Depth (m)	Geol Log.	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
		Flt									
		Flt Br									
245		Sil Tf	Epd V.								
		Sil Laptf									
248.80			Py V.								
249.50		Py diss (Epd. Cal rock)	Diss.								
250			Silh								
250.50											

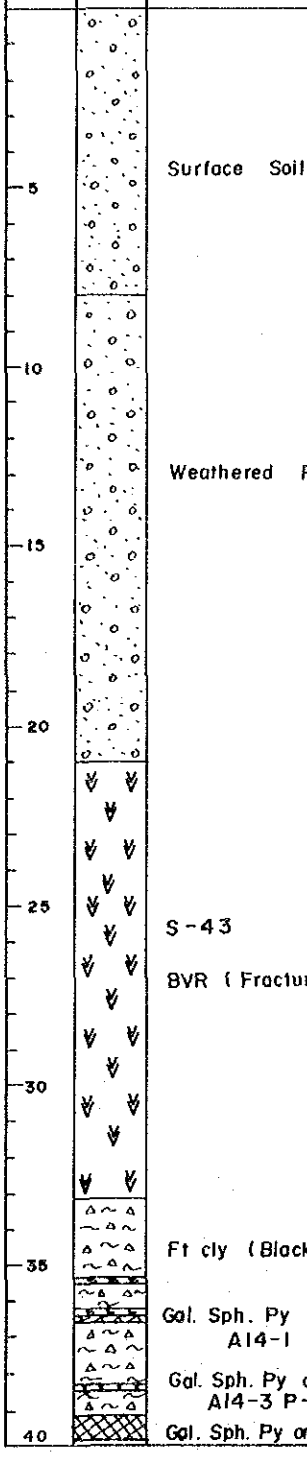
Drill Hole No. MJI-14 14-1

Location : Pagar Gunung East Elevation : 1,268 m.s.l.

Coordinate Point : 130m east of MJI-6 Inclination : -90°

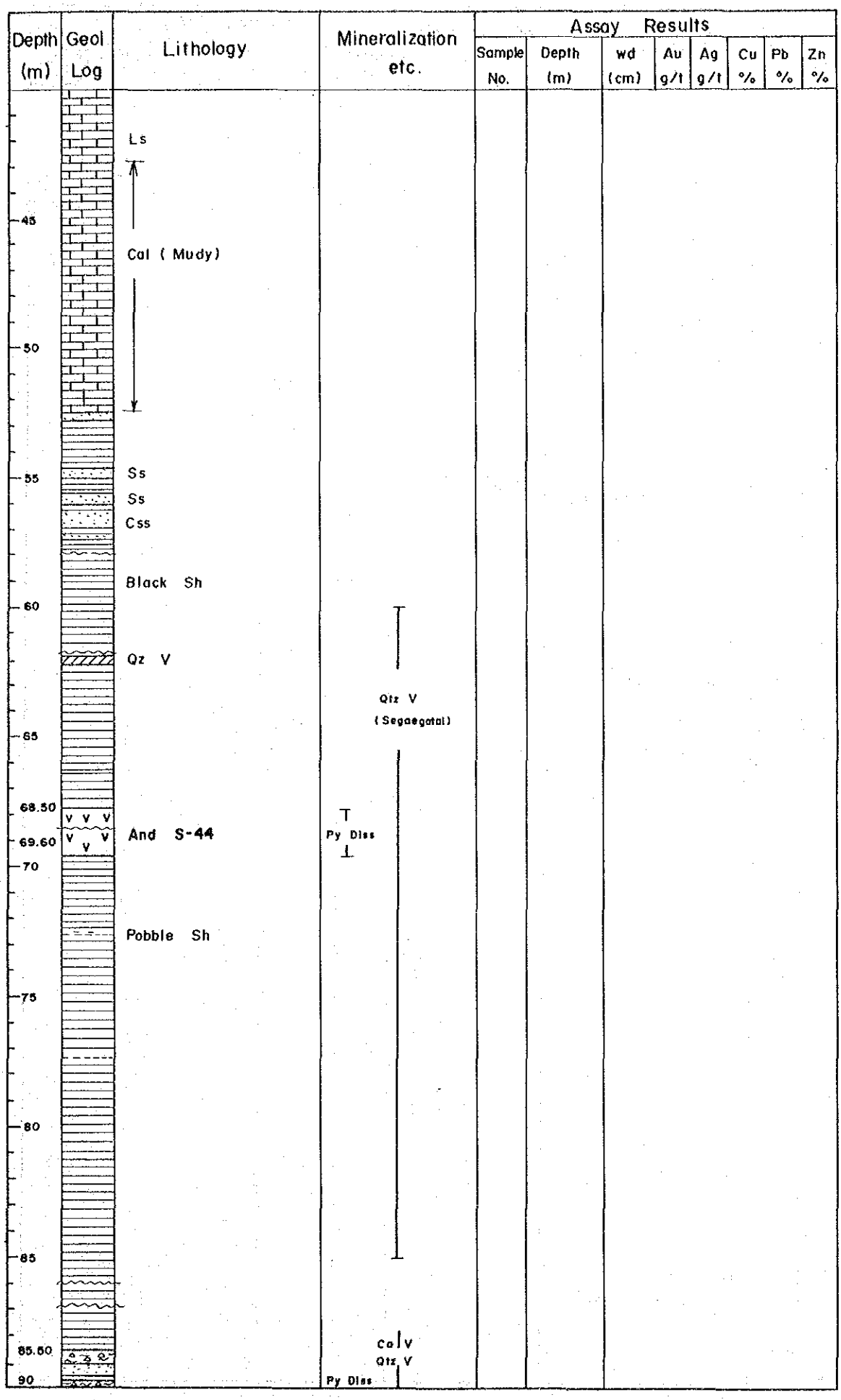
Depth : 250.70m Core Recovery : 88.2 %

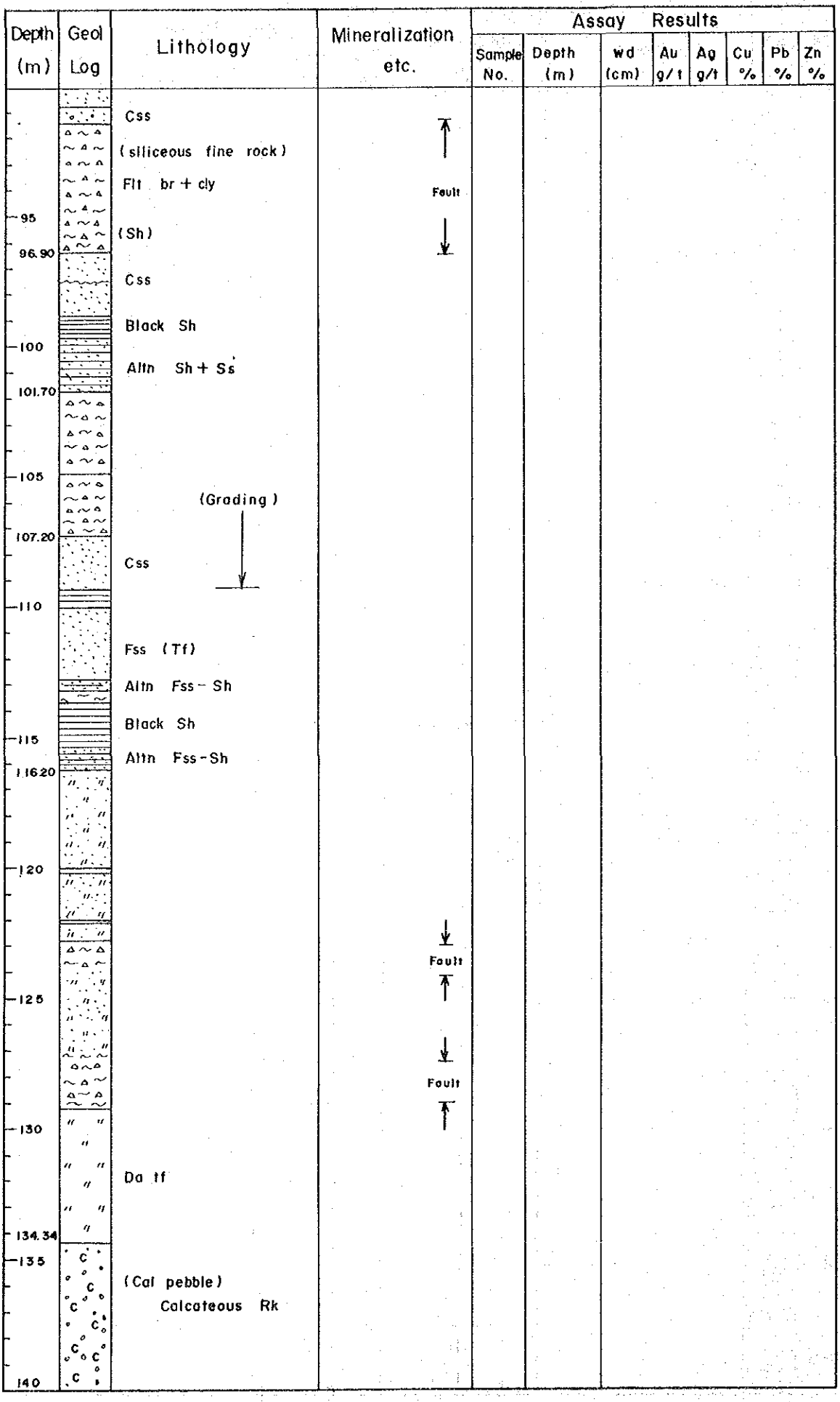
Drill Machine : OE-8BL Term : JAN. 10, 1985 ~ JAN. 23, 1985

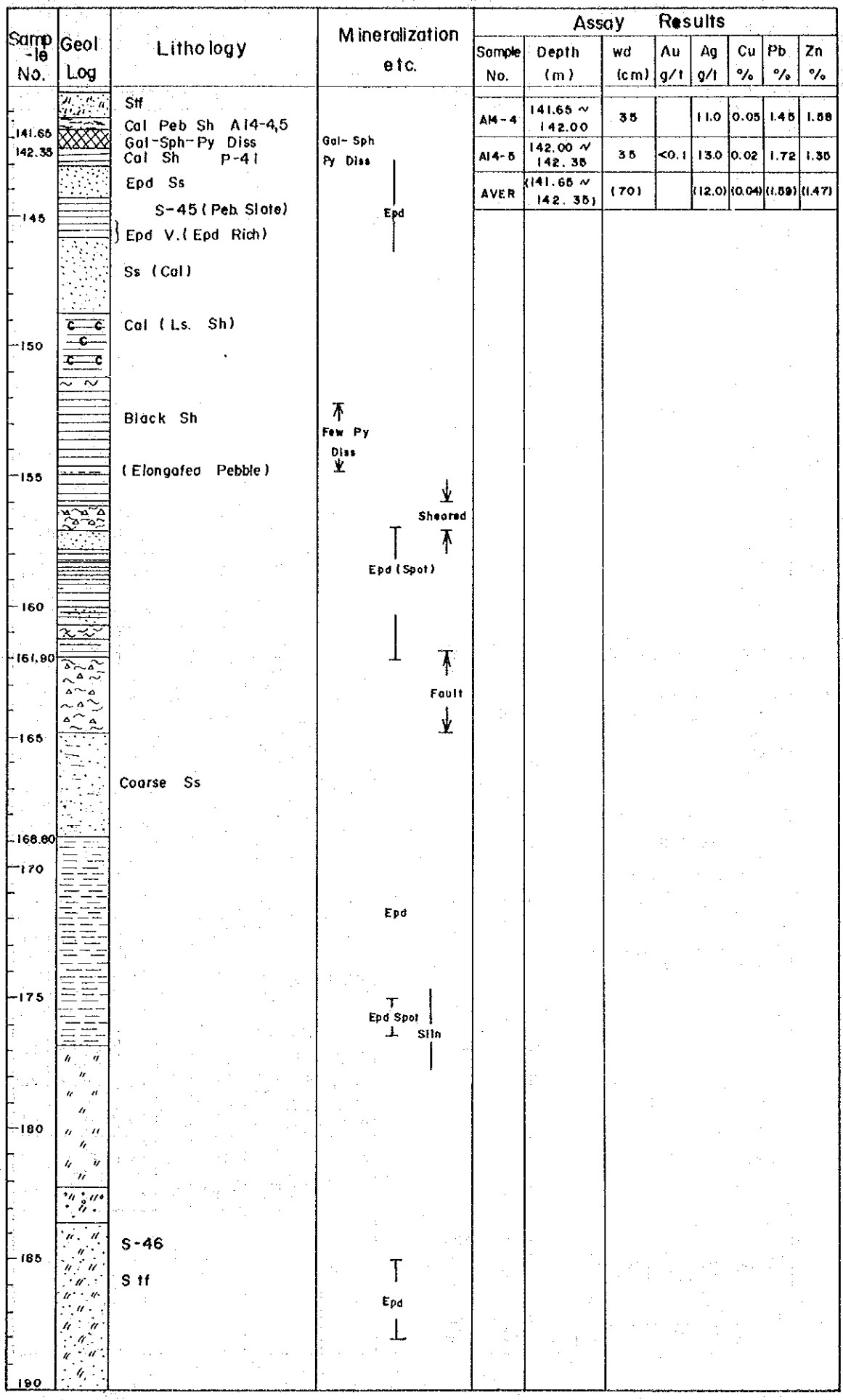


Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
			Assay Results				
A14-1	36.40 ~ 36.45	5		92.0	0.24	5.51	1.26
A14-2	38.30 ~ 38.50	20	1.63	94.0	0.90	6.48	3.84
A14-3	39.10 ~ 39.80	70		32.0	0.11	2.24	1.30

Fig. 3-10 Geological Log of MJI-14

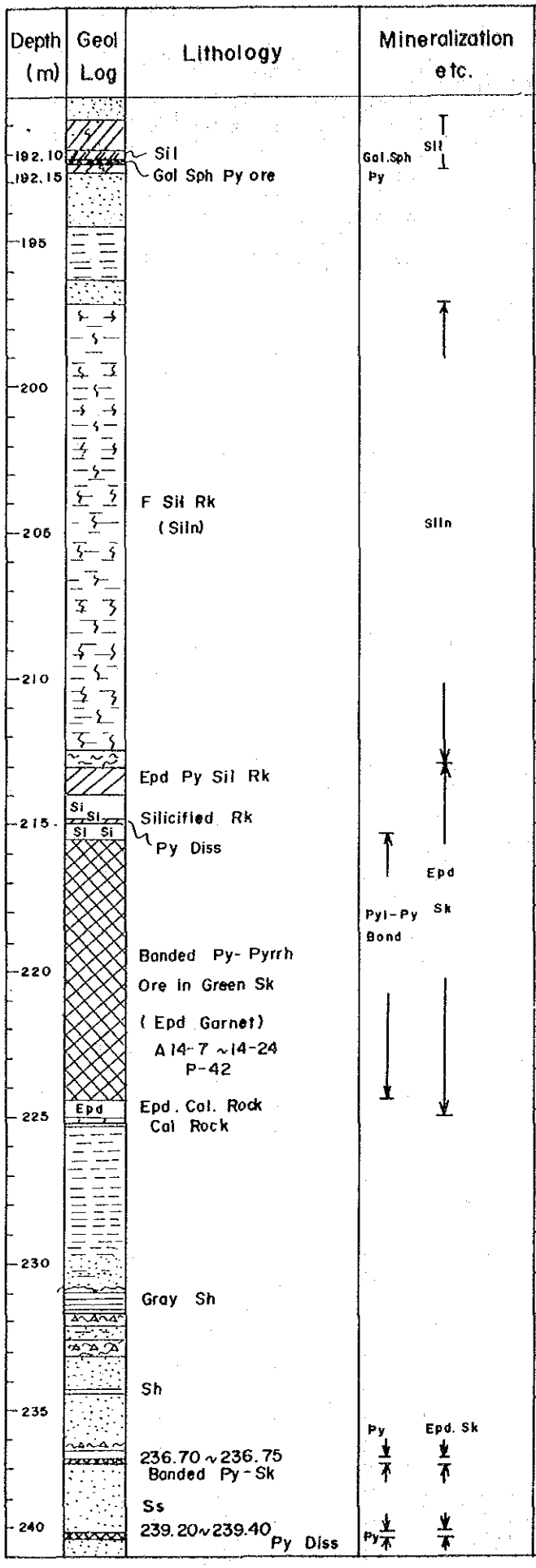

Depth (m)
Geol Log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
Ls
Cal (Mudy)
45
50
55
Ss
Ss
Css
Black Sh
60
Qz V
Qtz V
(Segregated)
65
68.50
And S-44
69.60
Py Diss
70
Pebble Sh
75
80
85
Cal V
Qtz V
85.50
Py Diss
90


Depth (m)
Geol Log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
Css
(siliceous fine rock)
Flt br + cly
(Sh)
Css
Black Sh
Altn Sh + Ss
(Grading)
Css
Fss (Tf)
Altn Fss - Sh
Black Sh
Altn Fss-Sh
Da tf
(Cal pebble)
Calcareous Rk
Fault
Fault
Fault
95
96.90
100
101.70
105
107.20
110
115
116.20
120
125
130
134.34
135
140



Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A14-4	141.65 ~ 142.00	35		11.0	0.05	1.45	1.58
A14-5	142.00 ~ 142.35	35	<0.1	13.0	0.02	1.72	1.35
AVER	(141.65 ~ 142.35)	(70)		(12.0)	(0.04)	(1.59)	(1.47)



Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
14-6	192.10 ~ 192.15	5	1.51	450.0	2.15	11.70	6.10
A14-7	215.50 ~ 216.00	50		5.5	0.11	0.06	0.04
A14-8	216.00 ~ 216.50	50		3.9	0.06	0.06	0.04
A14-9	216.50 ~ 217.00	50		3.9	0.14	0.01	0.01
A14-10	217.00 ~ 217.50	50		4.4	0.10	0.01	0.01
A14-11	217.50 ~ 218.00	50		6.5	0.04	0.09	0.11
A14-12	218.00 ~ 218.50	50	<0.1	3.3	0.13	<0.01	0.01
A14-13	218.50 ~ 219.00	50		2.8	0.16	0.04	0.04
A14-14	219.00 ~ 219.50	50		3.9	0.09	<0.01	0.01
A14-15	219.50 ~ 220.00	50		3.3	0.07	0.01	0.03
A14-16	220.00 ~ 220.50	50		3.3	0.06	0.01	<0.01
A14-17	220.50 ~ 221.00	50		5.0	0.16	0.01	0.02
A14-18	221.00 ~ 221.50	50		3.9	0.13	<0.01	<0.01
A14-19	221.50 ~ 222.00	50		4.4	0.16	<0.01	<0.01
A14-20	222.00 ~ 222.50	50	<0.1	3.9	0.14	<0.01	<0.01
A14-21	222.50 ~ 230.00	50		3.9	0.15	<0.01	0.01
A14-22	223.00 ~ 230.50	50		5.0	0.18	<0.01	0.01
A14-23	223.50 ~ 224.00	50		5.5	0.11	0.01	0.01
A14-24	224.00 ~ 224.50	50		6.0	0.12	0.01	0.12
Aver.	(215.50 ~ 224.50)	(900)	<0.1	4.4	0.12	0.02	0.01

Depth (m)	Geol Log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
		Ss									
245											
		Sil F Rk									
250											
250.70											

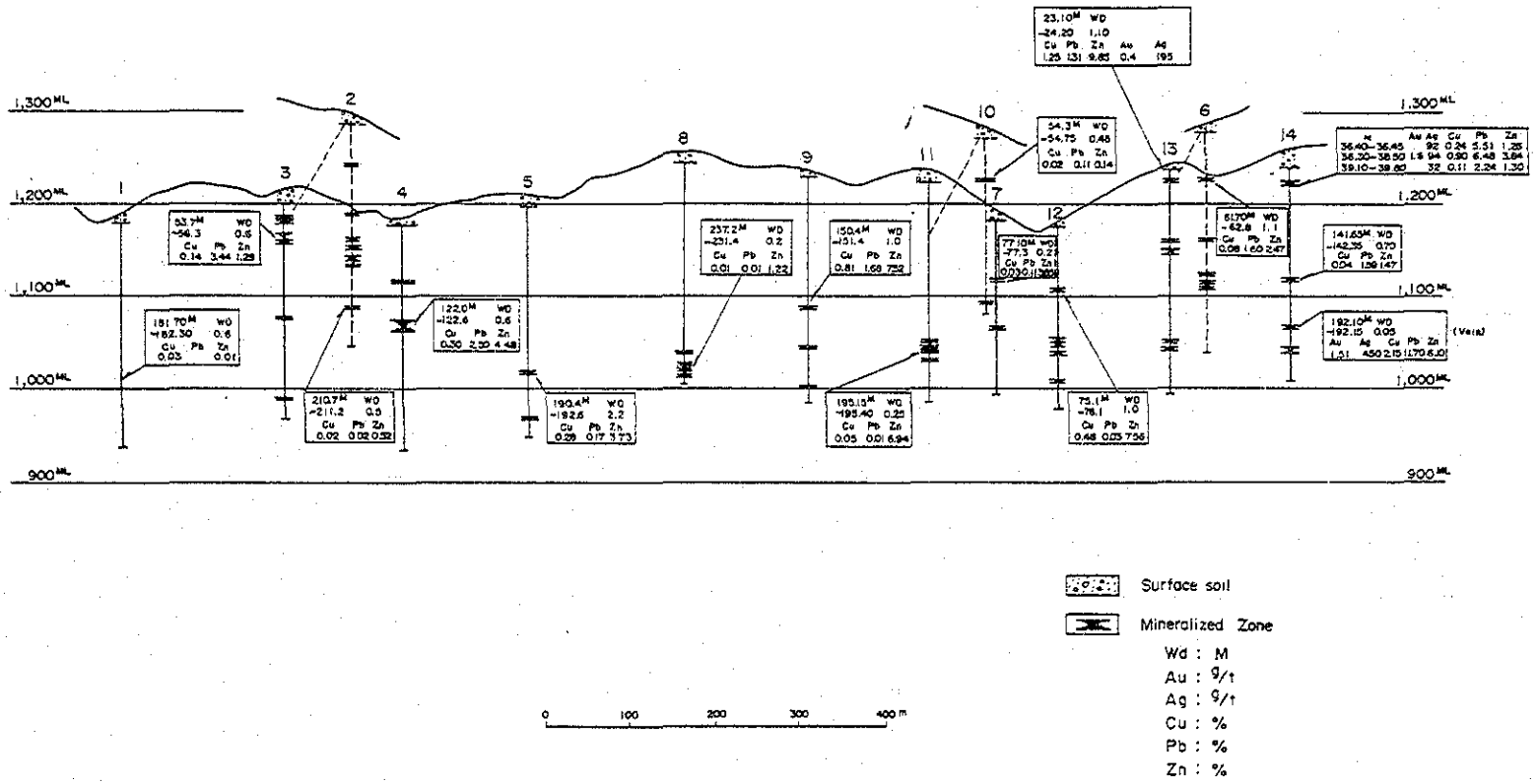
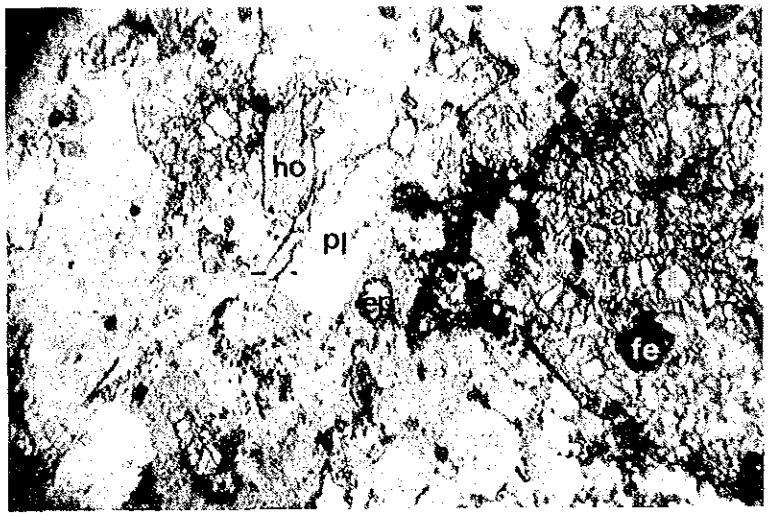


Fig. 3-11 Chemical Assay Result of Ore Sample of Drilling Core

Fig. 3-12 Microscopic Photograph of Rock Thin Section and Ore Polished Specimen

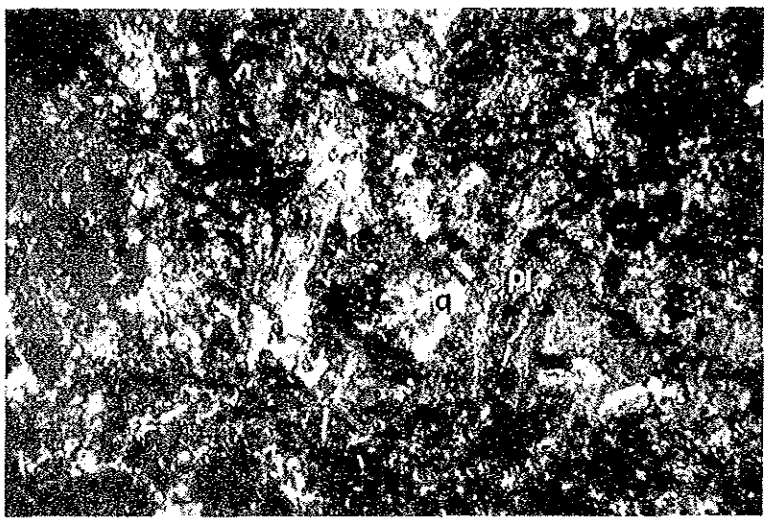
Abbreviation

q	:	Quartz
pl	:	Plagioclase
ho	:	Hornblende
se	:	Sericite
ep	:	Epidote
g	:	Garnet
mu	:	Muscovite
ca	:	Calcite
px	:	Pyroxene
cp	:	Chalcopyrite
sp	:	Sphalerite
ga	:	Galena
py	:	Pyrite
po	:	Pyrrhotite
su	:	Sulphide Mineral



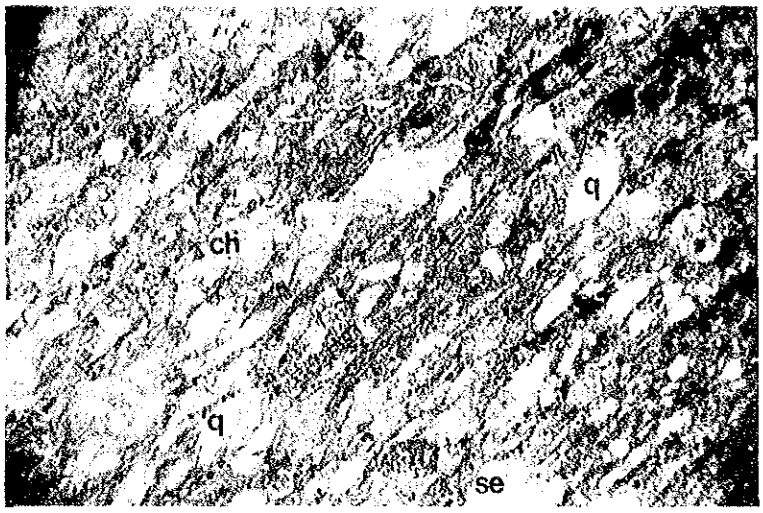
Sample Number : S-43
Drill Hole : MJI-14
Depth : 25.50 m
Rock Name : Basalt
Formation : Basic Volcanic Rock Member

0 0.5 1 mm
(only lower polar)



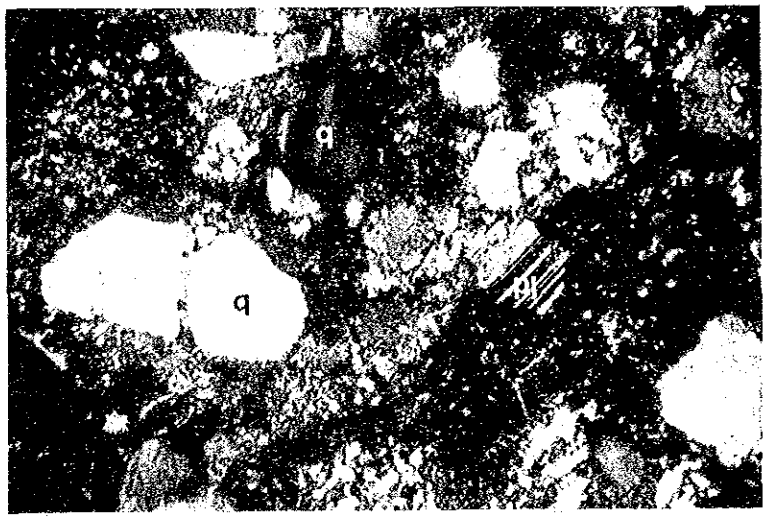
Sample Number : S-19
Drill Hole : MJI-9
Depth : 64.00 m
Rock Name : Andesite
Formation : Basic Volcanic Rock Member

0 0.5 1 mm
(cross polars)



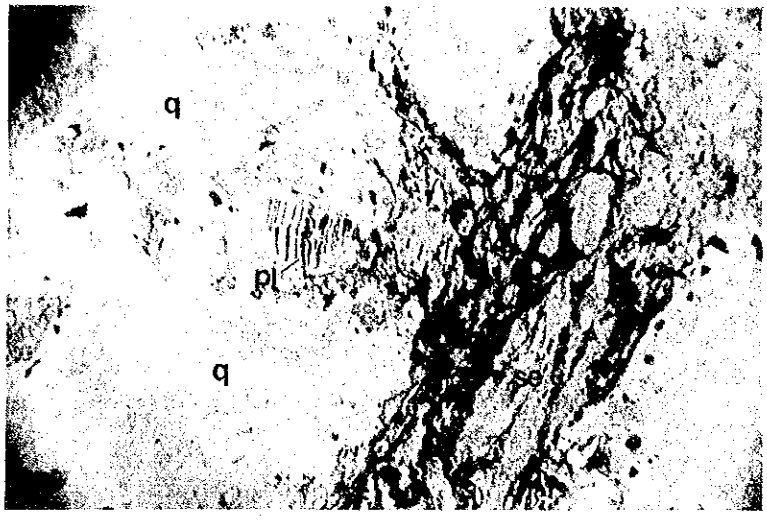
Sample Number : S-14
Drill Hole : MJI-7
Depth : 68.25 m
Rock Name : Fine grained sandstone
Formation : Shale-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(only lower polar)



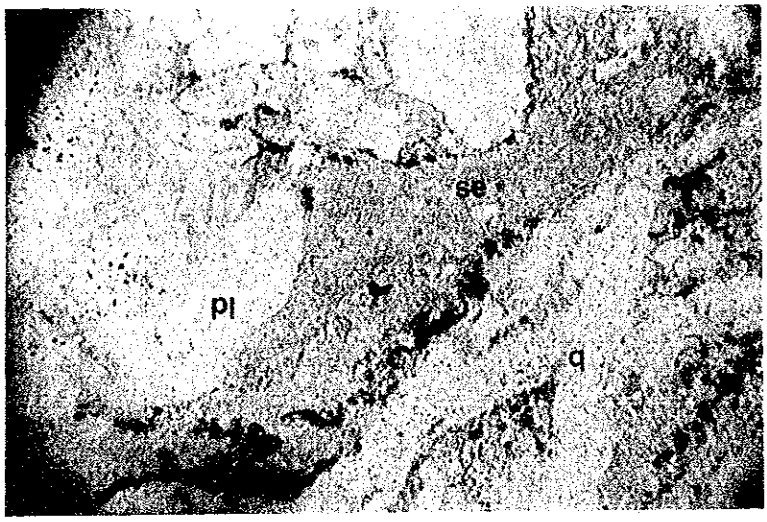
Sample Number : S-27
Drill Hole : MJI-11
Depth : 110.10 m
Rock Name : Tuffaceous sandstone
Formation : Shale-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(cross polars)



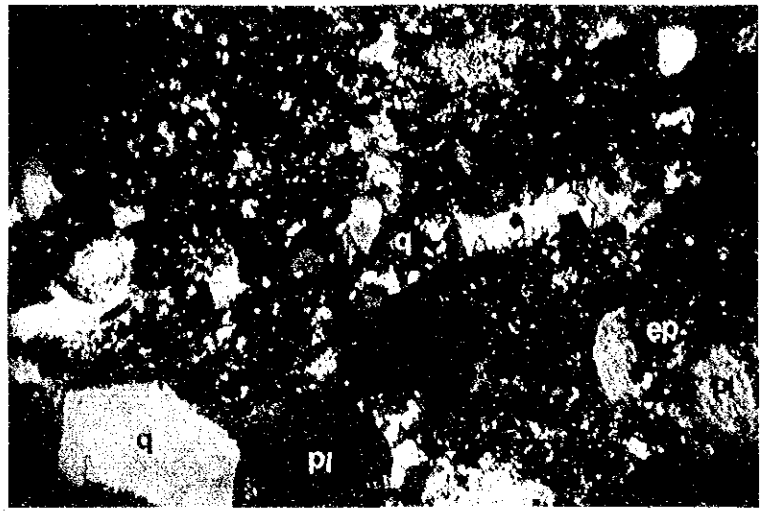
Sample Number : S-28
Drill Hole : MJI-11
Depth : 154.00 m
Rock Name : Andesitic sandy tuff
Formation : Calcareous Rock-Shale Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(only lower polar)



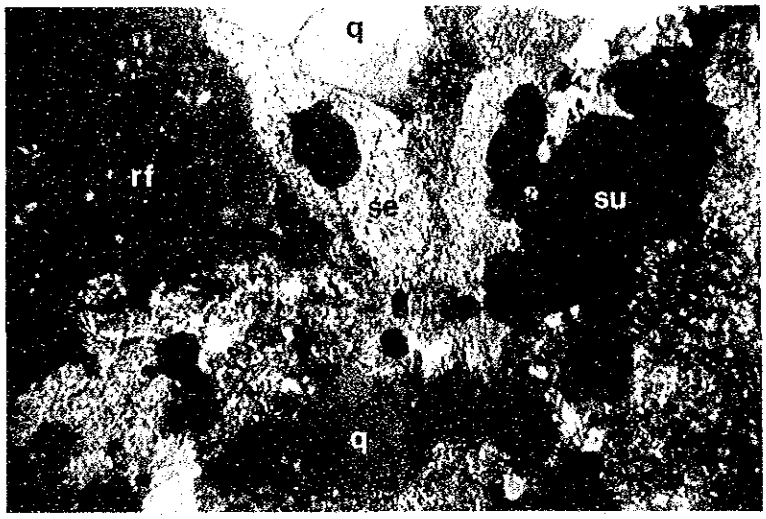
Sample Number : S-20
Drill Hole : MJI-9
Depth : 131.80 m
Rock Name : Sandy tuff
Formation : Calcareous Rock-Shale Facies,
Sedimentary and Pyroclastic Rock Member

0 0.5 1 mm
(only lower polar)



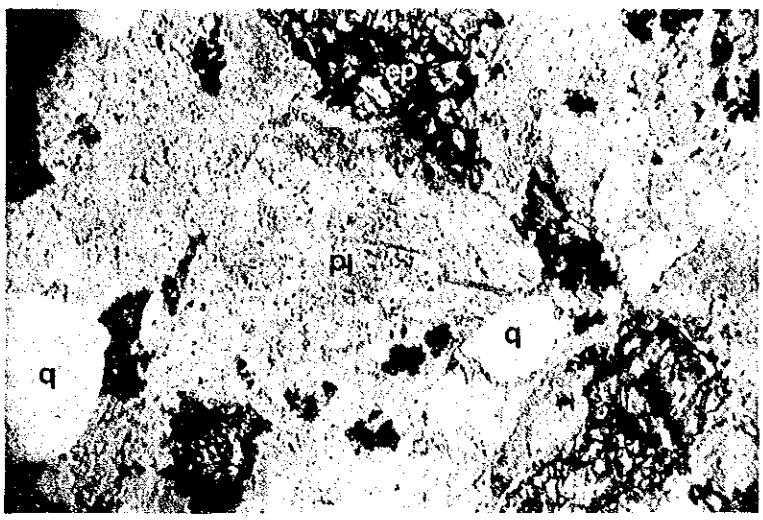
Sample Number : S-16
Drill Hole : MJI-8
Depth : 180.10 m
Rock Name : Dacitic sandy tuff
Formation : Siliceous Rock-Slate-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(cross polars)



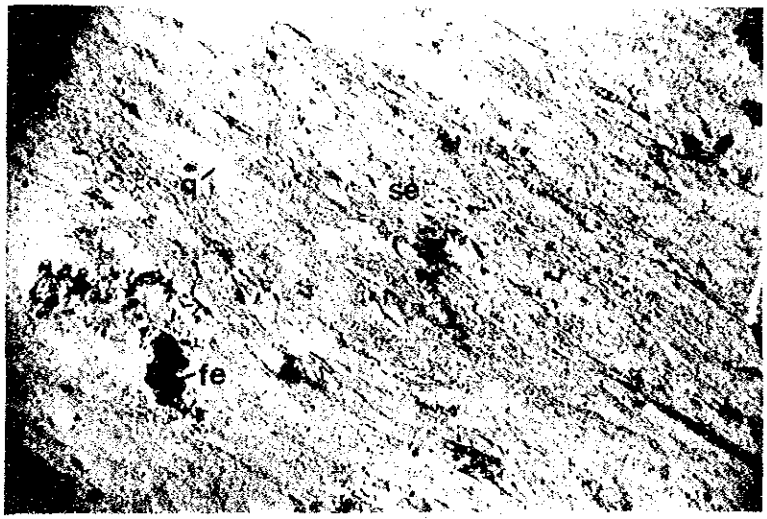
Sample Number : S-12
Drill Hole : MJI-6
Depth : 200.19 m
Rock Name : Sandy tuff
Formation : Siliceous Rock-Slate-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(Cross Polars)



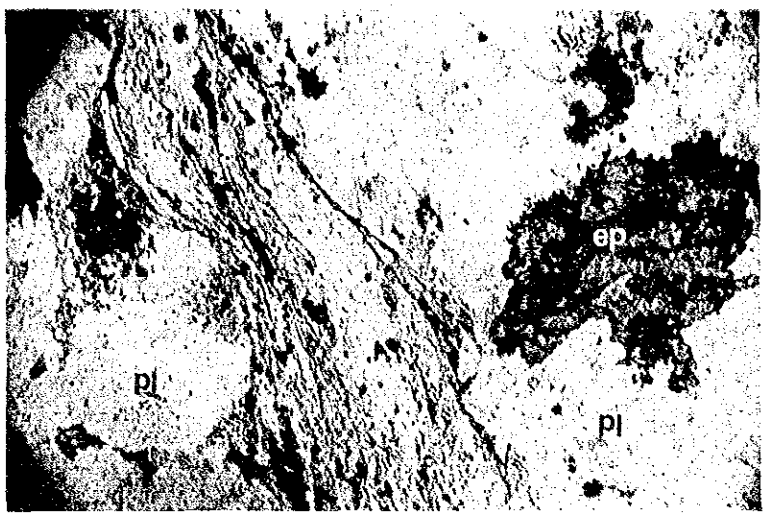
Sample Number : S-46
Drill Hole : MJI-14
Depth : 184.70 m
Rock Name : Tuffaceous sandstone
Formation : Siliceous Rock-Slate-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Facies

0 0.5 1 mm
(only lower polar)



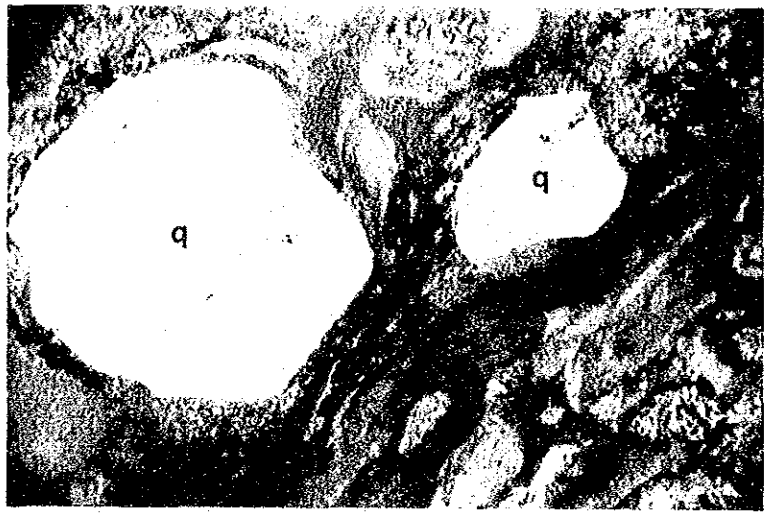
Sample Number : S-11
Drill Hole : MJI-6
Depth : 200.10 m
Rock Name : Pebble slate
Formation : Siliceous Rock-Slate-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(Only lower polar)



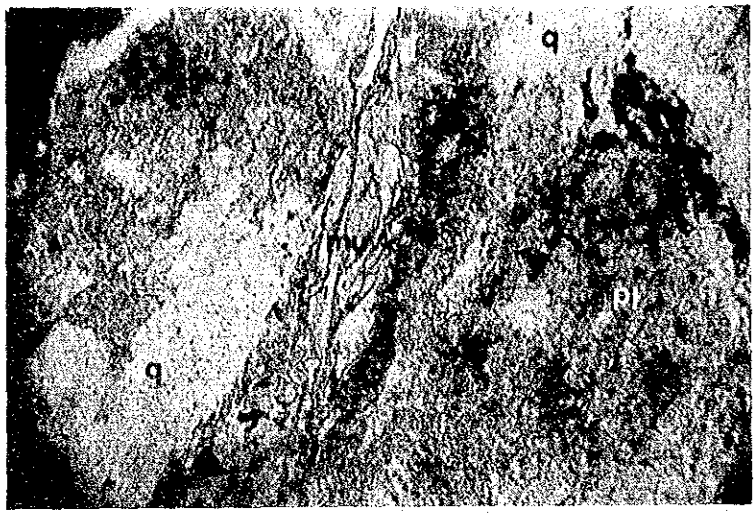
Sample Number : S-40
Drill Hole : MJI-12
Depth : 157.40 m
Rock Name : Sandy tuff
Formation : Siliceous Rock-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(only lower polar)



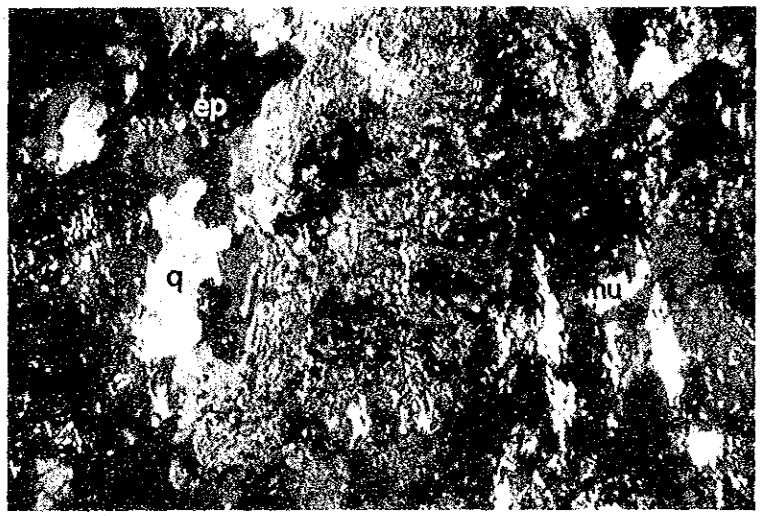
Sample Number : S-13
Drill Hole : MJI-6
Depth : 212.30 m
Rock Name : Tuffaceous sandstone
Formation : Siliceous-Rock-Slate-Tuff Facies,
Sedimentary Rock and Pyroclastic Rock Member

0 0.5 1 mm
(only lower polar)



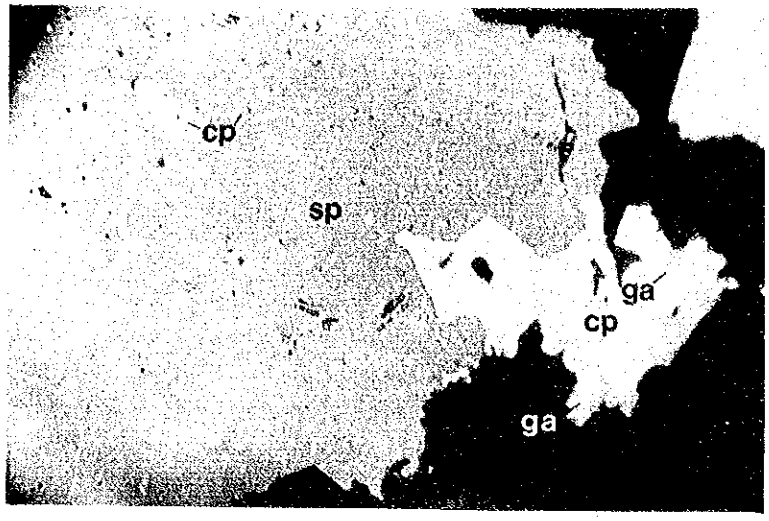
Sample Number : S-24
Drill Hole : MJI-10
Depth : 128.10 m
Rock Name : Mylonite (Granodiorite)

0 0.5 1 mm
(only lower polar)



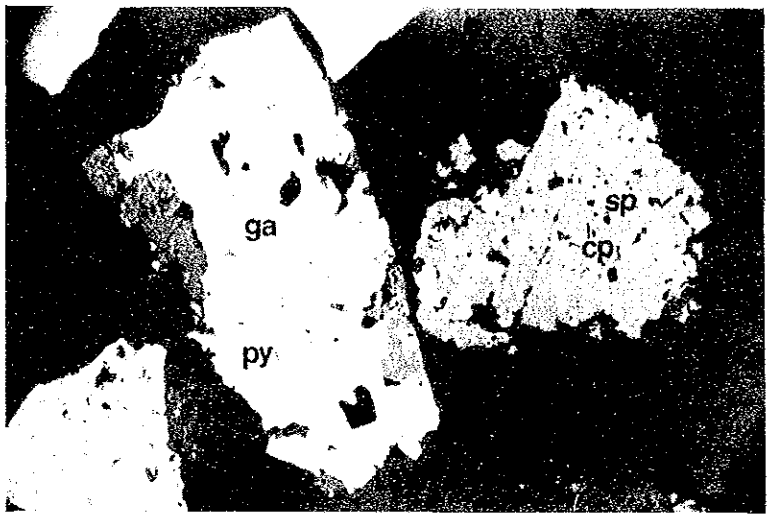
Sample Number : S-26
Drill Hole : MJI-10
Depth : 178.60
Rock Name : Quartz diorite

0 0.5 1 mm
(cross polars)



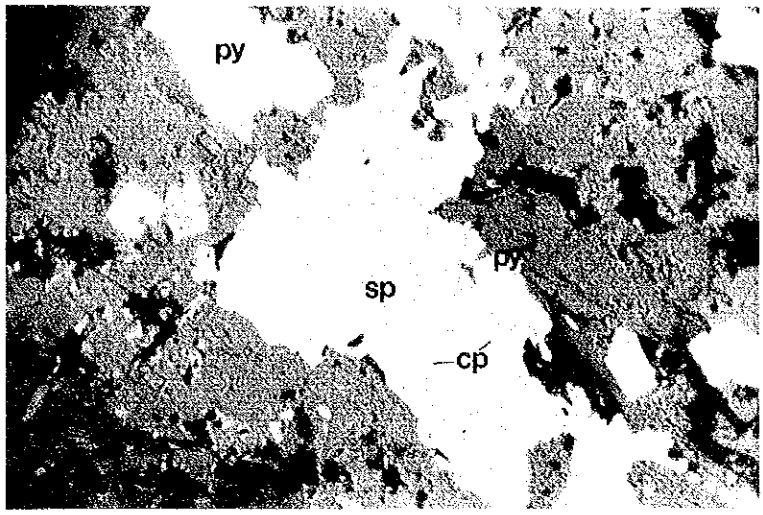
Sample Number : P-37
Drill Hole : MJI-13
Depth : 23.50 m
Ore Minerals : Chalcopyrite-galena-pyrite-sphalerite
Ore Deposit : Mineralized Zone I'

0 0.5 mm



Sample Number : P-40
Drill Hole : MJI-14
Depth : 39.50 m
Ore Minerals : (slime ore) pyrrhotite-chalcopyrite-sphalerite-galena-pyrite
Ore deposit : Mineralized Zone I'

0 0.5 mm

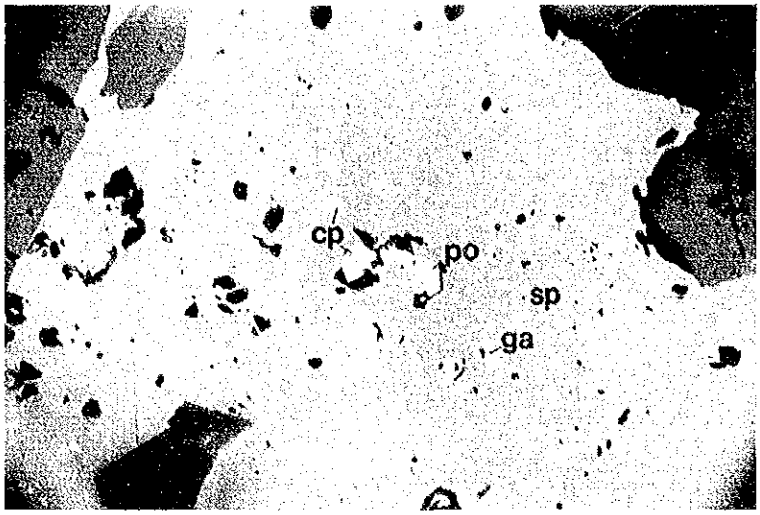


Sample Number : P-2
Drill Hole : MJI-6
Depth : 62.50 m
Ore Minerals : Chalcopyrite-pyrite-sphalerite
Ore Deposit : Mineralized Zone I

0 0.5 mm

Sample Number : S-2
Drill Hole : MJI-6
Depth : 62.50 m
Rock Name : Skarn
Ore Deposit : Mineralized Zone I

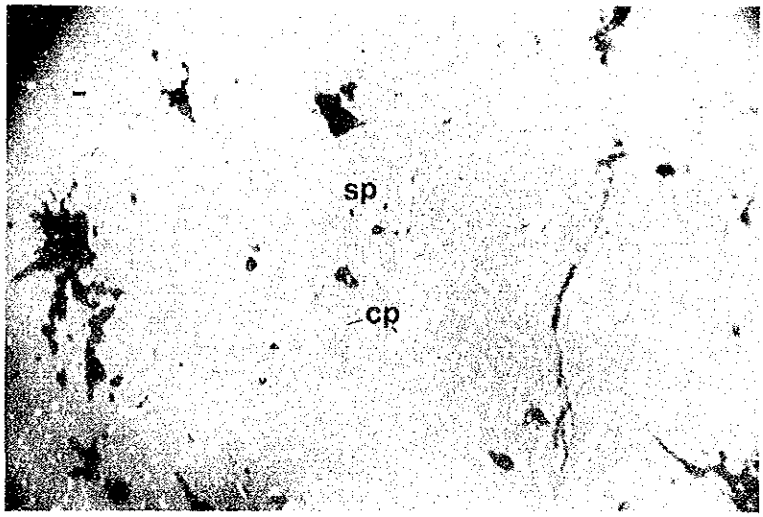
0 0.5 1 mm
(only lower polar)



Exsolution Texture of chalcopyrite and pyrrhotite in Sphalerite

Sample Number : P-14
Drill Hole : MJI-9
Depth : 149.50 m
Ore Minerals : Pyrite-sphalerite
Ore Deposit : Mineralized Zone I

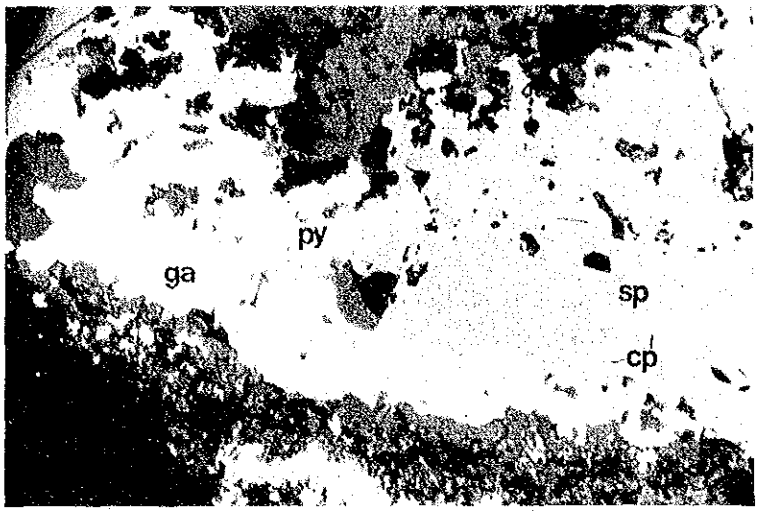
0 0.5 mm



Exsolution Texture of chalcopyrite in sphalerite

Sample Number : P-28
Drill Hole : MJI-12
Depth : 75.80 m
Ore Minerals : Galena-chalcopyrite-pyrite-sphalerite
Ore Deposit : Mineralized Zone I

0 0.5 mm



Poor part of the
Mineralized Zone I.

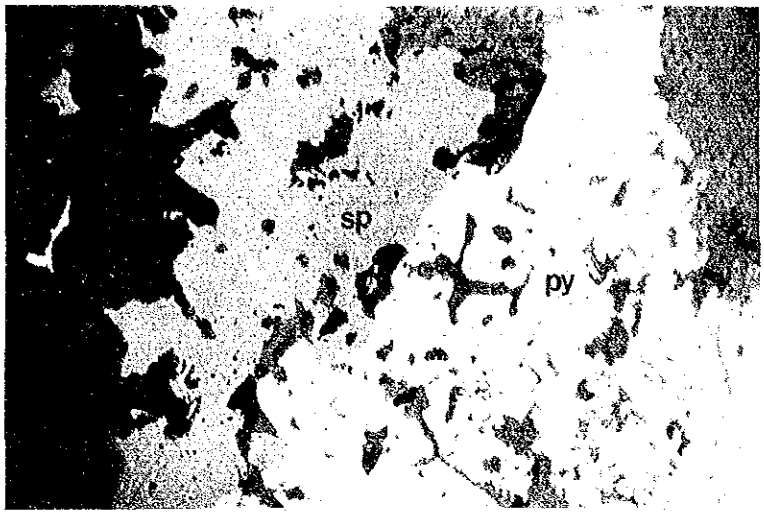
Sample Number : P-41
Drill Hole : MJI-14
Depth : 141.80 m
Ore Minerals : Chalcopyrite-sphalerite-galena-pyrite
Ore Deposit : Mineralized Zone I

0 0.5 mm

Country rock of poor part
of the Mineralization Zone I

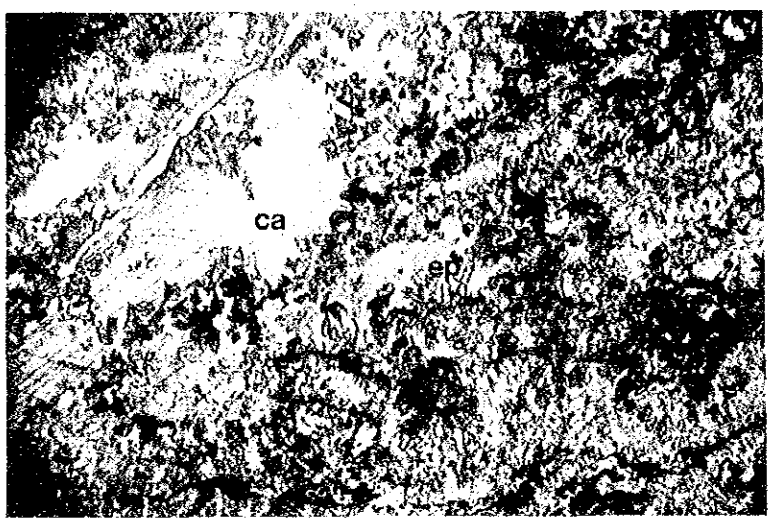
Sample Number : S-45
Drill Hole : MJI-14
Depth : 142.00 m
Rock Name : Pebble slate
Formation : Mineralized Zone I

0 0.5 1 mm
(only lower polar)



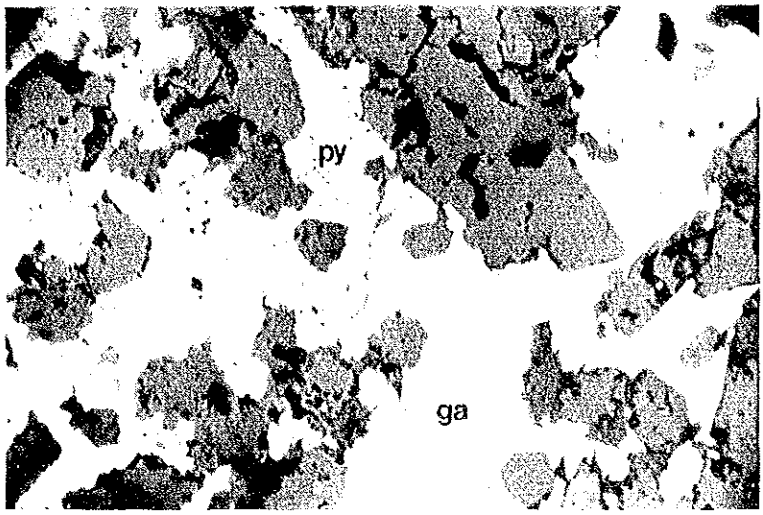
Sample Number : P-27
Drill Hole : MJI-12
Depth : 72.50 m
Ore Minerals : Chalcopyrite-sphalerite-pyrite (disseminated ore)
Ore Deposit : Mineralized Zone I

0 0.5 mm



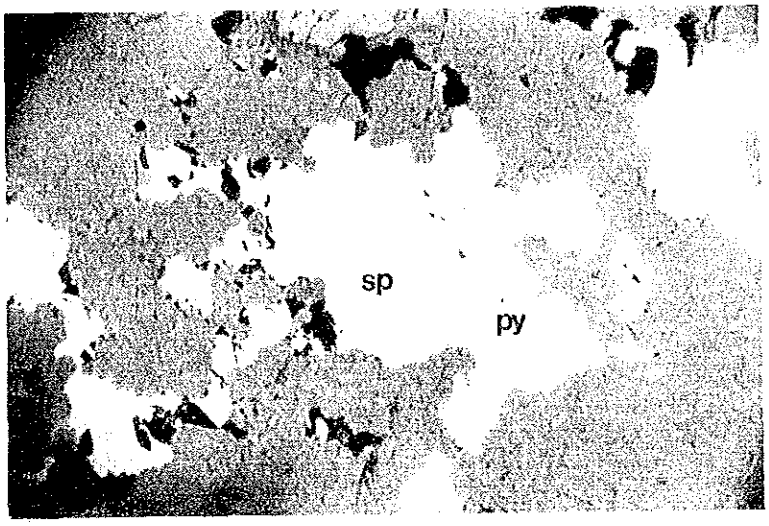
Sample Number : S-37
Drill Hole : MJI-12
Depth : 72.40 m
Rock Name : Skarn
Ore Deposit : Mineralized Zone I

0 0.5 1 mm
(only lower polar)



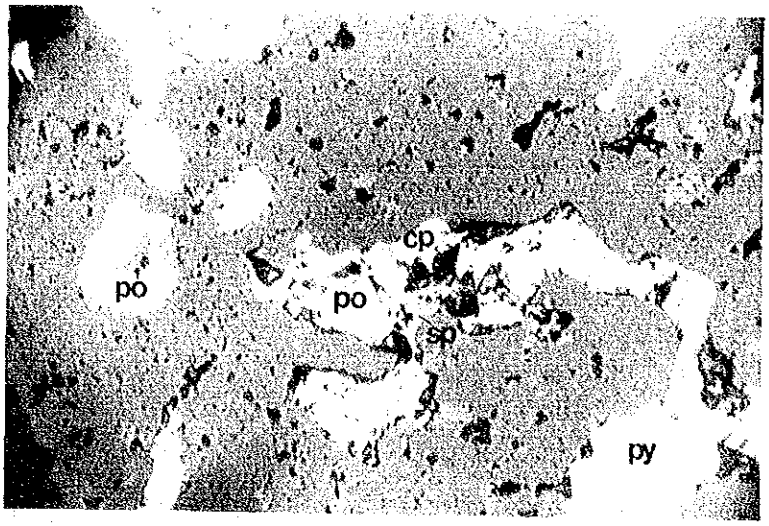
Sample Number : P-29
Drill Hole : MJI-12
Depth : 120.60 m
Ore Minerals : Galena-sphalerite-pyrite
Ore Deposit : Mineralized Zone II-2
(Sphalerite concentrated part of banded pyrite-pyrrhotite ore)

0 0.5 mm



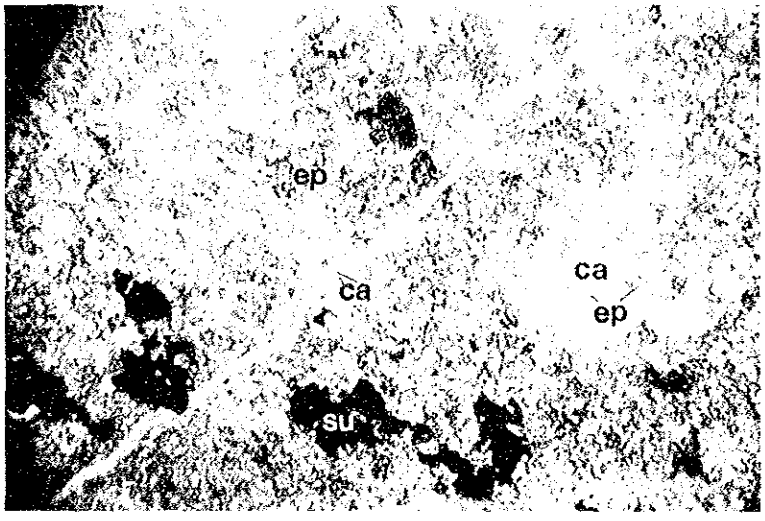
Sample Number : P-29
Drill Hole : MJI-12
Depth : 120.60
Ore Minerals : Galena-sphalerite-pyrite
Ore Deposit : Mineralized Zone II-2

0 0.5 mm



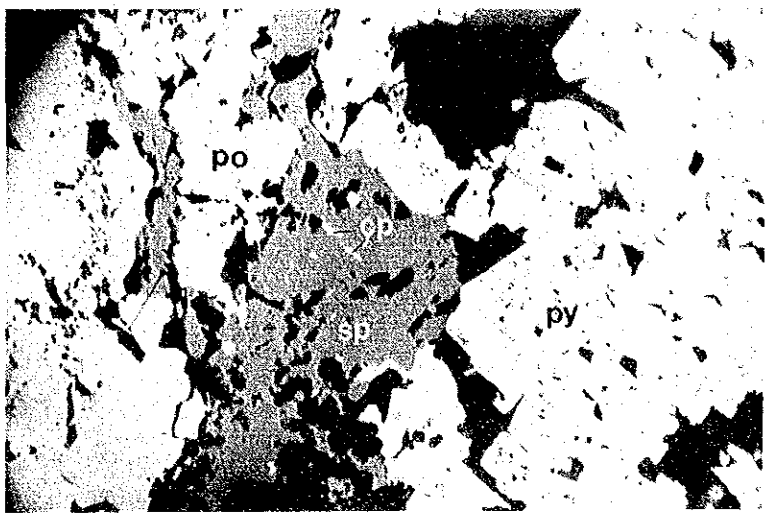
Sample Number : P-20
Drill Hole : MJI-11
Depth : 184.00 m
Ore Minerals : Pyrite-sphalerite-pyrrhotite
Ore Deposit : Mineralized Zone II-3

0 0.5 mm



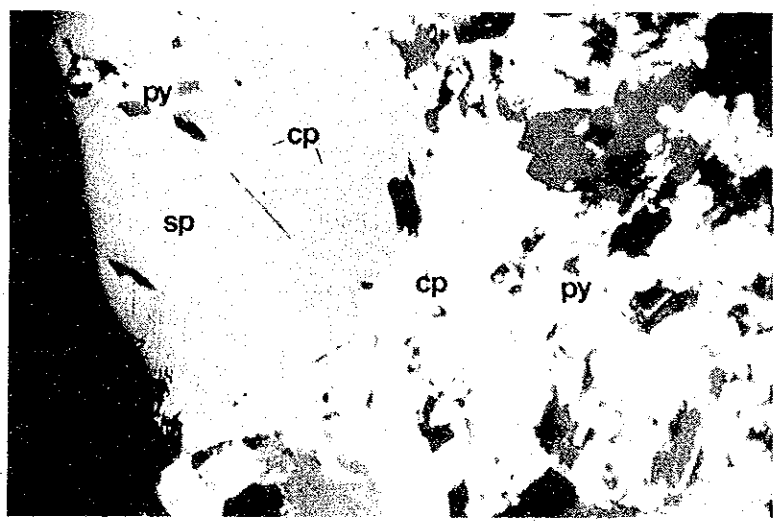
Sample Number : S-32
Drill Hole : MJI-11
Depth : 183.60 m
Rock Name : Skarn
Ore Deposit : Mineralized II-3

0 0.5 1 mm
(only lower polar)



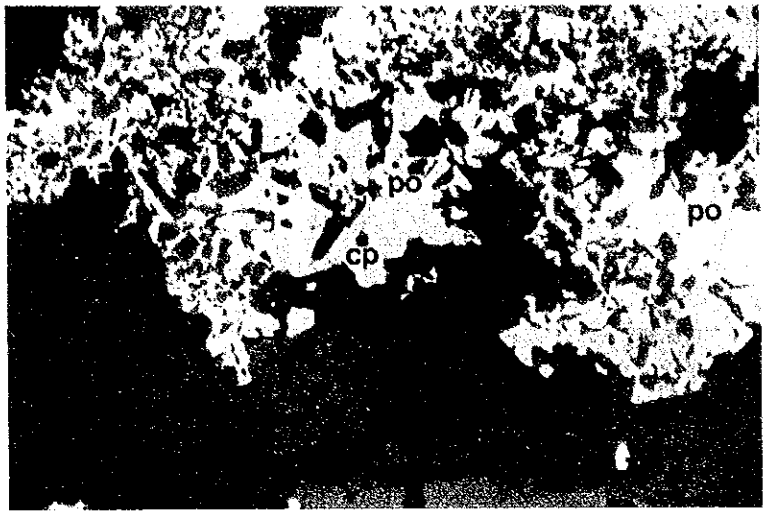
Sample Number : P-24
Drill Hole : MJI-11
Depth : 195.30 m
Ore Minerals : Chalcopyrite-sphalerite-pyrite
Ore Deposit : Mineralized Zone II-4

0 0.5 mm



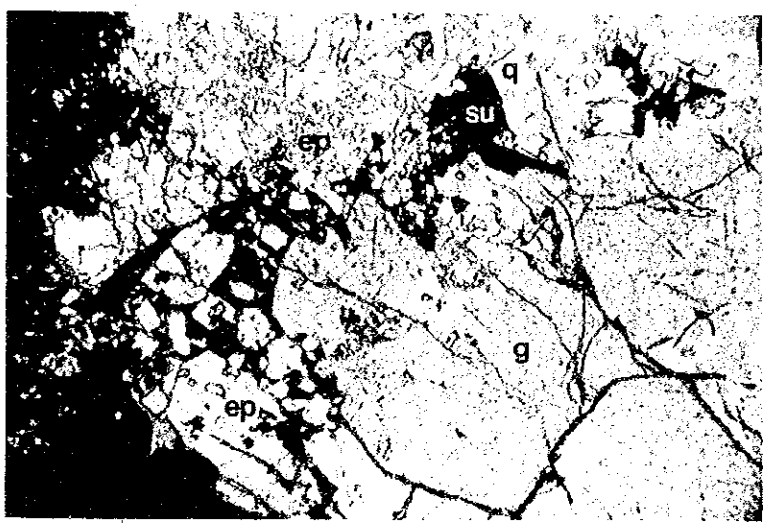
Sample Number : P-3
Drill Hole : MJI-6
Depth : 127.50 m
Ore Minerla : Chalcopyrite-galena-sphalerite-pyrite
Ore Deposit : Mineralized Zone II-5

0 0.5 mm



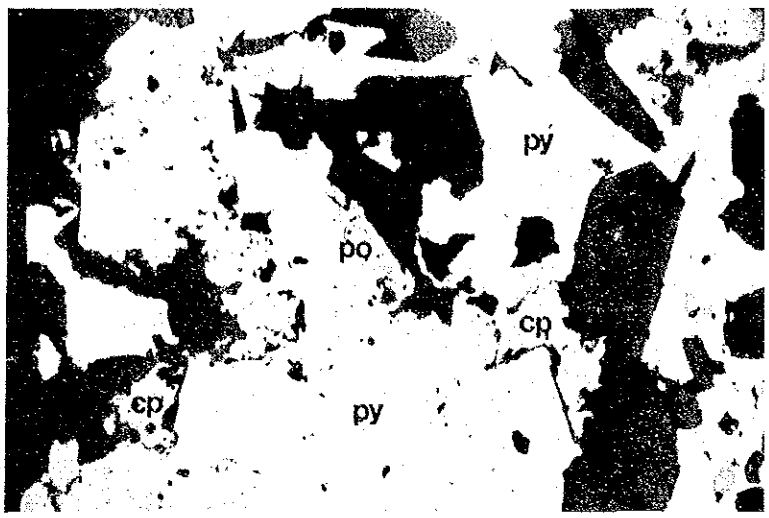
Sample Number : P-5
Drill Hole : MJI-6
Depth : 170.00 m
Ore Minerals : Chalcopyrite-pyrrhotite
Ore Deposit : Mineralized Zone II-6

0 0.5 mm



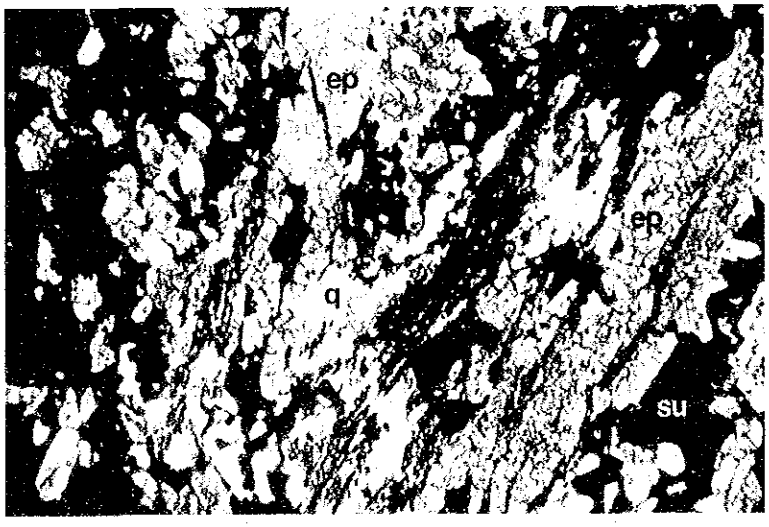
Sample Number : S-9
Drill Hole : MJI-6
Depth : 170.00 m
Rock Name : Skarn (Epidote and Garnet)
Formation : Mineralized Zone II-6

0 0.5 1 mm
(only lower polar)



Sample Number : P-7
Drill Hole : MJI-6
Depth : 173.50 m
Ore Minerals : Pyrrhotite-chalcopyrite-pyrite
Ore Deposit : Mineralized Zone II-6

0 0.5 mm



Sample Number : S-10
Drill Hole : MJI-6
Depth : 173.50 m
Rock Name : Skarn
Ore Deposit : Mineralized II-6

0 0.5 1 mm
(only lower polar)

Table 3-1 Microscopic Observation of Rock Thin Section of Drilling Core

Sample Number	Hole Number	Depth (m)	Horizone	Rock name	Phenocryst, Rock Fregment Mineral Fragment								Ground mass/Matrix								Skarn, Altered Mineral									Remarks
					q	kf	pl	bi	mu	mf	fe	others	q	kf	pl	bi	am	mf	ca	cl	fe	q	ch	se	ca	ep	ga	um	cpx	py	su	
S-1	MJ1-4	26.50	BVR	Basaltic tuff								ba pu	∘		∘			○			∘		○								1) common pyroxene
S-2	MJ1-6	62.50	IV	Skarn																		∘	∘		◎	○				○	with banded ore
S-3	MJ1-6	73.54	V	Skarn																		○		∘	∘	○				∘?	
S-4	MJ1-6	127.50	VII	Sandy tuff																		∘		∘	○					◎	with massive ore
S-5	MJ1-6	138.80	VII	Skarn																		∘	◎	∘	○	∘				∘	
S-6	MJ1-6	148.20	VII	Andesitic tuff			◎				∘	an	○	•	○		∘		∘	∘	∘	∘	?		∘						slightly acidic
S-7	MJ1-6	152.40	VII	Andesitic tuff	?		○					pu ∘	○		○				○	∘	∘		?	∘	○	∘					slightly acidic
S-8	MJ1-6	168.70	VII	(Medium) sandstone, slate	∘		∘			?	∘		∘		∘				∘	◎	∘		∘?	○	∘						banded texture
S-9	MJ1-6	170.00	VII	Skarn																		•			∘	◎	○				○	with banded ore
S-10	MJ1-6	173.50	VII	Skarn																		∘			•	◎					○	with banded ore
S-11	MJ1-6	200.10	VII	Pebble slate	∘		?						∘							◎	∘	∘	∘?							∘ ?		phyllitic
S-12	MJ1-6	200.19	VII	Sandy tuff	◎						∘	da ∘ pu ∘ ms ∘	○							◎	∘	∘		○							∘	
S13	MJ1-6	212.30	VII	Tuffaceous sand stone	○	∘?	∘			∘	∘	am ∘ ss • ms ∘	∘		∘				∘	○	∘	∘	∘	•	∘						phyllitic
S-14	MJ1-7	68.25	III	Fine sandstone	○	∘?	∘?			• ?			∘					?	∘	◎	∘	∘	∘	○	∘	∘					banded & slaty texture
S-15	MJ1-7	193.00	VII	Silicified rock																		◎			∘	∘					∘	mozaic quartz
S-16	MJ1-8	180.10	V	Decitic sandy tuff	○		○			?			◎		∘			?	∘	∘	∘	∘		∘	◎						∘	medium grain
S-17	MJ1-8	215.15	VII	Decitic sandy tuff																		○			•	◎					○	medium grain
S-18	MJ1-8	226.10	VII	Sandy tuff			○			∘ ?		∘	∘						∘	◎	∘	∘	∘	∘	∘	∘		∘				slightly andesitic
S-19	MJ1-9	64.00	BVR	Andesite			∘	• ?		∘ ?	∘		○		○	∘		?			∘	∘	○	∘	○						∘	
S-20	MJ1-9	131.80	IV	Sandy tuff	◎		∘					pu ∘	◎		∘			?		○	∘	∘	∘	○					∘ ?		acidic tuff
S-21	MJ1-9	191.80	VII	Skarn																		∘				◎			○		○	
S-22	MJ1-10	76.80	VII	Sandy tuff	◎		∘				∘	an • da • pu ∘	○		∘					◎	∘	∘	∘	∘							∘	dacitic
S-23	MJ1-10	124.20	Mylo	Mylonite (Granodiorite)	○	?	○			∘	?	○										∘	∘	∘	∘	○						mylonitic, fine band
S-24	MJ1-10	128.10	Mylo	Mylonite (Granodiorite)	○	?	○			∘		∘												∘	∘							mylonitic, fine band
S-25	MJ1-10	174.20	Mylo	Mylonite (Granodiorite)	◎	○	○			∘		∘												∘	∘							mylonitic coarse band
S-26	MJ1-10	178.60	QzDio	Quartz Diorite	◎	• ?	○			∘ ?	∘	∘												∘	○	∘	∘					catacrstized
S-27	MJ1-11	110.10	III	Tuff sandstone	○	∘	∘			∘ ?	∘	an • da ∘	○		∘				∘	○	∘			∘	∘	∘						
S-28	MJ1-11	154.00	IV	Andesitic sandy tuff			○			?	∘	an	◎		∘			?	∘	?	∘	∘			∘	○				∘ ?		catacrastized (skarn)
S-29	MJ1-11	154.00	IV	Tuff	○		∘			∘	∘	da ∘	◎		∘			?	∘	◎	∘		∘	○	∘	∘				∘		
S-30	MJ1-11	179.70	VII	Slate	∘		∘				∘		∘		?				∘	◎	∘	∘		∘	∘	∘						schistose banded
S-31	MJ1-11	182.50	VII	Skarn																		○	∘?		○	○		∘?			○	banded texture
S-32	MJ1-11	183.60	VII	Skarn																		∘			○	◎					∘	
S-33	MJ1-11	193.20	VII	Slate & Tuff			?				∘		∘						∘	○	○				∘	∘				∘ ?		banded texture
S-34	MJ1-11	199.90	VII	Skarn																		○				◎		∘		∘ ?		
S-35	MJ1-11	215.30	VII	Slate & Skarn	∘		• ?				∘		○		?				∘	◎	∘	•		○	∘	∘						
S-36	MJ1-11	215.40	VII	Skarn																		∘			○	○	◎	∘			○	
S-37	MJ1-12	72.40	IV	Skarn																		∘	∘		◎	○					∘	
S-38	MJ1-12	73.30	IV	Skarn																		∘			◎	∘					∘	
S-39	MJ1-12	81.30	V	Andesitic tuff			○						∘		∘			?		○	○		∘	∘?	∘							
S-40	MJ1-12	157.40	VII	Sandy tuff	∘	?	◎				∘	an ∘ da ∘	◎		○			?	∘	∘	∘		∘	∘	∘	∘				∘ ?		
S-41	MJ1-12	162.20	VII	Sandy tuff	○		∘			?	∘		◎		○		∘	?	○	∘	∘	∘	∘		○	∘		∘				slightly skarnized
S-42	MJ1-12	198.00	VII	slate	∘		∘				∘		∘		?				∘	◎	∘	∘				∘						
S-43	MJ1-14	25.50	BVR	basalt			○			○[1]	∘		∘		○			○[2]			∘					∘						
S-44	MJ1-14	69.40	And	Andesite			○			∘ ?	∘		∘		○			?			○	∘	○	∘	•							
S-45	MJ1-14	142.00	IV	Pebble slate	∘								○						○	○	∘	∘	?	○	○						∘	3) sphalerite
S-46	MJ1-14	184.70	VII	Tuff sandstone	○		○					an ? •	○		∘				∘	○	∘		∘	∘	∘							unsorting

1) common hornblend, common pyroxene
2) common pyroxene

Abbreviation

q: quartz
kf: kali feldspar
pl: plagioclase
bi: biotite
mu: muscovite
mf: mafic mineral
fe: iron mineral
am: amphibole
ca: calcite
cl: clay mineral
ch: chlorite
se: sericite
ep: epidote
cpx: clinopyroxene
ga: garnet
py: pyrite
su: sulpide mineral
pu: pumice
da: dacite
an: andesite
ba: basalt
ss: sandstone
ms: mudstone
Mylo: mylonite
QzDio: quartzdiorite

◎ abundant
○ common
∘ small amount
∘ rare

Table 3-2 Microscopic Observation of Ore Polished Specimen of Drilling Core

Sample No.	Hole No.	Depth (m)	Ore horizone	Ores	Ore Mineral								Gangue Mineral (Skarn)							Remarks
					cp	ga	sp	te	po	py	ma	others	q	ch	Se	ca	ep	g	am	
P-1	MJ1-6	38.70	I	cp-ga-sp-py	◦	◦	◦		•	◎										banded – massive ore
P-2	MJ1-6	62.50	I	cp-py-sp	◦		◎		•?	○			◦	◦		◎	○			banded (partly diss.)
P-3	MJ1-6	127.50	II-5	cp-ga-sp-py	◦	◦	◦		◦	◎			◦		•	○				massive ore
P-4	MJ1-6	165.50	II-6	cp-py-po	◦				◎	◎		asp •?								banded ore
P-5	MJ1-6	170.0	II-6	cp-po	◦				◎				•			◦	◎	○		banded ore
P-6	MJ1-6	172.50	II-6	cp-py-po	◦				○	○										veinlet – net-work ore
P-7	MJ1-6	173.50	II-6	po-cp-py	◦				◦	◎			◦			•	◎			massive-network ore
P-8	MJ1-7	77.20	I	po-cp-ga-asp-py-sp	•	•	◎		•	○		asp •								diss. ore (partly massive)
P-9	MJ1-7	131.75	II-3	cp-py-po	◦				◎	○										banded ore
P-10	MJ1-7	132.60	II-3	cp-py-po	◦				◎	◦	•?									diss. ore
P-11	MJ1-7	140.50	II-4	cp-ga-po-sp-py	•	◦	◎		○	◎										massive ore
P-12	MJ1-8	215.15	II-3	cp-py-sp-po	◦		○		◎	○	◦		○			•	◎			banded ore
P-13	MJ1-8	237.30	II-4	cp-po-py-sp	•		◎		•	○										massive ore (partly diss.)
P-14	MJ1-9	149.50	I	py-sp	•	•	◎		◦	○	◦									massive ore
P-15	MJ1-9	150.60	I	py-ga-po-sp		○	◎		○	○	◦	• 1)								massive ore
P-16	MJ1-9	151.00	I	ga-py-po-cp-sp	○	•	◎		○	◦										banded ore
P-17	MJ1-9	235.60	Vein	ga-cp-sp-py	•	•	○			◎										vein ore
P-18	MJ1-10	54.50	II-3	py	•	•	•			◎										diss. ore (low grade)
P-19	MJ1-10	190.00	III	py						○										diss. – banded ore
P-20	MJ1-11	184.00	II-3	py-sp-po	•		○		◎	○			◦			○	◎			banded ore
P-21	MJ1-11	185.50	II-3	cp-py-sp-po	•		◦		◎	◦										banded – massive ore
P-22	MJ1-11	186.50	II-3	cp-sp-po	◦		◦		◎	◦			◦			○	◎			massive – veinlet ore
P-23	MJ1-11	194.65	II-4	cp-py-po	◦				◎	○										massive – network ore
P-24	MJ1-11	195.30	II-4	cp-py-po	◦		○		◎	◦			○				◎			banded ore
P-25	MJ1-11	206.00	II-5	ga-sp-po-cp-py	◦	•	◦		◦	○		ag •?								banded ore
P-26	MJ1-12	49.80	I	cp-ga-sp	•	◦	◦													vein – diss ore
P-27	MJ1-12	72.50	I	cp-py-sp	◦		○	•	◦	○		• 1)	◦			◎	◦			banded ore
P-28	MJ1-12	75.80	I	ga-cp-py-sp	◦	◦	◎		•	○			◦			◎	◦			massive ore
P-29	MJ1-12	120.60	II-2	ga-sp-py	•	○	○			○	•									diss. ore
P-30	MJ1-12	130.30	II-4	cp-ga-sp-py-po	◦	◦	◦		◎	○		•1)								banded ore
P-31	MJ1-12	138.65	II-5	sp-py	•		•			◎		•1)								diss. ore
P-32	MJ1-12	140-50	II-5	cp-po-py	•				◦	◎										massive-diss. ore
P-33	MJ1-12	141.50	II-5	cp-py	•					◎										massive – diss. ore
P-34	MJ1-12	172.50	II-6	cp-py	•					◎										banded – diss. ore
p-35	MJ1-12	173.50	II-6	cp-py-po	◦				◎	○			◦	◦		○	◦		◦	banded – massive ore
P-36	MJ1-12	173.00	II-6	asp-cp-sp-po-py	◦		◦		○	◎		asp •								banded ore
P-37	MJ1-13	23.50	I'	cp-ga-py-sp	◦	◦	◎			○										diss. ore
P-38	MJ1-13	100.30	I	cp-po-sp	○		○		○											banded ore
P-39	MJ1-14	38.30	I'	cp-ga-py	◦	○				◎										massive (coarse) ore
P-40	MJ1-14	39.50	I'	po-p-sp-ga-py	•	○	○		•	◎		ag •?								slime ore
P-41	MJ1-14	141.80	I	cp-sp-ga-py	•	○	○		•	○										banded ore
P-42	MJ1-14	222.25	II-6	cp-po	○				◎											massive – network ore

1) unidentified mineral

Abbreviation

cp: chalcopyrite
ga: galena
sp: sphalerite
te: tetrahedrite
po: pyrrhotite

py: pyrite
ma: marcacite
q: quartz
ch: chlorite
se: sericite

ca: calcite
ep: epidote
g: garnet
am: amphibole
asp: arsenopyrite

ag: silver mineral

◎ abandant
○ common
◦ small amount
• rare

Table 3-3 Chemical Assay Result of Ore Samples of Drilling Core

Sample No.	Drill hole No.	Depth (m)	Core			Assay Result					Ore Zone	Remarks
			Width (m)	Core Rec. %	Dip	Au g/t	Ag g/t	Cu %	Pb %	Zn %		
	MJI-6											
1	6-1	38.60 ~ 38.90	30	100	–		6.2	0.05	0.89	0.77	I	*gal-sph-py diss ore with calcite vein and calcareous rock*
2	6-2	61.70 ~ 62.20	50	100	50	<0.10	18.7	0.08	2.31	2.96	I	gal-sph-py-pyrrh diss ore in weak green skarn
3	6-3	62.20 ~ 62.80	60	100	50		21.7	0.08	1.00	2.06	I	gal-sph-py-pyrrh diss ore in weak green skarn
	(Aver.)	(61.70 ~ 62.80)	(110)	(100)			20.3	0.08	1.60	2.47		
4	6-4	64.15 ~ 64.35	20	100	20		37.2	0.11	0.89	4.70	I	gal-sph-py-pynhdiss (cp veinlet)
5	6-5	77.80 ~ 78.30	50	100	10		5.6	0.02	0.22	0.35	II	banded py ore
6	6-6	98.15 ~ 98.65	50	100	15		7.4	0.03	0.17	0.34	II-1	network py veinlet in epd cal rock
7	6-7	98.65 ~ 98.95	30	100	30		9.3	0.04	0.44	0.74	II-1	network py veinlet in epd cal rock
	(Aver.)	(98.15 ~ 98.95)	(80)	(100)			8.1	0.03	0.27	0.49		
8	6-8	127.20 ~ 127.80	60	100	–		16.4	0.06	0.23	0.34	II-5	(gal-sph) py-pyrrh banded ore in green skarn
9	6-9	163.80 ~ 164.30	50	100	70		0.6	0.08	0.02	0.03	II-6	py-pyrrh banded ore in epd skarn
10	6-10	164.30 ~ 164.80	50	100	60		1.6	0.04	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
11	6-11	164.80 ~ 165.30	50	100	70		2.5	0.08	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
12	6-12	165.30 ~ 165.80	50	100	60	<0.01	1.9	0.11	<0.01	0.01	II-6	py-pyrrh banded ore in epd skarn
13	6-13	165.80 ~ 166.30	50	100	40		1.2	0.11	<0.01	0.01	II-6	py-pyrrh banded ore in epd skarn
14	6-14	166.30 ~ 166.85	55	100	20		1.9	0.16	<0.01	0.01	II-6	py-pyrrh banded ore in epd skarn
	(Aver.)	(163.80 ~ 166.85)	(305)	100			(1.6)	(0.10)	<0.01	(0.01)		
15	6-15	169.70 ~ 170.20	50	100	40		1.9	0.10	<0.01	<0.01	II-6	py-pyrrh massive-banded ore in epd skarn
16	6-16	170.20 ~ 170.70	50	100	45		0.6	0.12	<0.01	<0.01	II-6	py-pyrrh massive-banded ore in epd skarn
17	6-17	170.70 ~ 171.20	50	100	60		3.1	0.13	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
18	6-18	171.20 ~ 171.70	50	100	55		1.2	0.09	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
19	6-19	171.70 ~ 172.20	50	100	40		0.6	0.09	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
20	6-20	172.20 ~ 172.70	50	100	40		1.2	0.11	<0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
21	6-21	172.70 ~ 173.20	50	100	40	<0.10	1.2	0.08	<0.01	0.06	II-6	py-pyrrh banded ore in epd skarn
22	6-22	173.20 ~ 173.70	50	100	40		0.6	0.16	<0.01	0.01	II-6	pyrrh-py banded ore in epd skarn
23	6-23	173.70 ~ 174.20	50	100	50		0.9	0.13	<0.01	0.01	II-6	py rich banded ore in epd skarn
24	6-24	174.20 ~ 174.70	50	100	–		1.2	0.15	<0.01	0.01	II-6	py rich banded ore in epd skarn
25	6-25	174.70 ~ 175.20	50	100	30	<0.01	1.2	0.13	<0.01	0.01	II-6	py rich banded ore in epd skarn
26	6-26	175.20 ~ 175.70	50	100	45		(2.5)	(0.11)	(<0.01)	0.02	II-6	py rich banded ore in epd skarn
	(Aver.)	169.70 ~ 175.70	(600)	100			(1.4)	(0.12)	<0.01	(0.02)		
	MJI-7											
27	7-1	77.10 ~ 77.30	20	100	50	0.23	1.9	0.03	0.11	3.65	I	sph-py veinlet in epd skarn
28	7-2	131.50 ~ 132.00	50	100	50		1.9	0.05	<0.01	0.04	II-3	py-pyrrh banded ore in epd skarn
29	7-3	132.45 ~ 132.85	40	100	35		1.9	0.05	<0.01	0.21	II-3	py-pyrrh banded ore in epd skarn
30	7-4	140.05 ~ 140.70	65	100	40	<0.10	3.1	0.05	0.14	0.24	II-4	gal-sph-py diss and banded ore in epd skarn
31	7-5	88.70 ~ 88.80	10	100	30		28.0	0.01	1.42	1.44	I	gal-sph-py veinlet in epd skarn

Sample No.	Drill hole No.	Depth (m)	Core			Assay Result					Ore Zone	Remarks
			Width (m)	Core Rec. %	Dip	Au g/t	Ag g/t	Cu %	Pb %	Zn %		
	MJI-8											
32	8-1	215.05 ~ 215.30	25	100	35		1.9	0.01	0.01	0.24	II-3	(gal-sph)-py banded ore in epd skarn
33	8-2	237.20 ~ 237.40	20	100	15		1.9	<0.01	0.01	1.22	II-4	(gal-sph)-py banded ore in epd skarn
	MJI-9											
34	9-1	149.40 ~ 149.60	20	100			7.0	0.10	0.04	12.30	I	sph-(py) veinlet in epd skarn
35	9-2	150.40 ~ 150.90	50	100	30		193	0.63	2.03	6.52	I	cp-gal-sph banded ore in green-cal skarn
36	9-3	150.90 ~ 151.40	50	100	90	<0.1	136.0	1.00	1.34	8.52	I	cp-gal-sph banded ore in green-cal skarn
	(Aver.)	150.40 ~ 151.40	(100)	100			(164.6)	(0.82)	(1.69)	(7.52)		
37	9-4	191.50 ~ 192.05	55	100	30		1.7	0.02	0.02	0.04	II-3	pyrrh banded ore in epd skarn (sph, gal)
38	9-5	235.60 ~ 235.65	5	100	80		6.5	0.03	0.10	0.90	Vein	py-sph-pyrrh ore (vein)
	MJI-10											
39	10-1	54.30 ~ 54.75	45	100			14.7	0.02	0.11	0.14	II-3	massive and diss py ore in epd skarn
40	10-2	189.80 ~ 190.40	60	100			0.5	<0.01	0.01	0.03	III	massive and diss py ore in qtz rich ore
	MJI-11											
41	11-1	184.00 ~ 184.10	10	100	10	<0.1	12.5	0.07	0.11	1.39	II-3	sph-pyrrh banded ore in epd skarn
42	11-2	185.20 ~ 185.70	50	100	15		0.9	0.05	0.01	0.35	II-3	(sph) pyrrh banded ore in epd skarn
43	11-3	185.70 ~ 186.20	50	100	15		0.9	0.04	0.01	0.33	II-3	(sph) pyrrh banded ore in epd skarn
44	11-4	186.20 ~ 186.70	50	100	20		0.4	0.02	<0.01	0.02	II-3	pyrrh banded ore in epd skarn
	(Aver.)	185.20 ~ 186.70	150				(0.7)	(0.04)	(<0.01)	(0.23)		
45	11-5	192.55 ~ 192.95	50	100	30		1.9	0.05	0.01	0.05	II-4	pyrrh banded ore in epd skarn
46	11-6	194.60 ~ 194.75	15	100	20		1.2	0.08	<0.01	0.06	II-4	pyrrh banded ore in epd skarn
47	11-7	195.15 ~ 195.40	25	100	20	<0.1	0.9	0.05	<0.01	6.94	II-4	sph-pyrrh banded ore in epd skarn
48	11-8	195.70 ~ 195.80	10	100	40		1.1	0.05	0.01	0.02	II-4	pyrrh banded ore in epd skarn
49	11-9	203.70 ~ 204.00	30	100	10		0.9	0.04	<0.01	0.06	II-5	pyrrh banded ore in epd skarn
50	11-10	205.35 ~ 205.85	50	100	10		5.8	0.04	0.05	0.14	II-5	pyrrh banded ore in epd skarn
51	11-11	205.85 ~ 206.35	50	100	10		3.2	0.04	0.03	0.04	II-5	pyrrh banded ore in epd skarn
52	11-12	206.35 ~ 206.55	20	100	10		4.0	0.05	0.04	0.11	II-5	pyrrh banded ore in epd skarn
	(Aver.)	205.35 ~ 206.55	(120)				(4.4)	(0.04)	(0.04)	(0.09)		
53	11-13	207.50 ~ 208.00	50	100	10		1.5	0.03	0.04	0.05	II-5	pyrrh banded ore in epd skarn
54	11-14	208.00 ~ 208.60	60	100	10		0.8	0.02	0.01	0.01	II-5	pyrrh banded ore in epd skarn
	(Aver.)	207.50 ~ 208.60	(110)				(1.1)	(0.03)	(0.02)	(0.03)		
55	11-15	209.90 ~ 210.30	40	100	20		0.7	0.03	<0.01	0.01	II-5	pyrrh-py banded ore in epd skarn
	MJI-12											
56	12-1	49.60 ~ 49.90	30	100			34.0	0.13	3.02	3.97	I	py-gal-sph veinlet in epd skarn
57	12-2	51.60 ~ 51.80	20	100			20.0	0.06	0.90	1.43	I	sph diss in epd skarn
58	12-3	52.10 ~ 52.60	50	100			27.0	0.09	1.20	2.22	I	sph diss in epd skarn
59	12-4	72.30 ~ 72.80	50	100	55		1.8	0.04	0.01	0.95	I	sph diss in green skarn
60	12-5	72.80 ~ 73.30	50	100	45		0.6	0.01	<0.01	0.10	I	sph diss in green skarn
	(Aver.)	72.30 ~ 73.30	(100)				(1.2)	(0.04)	(<0.01)	(0.53)		

Sample No.	Drill hole No.	Depth (m)	Core			Assay Result					Ore Zone	Remarks
			Width (m)	Core Rec. %	Dip	Au g/t	Ag g/t	Cu %	Pb %	Zn %		
61	12-6	75.10 ~ 75.60	50	100	50	0.1	19.8	0.31	0.03	7.68	I	cp-gal-sph banded ore in green skarn
62	12-7	75.60 ~ 76.10	50	100	50		28.0	0.65	0.02	7.44	I	cp-gal-sph banded ore in green skarn
	(Aver.)	75.10 ~ 76.10	(100)				(23.9)	(0.48)	(0.03)	(7.56)		
63	12-8	108.35 ~ 108.75	40	100	30		4.0	0.04	0.20	0.58	II-1	(gal-sph) pyrrh banded ore in epd skarn
64	12-9	120.50 ~ 120.85	35	100	10	0.10	11.4	0.03	0.96	0.78	II-2	sph-gal-pyrrh banded ore in green skarn
65	12-10	126.85 ~ 127.25	40	100	10	<0.10	2.6	0.08	0.01	0.12	II-3	(sph)-pyrrh-py ore in epd skarn
66	12-11	130.05 ~ 130.55	50	100	10		1.7	0.03	0.07	0.17	II-4	(gal-sph) pyrrh ore in epd skarn
67	12-12	136.30 ~ 136.80	50	100	10		0.9	0.03	<0.01	0.01	II-5	(sph) Syrrn ore in epd skarn
68	12-13	138.60 ~ 138.75	15	100	–		0.7	0.01	0.02	0.03	II-5	py diss in epd skarn
69	12-14	139.20 ~ 139.70	50	100	–		0.5	0.01	<0.01	0.01	II-5	(pyrrh)-py diss in epd skarn
70	12-15	139.70 ~ 140.20	50	100	–		1.3	0.05	<0.01	0.01	II-5	py diss and veinlet in epd skarn
71	12-16	140.20 ~ 140.70	50	100	–		1.6	0.05	<0.01	0.01	II-5	py-pyrrh ore in epd skarn
72	12-17	140.70 ~ 140.90	20	100	–		1.2	0.01	0.01	0.03	II-5	py-(pyrrh) diss in epd skarn
	(Aver.)	(139.20 ~ 140.90)	170	100	–		(1.1)	(0.03)	(<0.01)	(0.01)		
73	12-18	141.35 ~ 141.85	50	100	)		2.7	0.02	0.02	0.03	II-5	py-(pyrrh) diss in epd skarn
74	12-19	141.85 ~ 142.35	50	100	–		3.4	0.04	0.01	0.06	II-5	py-(pyrrh) diss in epd skarn
75	12-20	142.35 ~ 142.85	50	100	–		3.3	0.05	0.01	0.02	II-5	py-(pyrrh) diss in epd skarn
76	12-21	142.85 ~ 143.00	15	100	–		3.0	0.02	0.02	0.03	II-5	py-(pyrrh) banded ore in epd skarn
	(Aver.)	(141.35 ~ 143.00)	(165)				(3.1)	(0.04)	(0.01)	(0.04)	II-5	
76	12-22	143.50 ~ 144.00	50	100	20		2.8	0.01	0.02	0.04	II-5	py-(pyrrh) banded ore in epd skarn
78	12-23	144.00 ~ 144.50	50	100	20		3.7	0.01	0.02	0.02	II-5	py-(pyrrh) banded ore in epd skarn
79	12-24	144.50 ~ 145.00	50	100	20		10.0	0.08	0.17	0.47	II-5	py-(pyrrh) banded ore in epd skarn (sph)
	(Aver.)	(143.50 ~ 145.00)	150				(5.5)	(0.03)	(0.07)	(0.18)		
80	12-25	172.35 ~ 172.85	50	100	20		1.2	0.08	<0.01	<0.01	II-6	py-(pyrrh) banded ore in epd skarn
81	12-26	172.85 ~ 173.35	50	100	30		1.4	0.19	<0.01	0.01	II-6	py-(pyrrh) massive, banded ore in epd skarn
82	12-27	173.35 ~ 173.85	50	100	30		1.0	0.17	<0.01	<0.01	II-6	py-(pyrrh) massive, banded ore in epd skarn
83	12-28	173.85 ~ 174.35	50	100	30		0.8	0.12	<0.01	<0.01	II-6	py-(pyrrh) massive, banded ore in epd skarn
84	12-29	174.35 ~ 174.85	50	100	30		1.2	0.18	<0.01	0.01	II-6	py-(pyrrh) massive, banded ore in epd skarn
85	12-30	174.85 ~ 175.35	50	100	30		2.0	0.14	<0.01	0.01	II-6	py-(pyrrh) massive, banded ore in epd skarn
86	12-31	175.35 ~ 175.65	30	100	30		0.8	0.07	<0.01	<0.01	II-6	py rich diss ore in epd skarn
	(Aver.)	(172.35 ~ 175.65)	(330)				1.2	0.14	<0.01	<0.01		py rich diss ore in epd skarn
	MJI-13											
87	13-1	23.10 ~ 23.65	55	82	20		215.0	1.56	1.28	9.93	New	py-(gal-cp)-sph ore in calcareous sh
88	13-2	23.65 ~ 24.20	55	100	20	0.41	175.0	0.93	1.34	9.76	New	py-(gal-cp)-sph ore in calcareous sh
	(Aver.)	(23.10 ~ 24.20)					(195.0)	(1.25)	(1.31)	(9.85)		
89	13-3	66.80 ~ 67.00	20	100	–	–	8.5	0.25	0.02	0.11	I	py massive ore in calcareous sh
90	13-4	86.30 ~ 86.75	45	100	–	0.41	94.0	1.07	0.39	2.70	I	cp-sph veinlet and diss ore
91	13-5	95.10 ~ 95.30	20	100	–		15.5	0.16	0.06	0.65	I	py-pyrrh banded ore in epd cal skarn

Sample No.	Drill hole No.	Depth (m)	Core			Assay Result					Ore Zone	Remarks
			Width (m)	Core Rec. %	Dip	Au g/t	Ag g/t	Cu %	Pb %	Zn %		
92	13-6	96.35 ~ 96.85	50	100	45	–	10.0	0.06	0.04	0.72	I	py-py banded ore in sil sh
93	13-7	96.85 ~ 97.20	35	100	15		5.0	0.03	<0.01	0.63	I	(pyrrh)-Py-sph ore in green skarn
	(Aver.)	(96.35 ~ 97.20)	85				(7.5)	0.05	0.02	0.68		
94	13-8	100.10 ~ 100.45	35	100	15	<0.10	28.0	0.68	<0.01	1.74	I	(cp) Sph-pyrrh ore in (epd) calcareous rock
95	13-9	102.20 ~ 102.40	20	100	30		3.3	0.06	<0.01	0.08	I	sph-py veinlets in green skarn
96	13-10	114.10 ~ 114.40	30	100	30		3.9	0.13	<0.01	0.17	II-1	(py) Pyrrh banded ore in epd skarn
97	13-11	184.60 ~ 184.70	10	100	20	<0.01	2.8	0.12	<0.01	0.01		py massive ore
98	13-12	195.40 ~ 195.90	50	100	20		2.8	0.07	<0.01	0.01	II-6	(py) pyrrh banded ore
99	13-13	195.90 ~ 196.40	50	100	20	<0.10	3.9	0.08	0.01	0.02	II-6	(py) pyrrh banded ore
100	13-14	196.40 ~ 196.70	30	100	20		3.9	0.09	0.01	0.01	II-6	(py) pyrrh banded ore
	(Aver.)	(195.40 ~ 196.70)	(130)				(3.5)	(0.08)	(<0.01)	(0.01)		
	MJI-14											
101	14-1	36.40 ~ 36.45	5	100			92.0	0.24	5.51	1.26	New	fault drag ore, gal sph py massive ore
102	14-2	38.30 ~ 38.50	20	100		1.63	94.0	0.90	6.48	3.84	New	fault drag ore, gal sph py massive ore
103	14-3	39.10 ~ 39.80	70	Slime			32.0	0.11	2.24	1.30	New	fault drag ore, gal sph py massive ore (slime)
104	14-4	141.65 ~ 142.00	35	100	50		11.0	0.05	1.45	1.58	I	py sph gal diss in calcareous shale
105	14-5	142.00 ~ 142.35	35	100	50	<0.1	13.0	0.02	1.72	1.35	I	py sph gal diss in calcareous shale
	(Aver.)	(141.65 ~ 142.35)	(70)				(12.0)	(0.04)	(1.59)	(1.47)		
106	14-6	192.10 ~ 192.1	5	100		1.51	450.0	2.15	11.70	6.10	Vein?	gal-sph-py ore (vein)
107	14-7	215.50 ~ 216.00	50	100	40		5.5	0.11	0.06	0.04	II-6	(pyrrh) Py massive ore in (epd) cal rock
108	14-8	216.00 ~ 216.50	50	100			3.9	0.06	0.05	0.04	II-6	py imp in epd skarn
109	14-9	216.50 ~ 217.00	50	100	35		3.9	0.14	0.01	0.01	II-6	pyrrh massive ore in epd skarn
110	14-10	217.00 ~ 217.50	50	100	30		4.4	0.10	0.01	0.01	II-6	pyrrh massive-banded ore in epd skarn
111	14-11	217.50 ~ 218.00	50	100	40		6.5	0.04	0.09	0.11	II-6	pyrrh-py diss in epd skarn
112	14-12	218.00 ~ 218.50	50	100	30	<0.01	3.3	0.13	<0.01	0.01	II-6	pyrrh massive ore in epd skarn
113	14-13	218.50 ~ 219.00	50	100	40		2.8	0.16	0.04	0.04	II-6	pyrrh massive ore in epd skarn
114	14-14	219.00 ~ 219.50	50	100	30		3.9	0.09	<0.01	0.01	II-6	pyrrh massive ore in epd skarn
115	14-15	219.50 ~ 220.00	50	100			3.3	0.07	0.01	0.03	II-6	pyrrh massive ore in epd skarn
116	14-16	220.00 ~ 220.50	50	100	30		3.3	0.06	0.01	<0.01	II-6	py-pyrrh banded ore in epd skarn
117	14-17	220.50 ~ 221.00	50	100			5.0	0.16	0.01	0.02	II-6	py-pyrrh banded ore in epd skarn
118	14-18	221.00 ~ 221.50	50	100	10		3.9	0.13	<0.01	<0.01	II-6	py-pyrrh massive-banded ore in epd skarn
119	14-19	221.50 ~ 222.00	50	100	30		4.4	0.16	<0.01	<0.01	II-6	py-pyrrh massive-banded ore in epd skarn
120	14-20	222.00 ~ 222.50	50	100		<0.10	3.9	0.14	<0.01	<0.01	II-6	(cp) Py-pyrrh massive-banded ore in epd skarn
121	14-21	222.50 ~ 223.00	50	100	30		3.9	0.15	<0.01	0.01	II-6	(cp) Py-pyrrh massive-banded ore in epd skarn
122	14-22	223.00 ~ 223.50	50	100	30		5.0	0.18	<0.01	0.01	II-6	(cp) Py-pyrrh massive-banded ore in epd skarn
123	14-23	223.50 ~ 224.00	50	100	30		5.5	0.11	0.01	0.01	II-6	pymrh-py banded ore in epd skarn
124	14-24	224.00 ~ 224.50	50	100	20		6.0	0.12	0.01	<0.01	II-6	py diss ore in epd skarn
	(Aver.)	(215.50 ~ 224.50)	900				(4.4)	(0.12)	(0.02)	(0.01)		

Table 3-4 Chemical Assay Summary on each individual Mineralization Zone

Drilling Number		Depth (m)	Assay Result						Core recovery %	Remarks
			Wd cm	Au g/t	Ag g/t	Cu %	Pb %	Zn %		
Mineralized Zone I'										
	MJI-13	23.10 ~ 24.20	110	0.41	195	1.25	1.31	9.85	100	py-gal-cp sph ore in calcareous shale
	MJI-14	36.40 ~ 36.45	5		92	0.24	5.51	1.26	100	drag ore of cp-gal-sph-py in thrust fault
		38.30 ~ 38.50	20	1.63	94	0.90	6.48	3.84	100	ditto
		39.10 ~ 39.80	70		32	0.11	2.24	1.30	(slime)	py-gal-sph-(cp) ore in fault
Mineralized Zone I										
	MJI-3	53.70 ~ 54.30	60	<0.1	62.0	0.14	3.44	1.29	50	gal-sph-cp ore in shear zone
		59.50 ~ 60.00	50	<0.1	34.0	0.29	0.90	0.85	92	ditto
	MJI-4	116.50 ~ 118.40	190	<0.1	4.5	0.93	0.71	1.50	68	gal-sph-cp massive ore in shear zone
		122.00 ~ 122.60	60	<0.1	42.0	0.30	2.50	4.48	100	ditto
		123.90 ~ 124.80	90	<0.1	47.0	0.21	0.80	1.53	78	ditto
	MJI-5	190.40 ~ 192.60	220	<0.1	27.7	0.28	0.17	3.73	95	ga-sph-cp banded, diss ore in calcarcous shale
	MJI-6	38.60 ~ 38.90	30		6.2	0.05	0.89	0.77	100	gal-sph-py diss with calcite vein-let. (calcareous shale)
		61.70 ~ 62.80	110		20.3	0.08	1.60	2.47	100	gal-sph-pyrrh-py diss in weak skarn zone
		64.15 ~ 64.35	20		37.2	0.11	0.89	4.70	100	gal-sph-pyrrh diss (cp veinlet)
	MJI-7	77.10 ~ 77.30	20	0.23	1.9	0.03	0.11	3.65	100	sph-py veinlets in epidote skarn
		88.70 ~ 88.80	10		28.0	0.01	1.42	1.44	100	ditto
	MJI-9	149.40 ~ 149.60	20		7.0	0.10	0.04	12.30	100	sph veinlet in green skarn
		150.40 ~ 151.40	100		164.6	0.82	1.69	7.52	100	cp-gal-sph bended ore in green cal skarn
	MJI-12	49.60 ~ 49.90	30		34.0	0.13	3.02	3.97	100	py-sph veinlet in epidote skarn
		51.60 ~ 51.80	20		20.0	0.06	0.90	1.43	100	gal-sph-diss in epidote skarn
		52.10 ~ 52.60	50		27.0	0.09	1.20	2.22	100	gal-sph diss in epidote skarn
		72.30 ~ 73.30	100		1.2	0.04	<0.01	0.53	100	sph diss in green skarn
		75.10 ~ 76.10	100		23.9	0.48	0.03	7.56	100	(gal)-cp-sph bended ore in green skarn
	MJI-13	66.80 ~ 67.00	20		8.5	0.25	0.02	0.11	100	py massive ore in calcareous shale
		86.30 ~ 86.75	45	0.41	94.0	1.07	0.39	2.70	100	cp-sph veinlet and diss in calcareous sh
		95.10 ~ 95.30	20		15.5	0.16	0.06	0.65	100	py-pyrrh-sph banded ore in green skarn
		96.35 ~ 97.20	85		7.5	0.05	0.02	0.68	100	py-pyrrh banded ore in sil shale
		100.10 ~ 100.45	35	<0.1	28.0	0.68	<0.01	1.74	100	cp-sph ore in (epd) calcareous
		102.20 ~ 102.40	20		3.3	0.06	<0.01	0.08	100	sph-py veinlets in green skarn
	MJI-14	141.65 ~ 142.35	70		12.0	0.04	1.59	1.47	100	py-gal-sph diss in calcareous shale
Mineralized Zone II										
II-1	MJI-6	77.80 ~ 78.30	50		5.6	0.02	0.22	0.35	100	banded py ore
		98.15 ~ 98.95	80		8.1	0.03	0.27	0.49	100	network of py-(gal-sph) veinlet in epido te sharn
	MJI-12	108.35 ~ 108.75	40		4.0	0.04	0.20	0.58	100	(gal-sph)-pyrrh banded ore in epidote skarn
	MJI-13	114.10 ~ 114.40	30		3.9	0.13	<0.01	0.17	100	pyrrh-py banded ore in epidote skarn
II-2	MJI-5	241.40 ~ 242.20	80	<0.1	13.0	0.05	0.60	2.03	100	gal-sph-
	MJI-12	120.50 ~ 120.85	35	0.10	11.4	0.03	0.96	0.78	100	gal-sph-pyrrh banded ore in green skarn
II-3	MJI-7	131.50 ~ 132.00	50		1.9	0.05	<0.01	0.04	100	py-pyrrh banded ore in epidote skarn
		132.45 ~ 132.85	40		1.9	0.05	<0.01	0.21	100	py-pyrrh banded ore in epidote skarn
	MJI-8	215.05 ~ 215.30	25		1.9	0.01	0.01	0.24	100	(gal-sph)-py banded ore in epidote skarn
	MJI-9	191.50 ~ 192.05	55		1.7	0.02	0.02	0.04	100	pyrrh-banded ore in epidote skarn
	MJI-10	54.30 ~ 54.75	45		14.7	0.02	0.11	0.14	100	massive-diss py ore in epidote skarn
	MJI-11	184.00 ~ 184.10	10	<0.1	12.5	0.07	0.11	1.39	100	sph-pyrrh banded ore in epidote skarn
		185.20 ~ 186.70	150		0.7	0.04	<0.01	0.23	100	(sph)-pyrrt banded ore in epidote skarn
	MJI-12	126.85 ~ 127.25	40	<0.1	2.6	0.08	0.01	0.12	100	(sph)-pytth-py ore in epidote skarn
II-4	MJI-7	140.05 ~ 140.70	65	<0.1	3.1	0.05	0.14	0.24	100	py-pyrrh banded ore in epidote skarn
	MJI-8	237.20 ~ 237.40	20		1.9	<0.01	0.01	1.22	100	(sph)-py-banded ore in epidote skarn
	MJI-11	192.55 ~ 192.95	40		1.9	0.05	0.01	0.05	100	pyrrh banded ore in epidote skarn
		194.60 ~ 194.75	15		1.2	0.08	<0.01	0.06	100	pyrrh banded ore in epidote skarn
		195.15 ~ 195.40	25	<0.1	0.9	0.05	<0.01	6.94	100	sph-pyrrh banded ore in epidote skarn
		195.70 ~ 195.80	10		1.1	0.05	0.01	0.02	100	pyrrh banded ore in epidote skarn
	MJI-12	130.05 ~ 130.55	50		1.7	0.03	0.07	0.17	100	(gal-sph) pyrrh ore in epidote skarn
II-5	MJI-6	127.20 ~ 127.80	60		16.4	0.06	0.23	0.34	100	(gal-sph) py-pyrrh banded ore in green skarn
	MJI-11	203.70 ~ 204.00	30		0.9	0.04	<0.01	0.06	100	pyrrh banded ore in epidote skarn
		205.35 ~ 206.55	120		4.4	0.04	0.04	0.09	100	pyrrh banded ore in epidote skarn
		207.50 ~ 208.60	110		1.1	0.03	0.02	0.03	100	pyrrh banded ore in epidote skarn
		209.90 ~ 210.30	40		0.7	0.03	<0.01	0.01	100	pyrrh-py banded ore in epidote skarn
	MJI-12	136.30 ~ 136.80	50		0.9	0.03	<0.01	0.01	100	pyrrh-py banded ore in (garnet) epidote skarn
		138.60 ~ 138.75	15		0.7	0.01	0.02	0.03	100	py diss in epidote skarn
		139.20 ~ 140.90	170		1.1	0.03	<0.01	0.01	100	(pyrrh)-py diss in epidote skarn
		141.35 ~ 143.00	165		3.1	0.04	0.01	0 04	100	(pyrrh)-py diss in epidote skarn
		143.50 ~ 145.00	150		5.5	0.03	0.07	0.18	100	(sph)-py-(pyrrh) bended ore in epidote skarn
II-6	MJI-6	163.80 ~ 166.85	305		1.6	0.10	<0.01	0.01	100	pyrrh-py massive ~ banded ore in epidote skarn
		169.70 ~ 175.70	600		1.4	0.12	<0.01	0.02	100	py-pyrrh massive ~ banded ore in epidote skarn
	MJI-12	172.35 ~ 175.65	330		1.2	0.14	<0.01	<0.01	100	py-pyrrh massive ~ banded ore in epidote skarn
	MJI-13	195.40 ~ 196.70	130		3.5	0.08	<0.01	0.01	100	py-pyrrh massive ~ banded ore in epidote skarn
	MJI-14	215.50 ~ 224.50	900	<0.1	4.4	0.12	0.02	0.01	100	py-pyrrh massive ~ banded ore in epidote skarn
Mineralized Zone III										
	MJI-10	189.80 ~ 190.40	60		0.5	<0.01	0.01	0.03	100	massive ~ diss py ore (sericitization)
Vein	MJI-9	235.60 ~ 235.65	5		6.5	0.03	0.10	0.90	100	sph-py-pyrrh ore
	MJI-14	192.10 ~ 192.15	5	1.51	450.0	2.15	11.70	6.10	100	cp-gal-sph ore (very coarse grain)

(Note, gal: galena Sph: sphalerite cp: chalcopyrite Pyrrh: Pyrrhotite
py: pyrite diss: dissemination

CHAPTER 4 INTERPRETATION OF THE DRILLING RESULTS

4-1 Outline of Geology

The Patahajang Formation, distributed at the Pagar Gunung-Patahajang Area, is divided into seven Members as shown in Fig. 4-2 through a geological survey carried out in the second phase.

The Pagar Gunung Area of drilling survey consists of Sedimentary rock and Pyroclastic rock Member (previsouly called Alternate Member of clastic rock and volcanic rock) and Basic volcanic Member. (Fig. 4-1, Fig. 4-4)

The drilling survey performed in the second and third phases revealed that these Members consist of several facieses in detail, and are classified as Sedimentary Rock and Pyroclastic Rock Member into seven rock facieses as shown in Table 4-1 and Fig. 4-3.

Table 4-1 Rock Facies Classification of Sedimentary Rock and Pyroclastic Rock Member in Pagar Gunung Area

Basic Volcanic Rock Member		
Lower Limestone Member		(Thrust Fault)
Sedimentary Rock and Pyroclastic Rock Member		
Shale-Calcareous Shale Facies	(I)	(MZ I') Argillaceous Rock Predominance Facies
Sandstone-shale Facies	(II)	
Shale-Tuff Facies	(II)	
Calcareous Rock-Shale Facies	(IV)	(MZI)
Siliceous Rock-Tuff Facies	(V)	Siliceous Rock and Pyroclastic Predominance Facies (MZII)
Banded Shale (slate) Facies	(VI)	
Siliceous Rock-slate-Tuff Facies	(VII)	
		(MZII)

(MZ): Mineralized zone

The Sedimentary Rock and Volcanic Rock Member can be divided into two groups by the characteristics of these rock facies, namely Argiraceous Rock Predominance Facies and Siliceous Rock-Pyroclastic Rock Predominance Facies. The former is grouped at the upper part of the Calcareous Rock-Shale Facies (IV), and the latter is grouned at the lower part of the Siliceous-Tuff Facies (V). Mineralized Zones, found by a drilling survey, are also four zones based on the relationship of the emplacement position and facies classification, namely Mineralized Zone I', Nineralized Zone I, Mineralized Zone II, and Mineralized Zone III. The relation is shown in Table 4-1 and Fig. 4-5.

4-2 Stratigraphy

4-2-1 Basic Volcanic Rock Member

The rock is massive green rock, and pyroxene phenocryst is recognizable, Chlorite and some quartz lie in a ground mass of common pyroxene, plagioclase. Basaltic tuff having basaltic fragment and pumice, andesitic rock are recognised. They are members of the basic volcanic rock distributed extensively at the top of the Pagar Gunung Mountain. Shear zone (fault caly part usually exists at the boundary of the Basic Volcanic Rock Member and Sedimentary Rock and Pyroclastic Rock Member and it is infrered that the both Member made contact along the thrust fault.

Shale and siliceous shale (slate) intercalating in Basic Volcanic rock have usually a kink band texture (refer to MJI-5, MJI-8 and MJI-9).

4-2-2 Sedimentary Rock and Pyroclastic Rock Member

I Shale-Calcareous Shale Facies

The stratum consists of calcareous shale, black shale and limestone. MJI-13 drilling cut the stratum about 45 m, and most characteristic rock facies of the stratum is pebble shale accompanied with flat calcareous pebble or nodule. Mineralized zone I' consisting of lead and zinc minerals is embaded in the calcareous pebble shale. In the thrust fault between Basic Volcanic Rock Member and the stratum, there are many drag ores of Mineralized Zone I' in MJI-14.

II Sandstone-Shale Facies

Sandstone is arkose or graywacke having a very clear grade bedding. The sandstone shows a sedimentary cycle with an intercalation of black shale and siliceous shale.

III Shale-Tuff Facies

Dacitic tuff and shale are the main constitutional bed. Andesitic tuff, containing chlorite and epidotc, is often intercalated.

IV Calcareous Rock-Shale Facies

The stratum consists mainly of calcareous shale, calcareous sandstone and limestone, intercalated with dacitic tuff. At the bottom of the stratum, tuff breccia containing calcareous rock and dacitic rock breccia or sub-breccia, and calcareous pebble shale is usually distributed. Among calcareous shale, pebble shale containing flat calcareous pebbles or nodules in found extensively, and it is very favourable for host rock of mineralized zone I. Namely, the rich ore found by MJI-9, MJI-12 are embeded in the rock. The ore is made up of banded galena-sphalerite with epidote and clinopyroxene skarn replacing the calcareous pebbles or nodules in the shale.

The stratum becomes thick in its thickness toward the east. Namely the stratum is 30 m – 40 m in thickness at the east extention part (MJI-6, 11 and 12 drill holes), while the west extention is only 5 m or so. The thickness may be reflects a mineralization condition, namely the east part is better than the western part.

V Siliceous Rock-Tuff Facies

The facies consist of fine siliceous rock (siliceous shale) and dacitif tuff. Lapilli tuff is sometimes accompanied by tuff. Shale is semi-schist and tuff became catacrasite-like-rock, having a weak schistosity and catacrstic cleavage.

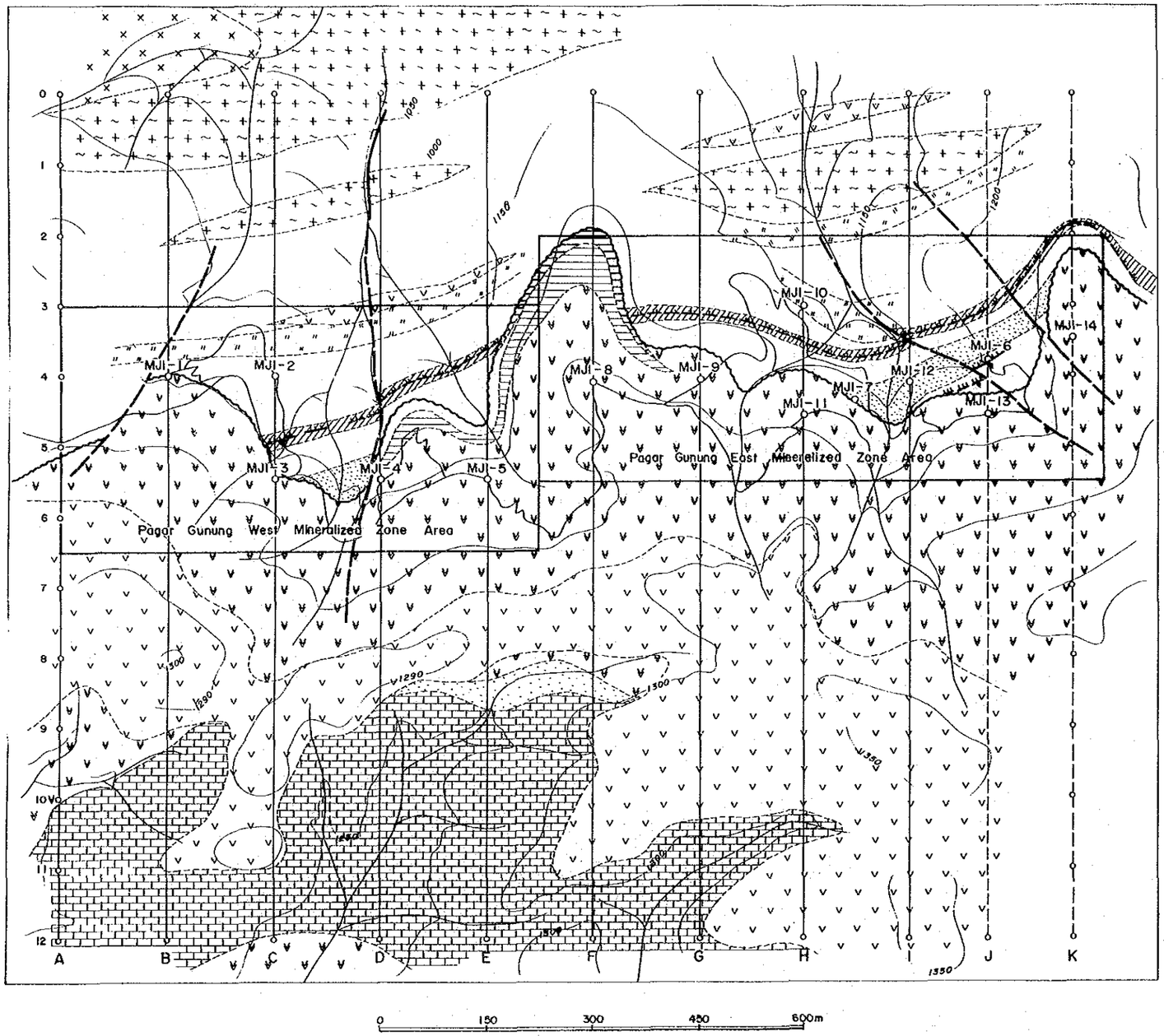
VI Banded Shale Facies

The rock has alternations with thin layers of sand-silt and mud, and mostly became semi-schist having weak schistosity. The average thickness of the banded shale is 10 m, but *its distribution is very continuous, therefore, the rock* can be used for a kie bed. Most ores of the mineralized zone II are embeded below the shale.

VII Siliceous Rock and Tuff Facies

Siliceous slate, slate, dacitif tuff (including dacitic lapilli tuff and dacitic sandy tuff) are main rocks of the facies. Andestic tuff is often intercalated with them. These rocks have schistosity or catacrastic cleavage, semischist or catacrasite like rock respectively.

Siliceous slate is accompanied by calcareous slate, sandstone, and the calcareous rocks have undergone skarnization. The skarn consists of epidote, calcite and garnet, and banded



Geological Age & Unit		Sedimentary Rock & Volcanic Rock	Intrusive Rock
Tertiary Mesozoic		V V	V V V
Jurassic Triassic			× × × Tonalite + ~ + Granodiorite
Paleozoic Permian Carboniferous (Potohajang Formation)	Upper Limeston Member (VII)	shale, sandstone Limestone sandstone	
	Basic Volcanic Rock Member (VI)	V V Basic Volcanic Rock sandstone, shale	
	Lower Limestone Member (V) Andesite Member (IV)	Limestone	
	Sedimentary Rock & Pyroclastic Rock Member (III)	Docite tuff Andesite tuff Limestone Sandstone & shale	V V V Andesite

SIP Survey

Outcrop (Ore)

Infered Ore Zone

Drill Hole

Fault

Thrust fault

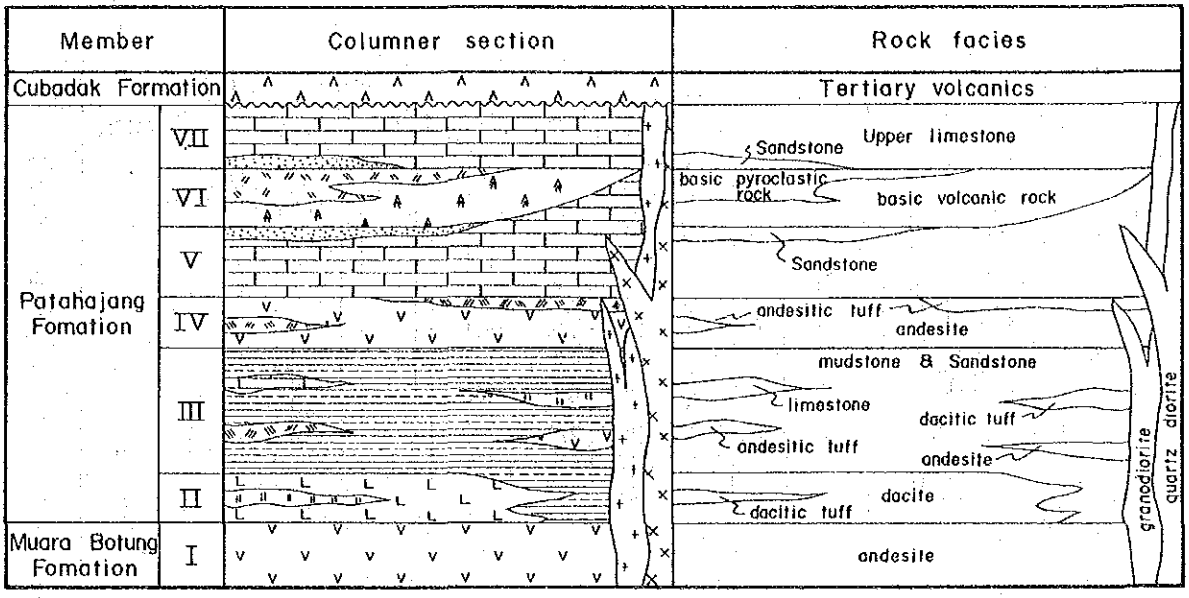
Pagar Gunung West Mineralized Zone

I	Adit 1
2	Adit 2
3	Adit 3
6	Adit 6

Pagar Gunung East Mineralized Zone

A	Outcrop A
B	Outcrop B

Fig. 4-1 Geological Map of Pagar Gunung Area



Patahajang Formation	VII	Upper Limestone Member
	VI	Basic Volcanic Rock Member
	V	Lower Limestone Member
	IV	Andesite Member
	III	Sedimentary Rock and Pyrocrastic Rock Member
	II	Dacite Member
M. Botung Formation	I	Andesite Member

Fig. 4-2 Generalized Stratigraphy in Pagar Gunung-Patahajang Area

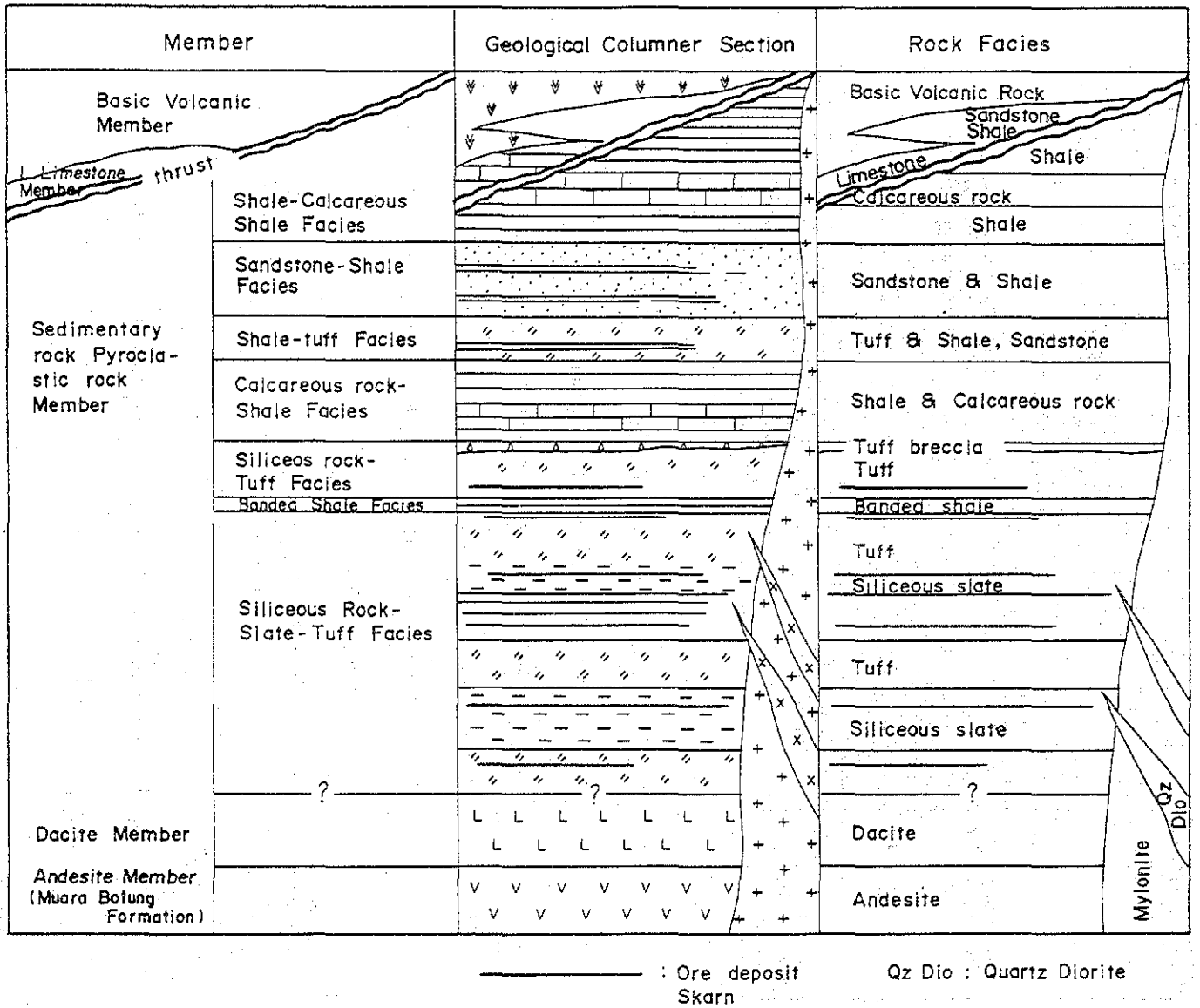


Fig. 4-3 Generalized Stratigraphy in Pagar Gunung Area

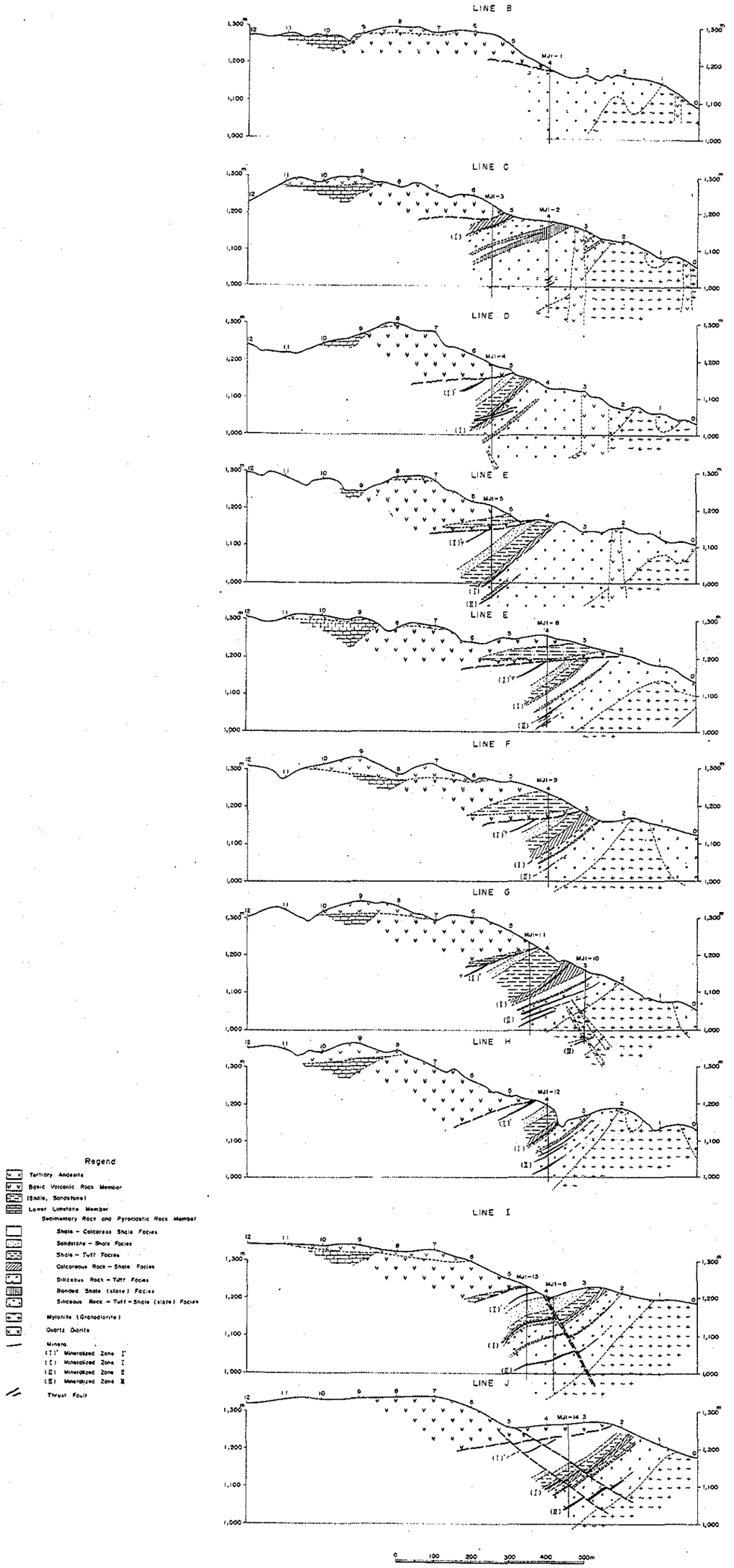


Fig. 4-4 Geological Profile of Pagar Gunung Area by Interpretation of Drilling geological Log

or disseminated pyrrhotite-pyrite ores are embaded in the skarn. Black slate increases toward the deeper part.

4-2-3 Intrusion Rock

Mylonite (granodiorite) is extensively distributed at the north part of the Pagar Gunung area, and quartz diorite/tonarite, member of Muara Sipongi granotoids, has intruded into the mylonite and Patahajang Formation. These rocks were found in only MJI-10 drilling cores through drilling survery of the third phase.

I Mylonite (granodiorite)

The rock is white massive rock distributed at 111.00 m– 182.80 m of MJI-10 drilling. Through microscopic observation, the rock is composed mainly of quartz, plagioclase and muscovite, with an association of sericite, chlorite, calcite as altered minerals. The rocks are strongly mylonitized, and it is very difficult to identify the original rock, but it is granodiorite, judging by the relict mineral and texture.

II Quartz Diorite

The rock is distributed at 120.00 m – 127.50 m and 175.50 m – 180.00 m of MJI-10. It is porphyritic rock and is mainly composed of quartz, plagioclase, mafic mineral altered completely to chlorite (may be pyroxene in original mineral). Plagioclase has mostly undergone selicitization, and the rock has been weakly catacrastized. The quartz diorite is a member of the Muara Sipongi granitoid intruded during the Jurasic time.

4-3 Geological Structure

There is a fault clay zone of 10 m and so thickness at contact with Basic Volcanic Rock Member and Sedimentary Rock and Pyroclastic Member. Below 20 m – 30 m of the fault, rocks are usually fractured very much. The fault could be a thrust fault, and it is inferred that the basic volcanic rock is an allochthonous body.

Through geological survey of Phase second, it has been made clear that synclinal structure that trends N60°W at ridge of Pagar Gunung Mountain, and Pagar Gunung mineralization is situated at the north wing of the syncline.

Sedimentary Rock and Pyroclastic Rock Member embeded the mineralization is holocline structure striking N 80 – 90 E, dipping 30 S at Pagar Gunung Mineralization Area. The Member folds minorly by judging inclination of bedding on drilling cores varying 10° to 70°.

The drilling survey found many faults showing fault clay and fault breccia. Following faults are of a comparatively large scale;

MJI-7	from 70.50 m – 76.50 m
MJI-6	from 36.00 m – 46.00 m
MJI-14	from 91.50 m – 106.00 m
	from 161.00 m – 165.00 m

The fault cut mineralized zone, and displaced it. Faults strikes N – S ~ N 45°W judging correlation of geology of core and surface, and are normal fault dipping east.

4-4 Metamorphism and Alteration

Shale and siliceous shale distributing in Pagar Gunung area have schistosity and become hard rock at deep zone, but have not recrystalyzed. They can be called a semi-schist or slate/siliceous state. Massive siliceous rock (tuff and granodiorite) are catacratized or mylonitized and become catacrasite or mylonite. Rocks of the area have undergone regional metamorphysm under low temperature and low pressure, because of no recrystlization.

Slate and siliceous slate intercalating in Basic Volcanic rock have characteristicaly kink band texture. At Pasaman area, located at 20 km south from Pagar Gunung area, there are com-

monly many clear kink bands in slate of Woyla Croup. (report of first phase). This area is an ophyolite area, exposing ultrabasic rock (hartzburgite). It is necessary to study the comparison between Pagar Gunung Basic Volcanic Rock which is regarded as allochthonous body and Pasaman ultrabasic rock.

Alteration associating with mineralization is commonly called skarnization. But it is different in mineralization type, namely epidote-clinopyroxene skarn accompany by galena-sphalerite ore deposit and epidote-garnet skarn associated with pyrrhotite-pyrite ore deposit. Neighbouring rock of the latter ore or skarn has a broadly spoted epidote or epidote veinlet, and has undergone extensive silicification, while the adjacent rock of the former is not strongly alterated.

4-5 Mineralization

4-5-1 Outline of Mineralization

A drilling survey revealed the emplacement condition, grade, relationship of the geological condition and igneous activity on Pagar Gunungs silver bearing leadzinc and new deposits. These mineralizations are embeded in Sedimentary Rock and Pyroclastic Rock Member of Patahajang Formation, and are skarn type ore deposit replaced calcareous layer in the Member. These mineralizations are grouped in four mineralization zoned based on the geological horizon, namely Mineralized Zone I', Mineralized Zone I, Mineralized Zone II and Mineralized Zone III, from upper zone. (Fig. 4-5)

4-5-2 Mineralized Zone I'

The mineralization has been found when the drilling site of MJI-6 drilling was being constructed. Porous limonitized outcrop (strike N 90°E dip 40° S width 0.80 cm) exposes at upper-stream of Palelo River. Its position is located at 70 m upper of ready-known Pagar Gunung Mineralization (outcrop B). The mineralization is embeded in shale-calcareous shale facies (I), replacing a calcareous layer.

MJI-14 drilling, locating at 130 m east from NJI-6 drilling site, detected the ore in the thrust fault between Basic Borcanic Rock Member and Sedimentary Rock and Pyroclastic Rock Member as drag ore.

MJI-13 drilling also found good ore consisting of chalcopyrite, galenas phalerite and pyrite from 23.10 m to 24.20 m. The ore is 80 m downwards extention of the outcrop.

Through microscopic observation, sphalerite is composed mainly of sphalerite, with subordinate amounts of galena, chalcopyrite and pyrite. Chalcopyrite is included as exsolution lamelaes or dots in sphalerite. The ore paragenesis is similar to ore of Mineralizes Zone I.

Content of gold grade in the ores are 0.4 g/t and 1.6 g/t, and this gold grade ore is higher than other mineralizations.

4-5-3 Mineralized Zone I

Mineralized Zone I is known Pagar Gunung West and East Mineralization and can be traced following outcrops and old adits. In has been found that the mineralized zone extended 1,200 m with thick and thin width, is good and poor in grade. Emplacement condition (thickness and grade) of the mineralizations changes very much along the west to east extention. Among the drillings, MJI-9, MJI-12 detected good ore. MJI-7, MJI-6 and MJI-14 found weak mineralization and MJI-8 failed to find any ore.

Fig. 4-6 ilustrates the emplacement condition of mineralization in the calcareous rock-shale.

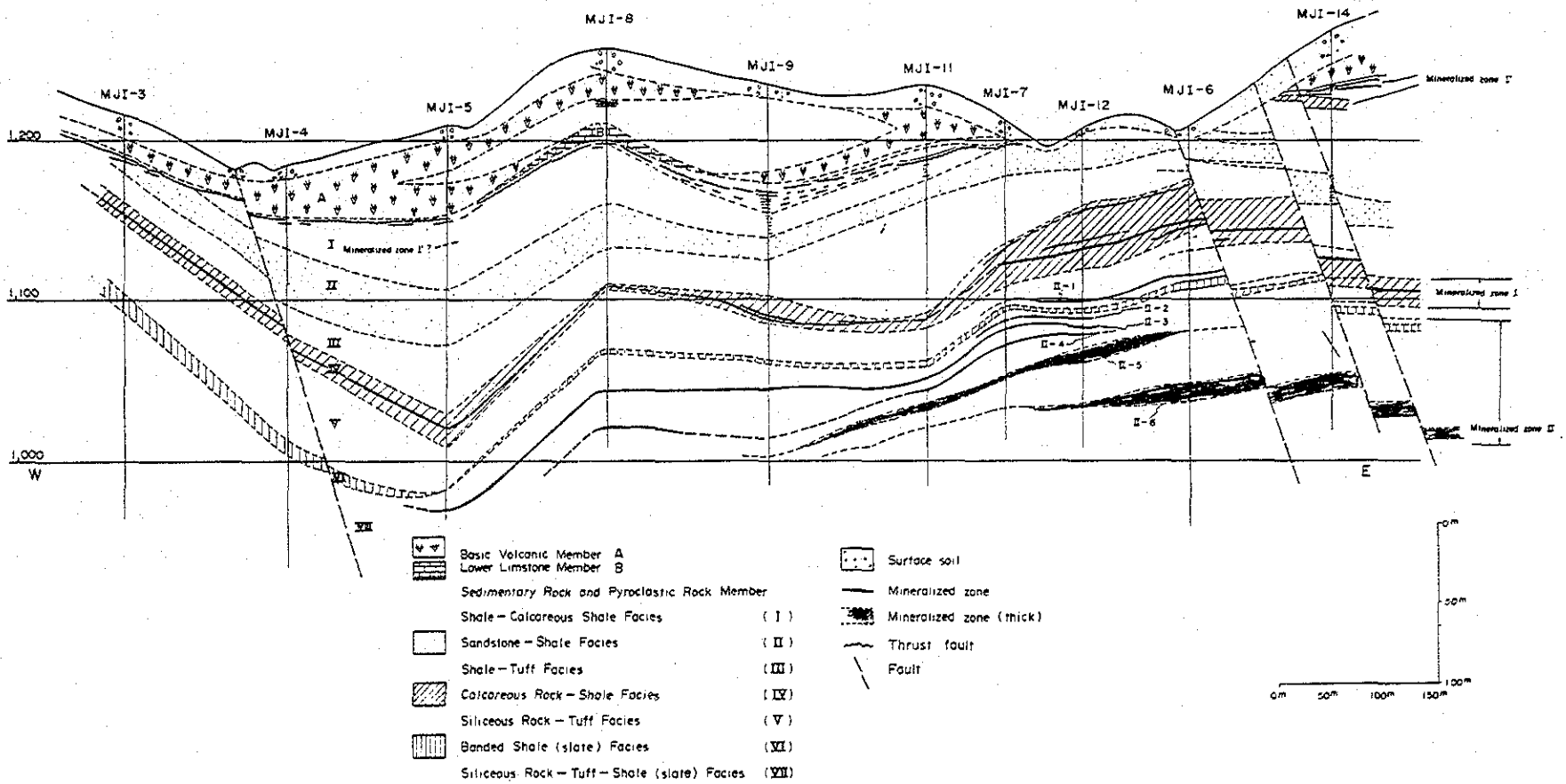


Fig. 4-5 Correlation of Drilling Geology and Mineralized Zone

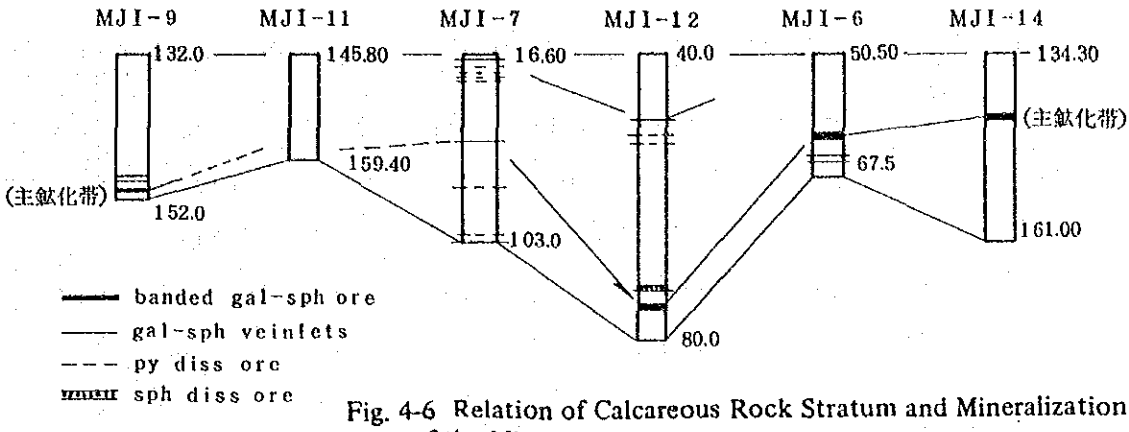


Fig. 4-6 Relation of Calcareous Rock Stratum and Mineralization of the Mineralization Zone I

Ore minerals containing in the main banded mineralization are sphalerite, galena, chalcopyrite, pyrite, pyrrhotite. Exsolution dots and lamellas of pyrrhotite and chalcopyrite exist in sphalerite. Sphalerite and galena bearing veinlets and dissemination ores are emplaced at the upper part from main mineralization. Marcasite is observed as a secondary mineral altered from pyrite. Based on microscopic observation of ores, paragenesis of the ores is shown in Figure 4-7.

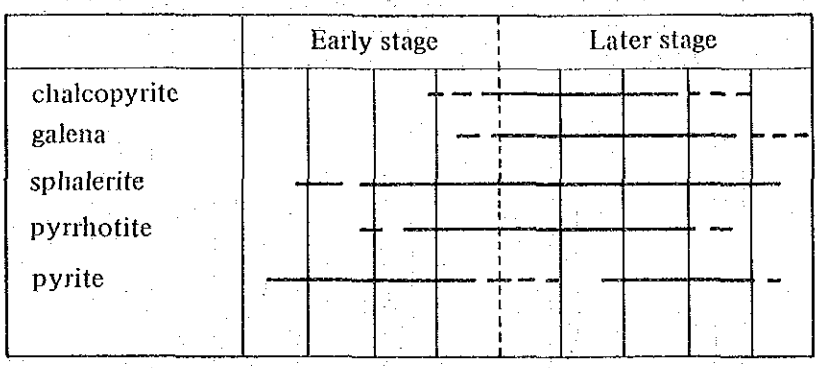


Fig. 4-7 Paragenesis for Pagar Gunung Mineralization

Skarn mineral, epidote and clinopyroxene (hedenburgite) accompanies the rich part of the mineralization (example NJI-9 and MJI-12), but the poor part of the mineralization (example MJI-14), occurs as sericitization instead of skarn mineral. In 1,200 m extention of the mineralization zone, center part (MJI-7 and MUI-12) is higher than the end part, as shown in Table 4-2.

Table 4-2 Variation of the Ag, Cu, Pb, Zn Contents and Ratio of Cu/Pb+Zn and Zn/Pb

	West MJI-3	MJI-4	MJI-5	MJI-9	MJI-7	MJI-12	MJI-6	East MJI-14
Wd cm	50	100	220	100	20	100	100	70
Ag g/t	62.0	42.0	27.7	164.6	1.9	23.9	20.3	12.0
Cu %	0.14	0.30	0.44	0.82	0.03	0.48	0.08	0.04
Pb %	3.44	2.50	0.24	1.69	0.11	0.03	1.60	1.59
Zn %	1.29	4.48	4.02	7.52	3.65	7.56	2.50	1.47
Zn/Pb	0.38	1.80	4.17	4.45	33.18	146.30	1.56	0.92
Cu/Zn + Pb	0.03	0.04	0.13	0.09	0.01	0.06	0.02	0.01

4-5-4 Mineralized Zone II

A layer is situated just on the Banded shale facies (VI), but most mineralized layers are emplaced in Siliseous Rock-Tuff Facies (VII). MJI-12 drilling found many of the mineralized layers, acounting 13 layers, among 9 holes, and in detail Mineralization Zone II can be divided into 6 sub zones, standardizing layers of MJI-12, as shown in Fig. 4-8.

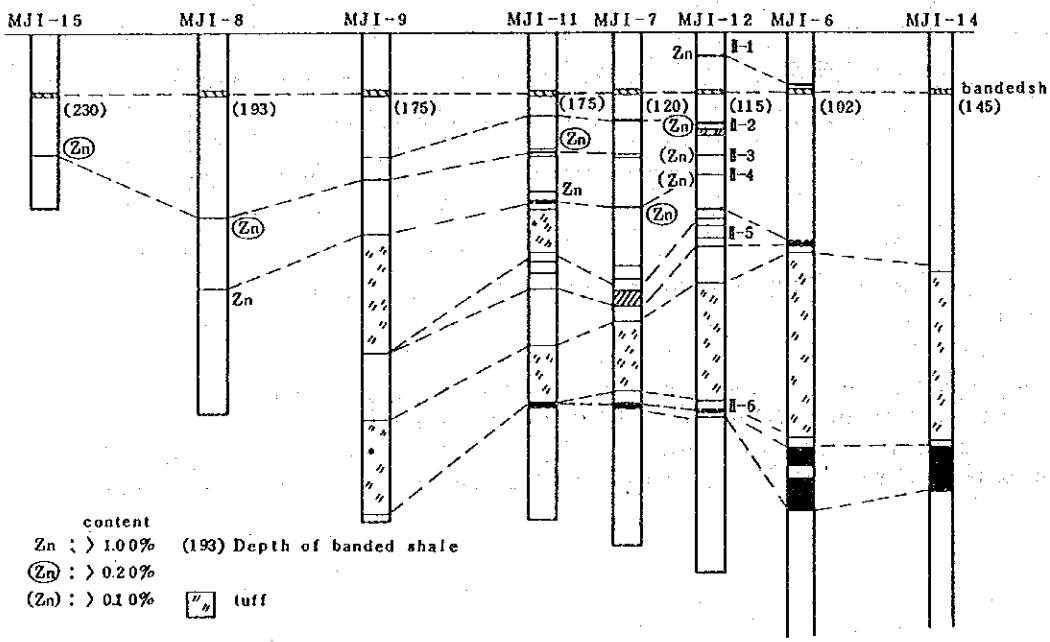


Fig. 4-8 Horizone of the Mineralization Zone II

These mineralizations consist of mainly pyrite and pyrrhotite, and have a banded ore dissemination texture. Mineralization is embeded in calcareous layers intercalating in siliceous slate or sandstone as skarn type ore deposits. Skarn minerals are epidote, calcite and grnet (grandite). The mineralization contains often some sphalerite. For example, ore at 195.15 m – 195.40 m (II-4 sub zone) of MJI-11 contains 6.94% of Zn, and ore at 184.00 m – 184.10 m (II-3 sub zone) of MJI-11 contains 1.39% of Zn, but zinc content grade is generally very low ranging 0.90% to

0.20%. Very wide mineralization layers of sub zone II-5 and sub-zone II-6 were detected by MJI-11, MJI-7, MJI-12, MJI-6, MJI-13 and MJI-14 (Maximum width; 9.00 m – MJI-14), but they have very low zinc content, less than 0.10%.

Mineralization sub zone II-5 and II-6 consist of more pyrite than pyrrhotite, comparing it with the upper sub-zone. Then Mineralization Zone II has a tendency to increase sphalerite and pyrrhotite in its upper sub-zone, on the contrary pyrite increases at the lower sub-zone.

At 54.30 m – 54.75 m of MJI-10, targeting the mineralized zone, massive-banded pyrite ore has been detected. The ore is correlative with outcrop A of Palelo River, and also Mineralized sub zone II-2 – 4. Difference of composition of ore, namely pyrrhotite and pyrite ratio, is changed not only in a deep direction but also in a horizontal direction, considering differences of skarnization.

4-5-5 Mineralized Zone III

Massive pyrite ore is emplaced at 189.80 m – 190.40 m of MJI-10. The ore is situated at 100 m below from Mineralization zone II. There are few epidote skarns, but mineralization part has undergone white argillization (sericite and so on). Only pyrite is the main constituent ore mineral, and no other mineral is observed through a microscopic test.

4-5-6 Summary of Mineralization

Elucidation points on the Pagar Gunung Mineralization by a drilling survey are summarized as follows:

(a) Pagar Gunung Mineralization is skarn type ore deposit which selectively replaced calcareous shale or calcareous sandstone layer in Sedimentary rock and Pyroclastic rock Member, Patahajang Formation.

(b) It has been made clear by the drilling survey that there have been several mineralized zones in Pagar Gunung Area. These mineralized Zones are grouped in to four mineralized zones, namely Mineralized Zone I', Mineralized Zone I, Mineralized Zone II and Mineralized Zone III. Mineralized Zone II consists of six sub-zones.

(c) Mineralized Zone I' and I are silver bearing lead-zinc mineralization, and they are accompanied by epidote-clynopyroxene skarn.

(d) Mineralized Zone I' was newly found by the drilling survey (MJI-13 and MJI-14), and is situated at 70 m upper horizon of Mineralized Zone I. The ore encountered at 23.10 m – 24.20 m of MJI-13 has grade of Au 0.4 g/t, Ag 195.0 g/t, Cu 1.25%, Pb 1.31% and Zn p.85%. Drag ore in thrust fault at 36 m ~ 40 m of MJI-14 has grade of Au 1.60 g/t. These gold grades are higher than Mineralized Zone I which has a grade of gold less than 0.1 g/t.

(e) Mineralized Zone I extends 1,200 m in an east-west direction, forming alternately rich zones and poor zones. Richest part of the zone at 141.65 m – 142.35 m of MJI-9 has 136 g/t of Ag, C.82% of Cu, 1.69% of Pb and 7.52% of Zn, and poorest part at 141.65 m – 142.35 m of MJI-14 has grade of Ag 12.0 g/t, Cu 0.04% Pb 1.59% and Zn 1.47%.

(f) Mineralized Zone II consists of six mineralised sub-zones. Upper sub-zone contains some zinc, but its grade is not exciting in value ranging from 1.00% to 0.20%. The sub-zone of lower horizon is oppositely sulphide iron mineralized zone without copper, lead and zinc. Epidote skarn contains garnet (grandite) at sub-zone II-5 or II-6. In the horizon there is strong barren epidote zone, in contrast to mineralized zone I. Namely the zone I has not skarn minerals at poor mineralized zones, while the zone II has still strong skarn at poor mineralized zones.

(g) Mineralized Zone III
Massive pyrite ore is embedded in sericitized tuffaceous rock without skarn minerals. The mineralized zone was detected by only MJI-10 drilling.

4-6 Correlation of Geochemical Survey Results and Drilling Survey Results

A geochemical survey which was carried out along the survey line of geophysical survey in

the second phase and obtained good anomalous area indicating by grade of Cu 91 ppm, Pb 120 ppm and Zn 360 ppm. The anomalous area coincides with mineralized-zone infered by the results of the drilling survey. Geochemical survey results showed that discontinuity of anomalous zones of a geochemical survey exists at conected points of West and East mineralized zones, namely F 2 ~ 5 (geophysical survey line and MJI-8 drilling site). The part is covered by a basic volcanic rock which is no a mineralized body, and also proved no mineralized part by drilling of MJI-8. It is very clear that the both geochemical results and the drilling results coincide on the discontinuity of Mineralized zones. (Fig. 4-9)

4-7 Interpretation of SIP and Drilling Results

Drilling survey targeted Spectral I P anomalies on the survey lines (F, G, H, I,) in the third phase, and reinterpretation of relation between SIP and drilling survey results was done. (Fig. 4-10)

Fig. 4-12 shows frequency effect (P.F.E. 0.125 – 1.0 hz) of F.G.H.I. survey lines, and Fig. 4-13 shows apparent Registivity (0.125 hz) of F.G.H.I. survey lines.

Freouency Effects on G.H.I. lines show that anomaly pattern is derived from origin distributing at No. 3 point – No. 4 point, and anomaly pattern on F line at No. 1 point – No. 2 point. These anomalies coincide with mineralization, showing in Fig. 4-11.

Low apparent resistivity area coincides with the anomaly of Frequency Effect, and also ore area/ore disseminated area shows low apperent registivity. For example, Frequency Effect anomaly and 60 – 80 ohm-m of apparent registivity of MJI-10 (H line) are considered to be the reflection of pyrite dissemination zone, and Frequency Effect anomaly and low apparent registivity of 20 – 40 ohm-m on MJI-12 (I line) also coincide with dissemination zone and banded sulphide ore part.

Following three types of phase spectrum were observed by the geophysical survey

(1) phase difference is large at low frequency range (higher harmonics of 0.125 Hz), and almost constant when frecuency varies.

(2) phase difference is large at low frequency range higher harmonics of 0.125 Hz, and it decreases when frequency increases.

(3) phase difference is small at low frequency range higher harmonics of 0.125 Hz case 1 and 2 show anomaly of phase difference, but their spectral shape are slightly different.

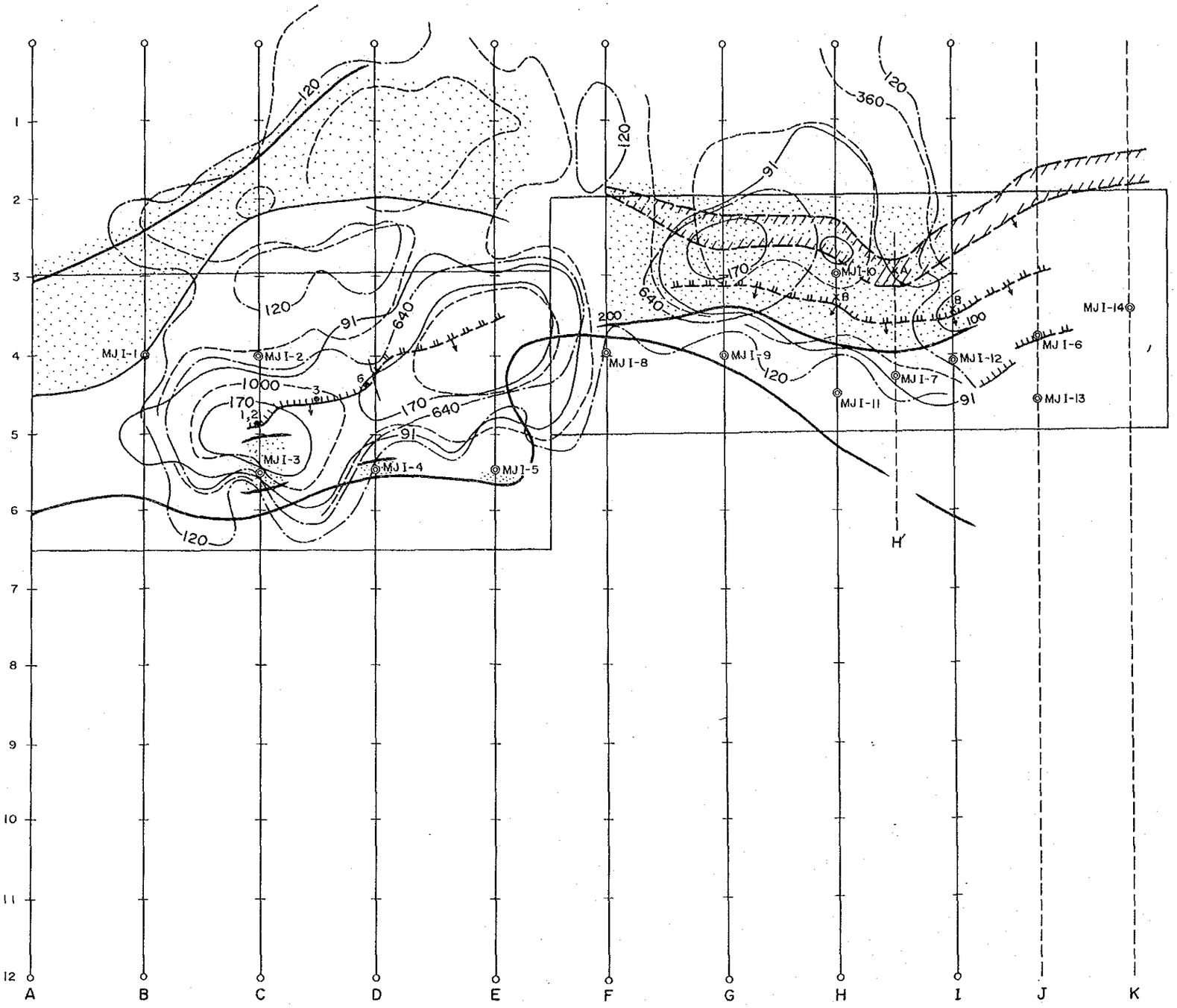
Physical property measurement of sample revealed that phase spectrum of ore sample and pyrite disseminated sample has a tendency to decrease when frequency increases. It was interesting that if the phenomenon would be observed at field survey. At F survey line, large phase difference is shown at low frequency range, and the phase decreases when frequency increases. It is inferred that it is reflected strong pyrite dissemination in MJI-8 drilling. On the other hand, at H survey line, phase difference is larger than the case of F survey line, and phase spectrum is flat and weak pyritization difference. But at I survey line, there is massive banded ore zone (MJI-12) and phase is large, and resistivity is small, but phase spectrum shows flat shape. Fowever between No. 3 and No. 4 (only one point) at I line, there is a very sharp decrease of phase difference. It may be the reflection of local low resistivity anomaly and strong mineralized zone.

4-8 Evaluation of Mineralized Zone

4-8-1 Ore Reserve

The drilling survey in the second and third phases found two type mineralized zones, namely silver bearing lead-zinc ore deposit (Mineralized Zone I' and Mineralized Zone I) and (sphalerite) phrrhotite-pyrite ore deposit (Mineralized Zone II and Mineralized Zone III).

Pyrrhotite-pyrite ore deposit has many mineralized sub-zones ranging 0.10 m to 9.00 m in their thickness, but they are generally very low grade ores of less than 1.00% of Zn. Accordingly,



LEGEND

- • Adit X Outcrop
- Ore zone I
- Ore zone traced adit-outcrop
- Ore zone inferred by drilling result
- Ore zone II
- Ore zone traced outcrop
- Ore zone inferred by drilling result
- Spectoral IP anomaly
- IP anomalous zone
  (100 : Depth to top of the surface)
- Low Resistivity zone in meter
  (less than 100m)
- Geochemical Anomaly
- (91) Cu ppm
- (120) Pb ppm
- (360) Zn ppm
- ◎ Hole drilled (MJI-1 ~ MJI-5 : second phase)
  (MJI-6 ~ MJI-14 : third phase)

Fig. 4-9 Generalized Map of Geochemical Anomalies, Geophysical Anomalies and Drilling Result

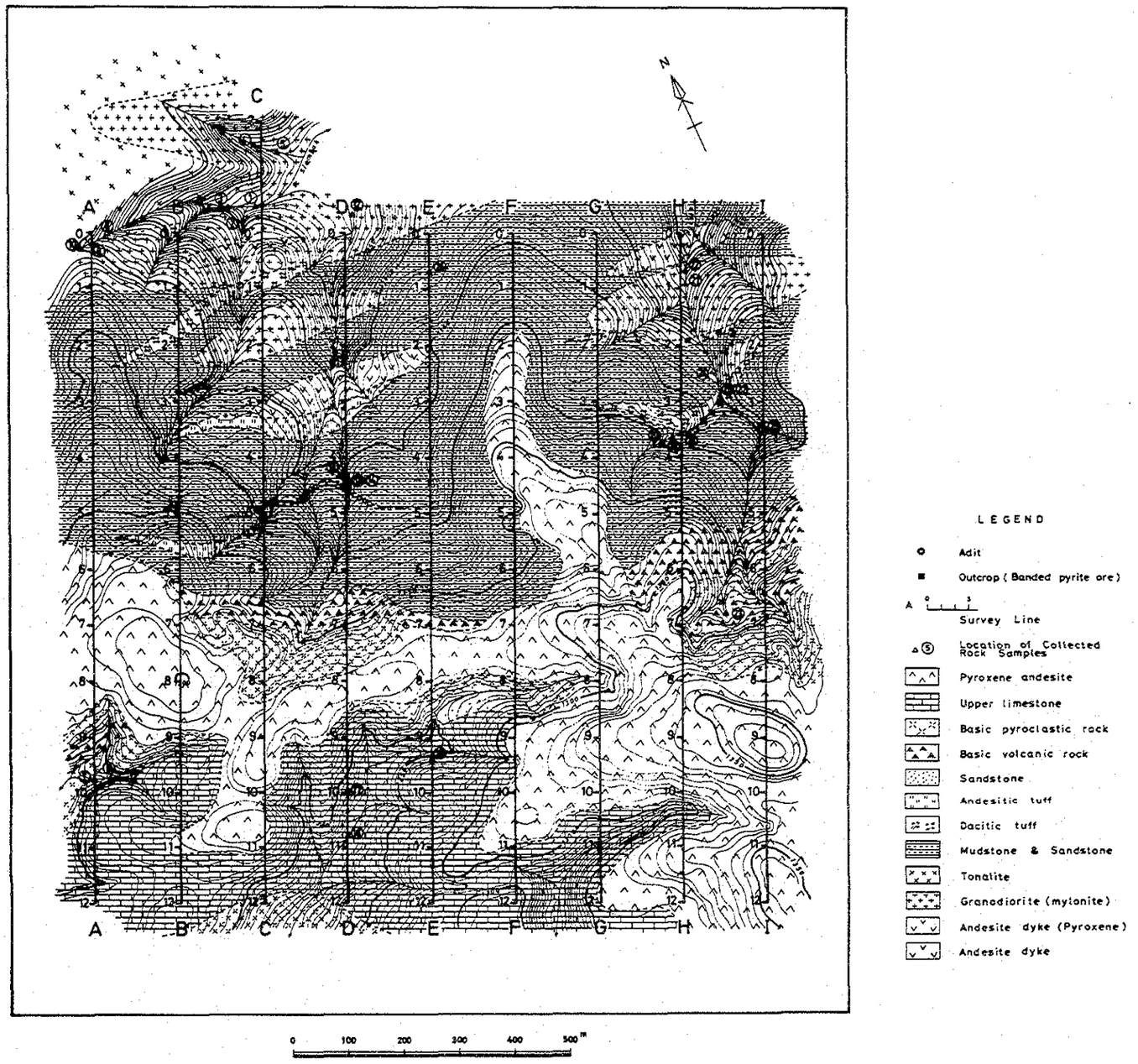


Fig. 4-10 Location Map of Spectral IP Survey Lines

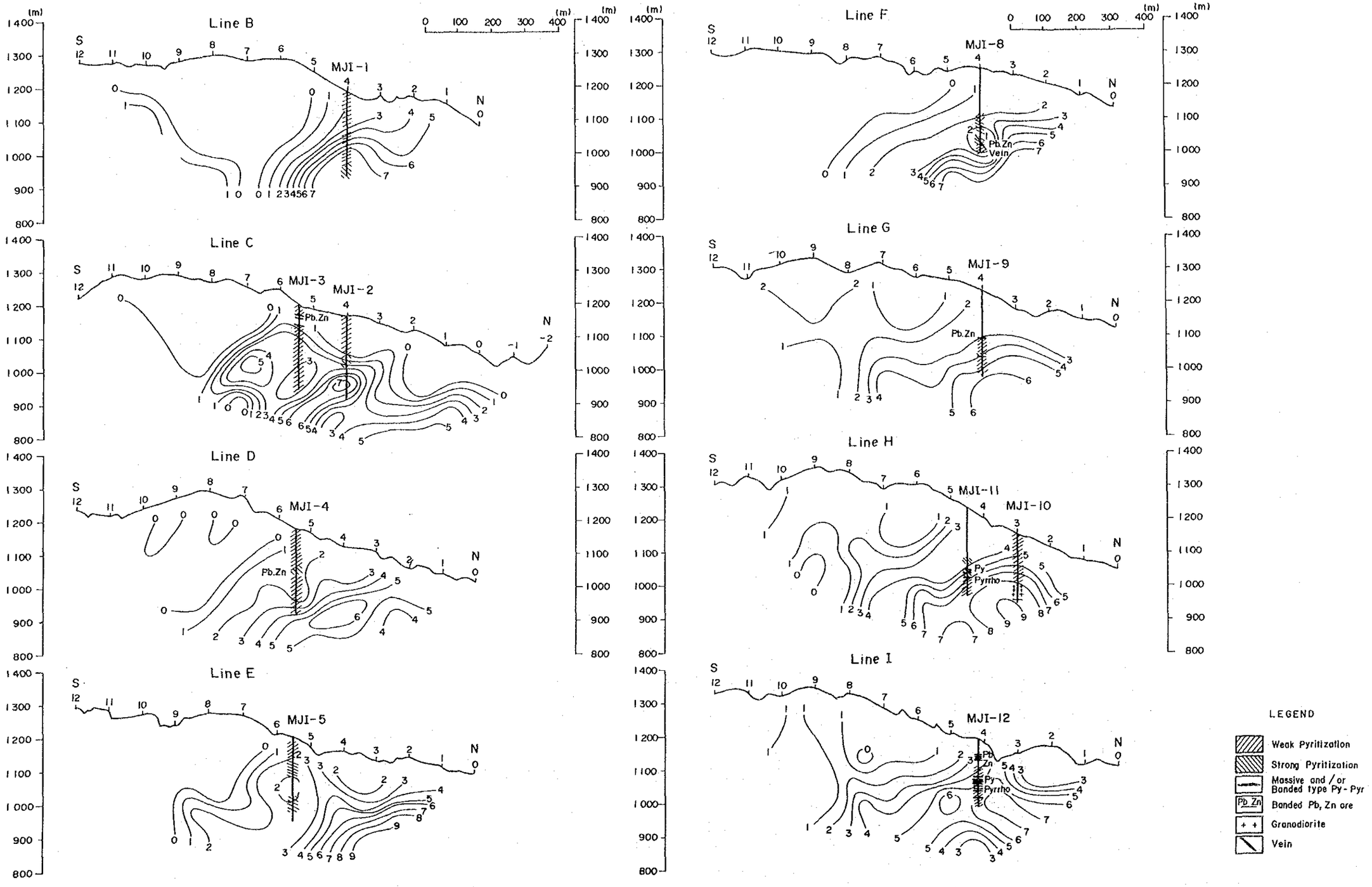


Fig. 4-11 Spectral IP Pseudo-Section Percent Frequency Effect (0.125 - 1.0 Hz) (Line F, G, H, I)

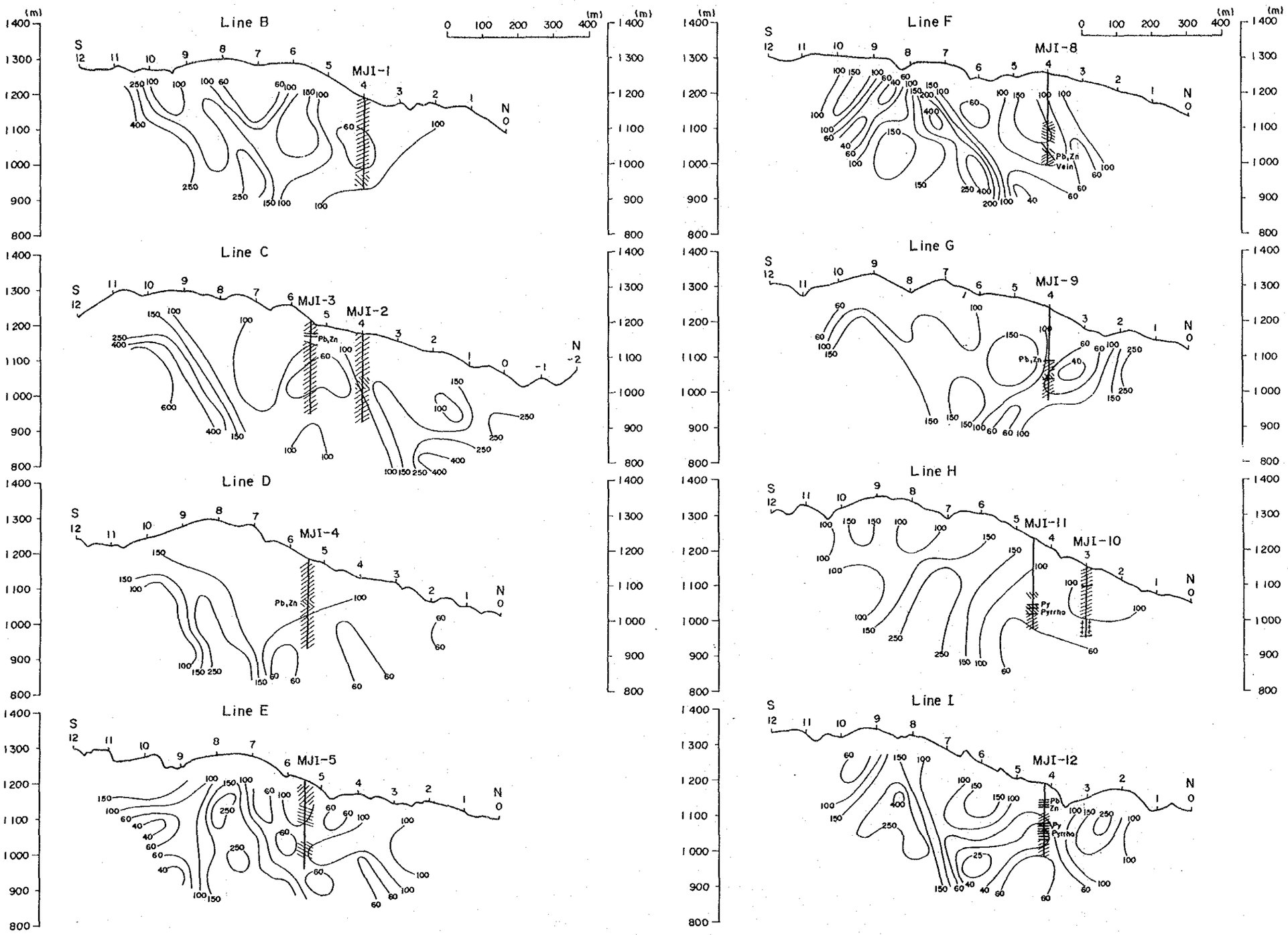


Fig. 4-12 Spectral IP Pseudo-Section Apparent Resistivity (0.125 Hz) (Line F, G, H, I,)

a possible ore reserve is calculated on Mineralized Zone I' and Mineralized Zone I, based on the following conditions:

(1) In consideration of relation with outcrop and ores of the drilling survey as shown in Fig. 4-13, it is inferred that ore shoot plunges 45° toward east, and ore block is drawn.

(2) Boundary of ore block is at the settled center point of the neighboring drill hole's ores.

(3) Width, grade of ore block is based on sampled ore's data from the drilling core.

(4) Bottom of ore block is limited at 1,000 m s,l..

(5) Mineralized zones change alternately with the rich part and the poor part along to their extention; then the probability of their existance of ore is estimated a 80%.

(6) True width of ore and true square of ore block are calculated based on that of the mineralized zone generally inclined 30°S.

(7) Specific gravity of ore is estimated at 3.5.

Possible ore reserve is calculated 800,000 t, mean width 0.88 m, silver 68 g/t, copper 0.45% lead 1.20% and zinc 4.5%. (Table 4-3)

4-8-2 The point Aimed at A Future Survey

Pagar Gunung ore deposit is skarn type deposit which has selectively replaced calcareous shale bed. But calcareous bed of Argillanceous Rock Predominance facies is found to the embeded lead-zinc ore rather than Siliceous Rock and Pyroclastic Rock Facies. When the survey targets lead-zinc ore deposit at an area from Pagar Gunung to Patahajang, it is recommended that the survey traces calcareous beds in Argillaceous Rock Predominance Facies.

Fig. 4-13 Possible Ore Reserve of Pagar Gunung Mineralization Zone

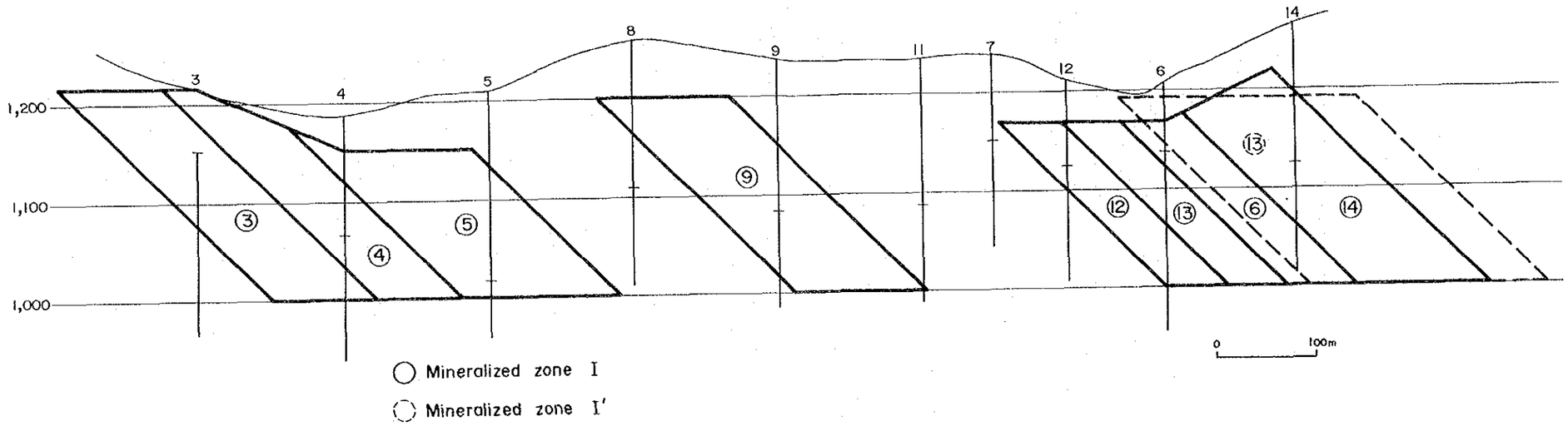


Table 4-3 Calculation of Possible Ore Reserve of Pagar Gunung Mineralization Zone

Drill No.	Square (M^2)		Thickness (M)		Volume M^3	sp. gr.	Ore Tons (t)	Ag		Cu		Pb		Zn	
	projected	real (x2)	drilled	true (x0.87)				g/t	kg	%	t	%	t	%	t
3	22,575	45,150	0.60	0.52	23,478	3.5	82,173	62.0	5,094,726	0.14	115,042	3.44	2,826,751	1.29	1,060,032
4	17,275	34,550	0.60	0.52	17,966	3.5	62,881	42.0	2,641,002	0.30	188,643	2.50	1,572,025	4.48	2,817,069
5	25,000	50,000	2.20	1.91	95,500	3.5	334,250	27.7	9,258,725	0.28	935,900	0.17	568,225	3.73	12,467,525
9	26,000	52,000	1.00	0.87	45,240	3.5	158,340	164.6	26,062,764	0.82	1,298,388	1.69	2,675,946	7.52	11,907,168
12	10,496	20,992	1.00	0.87	18,263	3.5	63,921	23.9	1,527,712	0.48	306,821	0.03	19,176	7.56	4,832,428
13	9,840	19,680	0.45	0.39	7,675	3.5	26,863	94.0	2,525,122	1.07	287,434	0.39	104,766	2.70	725,301
6	10,904	21,808	1.10	0.96	20,936	3.5	73,276	20.4	1,494,830	0.08	58,621	1.60	1,172,416	2.47	1,809,917
14	28,560	57,120	0.70	0.61	34,843	3.5	121,951	12.0	1,463,412	0.04	48,780	1.59	1,939,021	1.47	1,792,680
13 (1')	15,000	30,000	1.10	0.96	28,800	3.5	100,800	195.0	19,656,000	1.25	1,260,000	1.31	1,320,480	9.85	9,928,800
					Total		1,024,455	68.1	69,724,293	0.44	4,499,629	1.19	12,198,806	4.62	47,340,920

Possible Ore Reserve = 1,024,455 t x 80% (Existent Ratio) = 819,564 t (Mean Thickness 0.88 m)

CHAPTER 5 CONCLUSION AND RECOMMENDATION FOR THE FUTURE

5-1 Conclusion

The results of the Drilling survey in exploring east mineralized zones of Pagar Gunung area are concluded as follows;

1. Geology of Pagar Gunung area consists of Sedimentary Rock and Pyroclastic Rock Member, belonging to the Patahajang Formation of the Permian and the Carboniferous. Drilling survey has elucidated rock facies of the Member in detail. The Member is divided into Argillaceous Rock Predominance Facies and Siliceous Rock-Pyroclastic Rock Predominance Facies.

2. Many mineralized zones where found through the drilling survey, and are grouped in the following mineralized zones;

Mineralized Zone	Emplacement Horizon	Ore Mineral and Skarn Mineral
Mineralized Zone I'	Argillaceous Rock Predominance Facies (20 m)	gold and silver bearing chalcopyrite-galena-sphalerite-ore epidote (clinopyroxene)
Mineralized Zone I	ditto (10 m ~ 30 m)	silver bearing (chalcopyrite)-galena-sphalerite ore epidote, clinopyloxene
Mineralized Zone II (consisting of 6 sub-Zones)	Siliceous Rock-Pyro-clastic Rock Predominance facies (30 m ~ 60 m)	(sphalerite) pyrrhotite-pyrite ore. upper sub-Zone contains sphalerite, spidote, garnet (clinopyroxene)
Mineralized Zone III	ditto (10 m)	pyrite, sericitization, (weak skarnization)

( ): Thickness of Emplacement Horizone.

3. Mineralized Zone I'. was newly found through drilling survey, and is situated at 70 m upper horizon of Fineralized Zone I. Ore grade at Mji-13 is of width 11C cm, Au 0.4 g/t, Ag 195.0 g/t, Cu 1.25%, Pb 1.31% and 9.98%.

4. Mineralized Zone I is ready-known as Pagar Gunung Mineralized Zone having outcrop and old adits. The silver bearing lead-zinc mineralized zone will extend were east-west direction with 1,200 m extention, becoming alternately a rich and a poor part. The ore grades of the East Mineralization Zone detected by a drilling survey of the year are as follows;

The zone is accompanies by an epidote-clinopyroxene skarn with ore minerals at rich mineralized parts, but has undergone sericitization instead of skarnization at poor mineralized parts.

Drilling Hole	Depth (m)	Width (m)	Ag g/t	Cu %	Pb %	Zn %
MJI-9	150.40 – 151.40	1.00	164.6	0.82	1.69	9.52
MJI-12	75.10 – 76.10	1.00	23.9	0.48	0.02	7.56
MJI-6	61.70 – 62.70	1.00	20.3	0.08	1.60	2.67
MJI-14	141.65 – 142.35	0.70	12.0	0.04	1.59	1.47

5. Mineralized Zone II is embeded in Siliceous Rock-Pyroclastic Rock Predominance Facies, and is grouped in six sub Zones. The mineralized Zones consist mainly of pyrrhotite, pyrite, associating with epidote-garnet skarn. Upper sub-zones contain often sphalerite, but its grade ranges 1.00% to 0.20%.

6. Based on the chemical analysis of ores, a possible ore reserve is expected 800,000 t, mean thickness 0.88 m Ag 68 g/t, Cu 0.45%, Pb 1.20% and Zn 4.60%.

7. Pagar Gunung Mineralized Zone are of a skarn ore deposit, but they have replaced a selectively calcareous shale bed and are under structural control like stratabound.

5-2 Recommendation for the Future

Cooperative Mineral Exploration Survey in Northern Sumatra was completed in this year. Concerning the Pagar Gunung area, the following survey is recommendable for the future based on the results of the drilling surveys on Pagar Gunung Area;

1. Continuation of a drilling survey to explare east and west extention of Pagar Gunung silver bearing lead-zinc ore deposit, especially on Mineralized Zone I'.

2. For the area between Pagar Gunung mineralized zone to Patahajang area (6 km extention) execution of geophysical, geochemical and a drilling survey are recommendable, especially the tracing calcareous shale beds in Argilaceous Rock-pyroclastic Rock facies.

REFERENCE

Geology and Geochemistry

1. Aoki K. (1978); Petrology of Upper Mantle, Igneous Rock and its Genesis, Chikyu Kagaku (Geoscience) Vol. 3 41 – 86 (Iwanami Shoten) (in Japanese)
2. Aramaki S. et al (1972); Chemical Composition of Japanese Granites Part 2 Variation Trends and Average Composition. Jour. Gel. Soc. of Japan Vol. 78, No. 1, p.39 – 49
3. Aramaki S. (1978); Origine of Felsic Magma Igneous and its Genesis, Chikyu Kagaku (Geoscience) Vol. 3 138 – 150 (Iwanami Shoten) (in Japanese)
4. Bemmelen R. W. (1970); Geology of Indonesia 2 vols, Martinus Nijinhoff The Hague (2nd ed.)
5. Ben-Avraham, Z. (1978); The Evolution of Marginal Basin and Adjacent Shelves in East and South Asia, Tectonophysics 45, p.269 – 288
6. Cameron N. R. et al (1980; The Geological Evolution of Northern Sumatra, Ninth Indonesian Petroleum Association Convention
7. Clark M. C. G. et al (1982); Geological Map of the Pematangsiantar Quadrangle Sumatra (1/250,000)
   Geological Research and Development Center, Indonesia
8. Clark M. C. G. & Surjono (1982); Primary Tungsten Occurences in Sumatra and the Indonesian Tin Islands, Bull. Directorate of Mineral Resources Indonesia No. 5 bul. Vol. 1
9. Coleman R. L. (1977); Ophiolite, Springer – Verlag, Berlin
10. Dickey J. S. Jr. (1975); A Hypothesis of Origin for Podiform Chromite Deposits, Geoch. et Cosmochim. Vol. 39 1061 – 1074
11. Finaudi M.T. and Burt D.M. (1982); Introduction-Terminology, Classification and Composition of Skarn Deposits (A Special Issue Devoted to Skarn Deposits),
    Econ. Geol. vol. 77 No. 4, 745 – 754
12. Geochemical Study Group (1975); Hand Book of Geochemical Exploration (in Japanese) Mining and Metallugical Institute of Japan
13. Haan W. De (1921); Herinneringen aan mijnbouwkundig exploratiewerk in het Zuiden der Residentie Tapanoeli.
    Geol. Mijinb. Gen., Mijinb. Serie, Vol. I 1912 – 1221, 229 – 296.
14. Hamilton W. (1978); Tectonic Map of the Indonesian Region United State Geological Survey
15. Hamilton W, (1979); Tectonics of the Indonesia Region, USGS Prof. Rep. 1078
16. Hoskins K. F. G (1979); Tin Distribution Patterns, Geol. Soc. Malaysia, Bull. Vol. 11 Dec. 1 – 70
17. Hutchison C. S. (1973); Tectonic Evolution of Sundaland: A Phanerozoic Synthesis
    Geol. Soc. Malaysia, Bulletin 6, July, p.61 – 86
18. Hutchison C. S. (1975); Ophiolite in South Asia, Bulletin of Geological Society of America, Vol. 86, 797 – 806
19. Ishihara, S. (1977); The Magnetite-series and Ilmenite-series Granitic Rocks, Mining Geology 27, No. 145, p.293 – 305
20. Ishihara S. et al (1979); The Magnetite-series and Ilmenite-series Granitoids and Their Bearing of Tin Mineralization Particularly of the Malay Peninsular region,
    Geol. Soc. Malaysia Bull. Vol. 11, Dec. 103 – 110
21. Ishihara, S. et al (1980); grainites and Sn-W Deposites of Peninsular Thailand, Mining Geology Special Issue No. 8
22. IUGS (1973); Plutonic Rocks, Classification and Nomenclature Recommended by the

IUGS, Subcommission on the Systematics of Igneous Rocks. Geotimes Oct. 1973.

23. Katili J.A. (1967); On the Occurrence of Large Transcurrent Fault in Sumatra, Indonesia, Jour. of Geoscience, Osaka City University Vol. 10 Art 1 – 1 5 – 17
24. Katili J.A. (1969); Permian Volcanism and its Relation to the Tectonic Development of Sumatra, Bull. Volcanologique XXXIII-2, p.530 – 540
25. Katili J.A. (1970); Naplet Structure and Transcurrent Faults in Sumatra, Bull. National Institute of Geology and Mining Bandung vol. 3 No. 1 11 – 28
26. Katili J.A. (1973); Geochronology of West Indonesia and its Implication on Late Techtonics Tectonophysics 19, p.195 – 212
27. Katili, J.A. (1973); Plate Tectonics and its Significance in the Search Mineral Deposits in Western Indonesia, CCOP Technical Bulletin Vol. 7
28. Katili, J.A. and Hartono, H. M. S, (1979); Van Bemmelen Contributions to the Growth of Geotechnics and the Present State of Earth-Science Research in Indonesia, Geologie Mijinbouw Vol. 58 (2), p.107 – 116
29. Katili, J.A. (1981); Geology of South Asia with Paticular Reference to the South China Sea, Bull. of the Geological Research and Development Center of Indonesia No. 4, March 1981, p.1 – 12
30. Klompe H.F., Katili J.A., Johannas and Soekendar (1961); Late Paleozoic Volcanic Activity in The Sunda Land Area,
Pacific Sci. Cong. 9th Bangkok 1975 Proc. v 12 204 – 216
31. Mitchell A. H. G. (1979); Rift-Subduction-and Collision-Related Tin Belts, Geol. Soc. Malaysia, Bull. Vol. 11, Dec. p.81 – 102
32. Mori T. and Banno S. (1973); Petrology of Periodotite and Garnet Clinopyroxenite of Mt. Higashi Akaishi Mass, Central Shikoku, Japan (Subsolidus Relation of Anhydrous Phase, Contr. Mineral & Petrol. 41 301 – 323
33. OMRDC (1971); Summary Report on the Survey of Sumatra No. 5 Block (unpublished).
34. Page B. G. N. (1981); The Serpentinites of Northern Sumatra, Bull. Directorate of Mineral Resources Indonesia No. 3 Vol. 1 103 – 113
35. Prime, H. N. A. et al (1975); Isotope Geochronology in the Indonesian Tin Belt,
Geol. Mijinbouw 54, p.61 – 70
36. Rock N. M. S., A. Djunuddin and et al (1980); Geology of the Natal Teluk Dalam (Part) Quadrangles, DMR/IGS Northern Sumatra Project (unpublish)
37. Rocksalagora, W. and Djumhani (1971); Metallic Mineral Deposits of Indonesia, XII Pacific Science Congress
38. Silitonga P. H., Kastowo (1975); Geological Map of Solok Quadrangle, Sumatra Direktorat Geologi, Indonesia
39. Takahashi, M. and et el (1980); Magnetite Series/Ilmenite Series vs I-Type/S-Type Granitoids,
Mining Geology Special Issue No. 8
40. Taylor D. and Hutchison C. C. (1978); Pattern of Mineralization in Sourth Asia. Their Relationship to Broad Scale Geological Features and the Relevance of Plate Tectonics Concepts to their Understanding.
Eleventh Commonwealth Mining and Metallurgical Congress
41. Tsusue, A. and Ishihara, S. (1974); The Iron-Titanium Oxide in the Granitic Rocks of Southwest Japan
Mining Geology, Vol. 24, p.13 – 30

Geophysical Survey

42. J.S. Summer (1976); Principles of Induced Polarization for Geophysical Exploration

43. Kaku H. (1966); On the Coupling Effect in the Induced Poralization Method, Butsuri Tanko, 19 (405)

44. Wait J. R. (1958); Discussions on a Theoretical Study of Induced Electrical Polarization, Geophysics, 23

45. Hallof P. C. (1964, 1967); A Comparison of the Various Parameter Employed in the Variable Frequency Induced Polarization Method,

46. Pelton W.H., Ward S.H. Hallof P.G., Sill W.R. and Nelson P.H. (1977); Mineral Discrimination and Removal of Induced Coupling with Multi-frequency IP, Metal Mining Agency of Japan, 1980 – 1982
Report on Research and Development Survey for Mineral Resources – Spectral IP

Drilling Survey

1. Cumming J.D. (1975); Diamond Drilling Handbook J.K. Smit & Sons Diamond Products Ltd. Toront