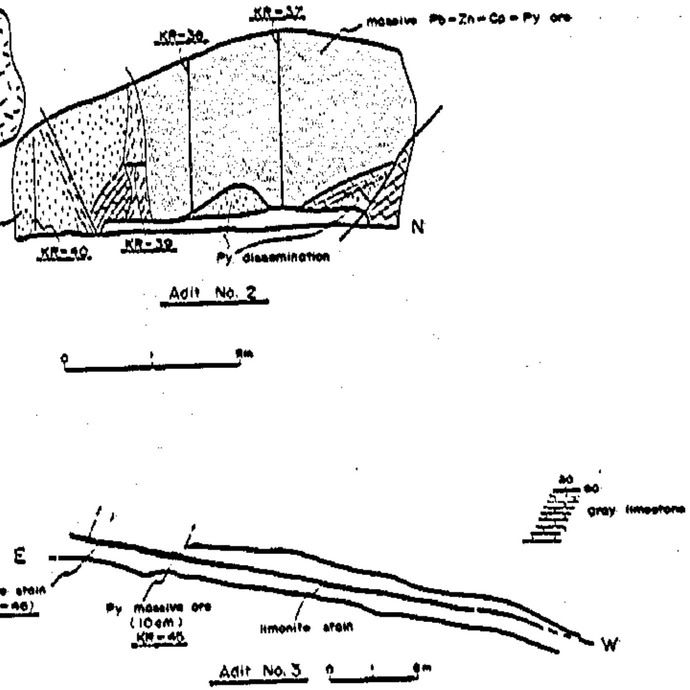


Fig. II-3-9 Route Map of Pagar Gunung West Ore Deposit Area, Muara Sipongi Area B





Adit	No.	Wd m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
No. 1	KR=41	0.20	0.3	6.9	0.02	0.41	0.90
	KR=42	0.90	0.3	40.9	0.25	2.74	2.82
	KR=43	0.20	0.4	147.4	0.69	15.30	17.60
	KR=44	1.40	0.1	36.3	0.12	2.68	3.60
No. 2	KR=37	2.00	0.3	130.7	0.67	16.00	14.10
	KR=38	1.00	0.3	116.6	0.65	12.80	15.30
	KR=39	0.50	0.4	130.3	0.10	11.30	1.63
	KR=40	1.20	0.3	61.7	0.40	4.48	6.94
No. 3	KR=45	0.10	0.3	93.2	0.07	6.42	0.65
	KR=46	0.10	<0.1	88.4	0.52	9.38	1.02
No. 5	KR=53	snp	0.3	512.1	1.07	7.41	24.60
	KR=54	0.40	0.3	89.1	0.14	7.76	6.14
No. 6	KR=51	1.00	0.1	24.7	0.14	1.42	1.18
	KR=48	1.00	3.7	117.9	0.18	8.58	6.94
	KR=49	1.10	0.9	97.4	0.13	6.83	6.74
	KR=50	0.90	0.2	63.8	0.08	6.24	6.40
	KR=47	0.80	7.5	113.1	0.17	7.79	7.95
	KR=52	1.00	0.1	166.0	0.16	11.90	11.60

Fig. II-3-10 Sketch of Ore Deposit, Pagar Gunung West Ore Deposit, Muara Sipongi Area B

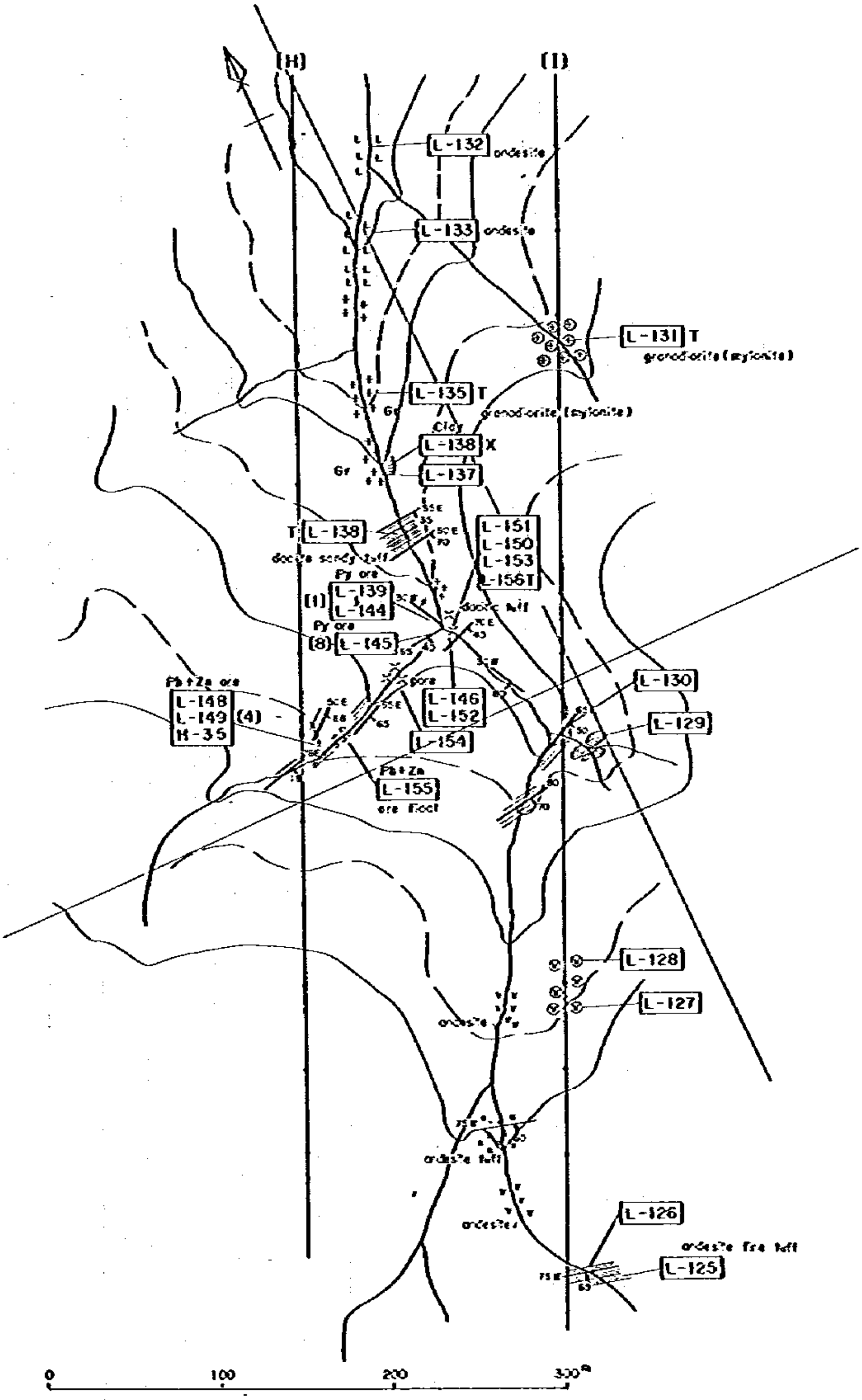
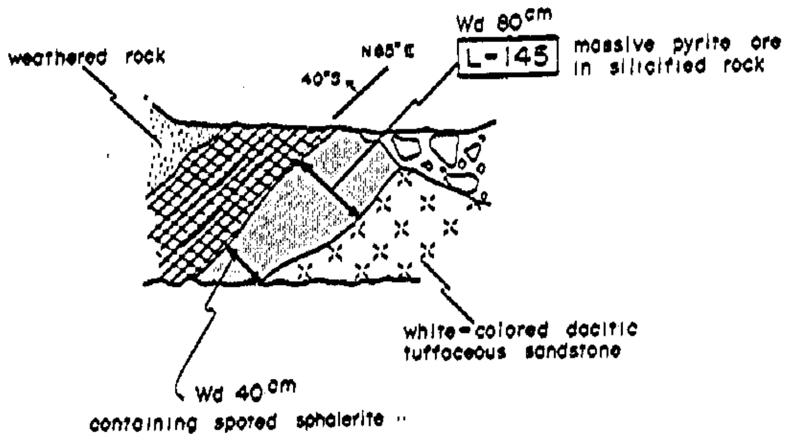
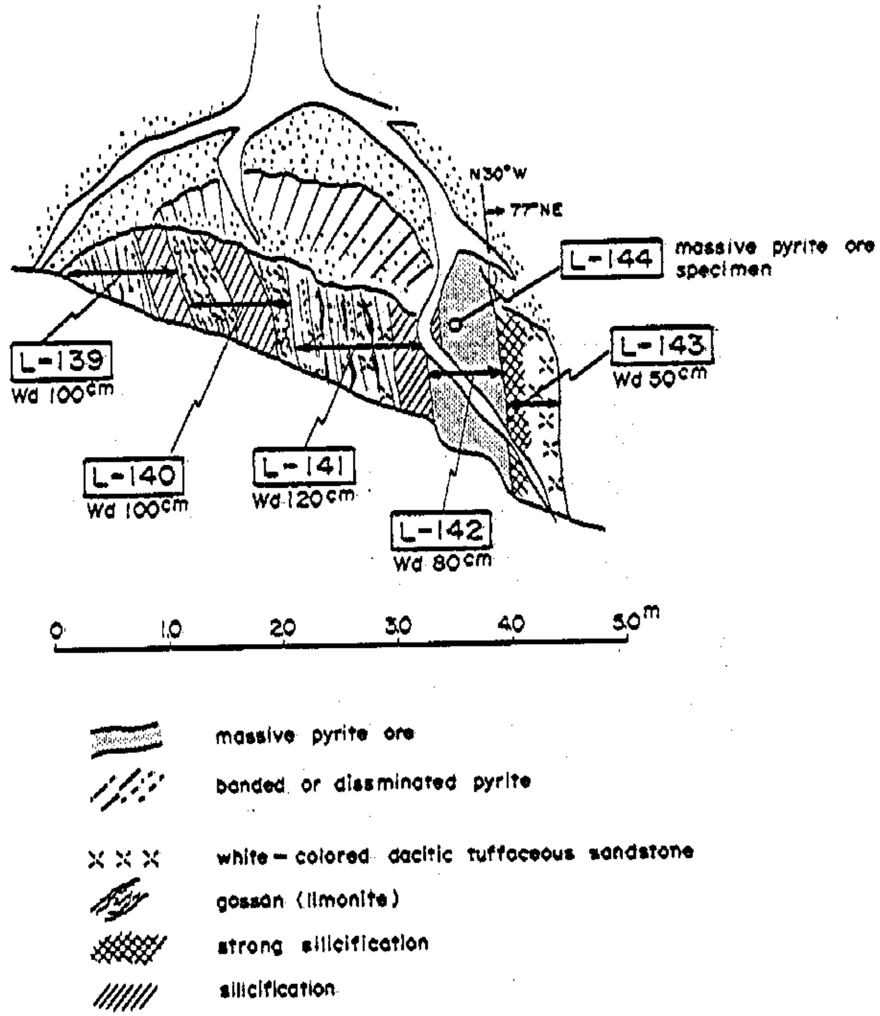


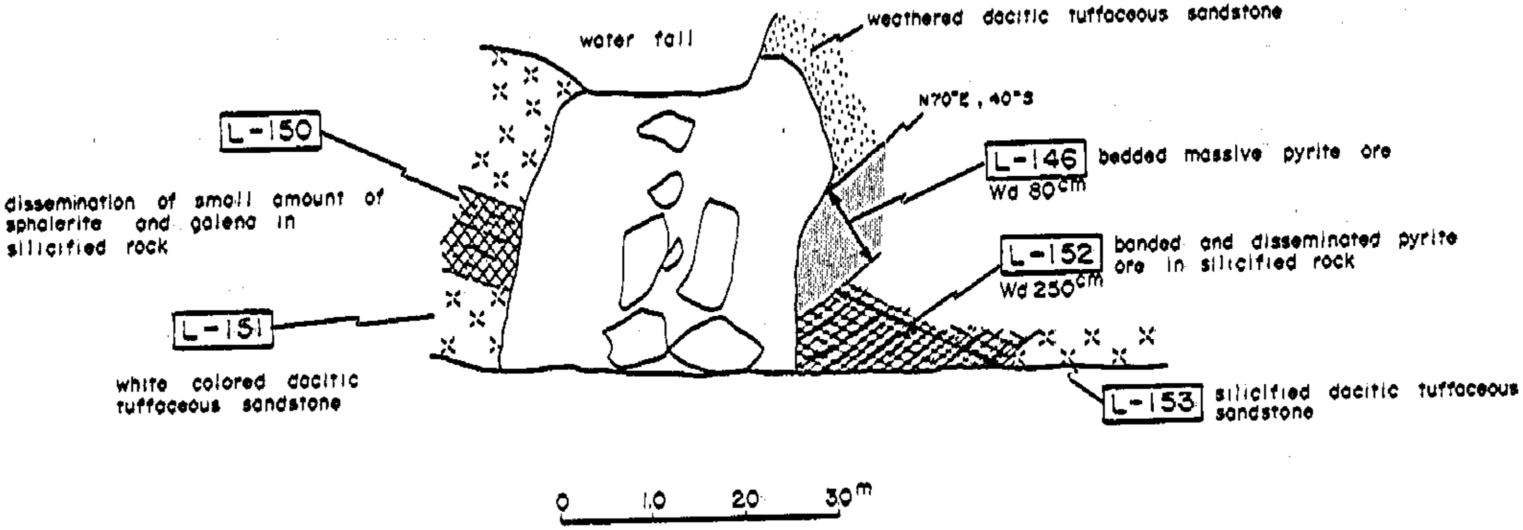
Fig. II-3-11 Route Map of Pagar Gunung East Ore Deposit Area, Muara Sipongi Area B





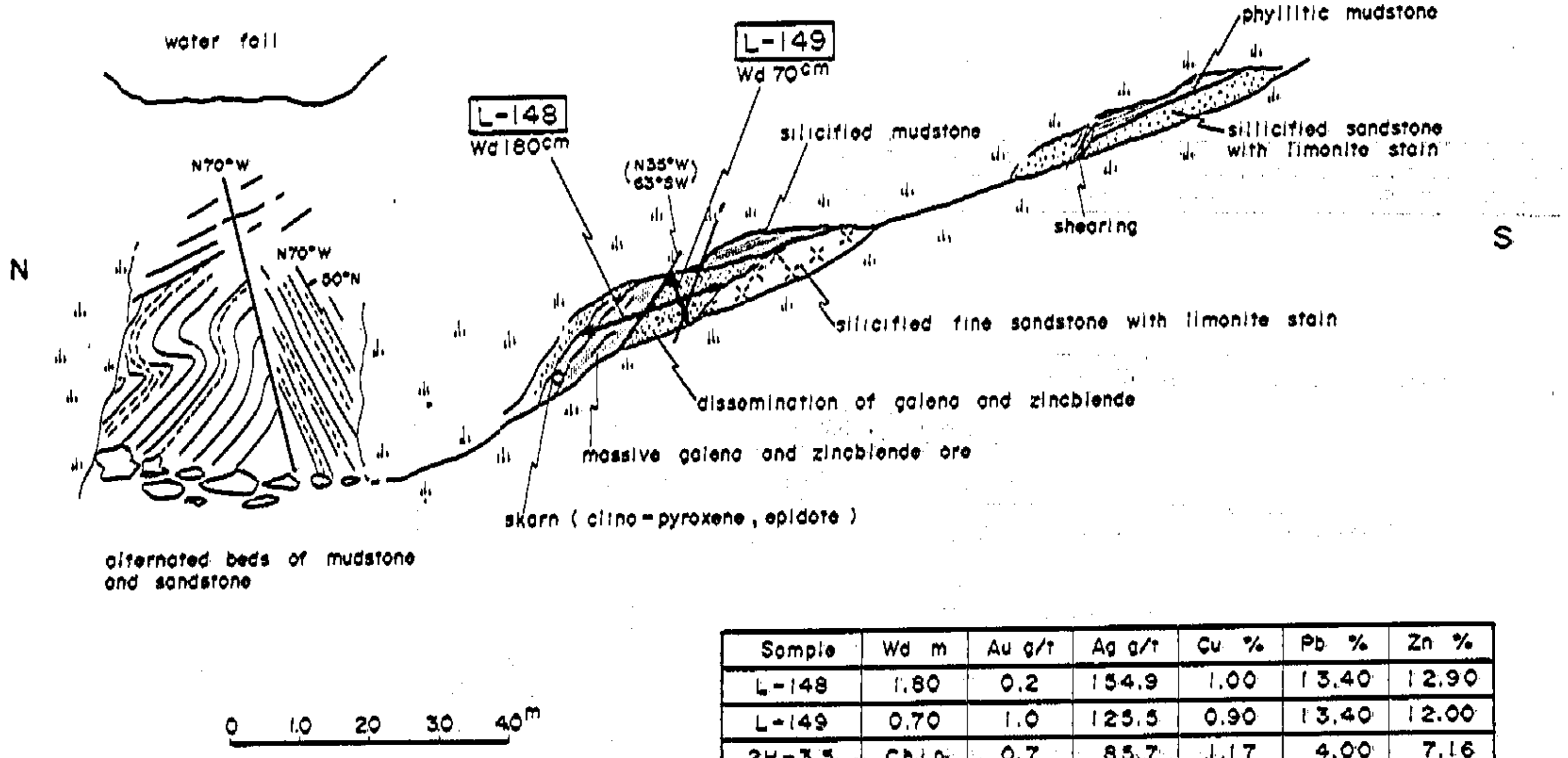
Sample	Wd m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
L-139	1.00	<0.1	11.0	0.29	0.02	0.01
L-140	1.00	0.2	13.7	0.18	0.02	0.02
L-141	1.20	<0.1	2.7	0.08	0.02	0.03
L-142	0.80	<0.1	7.5	0.23	<0.01	0.03
L-143	0.50	<0.1	3.4	0.07	<0.01	0.02
Ave.	4.50	<0.1	7.9	0.17	0.02	0.03
L-145	0.80	0.2	4.1	0.18	0.01	0.10

Fig. II-3-12 Sketch of Ore Deposit, Outcrop A of Pagar Gunung East Ore Deposit (1) Muara Sipongi Area B



Sample	Wd m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
L-146	0.80	<0.1	0.7	0.10	0.01	0.38

Fig. II-3-13 Sketch of Ore Deposit, Outcrop A of Pagar Gunung East Ore Deposit (2) Muara Sipongi Area B



Sample	Wd m	Au g/t	Ag g/t	Cu %	Pb %	Zn %
L-148	1.80	0.2	154.9	1.00	13.40	12.90
L-149	0.70	1.0	125.5	0.90	13.40	12.00
2H-3.5	Chip	0.7	85.7	1.17	4.00	7.16
2H-3.5a	Chip	0.2	52.8	0.29	6.90	8.52

Fig. II-3-14 Sketch of Ore Deposit, Outcrop B of Pagar Gunung East Ore Deposit (3) Muara Sipongi Area B

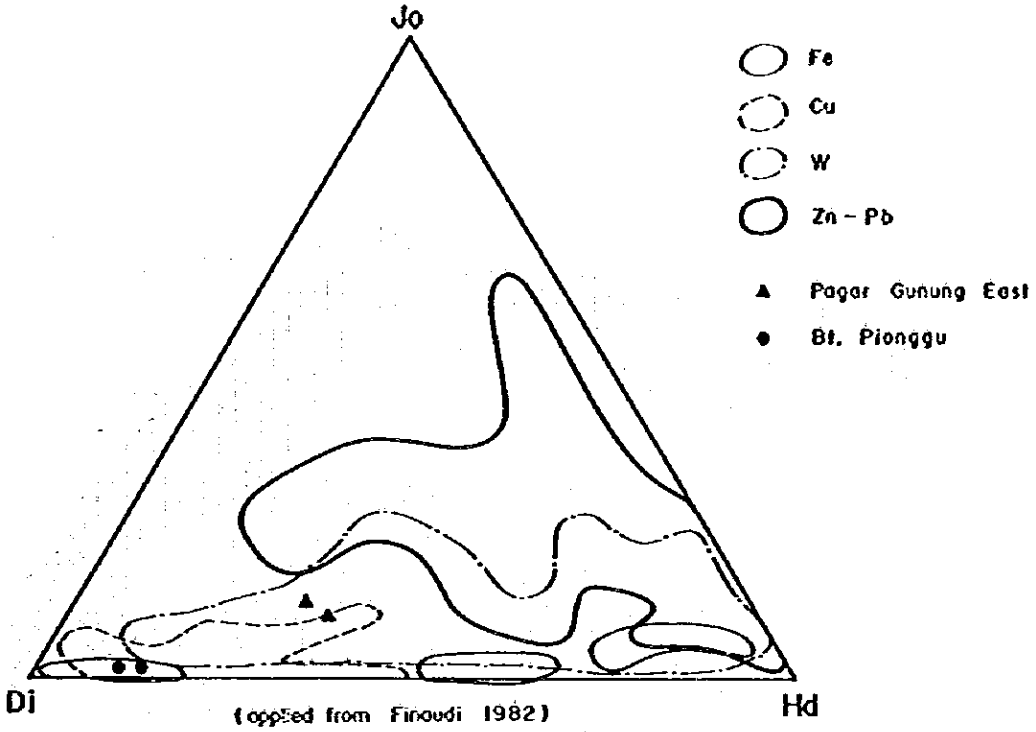


Fig. II-3-15 Jo-Di-Hd Diagram of Clinopyroxene of Skarn, Pagar Gunung East Ore Deposit, Muara Sipongi Area B

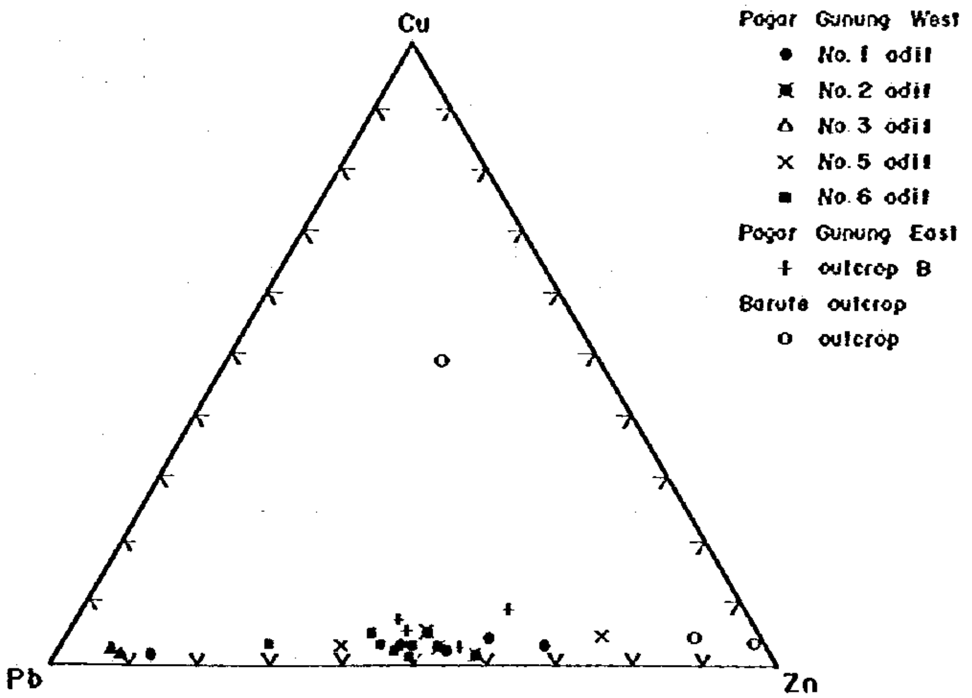
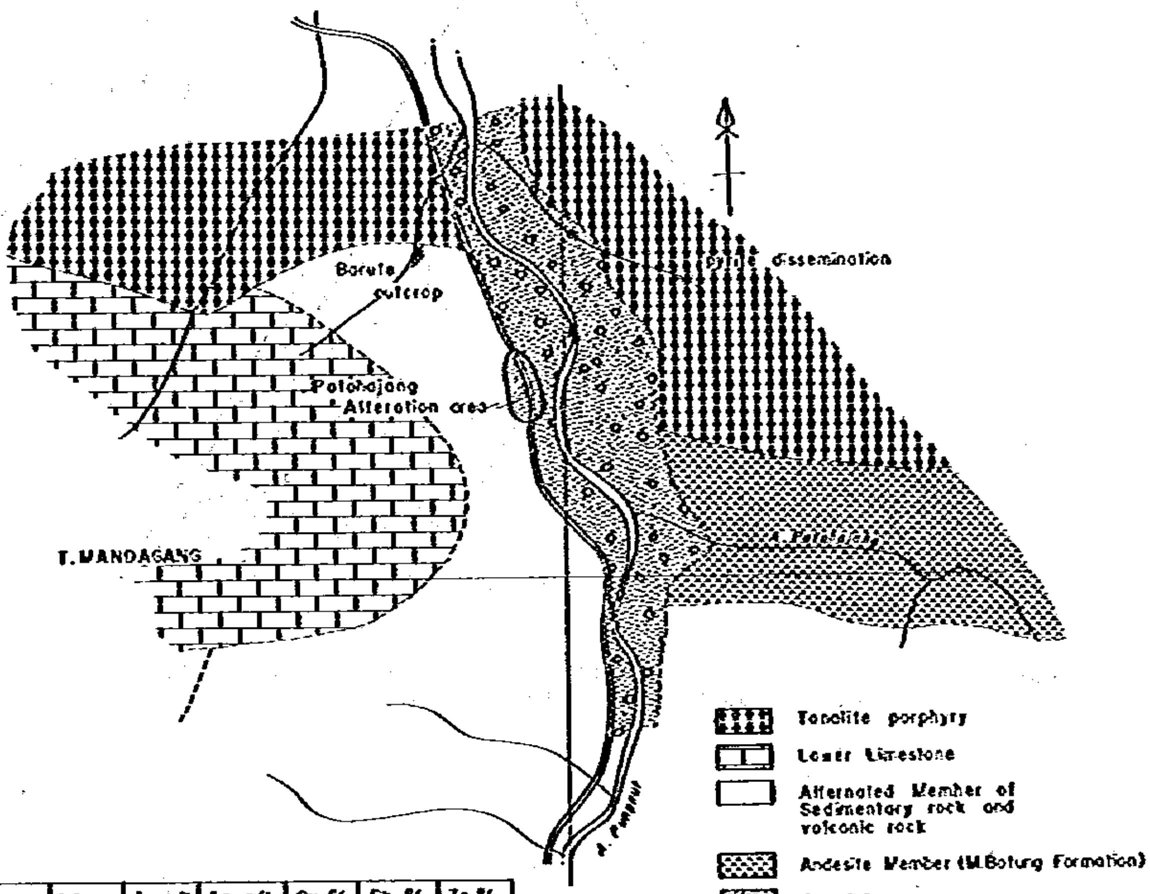


Fig. II-3-16 Cu-Pb-Zn Ratio Diagram of Pagar Gunung Ore Deposit and Barute Mineralization, Muara Sipongi Area B



No.	Wd cm	Au g/t	Ag g/t	Cu %	Pb %	Zn %
KR-1	10	<0.1	2.1	0.21	0.02	3.65
KR-2	10	0.3	47.3	0.29	0.90	7.94
KR-3	10	<0.1	6.2	3.60	1.54	2.04

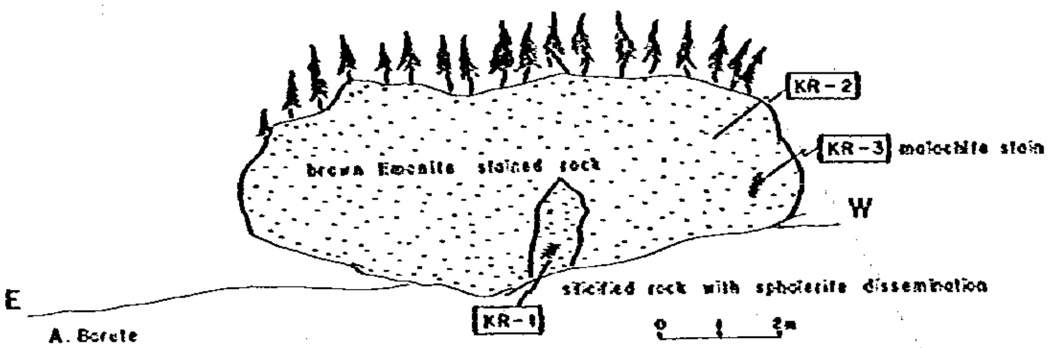


Fig. II-3-17 Sketch of Barute and Patabajang Mineralizations, Muara Sipongi Area B

Table II-3-2 Assay Result of Ore Samples, Muara Sipongi Area B

Ore Deposit		Sample No.	Location	Mode of Ore Deposit	Ore Mineral	Width (m)	Chemical Assay				
							Au g/t	Ag g/t	Cu %	Pb %	Zn %
Payar Gunung West		KR-41	up-stream of A. Sambak	disseminated ore	sph, ga, cp, py	0.20	0.3	6.9	0.02	0.41	0.90
Adit 1		KR-42	" "	disseminated ore	sph, ga, cp, py	0.90	0.3	45.9	0.25	2.74	17.60
		KR-43	" "	massive ore	sph, ga, cp, py	0.20	0.4	147.4	0.68	15.30	2.82
		KR-44	" "	disseminated ore	sph, ga, cp, py	1.40	0.1	36.3	0.12	2.68	3.65
Adit 2		KR-37	up-stream of A. Sambak	massive ore	sph, ga, cp, py	2.00	0.3	135.7	0.57	15.00	14.10
		KR-38	" "	massive ore	sph, ga, cp, py	1.60	0.3	116.6	0.65	12.80	15.30
		KR-39	" "	disseminated ore	sph, ga, cp, py	0.50	0.4	130.3	0.10	11.30	1.63
		KR-40	" "	disseminated ore	sph, ga, cp, py	1.20	0.3	61.7	0.40	4.48	6.94
Adit 3		KR-45	up-stream of A. Sambak	massive ore	sph, ga, cp, py	0.10	0.3	93.2	0.07	6.42	0.65
		KR-46	" "	massive ore	sph, ga, cp, py	0.10	<0.1	88.4	0.52	9.38	1.02
Adit 5		KR-53	" "	veins	sph, ga, cp, py	chip	0.3	512.1	1.07	7.41	24.60
		KR-54	" "	veins	sph, ga, cp, py	0.40	0.3	89.1	0.14	7.76	5.14
Adit 6	upper zone	KR-51	" "	veins in dissemination	sph, ga, cp, py	1.00	0.1	24.7	0.14	1.42	1.18
	middle zone	KR-48	" "	disseminated ore	sph, ga, cp, py	1.00	3.7	117.9	0.18	8.58	6.94
		KR-49	" "	disseminated ore	sph, ga, cp, py	1.10	0.5	97.4	0.13	5.83	5.74
		KR-50	" "	disseminated ore	sph, ga, cp, py	0.90	0.2	63.8	0.08	6.24	5.40
					(Average)	1.00	1.5	94.2	0.13	6.87	6.03
	lower zone	KR-47	" "	massive ore	sph, ga, cp, ph	0.80	7.5	113.1	0.17	7.79	7.95
		KR-52	" "	massive ore	sph, ga, cp, py, pyr	1.00	0.1	168.0	0.16	11.90	11.50
					(Average)	0.90	3.4	143.6	0.16	10.07	9.92
					(Average)	2.90	1.6	85.6	0.14	5.97	5.56

Table II-3-2 Assay Result of Ore Samples, Muara Sipongi Area B (cont'd)

Ore Deposit	Sample No.	Location	Mode of Ore Deposit	Ore Mineral	Width (m)	Chemical Assay				
						Au g/t	Ag g/t	Cu %	Pb %	Zn %
Pager Gunung East										
Outcrop A	L-139	A. Palelo	disseminated and banded ore	py	1.00	<0.1	11.0	0.29	0.02	0.04
	L-140	"	banded massive	py	1.00	<0.2	13.7	0.18	0.02	0.02
	L-141	"	disseminated and banded ore	py	1.20	<0.1	2.7	0.08	0.02	0.03
	L-142	"	massive ore	py	0.80	<0.1	7.5	0.23	<0.01	0.03
	L-143	"	disseminated ore	py	0.50	<0.1	3.4	0.07	<0.01	0.02
				(Average)	4.50	<0.1	7.9	0.17	0.02	0.03
	L-145	"	massive ore	py	0.80	<0.2	4.1	0.18	0.01	0.10
	L-146	"	"	py	0.80	<0.1	0.7	0.10	0.01	0.38
Outcrop B	L-148	Tributary of A. Palelo	massive skarn	py, sph, ga, cp	1.80	0.2	154.9	1.00	13.40	12.90
	L-149	" "	"	py, sph, ga, cp	0.70	1.0	125.5	0.90	13.40	12.00
				(Average)	(1.25)	0.4	146.7	0.97	13.40	12.65
	ZH-3.5	" "	"	pyr, py, sph, ga, cp	chip	0.7	85.7	1.17	4.00	7.16
	ZH-3.5a	" "	"	py, sph, ga, py	"	0.2	52.8	0.29	6.90	8.52
				(Average)		0.5	69.3	0.73	5.45	7.84
Barute	KR-1	A. Barute	dissemination	py, sph, ga	chip	<0.1	2.1	0.21	0.02	3.65
	KR-2	"	"	py, sph, ga	"	0.3	47.3	0.29	0.90	7.94
	KR-3	"	"	py, sph, mal	"	<0.1	6.2	3.60	1.54	2.04
A. Tambang Buluh	L-42	A. Tambang Buluh	quartz vein	py, (cp)	0.01	<0.1	4.1	0.01	0.16	0.14
A. Bararan	L-54	A. Bararan	"	"	0.10	<0.1	1.4	<0.01	0.06	0.05
"	L-55	"	"	"	0.10	<0.1	0.7	<0.01	0.04	0.03

Abbreviation

mal: malachite
azu: azurite
py : pyrite
gal: galena
cp : chalcopyrite
cov: covelline
sph: sphalerite
pyr: pyrrhotite

	cpx 1 oxide	cpx 1 formura	cpx 2 oxide	cpx 2 formura
SiO2	51.53	1.985	51.25	1.984
Al2O3	0.11	0.005	0.24	0.011
TiO2	0.15	0.004	0.00	0.000
FeO	10.90	0.352	9.72	0.315
MnO	2.95	0.096	3.62	0.119
MgO	9.80	0.562	10.40	0.600
CaO	24.26	0.999	23.52	0.976
Na2O	0.15	0.011	0.15	0.011
Total	99.85	4.014	98.90	4.016

(cpx : clinopyroxene)

carbonate	
FeO	45.6
CaO	2.9
MnO	11.7
TiO2	0.2
MgO	0.5
Total	60.9

	sphalerite 1 elmt	sphalerite 1 atom	sphalerite 2 elmt	sphalerite 2 atom
ZN	51.9	38.26	51.5	37.61
S	32.5	48.82	32.9	49.07
MN	1.5	1.31	1.3	1.17
Fe	13.4	11.61	13.8	11.8
Cu	0.0	0.00	0.5	0.35
Total	99.3		100.0	

	epidote 1 oxide	epidote 1 formura	epidote 2 oxide	epidote 2 formura
SiO2	38.04	6.035	38.04	6.033
Al2O3	23.82	4.455	23.99	4.486
Fe2O3	11.19	1.336	11.63	1.388
TiO2	0.15	0.018	0.07	0.008
MnO	0.78	0.105	0.62	0.084
CaO	23.67	4.024	23.55	4.002
Total	97.65	15.972	97.90	16.000

Sample No. ZH 3.5

Table II-3-3 Chemical Composition of Skarn Mineral from Pagar Gunung East Ore Deposit Outcrop B, Muara Sipongi Area B

Table II-3-4 Microscopic Observation of Ore Mineral from Pagar Gunung Ore Deposit, Barute Ore Deposit, Muara Sipongi Area B

Ore Deposit	Sample No.	Location	Ore mineral								Gangue Mineral										
			pyr	py	sph	ga	cp	cov	mal	he	q	chl	cal	ep	cpx	hor	se	Kao	Pl	gar	act
Pagar Gunung West																					
Adit No. 1	KR-43	up-stream of A. Sausbak		○	◎	○	○	o			◎		o					o			[illegible]
Adit No. 2	KR-37	" "		◎	◎	○	○	o			o		o								
	KR-38	" "		◎	○	o	o				○	o	○								
Adit No. 6	KR-52	" "	◎	o	◎	○	o				o		o								
Pagar Gunung East																					
Outcrop A	L-139	A. Palelo		◎		o	o				◎	o	o*								
	L-140	"		◎	o		o	o			o	○									
	L-142	"		◎	o		○					○	o								
	L-145	"		○							◎	○	○							o	
	L-146	"		○							◎	○		○							
	Lr-15	"		o	○	o	o				○		o	○							
Outcrop B	ZH-3.5a	"	◎	o	◎	○	o														
	ZH-3.5b	"		o	◎	○	o				○				○	○	o				
	L-155a	"		◎	○	o	o							◎							o
	L-155b	"		◎	○	o	o					○	◎	○							
Barute	KR-1	A. Baqute		o	○		o				o	◎	o	o							
	(X-11)	Patahajang		◎	o		o			o?	o			o		○			◎		
Simpang Pining	L-42	S. Pining		○							o	o		○		◎					

Abbreviation

pyr: Pyrrhotite
py : Pyrite
sph: Sphalerite
ga : Galena
cp : Chalcopyrite
cov: Coveline
mal: Malachite
he : Hematite

q : Quartz
chl: Chlorite
cal: Calcite
ep : Epidote
cpx: Clinopyroxene
hor: Hornblende
se : Sericite
Kao: Kaoline

pl : Plagioclase
gar: Garnet
act: Actinolite

◎: Abundant ○: Common o: Rare

Table II-3-6 List and Chart of X-ray Diffractive Analysis, Muara Sipongi Area B

Sample No.	Sample Name	Location	m	mix	se	ch	k	la	ca	px	ho	si	po	ga	mal	sph	py	q	kf	pl	Remarks
KR-1	Silicified rock	A. Barute				◎										o	o?	o			
KR-4	Silicified rock	A. Barute			○*												o	◎			* 2M, type
KR-22	White clay	up-stream of A. Sambak			o	o?												◎		○	
KR-34	White clay	" "	○		o	o?												◎			
KR-41	Gangue mineral	Pagar Gunung West										○		○			o	◎			
K-1	Silicified rock	North pacahajang				◎*											o	o			* Mg rich ch
K-4	Silicified rock	" "			o		o										o	◎			
K-12	Argilized qz dio	A. Pacahajang			o	o												◎		○	
L-52	Clay	A. Tambang Buluh	o		o		o?		◎									○			
L-53	Silicified rock	A. Tambang Buluh	o		o	o?											o	◎		○	
L-58	Clay	A. Tambang Buluh	o		o		o?											◎	○	o	
L-105	Clay	North Pagar Gunung			o		o											◎		o	
L-107	Clay	North Pagar Gunung			○*		○										o	◎			* 2M, type
L-136	Clay in granodiorite	A. Palelo			○*													◎			* 2M, type
L-156	Silicified dacitic tuff	A. Palelo				○										o	o	○			
Lr-20	Clay	A. Palelo			○	o												◎		o	
M-23	Silicified dacite tuff	A. Nabobar			○*												o	◎			* 2M, type
ZH-3.5	Green skarn	Pagar Gunung East			o			o?		○*	○										* Di Hd Jo
ZH-3.5	Ore	A. Palelo											○*	◎		○	o				* monoclinic

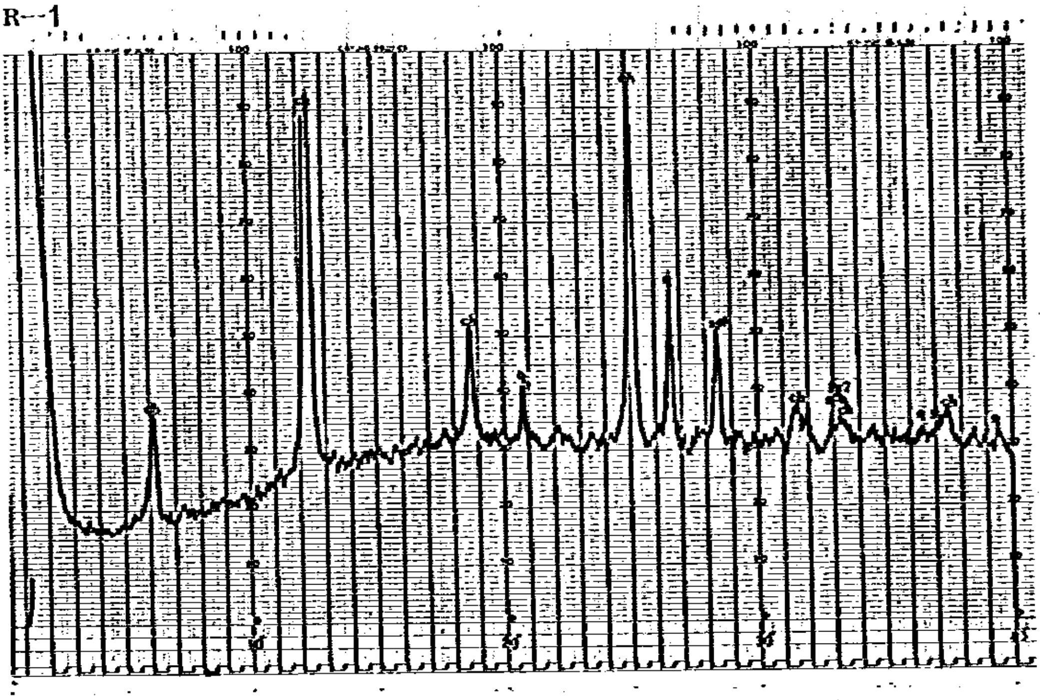
Abbreviation

m : Montmorillonite
mix: Mixed-layer mineral
se : Sericite
ch : Chlorite
k : Kaoline mineral
la : Laumontite
ca : Calcite
po : Pyrrhotite
ga : Galena

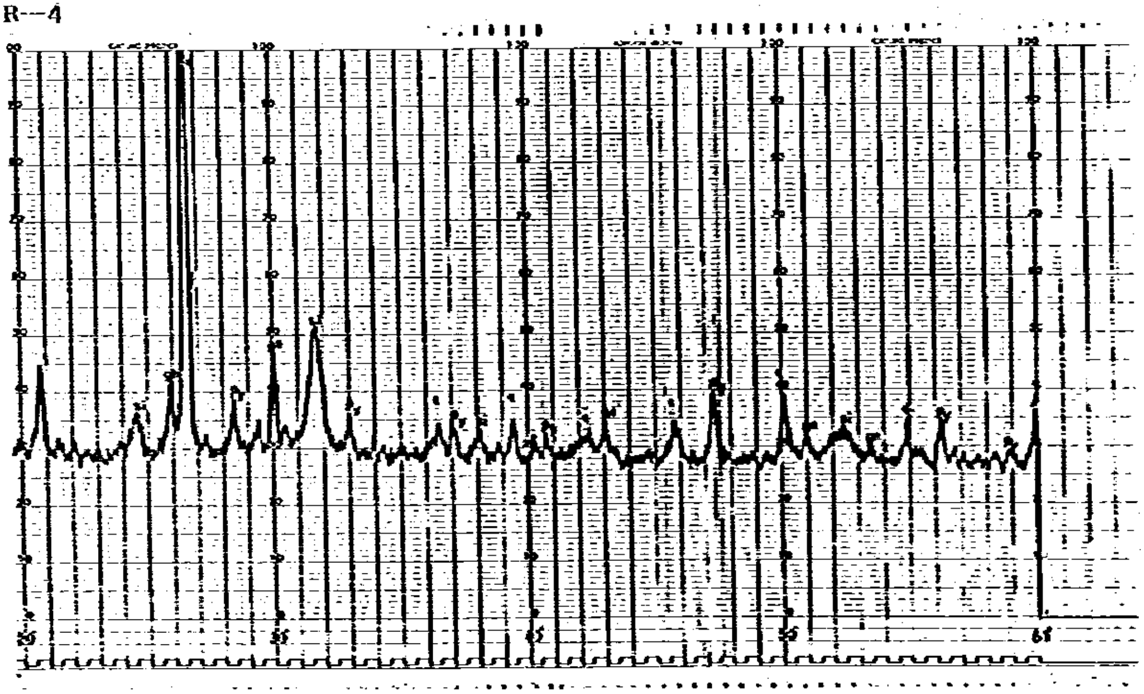
si : Siderite
px : Pyroxene
ho : Hornblende
mal: Malachite
sp : Sphalerite
py : Pyrite
q : Quartz
kf : Potash feldspar
pl : Plagioclase

◎ : Abundant ○ : Common o : Rare

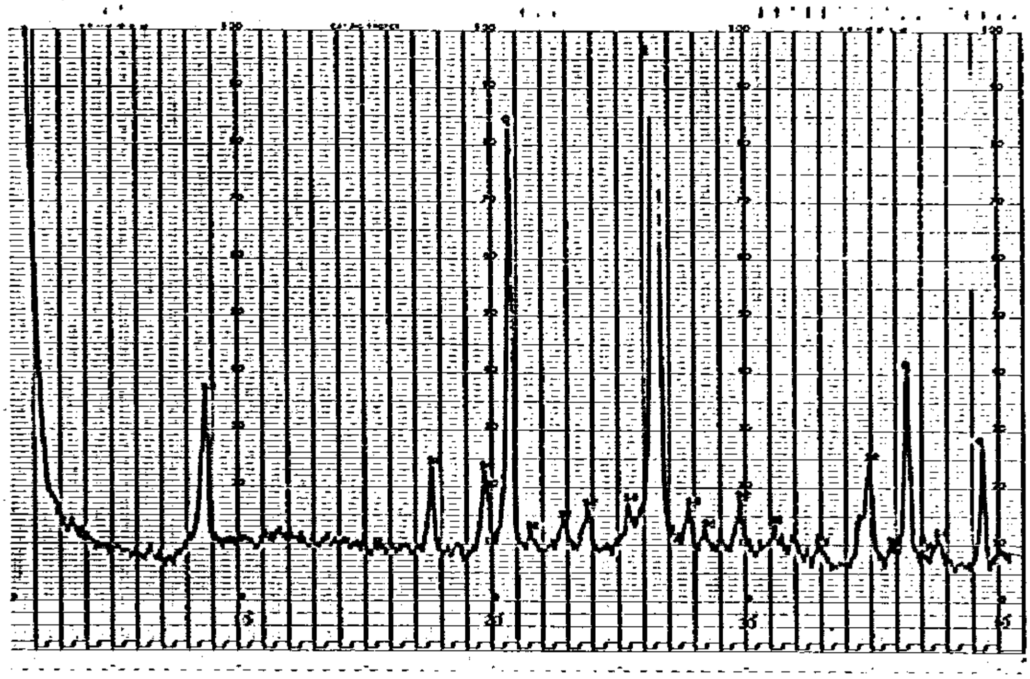
KR--1



KR--4



KR--4



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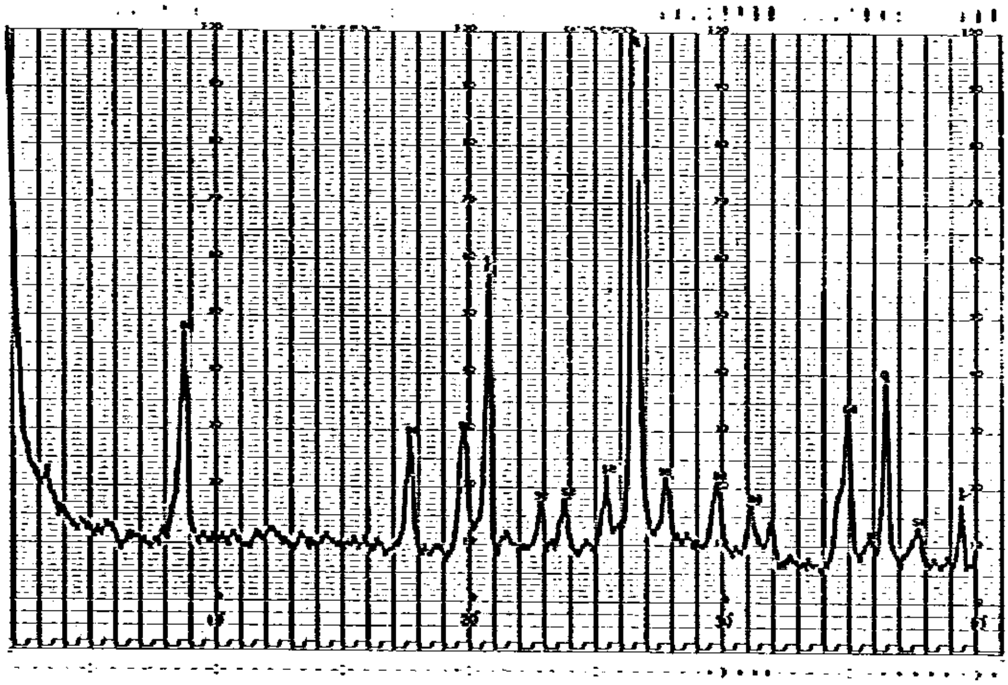
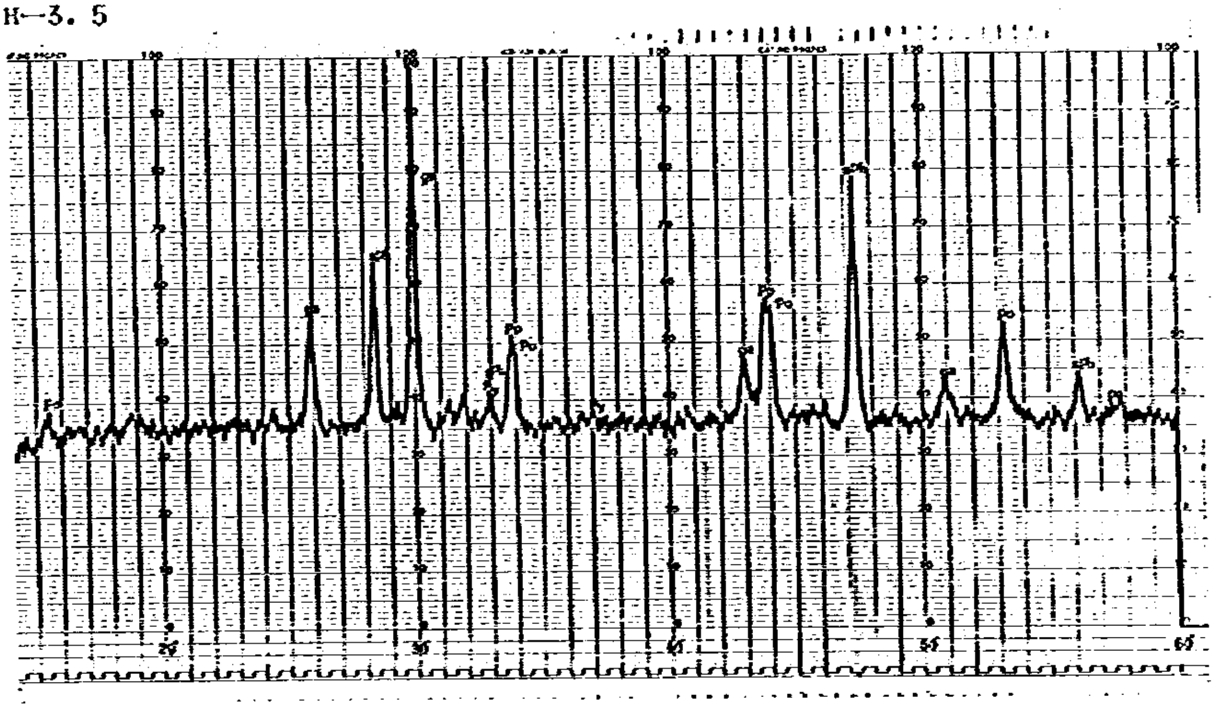


ZH—3. 5



ZH—3. 5

CHAPTER 5 GEOCHEMICAL SURVEY

5-1 SAMPLING

A geochemical survey of the soil was conducted along with the geological survey. 229 soil samples were collected at intervals of 50 m along the geophysical survey lines (9 sampling lines spaced 150 m apart, each line 1.2 km, the total sampling line 10.8 km) in the N 25° E direction in the Pagar Gunung mineralization region. Also, outside the area of the geophysical survey, sampling positions were set at a rate of 7 samples per km^2 so as to uniformly distribute the position and 198 samples were collected. These make the total number of samples 426.

Efforts were made to avoid taking samples at places which would have been influenced by valleys and rivers and thus the samples were collected on mountain slopes and tops. Also, precautions were taken so as not to contaminate the samples on sampling along the geophysical survey lines with the cupric sulfate solution used for the geophysical survey's electrodes. The soil samples were taken from B-horizon. All collected samples were naturally dried under the sun in the Kotanopan base camp, and each sample was divided into two and kept by the Japanese and Indonesian sides. Since the deposits that are distributed in the survey area are gold and silver-bearing copper-land-zinc ore deposits, the analysis was made using gold, silver, copper, lead and zinc as path-finder elements in reference to the geochemical survey results on the stream sediment conducted in the First Phase Survey. The analysis results are shown in Table II-3-9.

5-2 DATA PROCESSING

The data obtained from the analysis was firstly standardized by logarithmic conversion of the analysis values, then the histogram, average value, standard deviation and coefficient of correlation of each path-finder element were calculated, and threshold (I) (M + S.D.) and threshold (II) (M + 2 x S.D.) of anomalous values were obtained (Table II-3-7 - 8, Fig. II-3-18 - 20).

5-2-1 Geophysical Survey Area

(1) Correlation between path-finder elements

The correlation and correlation coefficients among all path-finder elements are shown in Fig. II-3-19 and Table II-3-8. The correlations between gold and silver and copper are somewhat low, but others are favorable.

(2) Histogram

The maximum and minimum values of each element are gold 175 ppb, 1 ppb, silver 10.5 ppm, 0.1 ppm, copper 415 ppm, 12 ppm, lead 9,500 ppm, 1 ppm, and zinc 4,900 ppm, 31 ppm. Each of these was converted to logarithmic values and placed in 15 groups, and a histogram was prepared. Since the analysis values of gold and silver were extremely low and, on gold, the value of analysis limit 1 ppb, including cases where the value is less than the analysis limit, occupies 21.3% and on silver the value of analysis limit 0.1 ppm, including cases where the value is less than the analysis limit, occupies 47.5%, the distribution maps of gold and silver are in an asymmetric L-shape. The distribution maps of copper, lead and zinc are normal (Fig. II-3-18).

(3) Anomalous Area

The average value, standard deviation (S.D.) and resulting thresholds (M + S.D., M + 2 x S.D. and M + 3 x S.D.) were calculated. The threshold of (M + S.D.) was set as the anomalous value of Class 2 and the threshold of (M + 2 x S.D.) was set as the anomalous value of Class 1, and the area which indicated an anomalous value of 2 points or greater was regarded as an anomalous area. An extraordinary large anomalous value (M + 3 x S.D.) was marked as a high anomalous value. The results are shown in Table II-3-7, Fig. II-3-27 - 32.

In the geophysical survey area, the Class 1 anomalous areas of copper, lead and zinc overlap each other and there are continuous anomalous zones in the two parts at (B5)·(C5 - C4)·(D5 - D4)·(E5 - E3) and G (3.5 - G2)·(H3.5 - H1)·(I4.5 - I1) of geophysical lines. The class 1 anomalous zones of gold and silver exist partially, and the class 2 anomalous zones exist continuously in about the same area. These anomalous areas concur with the locations of Pagar Gunung West and East ore deposits. As additional information, on zinc, a class 1 anomalous area exists in (C2.5)·(D1 - D2)·(E1), a class 2 anomalous zone of lead exists covering this area, and there are class 1 anomalous zones of silver and gold distributed in about the same area. This is the area where the silicification zone is accompanied by pyrite in muscovite granodiorite (mylonite) and dacite tuff were found through the geological survey and the area where strong anomalous parts was indicated in the geophysical survey by