As shown on above table, mineralized zone in Area B consists of two zones of the upper and lower mineralized zones. Assay results are shown in Appendix 8 together with geologic core logs.

Following samples were collected for beneficiation test:

MJO-B1	35.00 ~ 37.00 m,	39.00 ~ 41.70 m
	43.50 ~ 45.00 m,	46.90 ~ 50.60 m
MJO-B2	93.00 ~ 96.80 m,	141.50 ~ 143.40 m
MJO-B4	49.00 ~ 54.70 m,	76.00 ~ 80.10 m
MJO-B5	52.80 ~ 55.60 m,	62.90 ~ 65.70 m
	115.10 ~ 117.70 m	
MJO-B6	53.70 ~ 57.70 m	

2-4-2 Survey Results

1. Drilling Result

(1) MJO-B1

The drill hole MJO-B1 was carried out to examine the nature of massive sulfide ore which had been confirmed by previous drilling at the northwestern part of the Rakah ore deposit area. Results of the hole are as below:

0 ~ 3.00 m	Cassing. No recovery.
3.00 ~ 3.80 m	Gossan soil.
3.80 ~ 10.00 m	Weathered and argillized zone with oxide copper minerals.
10.00 ~ 21.40 m	Lower Extrusives II. Weathered and argillized pillow lavas.
21.40 ~ 22.00 m	Gossan soil.
22.00 ~ 26.60 m	Siliceous gossan.
26.60 ~ 37.80 m	Siliceous ore. Strongly silicified and brecciated. More sulfides in Lower part.
37.80 ~ 46.90 m	Massive sulfide ore with minor siliceous fragments.
46.90 ~ 55.20 m	Siliceous ore with satin -spar veinlets.
55.20 ~ 56.10 m	Brecciated clay zone with pyrite disseminations.
56.10 ~ 58.00 m	Strongly chloritized zone. Phyllitic.
58.00 ~ 100.35 m (bottom)	Lower Extrusives I. Chloritized pillow lavas with hematite and quartz.

This hole encountered heavy caving zones up to the depth of 33 m and core recovery was poor at the part. Old working is reported in core logs of a previous drill hole 29-1 from the surface to the depth of 38 m. This hole is 22 m away for southwest from MJO-B1 and confirmed a massive sulfide zone. Therefore, the massive ore zones including the intersection of MJO-B1 were mined in places at ancient time.

The massive ore encountered in this hole contains chalcanthite ($CuSO_4 \cdot 5H_2O$) along fractures.

Assay results give high values of Au and Cu in the massive ore. Pb also give slightly higher values compare with other holes. Average grades of the intersection give following values.

26.00 m ~ 55.20 m D.L. 28.60 m
5.94 g/t Au, 10.3 g/t Ag, 1.37% Cu, 0.03% Pb, 0.16% Zn

The massive ore shows high grade and Au is comcentrated between 34.60 m and 52.90 m. This 18.30 m section show high concentration of Au and Ag and gave 8.96 g/t Au and 13.3 g/t Ag. This zone is gossanized and supergene copper minerals are observed thoughout the mineralized zone. Sketch for the mineralized zone in this hole is shown in Fig. II-2-14.

(2) MJO-B2

This hole was carried out at the northern middle of the known deposits area. Result of the hole summarized below:

0 ~ 88.80 m	Lower Extrusives II. Chloritized pillow lavas and pillow breccia. Calcite stringers, and hematite in fractures and matrix.
88.80 ~ 91.10 m	Strongly chloritized zone. Brecciated and sheared.
91.10 ~ 122.20 m	Chloritized, silicified and brecciated zone with stockwork mineralization (Upper mineralized zone). Pyrite disseminations. Pyrite-chalcopyrite stringers and veinlets.
122.20 ~ 124.60 m	Silicified and strongly chloritized zone with pyrite and chalcopyrite disseminations and stringers.
124.60 ~ 139.50 m	Lower Extrusives I. Chloritized and weakly silicified pillow lavas.
139.50 ~ 140.90 m	Strongly chloritized and brecciated zone.
140.90 ~ 154.20 m	Silicified and chloritized zone with stockwork mineralization. Lower mineralized zone. Pyrite and chalcopyrite disseminations and stockwork veinlets.
154.20 ~ 157.25 m (bottom)	Lower Extrusives I. Chloritized pillow lavas with quartz-hematite veins.

This hole confirmed two mineralized zones of the upper and lower mineralized zones. These two mineralized zones show similar occurrences, mineral assemblage and alteration. Host rocks of the both mineralized zone are strongly chloritized and silicified pillow lavas.

Assay results of encountered mineralized zones are summarized as below:

Upper mineralized zone 93.10 m ~ 117.10 m D.L. 24.00 m
0.28 g/t Au, 0.7 g/t Ag, 0.51% Cu, 0.01% > Pb, 0.16% Zn
Lower mineralized zone 140.90 m ~ 150.90 m D.L. 10.00 m
0.16 g/t Au, 0.2 g/t Ag, 0.59% Cu, 0.01% > Pb, 0.05% Zn

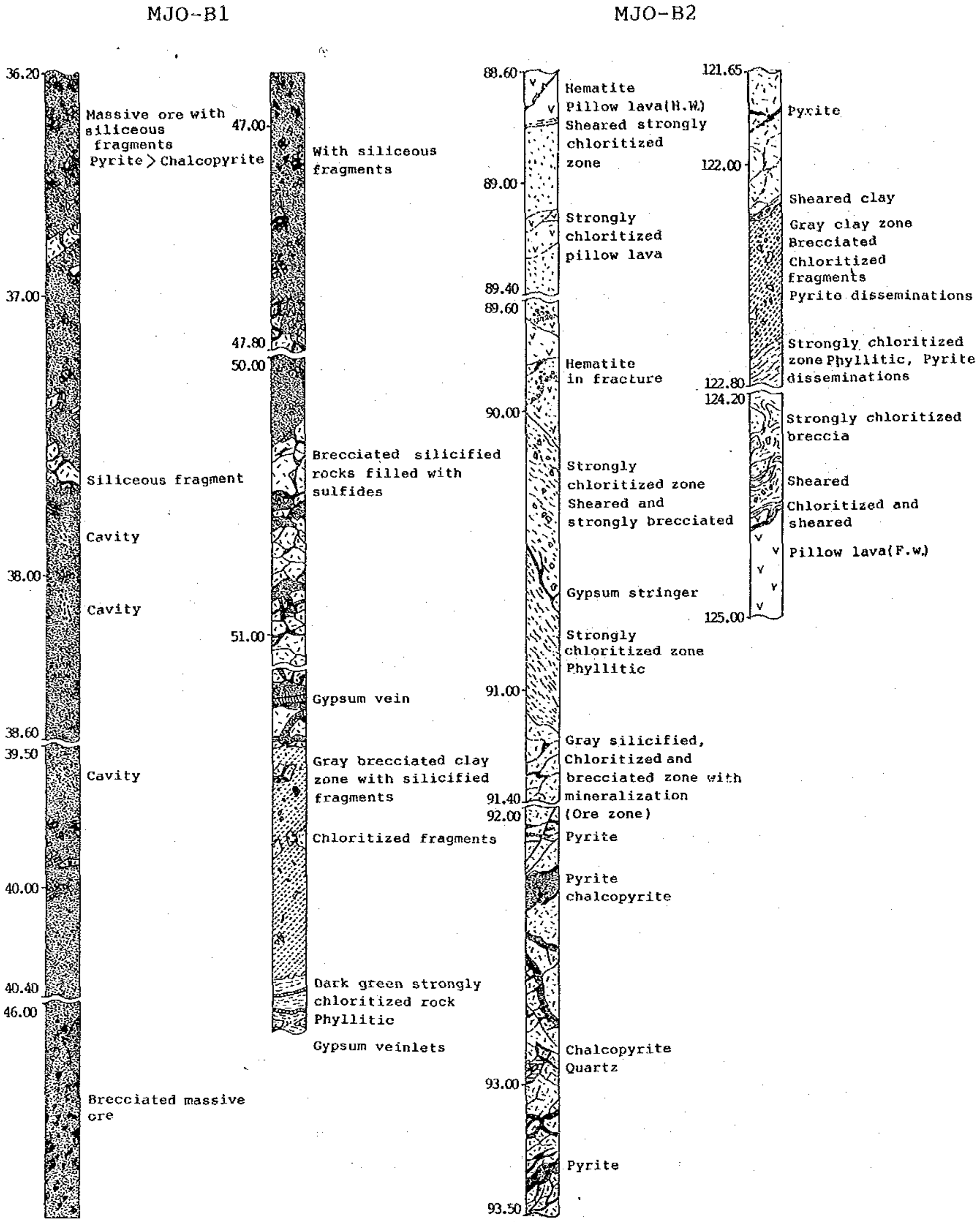


Fig. II-2-14　Detailed Sketch for Mineralized zone of Core Sections (1), MJO-B4

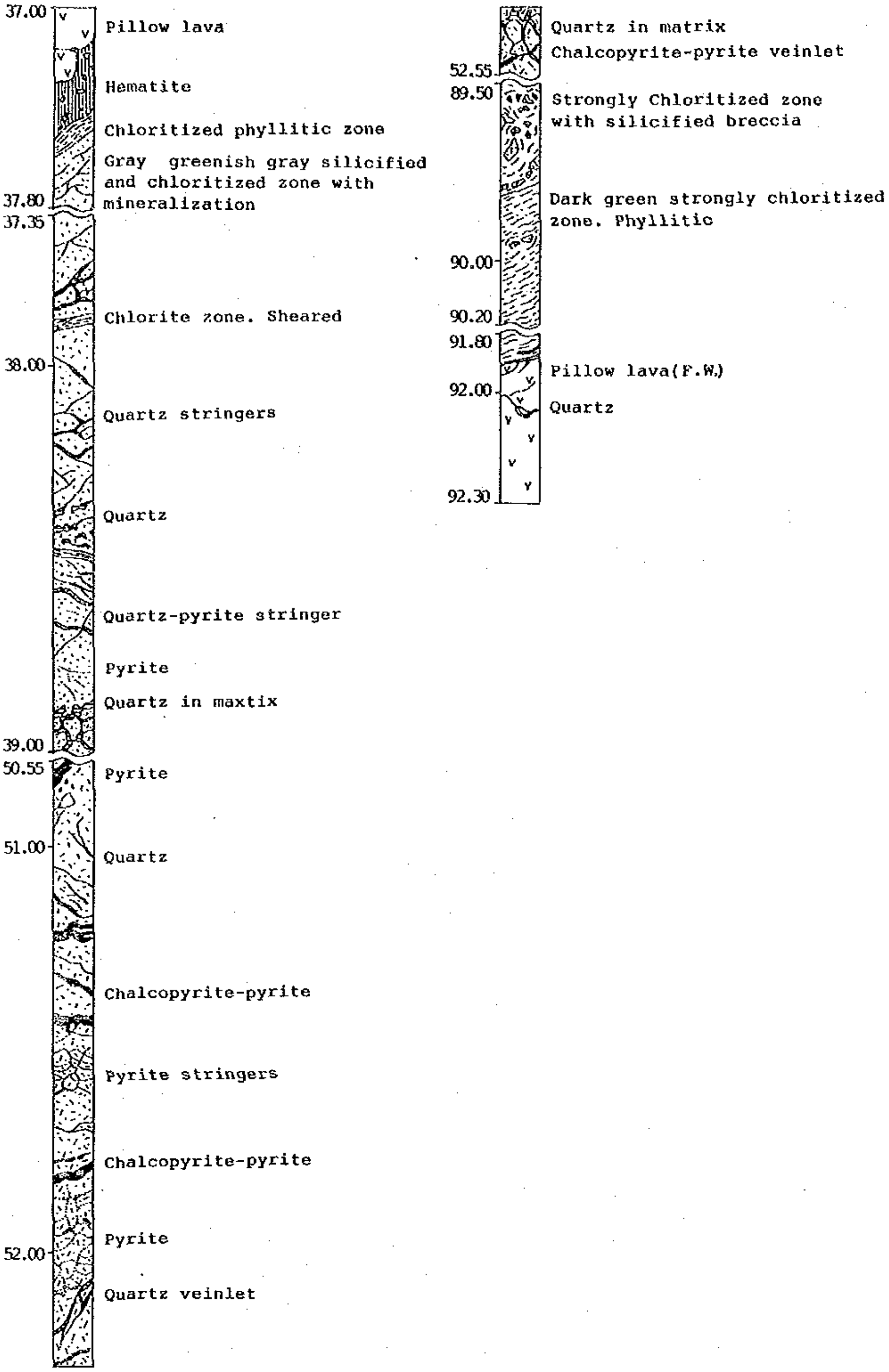


Fig. II-2-14 Detailed Sketch for Mineralized zone of Core Sections (2)

Sketch for the mineralized zone in this hole is shown in Fig. II-2-14.

(3) MJO-B3

Drill hole MJO-B3 was carried out to examine the eastern extension of the Rakah ore deposit. The results are summarized as follows:

0 ~ 68.90 m	Lower Extrusives II. Chloritized pillow lavas with subordinate massive lavas and pillow breccia. Calcite stringers and hematite in matrix.
68.90 ~ 69.20 m	Hematite-quartz zone; weakly sheared.
69.20 ~ 137.20 m	Silicified, chloritized and brecciated zone with stockwork mineralization. Pyrite-quartz-calcite stockwork and pyrite disseminations. Poor chalcopyrite.
137.20 ~ 198.70 m	Lower Extrusives I. Weakly chloritized and hematized.
198.70 ~ 199.90 m	Silicified, brecciated and strongly chloritized zone with stockwork mineralization. Sheared at the top and bottom.
199.90 ~ 200.30 m	Lower Extrusives I. Brecciated and chloritized pillow lavas.
200.30 ~ 200.60 m	Same as 198.70 ~ 199.90 m.
200.60 ~ 201.70 m (bottom)	Same as 199.90 ~ 200.30 m.

This hole confirmed a thick mineralized zone. But the mineralization and alteration are very weak, and only pyrite and minor sphalerite are observed.

Pyrite concentrated zones were assayed but the results are disappointing. The best intersection of two meter section was 0.04% Cu and 0.45% Zn.

The thin mineralized zone encountered at the bottom of the hole can be interpreated on the geologic section that upper thick mineralized zone and the lower thin mineralized zone are originally same zone and a reverse fault dislocated the zone.

(4) MJO-B4

This hole was completed at the center of the ore deposits and is situated about 10 m north of a significant gossan zone. Results are summarized below:

0 ~ 27.60 m	Lower Extrusives II. Chloritized and weakly brecciated pillow lavas.
27.60 ~ 37.70 m	Strongly chloritized and weakly sheared pillow lavas. Brecciated.
37.70 ~ 89.80 m	Silicified, chloritized and brecciated zone with stockwork mineralization. Pyrite (cholcopyrite) stringers and disseminations.
89.80 ~ 91.90 m	Strongly chloritized zone with pyrite disseminations.
91.90 ~ 101.30 m (bottom)	Lower Extrusives I. Silicified and chloritized pillow lavas with weak pyrite disseminations and quartz-hematite stringers.

The upper mineralized zone confirmed in the hole shows thick and comparatively high grade zone. Five drill holes other than this hole completed in Area B show no sulfide minerals in the hanging wall and footwall volcanic rocks except the volcanic rocks between the upper and lower mineralized zones. Weak pyrite desseminations can be observed in lower Extrusives I encountered in this hole from the depth of 91.90 m. This fact suggest that potential of the lower mineralized zone is high in the surroundings of this hole.

Following average assay values were obtained for the mineralized zone except the top of the zone which shows low values.

Upper mineralized zone 41.70 m ~ 89.90 m D.L. 48.10 m
0.43 g/t Au, 1.6 g/t Ag, 0.85% Cu, 0.01% > Pb, 0.28% Zn

The best intersection is between 63.70 m and 65.70 m. This two meters section give 0.9 g/t Au and 2.27% Cu. Sketch for the stockwork zone give in Fig. II-2-14.

(5) MJO-B5

This drill hole was carried out at the center of the known ore deposits. Results are as below:

0 ~ 28.30 m	Lower Extrusives II. Chloritized pillow lavas. Upper part is argillized and weathered.
28.30 ~ 28.70 m	Strongly chloritized phyllitic zone.
28.70 ~ 71.00 m	Chloritized, weakly silicified and brecciated zone with stockwork mineralization (upper mineralized zone). Pyrite-chalcopyrite stringers and pyrite disseminations.
71.00 ~ 72.90 m	Strongly chloritized zone. Phyllitic.
72.90 ~ 84.10 m	Lower Extrusives I. Weakly chloritized pillow lavas with very weak pyrite disseminations.
84.10 ~ 84.20 m	Brecciated zone with quartz-hematite vein.
84.20 ~ 124.60 m	Brecciated, silicified and chloritized zone with stockwork mineralization (lower mineralized zone). Pyrite-chalcopyrite veins and veinlets.
124.60 ~ 150.00 m (bottom)	Lower Extrusives I. Chloritized pillow lavas with hematite in matrix.

This hole also confirmed two zones of the upper and lower mineralized zones. A lower half of each mineralized zone shows more concentration of copper.

Assay results for the copper concentrated zones are as follows:

Upper mineralized zone 47.40 m ~ 71.00 m D.L. 23.60 m
0.23 g/t Au, 1.0 g/t Ag, 1.15% Cu, 0.01% > Pb, 0.09% Zn
Lower mineralized zone 106.30 m ~ 124.60 m D.L. 18.30 m
0.24 g/t Au, 0.4 g/t Ag, 1.09% Cu, 0.01% > Pb, 0.04% Zn

The best two meter section for the upper mineralized zone is 62.90 m ~ 64.90 m 0.7 g/t Au, 1.7 g/t Ag, 3.54% Cu, 0.16% Zn, and the best section for the Lower mineralized zone is 110.30 m ~ 112.30 m grading 1.0 g/t Au, 1.1 g/t Ag, 1.91% Cu and 0.09% Zn.

(6) MJO-B6

This drill hole was carried out southern middle part of the Rakah deposit area.

0 ~ 11.20 m	Gossan and gossan dump.
11.20 ~ 25.30 m	Argillized, chloritized and brecciated zone with stockwork mineralization (upper mineralized zone). Pyrite-chalcopyrite disseminations and stringers.
25.30 ~ 31.50 m	Clay zone. Possibly old working. 27.00 m : wooden chips.
31.50 ~ 37.00 m	Lower Extrusives II. Chloritized and silicified pillow lavas. Weak pyrite disseminations.
37.00 ~ 39.35 m	Strongly chloritized zone. Bottom : Sheared and argillized zone.
39.35 ~ 75.90 m	Chloritized, silicified and brecciated zone with stockwork mineralization (lower mineralized zone). Chalcapyrite pyrite stringers and disseminations. Minor sphalerite stringers.
75.90 ~ 100.85 m (bottom)	Lower Extrusives I. Chloritized and weakly brecciated pillow lavas. Hematite in matrix and fractures.

This hole encountered clayey zone from 25.30 m to 31.50 m. Because wooden ships were recovered in the hole at the depth of 27.00 m, this zone is thought to be old working. Gossan zone encountered at the top of the hole is soft. This gossan zone might be gossan dump at ancient time.

Assay results are as follows.

Upper mineralized zone 11.20 m ~ 25.30 m D.L. 14.10 m

0.52 g/t Au, 2.2 g/t Ag, 3.51% Cu, 0.01% > Pb, 0.15% Zn

Lower mineralized zone 49.35 m ~ 67.35 m D.L. 18.00 m

0.18 g/t Au, 0.4 g/t Ag, 0.98% Cu, 0.01% > Pb, 0.04% Zn

The upper mineralized zone show high grade, but this hight grade zone may formed by secondary enrichment.

2. Observation Results of Polished Sections

Twenty samples of the polished sections collected from drill core in Area B were observed microscopically. The results of microscopic observation are shown in Table II-2-3.

Ore minerals consist of pyrite, chalcopyrite, covellite, bornite, chalcocite and sphalerite, which are similar to the constituent ore minerals of Hayl as Safil deposit in Area A, as well as native gold. In particular, native gold is found in one sample of MJO-B6 drill hole (57.60 m in depth). Most of samples, except massive ore of MJO-B1 are collected in sotkwork ore zone. The ore minerals of the stockwork ore consist of mastly pyrite, chalcopyrite and subordinate covellite and chalcocite. The chalcocite is thought to be primary mineral because veinlet of chalcocite cuts chalcopyrite. And chalcopyrite diserse in the sphalerite is present in several samples. Sulfide veinlets display an occurrence in the order of crystallization from pyrite, chalcopyrite to sphalerite. the native gold, 9 micrometer in diameter, is found in chalcopyrite of stockwork ore.

The massive ore of drill hole MJO-B1 consists of pyrite, chalcopyrite, covellite, chalcocite,

Table II-2-3 Results of Microscopic Observation for Polished Sections in the Rakah Deposit

Hole No.	Depth (m)	Occurrence	Pyrite	Chalcopyrite	Covellite	Chalcocite	Bornite	Sphalerite	Native gold	Gangue minerals and alteration minerals
MJO-B1	34.70	secondary enrichment of massive py-(cp) ore	◎	•	●	○		•		●
"	37.50	secondary enrichment of massive py-(cp) ore	◎ colloform brecciated	•	●	•	•	•*		●
"	41.10	massive py ore	◎ brecciated colloform framboidal	•	•		•	•*		●
"	48.00	massive py ore with fragment of silicified rock	◎ brecciated colloform framboidal	•	•	•	•	•*		○
"	51.15	massive py ore	◎	•	•			•		●
MJO-B2	97.70	py veinlet in chloritized (?) pillow lava	●	•				•		◎
"	101.45	py-cp veinlet in chloritized (?) pillow lava	◎	○		•		•		•
"	111.90	py veinlet in chloritized(?) pillow lava	○ brecciated fractured	●				•		◎ with calcite
"	145.60	lenticular ore (py-cp) in chloritized rock (?)	○	○				•		◎
MJO-B3	80.10	quartz-calcite veinlet and py-dissemination in chloritized pillow lava	• partly brecciated	•				•		◎ quartz > calcite
"	133.60	py veinlet and py dissemination in chloritized (?) pillow lava	● partly brecciated	•				•		◎
MJO-B4	43.70	py-cp veinlet and py-cp dissemination (stockwork zone)	○	●				•		◎
"	56.00	cp-sp-py veinlet	●	○				●*		◎
"	77.40	py-cp-sp veinlet in chloritized (?) pillow lava	◎ partly brecciated	●	•			●*		●
"	85.10	py-cp veinlet	●	●	•			•*		◎
MJO-B5	47.70	cp-py veinlet in chloritized (?) pillow lava	●	○				•*		◎
"	107.60	cp-py veinlet and cp-py dissemination	○	◎				•		◎
MJO-B6	42.10	cp-sp-py-quartz-calcite veinlet in chloritized (?) pillow lava	•	●				●*		◎ quartz > calcite
"	57.60	cp-py veinlet (Au-bearing veinlet)	○	◎				•	•	○
"	71.30	cp-py veinlet in chloritized pillow lava	●	●				•*		◎

* : chalcopyrite disease ◎ : abundant ○ : common ● : rare • : very rare py : pyrite cp : chalcopyrite sp : sphalerite

bornite and sphalenite. Pyrite dominates markedly the massive ore and is affected brecciation. This breccia consisting of pyrite shows locally colloform and framboidal testures. Copper minerals in the massive ore comprise mainly covellite and chalcocite with subordinate chalcopyrite. The occurrence of covellite and chalcocite suggests to have been formed by secondary enrichment. Chalcopyrite disease in sphalerite is also found in the massive ore.

3. Results of EPMA Analyses

Four samples collected from drilling cores in the Aera B were analyzed by EPMA after made polished sections and carbon coating. Analyses methods are area and quantitive analyses for native gole, quantitive analysis of Zn, Fe and Cu for sphalerite and quantitive analysis of Cu, Fe and Zn and qualitative analysis for chalcopyrite. The results of them show in Table II-2-4.

A grain of native gold is observed in the stockwork ore zone at the drill hole MJO-B6 (57.60 m) and it shows triangle shape of 4×9 μ wide. Ag content (3.56 ~ 3.76%) is very low and Ag/Au ratio is 1/25 to 26 resulting from the quantitive analysis. The distribution of Ag is inferred to be scattered equally in the native gold without zonal structure bsed on the area analyses.

Most of chalcopyrite is composed qualitatively of Cu, Fe and S. The quantitive analyses show chalcopyrite from MJO-B6 (57.60 m) contains 0.17 to 0.22% Zn. Small quantity of Zn auggests disseminatins of sphalerite, because a small amount of fine grained sphalerite in the chalcopyrite is obsrved around the analyzed point of EPMA in the polished sectoin.

4. Results of Minor Elements Analyses.

The sample taken from MJO-B1 drill hole (40.80 m in depth) was chemically analysed for 24 minor elements. The results of chemical analyses are shown in Table II-3-3.

Mn is marked by high value (1,914 ppm). Highly concentrated zones in the Lasail deposit of the Sohar area are found in the marginal part of the deposits. The massive ore which shows high content of Mn is also situated at the marginal part of the Rakah deposit. Pb show relatively high value.

5. Results of X-ray diffraction analyses

In the Area B, a total of six samples, including two samples of Lower Extrusives I, one sample of Lower Extrusives II and three samples of mineralized zone, are examined by X-ray diffraction analyses. The results are shown in Table II-2-5.

Results of X-ray diffraction analyses together with microscopic observation of thin and polished sections are as follows:

Table II-2-4 Results of EPMA Analyses

Sample location			Minerals	Analyzed point No.	Analysis method	Analyzed elements	Results						SEM image*1 photo No.	Remarks
Area	Drill Hole No.	Depth (m)												
A	HS-17	61.55	sphalerite	1	quantitive	Zn, Fe, Cu	Point	Zn	Fe	Cu	(%)	Fe/Zn ratio	(1)	massive ore
							1	63.26	1.09	1.19		1/58		
							2	65.04	0.60	0.66		1/108		
							3	63.54	1.16	1.47		1/55		
			chalcopyrite	2	qualitaitive	B ~ U	Cu, Fe, S						(2)	
B	MJO-B4	56.00	sphalerite	3	qualitative	Zn, Fe, Cu	Point	Zn	Fe	Cu	(%)	Fe/Zn ratio	(3)	stockwork ore
							1	57.66	3.23	3.98		1/18		
							2	59.16	3.29	3.59		1/18		
							3	57.87	3.75	3.98		1/15		
			chalcopyrite	4	qualitative	B ~ U	Cu, Fe, S						(4)	
		77.40	sphalerite	5	qualitative	Zn, Fe, Cu	Point	Zn	Fe	Cu	(%)	Fe/Zn ratio	(4)	stockwork ore
							1	52.36	6.28	6.68		1/8		
							2	56.01	4.46	5.30		2/13		
							3	53.87	5.50	5.96		3/10		
			chalcopyrite	6	qualitative		Cu, Fe, S						(6)	
	MJO-B6	42.10	sphalerite	7	qualitative	Zn, Fe, Cu	Point	Zn	Fe	Cu	(%)	Fe/Zn ratio	(7)	stockwork ore
							1	43.96	9.49	10.67		1/5		
							2	45.07	9.44	10.30		1/5		
							3	46.89	9.13	9.88		1/5		
		57.60	native gold	8	area	Au, Ag							Au, Ag *2 (8) (9) (10)	stockwork ore
				9	qualitative	Zn, Fe, Cu	Point	Au	Ag	Cu	(%)	Fe/Zn ratio		
							1	92.99	3.76	1.68		1/25		
							2	93.40	3.56	1.44		1/26		
			chalcopyrite	10	qualitative	Zn, Fe, Cu	Point	Zn	Fe	Cu	(%)	Fe/Zn ratio	(11)	
							1	32.90	30.60	0.19		1/58		
							2	32.32	30.85	0.17				
							3	31.88	30.68	0.22				
				11	qualitative	B ~ U	Cu, Fe, Zn, S							
				12	qualitative	B ~ U	Cu, Fe, S						(12)	

*1 SEM images are shown in Appendices.

*2 SEM image of native gold and Microprobe images of Au and Ag are shown Photographs 8, 9 and 10, respectively.

Table II-2-5 Results of X-ray Diffraction Analyses in Area B

Sample No.	Geol. Unit	Quartz	Plagioclase	Augite	Chlorite	Smectite	Prehnite	Pumpellyite	Epidote	Sphene	Analcite	Calcite	Pyrite	Chalcopyrite	Hematite	Titanomagnetite (?)	Remarks
MJO-B3 125.90	ORE	○	◎*		◎	△				●		○	△				*labradorite
MJO-B4 62.30	ORE	◎	●*		◎								○	△			*oligoclase
MJO-B5 23.50	LII.	○	◎*	○	○	○						○	△			△	*labradorite
MJO-B5 69.00	ORE	○			◎									○			
MJO-B5 79.20	LI.	△	△*	○	○	○		●			◎				●	△	*labradorite
MJO-B5 136.10	LI.	○	◎*	○	○			●	●	●					●	●	*andesine

◎ : abundant ○ : common △ : rare ● : very rare

Lower Extrusives I, footwall of ore body, shows silicification, chloritization and hematitizaion and have subordinate epidote and pumpellyite, which indicate low-grade metamorphism. Lower Extrusives I (MJO-B5, 79.20 m) intercalating in the mineralized zone, between upper and lower mineralized zone, is similar to the footwall in the lithological features, but it is associated with smectite and zeolites. The samples taken from the mineralized zone, of MJO-B4 62,30 m and MJO-B5 69.00 m in depth, are affected by strong alterations of silicification and chloritization.

The sample collected at the northeastern margin of the mineralized zone (MJO-B3, 125.90 m) is affected weak mineralization togeather with weak alteration, so that strong peak of plagroclase is revealed on the chart of X-ray diffraction. This sample also contains smectite.

The Lower Extrusives II, hanging wall of the mineralized zone, is affected silicification and chloritization associated smectite and calcite.

2-5 Discussion

Exploration work including geologic, geophysical and drilling surveys was also completed in Area B in this plase. Based on the survey results, nature of the mineralization, potential of ore reserves and future exploration work were considered and obtained following conclousions.

1. Nature of Mineralization of the Rakah Deposits

Mineralized zone of the Rakah deposit is situated at the top of the Lower Extrusives I and covered with the Lower Extrusives II. The stratigraphic posision is similar to the Lasail and Bayda deposits in the Sohar area and the Hayl as Safil deposit of Area A. The mineralized zone extends E-W and ENE-WSW directions. The area of known mineralized zone is estimated 400 m (E-W) ×300 m (N-S) and has good agreement with the conductive zone confirmed by the geophysical survey.

Geologic and drilling results gave following characteristics for the Rakah deposit.

(i) An anticlinal axis trending NW-SE is found along the gossan zone, which is exposed in the western part of the deposit. The mineralized zone dips to NW in the mortheastern flank and to SW in the south-western flank of the anticline. The mineralized zone has thrust fault contact with Sheeted-dyke Complex at the morthern part of the area. Faults cutting mineralized zone are divided into two systems including E-W and NNW-SSE. The E-W system consists of several normal faults dipping to the north. A reverse fault dipping to the east-northeast is found in the eastern part of the area.

(ii) The mineralized zone is made up of upper and lower mineralized zones. The upper mineralized zone consists of stockwork ore, masssive ore and siliceous ore in ascending order. The lower mineralized zone consists of only stockwork ore with similar occurrence to the upper mineralized zone. This zone is smaller than the upper mineralized zone. Pilow lavas beloging the Lower Extrusives I are interbedded between upper and lower mineralized zones. These pillow lavas are present weak pyrite disseminations. They thin eastward and disappear in the eastern part of the area as well as two mineralized zones become one zone.

(iii) Massive and siliceous ores are found in the notheastern part of the area and grade eastward into chert dominated sediments. The siliceous ore seems to be chert in origin. Au concentrates in the massive ore. Both massive and siliceous ores are brecciated.

(iv) The stockwork ore is originally pillow lavas, which were subjected to strong chloritization and silicification. Strong chloritization zone is found mostly between mineralized zone and volcanic rocks of hanging wall and footwall. The boundary between them is clear owing to the degree of alteration. Ore minerals occur as the disseminations, veinlets and in the matrix of breccia.

(v) Ore minerals consist of pyrite, chalcopyrite and subordinate sphalerite, covellite, chalcocite and bornite. Covellite, bornite and most of chalcocite occurs as secondary copper minerals. In the MJO-B6 drill hole, native gold of 9 micron in diameter is observed in chalcopyrite. And copper minerals in the massive ore consist mainly of secondary minerals owing to the enrichment. Au concentrates in the massive ore.

Stockwork ore forms main part of the Rakah deposit. The matrix of breccia and pillow lavas is filled with sulfide minerals and is cut by pyrite-chalcopyrite veinlets. However, intense brecciation and silicification which are similar with the Hayl as Safil deposit are not found and quartz veins are also less. The margin of the orebody tends weak alteration, so that original terxture of the rock can be observed under microscope. Because of the above-mentioned facts, the hydrothermal actitivy forming the deposit seems to be gentle. And the center of the mineralization is thought to be the center of the known deposit.

Massive ore is confirmed in the northwestern margin of sediments consisting of mainly chart, which was piled between Lower Extrusives I and II. The sediments contain brecciated massive ore. The origin of the siliceous ore, which is found at the hanging wall and footwall of the massive ore, thought to be chert. The massive ore displays locally framboidal and colloform textures. Therefore, it is thought that the formation of the massive ore has a close relation with the sediments.

2. Ore Reserves

Estimation of ore reserves for the Rakah deposit had been carried out several times using the drilling date by Prospoction Ltd.

Prospection Ltd. divided the ore zone to the upper stockwork zone (or main mineralized zone) and lower stockwork zone, and ertimated the following ore reserves in 1977:

Upper stockwork zone	2.90 Mt	1.55% Cu	0.24% Zn
Lower stockwork zone	1.25 Mt	0.74% Cu	0.14% Zn
Total	4.15 Mt	1.31% Cu	0.21% Zn

These ore reserves were re-calculated by I.G.Pettitt (OMCO) in 1980. He delineated a precious metal rich zone within the upper zone and estimated following reserves.

Gold-silver-copper ore zone	0.377 Mt	1.51% Cu	4.6 g/t Au	4.50 g/t Ag
Upper copper ore zone	3.172 Mt	1.51% Cu	0.57 g/t Au	0.58 g/t Ag
Lower copper ore zone	1.670 Mt	0.76% Cu		
Total	5.219 Mt	1.28% Cu	1 g/t Au	1 g/t Ag

These ore reserves were also evaluated by L. Carlson (MPM) in 1981, based on higher cut-off grade.

Copper ore zone	0.518 Mt	2.94% Cu	
Copper gold ore zone	0.213 Mt	2.39% Cu	3.8 g/t Au

Re-interpretation for the Rakah prospect was conducted by BRGM in 1985. evaluation of the ore reserves were also made by BRGM, based on the newly introduced classification.

Zone A (massive ore)	0.175 Mt	5.07% Cu	1.03% Zn	5.0 g/t Au
Zone B (siliceous ore)	0.500 Mt	2.40% Cu	0.18% Zn	1.5 g/t Au
Zone C (stockwork ore)	0.635 Mt	1.90% Cu	0.18% Zn	0.5 g/t Au
Total	1.300 Mt	2.50% Cu	0.30 %Zn	1.5 g/t Au

As mentioned above, several kinds of estimation had been made for the Rakah deposit. Results of this project reveal that following consideration should be made for the calculation of the ore reserves.

(i) Mineralized zone consists of distinguiish two mineralized zones of upper and lower. the upper mineraized zone is classified to siliceous ore, massive ore and stockwork ore. The lower mineralized zoned consists of stockwork ore.

(ii) Siliceous and massive ores confirmed by the drill hole MJO-B1 show higher contents of Au (D.L. 18.30 m, 8.96 g/t Au, 13.3 g/t Ag)

(iii) High copper zones in the stockwork zone show irregular shape.

Therefore, the ore reserve estimation should be made separately for the upper and lower mineralized zones. Ore reserves of massive ore with high Au contents are expected to be slightly large reserves. Because the reserves affect significantly for the evaluation of this project, the ore reserves of this high Au zone should be estimated separetely and also additional detailed survey is required for the high Au zone.

Because no tendencies are observed for the copper concentrated zone in the mineralized zone, it may be very difficult to mine only the high Cu zone without intense drilling work to clearify the high Cu zone in the mineralized zone. Therefore, the ore resurves estimated by Prospection Ltd. and OMCO (about 4 MT to 5 MT) are thought to be the most reasonable ore reserves for the Rakah deposit.

Results of geophysical and drilling surveys in this project revealed that the outside extensions are limitted for the Rakah deposit. However, if the exploration work for the lower mineralized zone is carried out, it may be possible to obtain several hundred thousands tons of ore as the additional ore reserves.

3. Potential

Geologic sections constructed in this survey suggest some extensions of the Rakah deposit to southwest of the previous drill hole 32 and southeast of drill hole 36. These extensions were also confirmed by the geophysical survey. Many previous drill holes completed were too short to confirm the lower mineralized zone and the drilling work is not enough for the zone. Drill holes completed in this project clarified that the both ore zones have similar ore zone. Further drilling work for the lower mineralized zone may confirm additional ore reserves. It is very important for the evaluation of this project to comfirm the ore reserves of highly Au concentrated zone which was encountered by the drill hole MJO-B1. If the significant ore reserves are confirmed, the ore must be treated separately. Therefore, detailed survey is required for the high Au zone including gossan zone and gossan dump.

Chapter 3 Petrochemical Survey

3-1 Purpose and Survey Method

The survey was carried out to clarify the nature of the Samail Volcanic Rocks which played important roles for formation of Cyprus-type copper deposit in the area and to examine whether it is possibility to classify the volcanic sequence petrochenically or not.

Thirty samples were used for whole rock anlyses of 13 major components and 33 samples were chemically analyzed for 24 elements. These samples were collected from the Samail Ophiolite and mineralized zones. The samples collected from the mineralized zone were used for correlation between known ore deposits in the Sohar area and Rakah area. These chemical analyses were done by ICAP (Induced Coupled Argon Plasma Emission Spectrophotometer) and flame spectrometory methods at the Geotechnical Laboratory of Bishimetal Exploration Co., Ltd.

The results of chemical analyses and norm calculation are given in Table II-3-1, Table II-3-2 and Table II-3-3 respectively. Detection limits for each element are as follows:

Al, Ca Fe, Mg, P, K, Na, W:	10 ppm
Bi, Pb:	3 ppm
Mo:	2 ppm
Ag:	0.1 ppm

Other than above elements are 1 ppm. The chemical analyses were made in Geotecnical Laboratory of Bishimetal Exploration Co., Ltd. The analyses were made by ICAP method except Ag by atomic absorption, and K and Na by flame spectrometory methods.

3-2 Survey Results

1. Culmulate Sequence (Cg) and High-level Gabbro (Hg)

One sample of Cumulate Sequence and one sample of High-level Gabbro were analyzed. Among the major components and minor elements, SiO_2 contents (48.23% ~ 48.28%) as well as Al_2O_3, MnO, P_2O_5, Co, Ni, Pb, Ag and Zn show almost same volue between both rocks. However, MgO, CaO, Cr and Ni are rich in Cumulate Sequence. Fe_2O_3* (* : total), Na_2O, Ki_2O, V, Zn and incompatible elements including TiO_2, P_2O_5, Ba and Sr are comparatively poor, so that small differentiation between them can be recognized. In addition, their solidification indices (S.I. = 53.59, 66.96) show higher value than that of Sheeted-dyke Complex and Samail Volcanic Rocks. FeO*/MgO ratios (F.M.I. = 0.37, 0.63) show comparatively low value and MgO are rich in MgO.

Table II-3-1 Results of Whole Rock Chemical Analyses

Ser. No.	Sample No.	Coodinates		Geol. *1 Unit	Rock Name	MAJOR COMPONENTS (%)														Remarks
		N (km)	E (km)			SiO_2	TiO_2	Al_2O_3	Fe_2O_3*2	MnO	MgO	CaO	Na_2O	K_2O	BaO*3	P_2O_5	LOI*4	CO_2	Total	
1	M003	2,618.723	453.108	Me	basalt	43.82	0.48	14.33	7.26	0.10	4.59	16.36	3.75	0.08	17	0.05	9017	5.09	100.21	calcareous
2	M005	2,619.150	452.857	Me	dolerite	43.68	1.19	14.34	10.19	0.21	5.65	11.70	4.15	0.12	40	0.11	1089	1.09	100.23	
3	M011	2,618.724	454.245	Hg	hb-cpx gabbro	48.23	0.38	14.92	7.35	0.12	10.44	12.12	2.04	0.39	16	0.02	4034	0.43	100.35	
4	M012	2,618.638	454.222	Sd	dolerite	51.75	0.72	15.77	10.54	0.17	3.71	14.14	0.16	0.03	4	0.05	3017	0.10	100.21	
5	M015	2,619.830	453.344	LII	andesite	54.52	0.31	14.91	9.12	0.08	6.80	5.56	5.39	0.19	13	0.01	3.07	0.00	99.96	
6	M016	2,617.975	457.542	Sd	andesite	52.48	0.83	14.73	9.49	0.16	8.20	5.86	3.34	0.29	3	0.06	4.74	0.16	100.18	
7	M017	2,618.985	457.200	Cg	cpx gabbro	48.28	0.15	14.45	4.85	0.10	11.85	15.45	1.42	0.07	3	0.00	3.77	0.23	100.39	
8	M018	2,618.950	457.236	L'	andesite	54.77	0.48	14.57	11.64	0.15	6.04	6.49	1.01	0.05	2	0.05	4.72	0.06	99.97	
9	M020	2,618.365	457.172	LII	basalt	50.16	0.21	10.68	6.64	0.27	6.16	13.29	2.75	0.55	29	0.02	9.12	6.33	99.85	
10	M022	2,618.938	458.642	Me	andesite	55.32	0.72	14.83	9.11	0.10	4.90	6.65	3.32	0.11	8	0.06	4.87	0.15	99.99	
11	M023	2,618.440	458.925	Me	basalt	51.21	0.66	14.80	8.32	0.16	7.40	7.09	4.56	0.29	22	0.05	5.42	1.35	99.96	
12	M024	2,618.314	458.596	LI	basalt	50.11	1.23	16.13	10.29	0.19	5.15	7.57	4.18	0.58	34	0.12	4.34	0.20	99.89	
13	M031	2,618.249	457.534	L'	dolerite	50.32	1.11	15.42	9.91	0.22	4.75	8.97	4.52	0.69	45	0.10	4.48	1.58	100.49	
14	M032	2,617.977	457.502	LI	andesite	52.18	0.84	14.42	10.22	0.18	7.35	6.04	2.13	0.76	18	0.06	5.83	0.17	100.03	
15	M034	2,619.127	453.198	LI	andesite	61.46	0.61	9.92	12.82	0.04	8.06	0.67	0.24	0.07	12	0.01	6.14	0.24	100.04	altered, silicified
16	MJO-A4 44.20	2,618.676	453.458	LII	andesite	52.71	0.50	15.77	7.98	0.09	6.78	5.58	5.61	0.07	14	0.05	4.69	0.36	99.83	
17	MJO-A4 143.70	2,618.676	453.458	LI	basalt	47.12	0.45	16.02	6.75	0.13	9.50	9.03	2.22	1.36	42	0.03	7.16	0.50	99.77	
18	MJO-A1 63.70	2,618.742	453.434	LII	basalt	51.92	0.52	16.91	7.73	0.08	6.10	7.13	5.26	0.41	30	0.06	4.26	0.23	100.38	
19	MJO-A1 172.00	2,618.742	453.434	LI	basalt	46.55	0.26	12.77	8.49	0.09	12.35	11.71	0.49	0.11	6	0.01	7.22	0.62	100.05	
20	MJO-B5 23.50	2,618.700	457.404	LII	basalt	49.01	0.27	14.05	7.84	0.11	8.04	11.43	2.22	0.96	30	0.04	6.01	2.09	99.98	
21	MJO-B5 79.20	3,618.700	457.404	LI	basalt	45.64	0.33	15.49	9.47	0.10	8.97	8.28	1.78	1.22	22	0.03	8.29	0.30	99.60	
22	MJO-B5 136.10	2,618.700	457.404	LI	basalt	50.77	1.09	15.22	9.64	0.26	6.66	6.51	4.84	0.16	18	0.10	4.40	0.36	99.29	
23	MJO-B3 55.20	2,618.784	457.526	LII	basalt	51.91	0.45	15.54	8.33	0.09	4.79	9.83	4.25	0.17	15	0.04	4.39	0.30	99.79	
24	MJO-B3 147.70	2,618.784	457.526	LI	basalt	50.05	1.19	16.08	10.06	0.17	5.21	4.84	3.81	0.92	37	0.11	4.47	0.43	99.91	
25	MJO-B4 101.20	2,618.723	457.358	LI	basalt	49.49	0.30	13.42	8.20	0.09	10.09	8.93	1.50	0.94	22	0.01	6.87	0.39	99.84	
26	MJO-B6 85.90	2,618.631	457.405	LI	basalt	49.22	0.76	16.83	9.27	0.18	5.95	7.64	5.10	0.11	16	0.10	5.09	0.68	100.25	
27	N011	2,618.782	453.194	LII	andesite	57.48	0.21	12.67	8.96	0.07	7.02	6.00	3.61	0.51	18	0.01	3.62	0.50	100.16	
28	MJO-B2 52.20	2,618.772	457.385	LII	andesite	57.07	0.28	12.13	7.22	0.10	6.05	9.66	3.02	0.48	19	0.04	3.90	0.95	99.95	
29	MJO-A2 136.00	2,618.698	4553.296	LI	basalt	51.85	10.64	15.92	10.58	0.17	6.47	3.29	5.81	0.13	38	0.16	4.33	0.16	100.35	
30	MJO-A5 17.50	2,618.792	453.296	LII	basalt	47.60	0.25	11.89	8.36	0.19	15.45	7.81	0.40	0.08	99	0.01	7.91	0.10	99.95	

*1 : Abbreviations are shown in Fig. II-3-1. *2 : Total iron as Fe_2O_3 *3 : PPM *4 : Ignition loss

Table II-3-2 Results of C. I. P W. Norm Calclation

Ser. No.	Sample No.	Geol.[*1] Unit	q	c	or	ab	an	ne	ac	ns	ks	wo	diwo	dien	difs	hyen	olfo	olfa	mt	hm	il	tn	pf	ru	ap	cc	pr	Total FeO	S.I.[*2]	F.M.I.[*3]
1	M003	Me	0.00	0.00	0.47	30.30	22.58	0.77	0.00	0.00	0.00	0.00	9.54	5.43	3.71	0.00	4.21	3.17	2.12	0.00	0.91	0.00	0.00	0.00	0.12	11.58	0.00	6.55	30.65	1.43
2	M005	Me	0.00	0.00	0.71	31.31	20.15	2.06	0.00	0.00	0.00	0.00	12.36	6.88	4.99	0.00	5.04	4.03	2.96	0.00	2.26	0.00	0.00	0.00	0.25	2.48	0.00	9.18	29.59	4.62
3	M011	Hg	0.00	0.00	2.30	17.26	30.40	0.00	0.00	0.00	0.00	0.00	11.11	7.76	2.42	2.94	6.16	2.11	2.13	0.00	0.72	0.00	0.00	0.00	0.05	0.98	0.00	6.61	63.59	0.63
4	M012	Sd	0.00	0.00	0.47	30.30	22.58	0.77	0.00	0.00	0.00	0.00	9.54	5.43	3.71	0.00	4.21	3.17	2.12	0.00	0.91	0.00	0.00	0.00	0.12	11.58	0.00	9.49	27.71	2.56
5	M015	LII	0.00	0.00	1.12	45.61	15.93	0.00	0.00	0.00	0.00	0.00	4.84	2.84	1.73	6.09	2.77	1.84	2.64	0.00	0.59	0.00	0.00	0.00	0.02	0.00	0.00	8.21	33.03	1.21
6	M016	Sd	0.00	0.00	0.71	31.31	20.15	2.06	0.00	0.00	0.00	0.00	12.36	6.88	4.99	0.00	5.04	4.03	2.96	0.00	2.26	0.00	0.00	0.00	0.25	2.48	0.00	8.54	40.26	1.04
7	M017	Cg	0.00	0.00	0.41	12.02	32.85	0.00	0.00	0.00	0.00	0.00	17.62	13.32	2.50	0.99	7.66	1.59	1.41	0.00	0.28	0.00	0.00	0.00	0.00	0.52	0.00	4.36	66.94	0.37
8	M018	L'	0.00	0.00	0.47	30.30	22.58	0.77	0.00	0.00	0.00	0.00	9.54	5.43	3.71	0.00	4.21	3.17	2.12	0.00	0.91	0.00	0.00	0.00	0.12	11.58	0.00	10.48	34.36	1.73
9	M020	LII	0.00	0.00	2.30	17.26	30.40	0.00	0.00	0.00	0.00	0.00	11.11	7.76	2.42	2.94	6.16	2.11	2.13	0.00	0.72	0.00	0.00	0.00	0.05	0.98	0.00	5.98	39.9.	0.97
10	M022	Me	0.00	0.00	0.71	31.31	20.15	0.00	0.00	0.00	0.00	0.00	12.36	6.88	4.99	0.00	5.04	4.03	2.96	0.00	2.26	0.00	0.00	0.00	0.25	2.48	0.00	8.20	29.65	1.67
11	M023	Me	0.00	0.00	0.47	30.30	22.58	0.00	0.00	0.00	0.00	0.00	9.54	5.43	3.71	0.00	4.21	3.17	2.12	0.00	0.91	0.00	0.00	0.00	0.12	11.58	0.00	7.48	37.50	1.01
12	M024	LI	0.00	0.00	0.71	31.31	20.15	0.00	0.00	0.00	0.00	0.00	12.36	6.88	4.99	0.00	5.04	4.03	2.96	0.00	2.26	0.00	0.00	0.00	0.25	2.48	0.00	9.29	26.86	1.80
13	M031	L'	0.00	0.00	2.30	17.26	30.40	0.00	0.00	0.00	0.00	0.00	11.11	7.76	2.42	2.94	6.16	2.11	2.13	0.00	0.72	0.00	0.00	0.00	0.05	0.98	0.00	8.91	25.17	1.88
14	M032	LI	0.00	0.00	0.47	30.30	22.58	0.00	0.00	0.00	0.00	0.00	9.54	5.43	3.71	0.00	4.21	3.17	2.12	0.00	0.91	0.00	0.00	0.00	0.12	11.53	0.00	9.20	37.88	1.25
15	M034	LI	0.00	0.00	1.12	45.31	15.93	0.00	0.00	0.00	0.00	0.00	4.84	2.87	1.73	6.09	2.77	1.84	2.64	0.00	0.59	0.00	0.00	0.00	0.02	0.00	0.00	11.53	40.50	1.43
16	MJO-A4 44.20	LII	0.00	0.00	0.41	47.47	17.64	0.00	0.00	0.00	0.00	0.00	3.10	1.88	0.95	3.49	5.70	3.18	2.32	0.00	0.95	0.00	0.00	0.00	0.12	0.82	0.00	7.18	34.52	1.06
17	MJO-A4 143.70	LI	0.00	0.00	8.04	18.79	29.73	0.00	0.00	0.00	0.00	0.00	4.47	3.13	0.97	3.30	6.90	2.35	1.96	0.00	0.85	0.00	0.00	0.00	0.07	1.36	0.00	6.07	49.60	0.64
18	MJO-A1 63.70	LII	0.00	0.00	2.42	44.51	21.32	0.00	0.00	0.00	0.00	0.00	5.04	3.08	1.67	0.28	8.12	4.84	2.25	0.00	0.99	0.00	0.00	0.00	4.07	0.52	0.00	6.95	32.58	1.14
19	MJO-A1 172.00	LI	1.94	0.00	0.65	4.15	32.32	0.00	0.00	0.00	0.00	0.00	8.93	6.24	1.94	7.76	0.00	0.00	2.46	0.00	0.49	0.00	0.00	0.00	0.02	1.41	0.00	7.64	59.98	0.62
20	MJO-B5 23.50	LII	1.86	0.00	5.67	18.79	25.54	0.00	0.00	0.00	0.00	0.00	6.34	4.42	1.96	7.00	0.00	0.00	2.28	0.00	0.51	0.00	0.00	0.00	0.09	4.75	0.00	7.05	44.00	0.88
21	MJO-B5 79.20	LI	0.00	0.00	7.21	15.06	30.67	0.00	0.00	0.00	0.00	0.00	3.39	2.15	1.02	6.57	4.45	2.33	2.74	0.00	0.63	0.00	0.00	0.00	0.07	0.68	0.00	8.52	43.78	0.95
22	MJO-B5 136.10	LI	0.00	0.00	0.95	40.95	19.33	0.00	0.00	0.00	0.00	0.00	4.10	2.44	1.45	4.47	4.63	3.02	2.80	0.00	2.07	0.00	0.00	0.00	0.23	0.82	0.00	8.68	32.75	1.30
23	MJO-B3 55.20	LII	0.32	0.00	1.00	35.96	22.82	0.00	0.00	0.00	0.00	0.00	9.85	5.40	4.10	5.10	0.00	0.00	2.42	0.00	0.86	0.00	0.00	0.00	0.09	0.68	0.00	7.50	28.66	1.57
24	MJO-B3 147.70	LI	0.00	0.00	5.44	32.24	24.06	0.00	0.00	0.00	0.00	0.00	4.65	2.53	1.95	6.83	1.09	0.93	2.91	0.00	2.26	0.00	0.00	0.00	0.25	0.98	0.00	9.05	27.44	1.74
25	MJO-B4 101.20	LI	3.14	0.00	5.55	12.69	27.11	0.00	0.00	0.00	0.00	0.00	6.02	4.07	1.48	7.80	0.00	0.00	2.38	0.00	0.57	0.00	0.00	0.00	0.02	0.89	0.00	7.38	50.69	0.73
26	MJO-B6 85.90	LI	0.00	0.00	0.65	42.03	22.70	0.00	0.00	0.00	0.00	0.00	4.10	2.36	1.56	0.00	8.73	6.36	2.68	0.00	1.44	0.00	0.00	0.00	0.23	1.55	0.00	8.33	30.52	1.40
27	N011	LII	0.00	0.00	0.41	47.47	17.64	0.00	0.00	0.00	0.00	0.00	6.01	1.88	0.95	3.49	5.70	3.18	2.32	0.00	0.95	0.00	0.00	0.00	0.12	0.82	0.00	8.06	36.56	1.15
28	MJO-B2 52.20	LII	12.19	0.00	2.84	25.55	18.12	0.00	0.00	0.00	0.00	0.00	9.52	5.88	3.15	5.05	0.00	0.00	2.09	0.00	0.53	0.00	0.00	0.00	0.09	2.16	0.00	6.50	37.70	1.07
29	MJO-A2 136.00	LI	0.00	1.03	0.77	49.16	14.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.10	4.30	2.89	3.07	0.00	3.11	0.00	0.00	0.00	0.37	0.36	0.00	9.53	29.49	1.47
30	MJO-A5 17.50	LII	2.79	0.00	0.47	3.38	30.41	0.00	0.00	0.00	0.00	0.00	3.16	2.30	0.57	9.18	0.00	0.00	2.42	0.00	0.47	0.00	0.00	0.00	0.02	0.23	0.00	7.52	65.88	0.49

*1 S.I.: Abbreviations are shown in Fig. II-3-1. *2 S.I.: Solidification Index = MgO×100/(MgO + Total FeO + Na_2O + K_2O) *3 F.M.I.: Total FeO – MgO Index = Total FeO/MgO (Fe_2O_3 : FeO was estimated to be 1 : 4.)

Table II-3-3 Results of Chemical Analyses for Minor Elements

Ser. No.	Sample No.	Geol.*1 Unit	Al	Ba	Be	Bi	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	P	K	Ag	Na	Sr	Ti	W	V	Zn
1	M003	Me	75900	15	1	<3	<1	117000	58	29	67	50900	6	27700	774	<2	37	235	640	2.2	27800	89	2700	<10	214	54
2	M005	Me	45900	35	3	<3	<1	83600	156	45	54	71300	7	34100	1680	<2	78	450	1000	1.0	30800	132	7020	<10	267	71
3	M011	Hg	79000	15	1	<3	<1	86600	322	35	87	51400	6	63000	906	<2	130	76	3200	0.7	15100	134	2290	<10	190	55
4	M012	Sd	83400	3	2	<3	<1	101000	166	22	7	73800	5	22400	1300	<2	25	238	270	0.2	1200	383	4320	33	317	38
5	M015	LII	78900	11	1	<3	<1	39700	322	31	53	63800	5	41000	612	<2	149	58	1550	0.1	40000	151	1850	<10	243	72
6	M016	Sd	78000	3	1	<3	<1	41900	81	35	5	66300	4	49500	1250	<2	45	261	2400	0.1	24800	73	4990	<10	105	28
7	M017	Cg	76500	3	<1	3	<1	110000	463	28	134	33900	4	71500	743	<2	14	12	550	0.6	10500	108	911	27	74	30
8	M018	L'	77100	1	2	<3	<1	46400	127	33	34	81400	5	36400	1140	<2	42	225	450	<0.1	7500	127	2850	<10	190	60
9	M020	LII	56500	26	1	3	<1	95000	359	29	45	46400	9	73100	2070	<2	192	71	4600	1.3	20400	124	1270	34	158	55
10	M022	Me	78500	7	2	<3	<1	47500	98	29	220	63700	<3	29600	805	<2	31	278	910	0.7	24600	55	4330	<10	224	65
11	M023	Me	78200	20	1	<3	<1	50700	43	32	31	58200	7	44600	1240	<2	39	202	2400	0.4	33800	128	3970	<10	220	73
12	M024	LI	85400	30	3	<3	<1	54100	70	35	75	72000	6	31100	1470	<2	42	507	4800	0.6	31000	148	7340	<10	291	83
13	M031	L'	81600	40	3	<3	<1	64100	56	35	27	69300	7	28600	1730	<2	26	418	5800	0.4	33500	197	6660	30	288	76
14	M032	LI	76300	16	2	<3	<1	43200	56	35	46	71500	3	44400	1430	<2	31	257	6300	0.3	15800	253	5040	<10	285	87
15	M034	LI	52500	11	1	<3	<1	4790	93	33	1830	89700	<3	48600	297	<2	35	57	550	0.1	1800	22	3670	35	156	292
16	MJO-A4 44.20	LII	83500	13	2	<3	<1	39800	165	124	13	55800	5	40900	666	<2	46	224	550	0.9	41600	87	2980	<10	196	195
17	MJO-A4 143.70	LI	84800	37	1	<3	<1	64500	263	31	12	47200	8	57300	976	<2	93	128	11300	0.6	16500	186	2690	18	186	58
18	MJO-A1 63.70	LII	89500	27	2	<3	<1	51000	113	34	8	54100	10	36800	602	<2	44	250	3400	0.6	39000	135	3120	20	197	90
19	MJO-A1 172.00	LI	67600	6	1	<3	<1	82700	457	25	22	39400	6	74500	724	<2	211	65	910	0.9	3600	40	1540	54	231	67
20	MJO-B5 23.50	LII	74400	27	1	<3	<1	81700	312	39	37	54800	<3	48500	843	<2	137	166	8000	0.8	16500	86	1610	48	207	71
21	MJO-B5 79.20	LI	82000	20	1	<3	<1	63100	305	30	8	66200	4	54100	805	<2	106	111	10100	0.6	13200	80	1950	<10	244	85
22	MJO-B5 136.10	LI	80600	16	2	<3	<1	46600	76	45	26	67400	3	40200	2000	<2	49	416	1360	0.3	35900	104	6550	<10	249	87
23	MJO-B3 55.20	LII	82200	13	3	<3	<1	70300	127	36	18	56300	5	28900	720	<2	54	179	1450	0.7	31500	67	2710	49	237	59
24	MJO-B3 147.70	LI	85160	33	3	<3	<1	56000	61	28	15	70400	<3	31400	1280	<2	38	485	7600	0.2	28300	154	7150	10	291	83
25	MJO-B4 101.20	LI	71000	20	1	<3	<1	63800	367	33	101	57300	6	60900	685	<2	174	32	7800	0.2	11100	147	1800	29	220	70
26	MJO-B6 85.90	LI	89100	15	3	<3	<1	54600	41	37	25	64800	9	35900	1400	<2	31	413	910	0.6	3800	107	4560	<10	272	72
27	N011	LII	67100	16	1	<3	<1	42800	396	30	34	62700	6	42300	546	<2	137	33	4200	0.1	26800	133	1260	32	228	65
28	MJO-B2 52.20	LII	64200	17	2	<3	<1	69000	464	34	26	50500	6	36500	787	<2	186	154	4000	0.6	22400	85	1690	30	207	54
29	MJO-A2 136.00	LI	84300	34	6	<3	<1	23500	65	45	40	74000	15	39000	1350	<2	25	698	1100	0.2	43100	121	9830	<10	321	540
30	MJO-A5 17.50	LII	62900	88	3	<3	<1	55800	655	100	2310	58500	6	93200	1460	<2	419	<3	700	0.4	3000	89	1500	16	200	472
31	MJO-A1 106.90	LI	63300	2	1	<3	<1	3650	209	128	653	123700	4	54600	349	2	70	68	910	<0.1	7400	16	3260	34	195	601
32	N010*2	ORE	4380	8	1	<3	<1	4750	769	40	36	38700	<3	2370	84	5	36	45	450	0.6	1700	40	181	28	33	60
33	MJO-B1*3 40.80	ORE	4340	<1	<1	<3	4	423	94	14	7070	408200	511	2710	1914	2	20	39	180	20.2	500	2	229	35	31	641

*1 Abbreviations are shown in Fig. II-3-1. *2 Coodinates: N 2,618.845, E 453.168 *3 Coodinates: N 2,618.796, E 457.278

2. Sheeted-dyke Complex (Sd)

Two samples of Sheeted-dyke Complex show basaltic in SiO_2 contents (51, 52%). The rocks are relatively rich in FeO*, CaO, TiO_2, V and Sr and relatively poor in MgO, Cr and Ni, which range mostly same to Lower Volcanic Rocks. Cu content (5 ~7 ppm) is the lowest in the Sheeted-dykes.

3. Lower Volcanic Rocks (L)

Eleven samples of Lower Extrusives I and nine samples of Lower Extrusives II from the Lower Volcanic Rocks were analyzed.

Lower Extrusives I (LI)

SiO_2 contents (46 ~ 61%) of the rocks range from basaltic (45 ~ 52% SiO_2) to andesitic (53 ~ 66% SiO_2). The contents of Fe_2O_3* (6 ~ 12%), MgO (5 ~ 12%), CaO (1 ~ 6%) and most of minor elements of the Lower Extrusives I range wider than the Lower Extrusives II and Middle Volcanic Rocks (M). However, the rocks are rich in FeO_3*, TiO_2, Cr, Co, W and Zn and have a tendency of poor in MgO, CaO and Cu. F.M.I. values (FeO*/MgO ratio) ranging from 0.64 to 1.80 and S.I. (consolidation index) values show wide range from 26 to 59.

Lower Extrusives II (LII)

SiO_2 contents of the rocks range from 49% (basaltic) to 57% (andesitic). The contents of major components concentrates show norrower range than that of the Lower Extrusives I. Fe_2O_3* (6 ~ 9%), TiO_2 (0.2 ~ 0.5%) are relatively poor and Na_2O (2.2 5.6%) is relatively rich. On the minor elements, the rocks have a tendency of slightly richer in Ni, poor in Co and relatively poor in Cu, V and Zn in comparison with the Lower Extrusives I.

F.M.I. value (0.88 ~ 1.47) and S.I. value (28 ~ 44) of the rocks are mostly within the same range to the Lower Extruasives I.

4. Middle Vocanic Roks (M)

Four samples of the Middle Volcanic Rocks show basaltic to andesitic in SiO_2 content ranging from 47% to 55%. In general, the rocks show a tendency of richer in incompatible elements (TiO_2, P_2O_5), Fe_2O_3* and Cu and relatively poor in MgO, K_2O, Co, Ni, Sr and Cr. And then, the rocks tend to rich in MnO, Co, Cr Ni and Zn in comparison with the Lower Volcanic Rocks.

F.M.I. value (1.01 ~ 1.67) and S.I. value (29 ~ 37) of the rocks indicate to be rich in Fe and poor in Mg.

5. Late dyke

Two samples of Late dyke were analyzed. SiO_2 content (50.32%, 54.77%) show basaltic and andesitic. The rocks are generally rich in TiO_2, Fe_2O_3*, P_2O_5 and poor in MgO, CaO, Cu and Cr.

These tendencies mostly correspond with the Middle Volcanic Rocks, so that the Late dyke and Middle Volcanic Rocks are infered to be same origin. The rocks tends to be richer in TiO_2, Na_2O, K_2O, BaO, Cu and Zn and poor in CaO, MnO, MgO and Sr in conporison with the Sheeted-dyke Complex.

F.M.I.value (1.73, 1.88) is high and S.I. value (25, 34) is relatively low.

3-3 Discussion

The rocks of the Rakah area are generally undergone alteration and metamorphism, so that it is necessary to examine petrochemically by stable components and elements against alteration and metamorphism. In general, incompatible elements including Ti, P, Zr and Y are considered to be immobile elements. TiO_2 - FeO*/MgO and P_2O_5 - FeO*/MgO diagrams are shown in Fig. II-3-2. TiO_2 and P_2O_5 increase gently togather with increasing FeO*/MgO ratio which is used to the scale of differentiation of magma. Therefore, it is thought that TiO_2 and P_2O_5 are incompatible components to some degree. And then, the relationship between TiO_2 and P_2O_5, which is shown in Fig. II-3-1, shows positive correlation, which indicates that these components are not affected relatively by alteration and metamorphism (Ocean-floor metamorphism). Consequently, it can be calculated the influence of alteration and metamorphism between TiO_2 and other components.

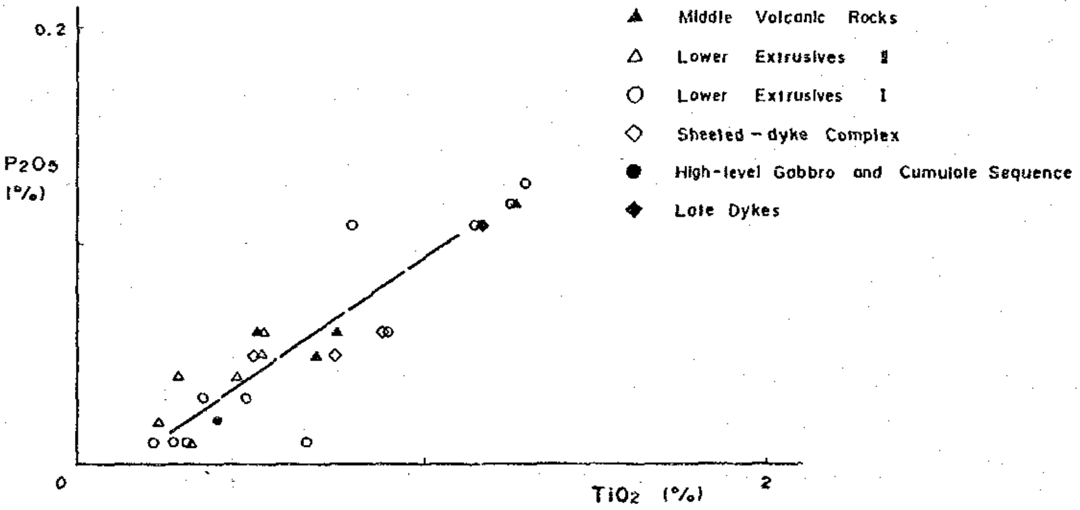


Fig. II-3-1 P_2O_5-TiO_2 Diagram

Right angle diagrams of TiO_2 versus other components are given in Fig. II-3-3. Relatively well concentrated components, which is thought to be less affection of alteration and metamorphism, are SiO_2, FeO*, MnO, P_2O_5, Ni, Cr, V and Zn. Slightly scattered components in the diagrams, which are relatively affected by alteration and metamorphism, are Al_2O_3, MgO and Cu. On the

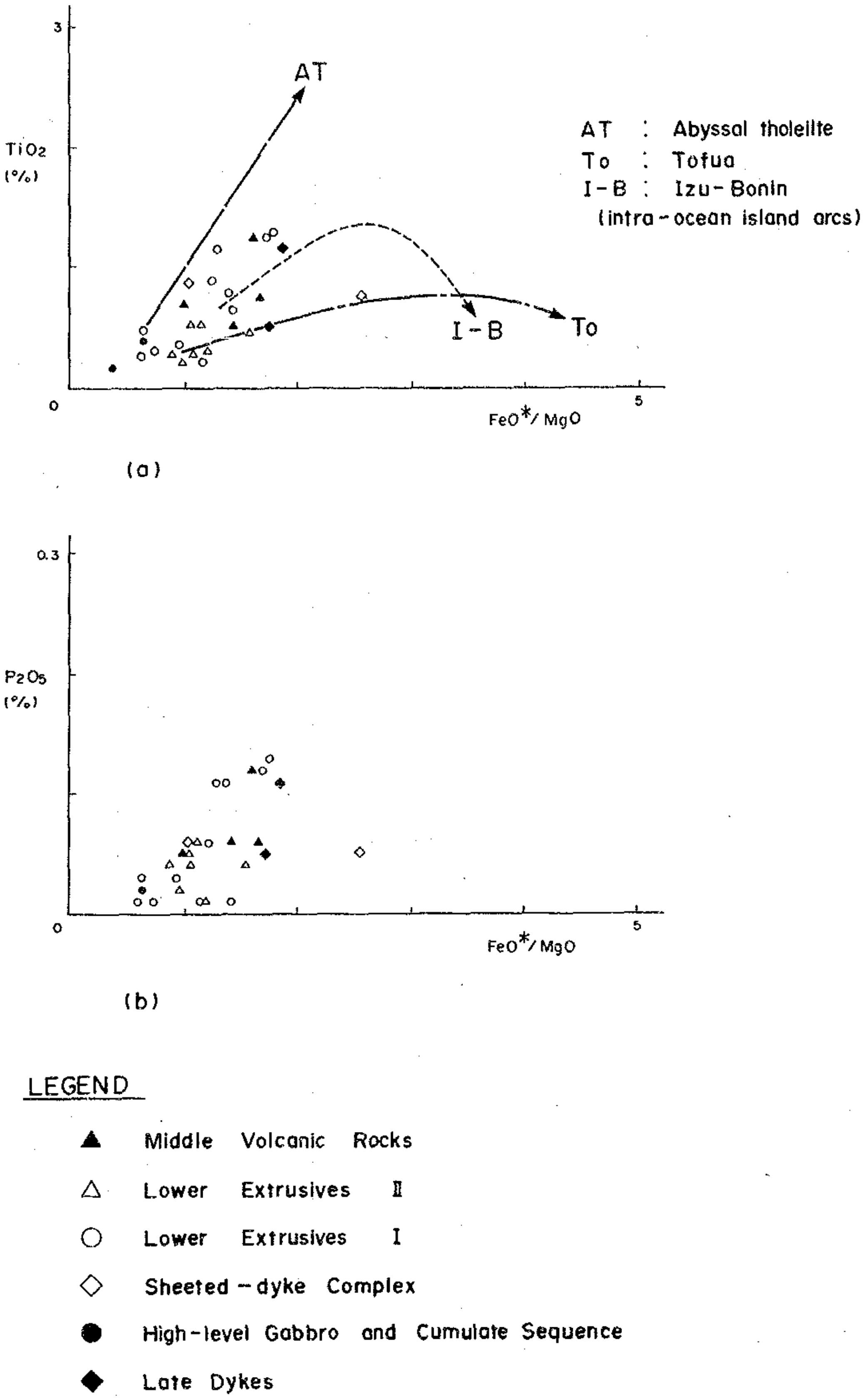


Fig. II-3-2 TiO_2-FeO*/MgO and P_2O_5-FeO*/MgO Diagrams

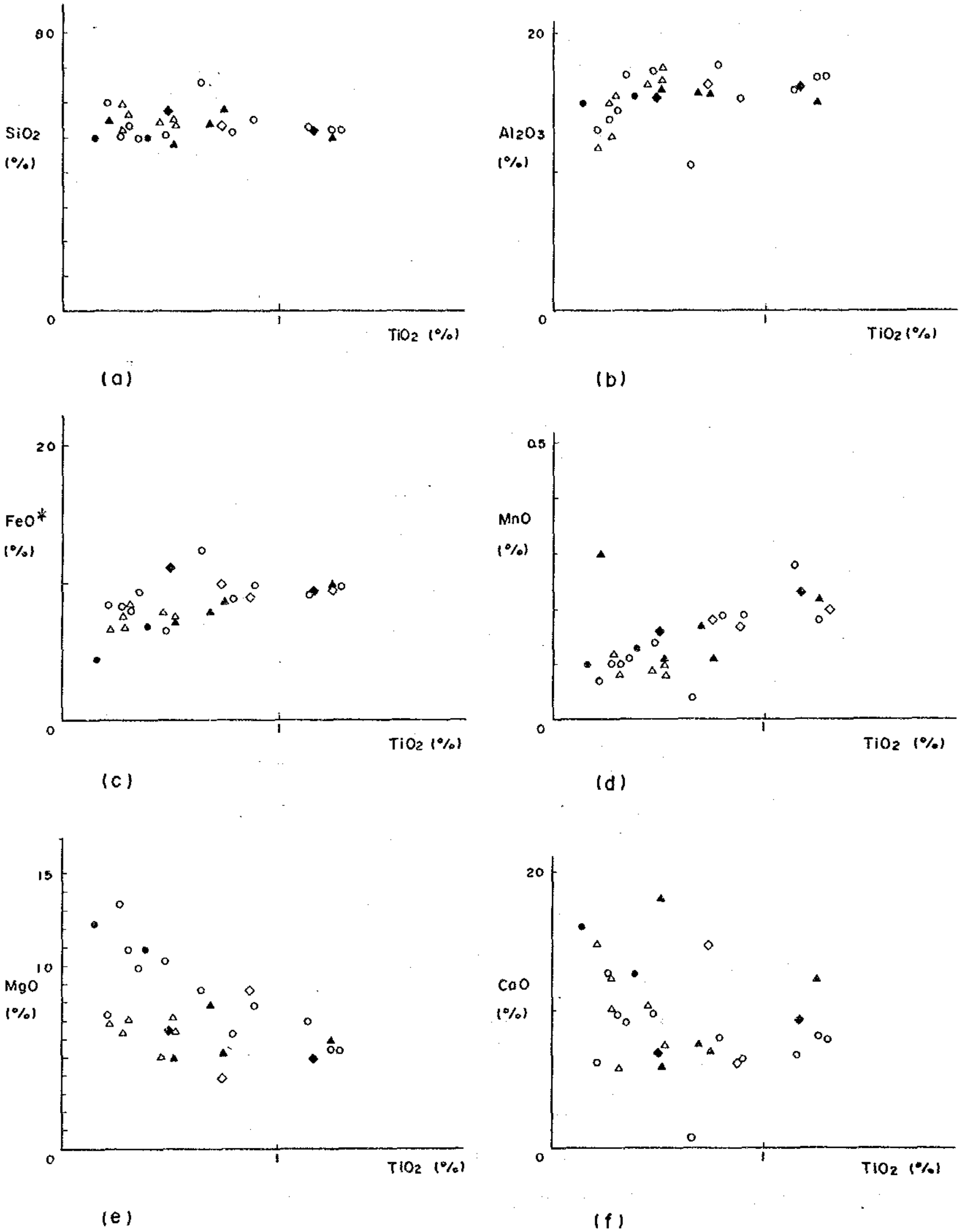


Fig. II-3-3 TiO2 Diagram (1)

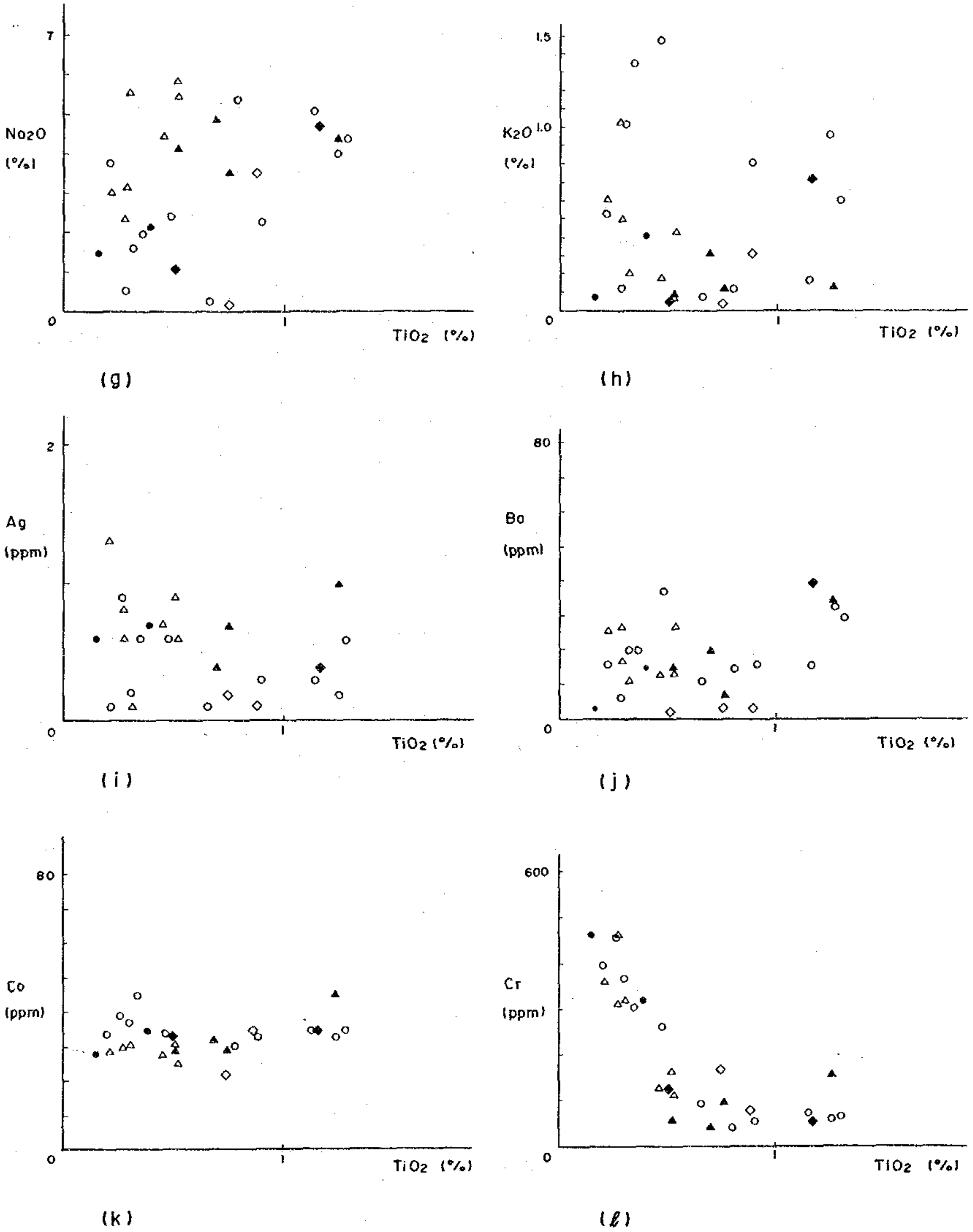


Fig. II-3-3 TiO_2 Diagram (2)

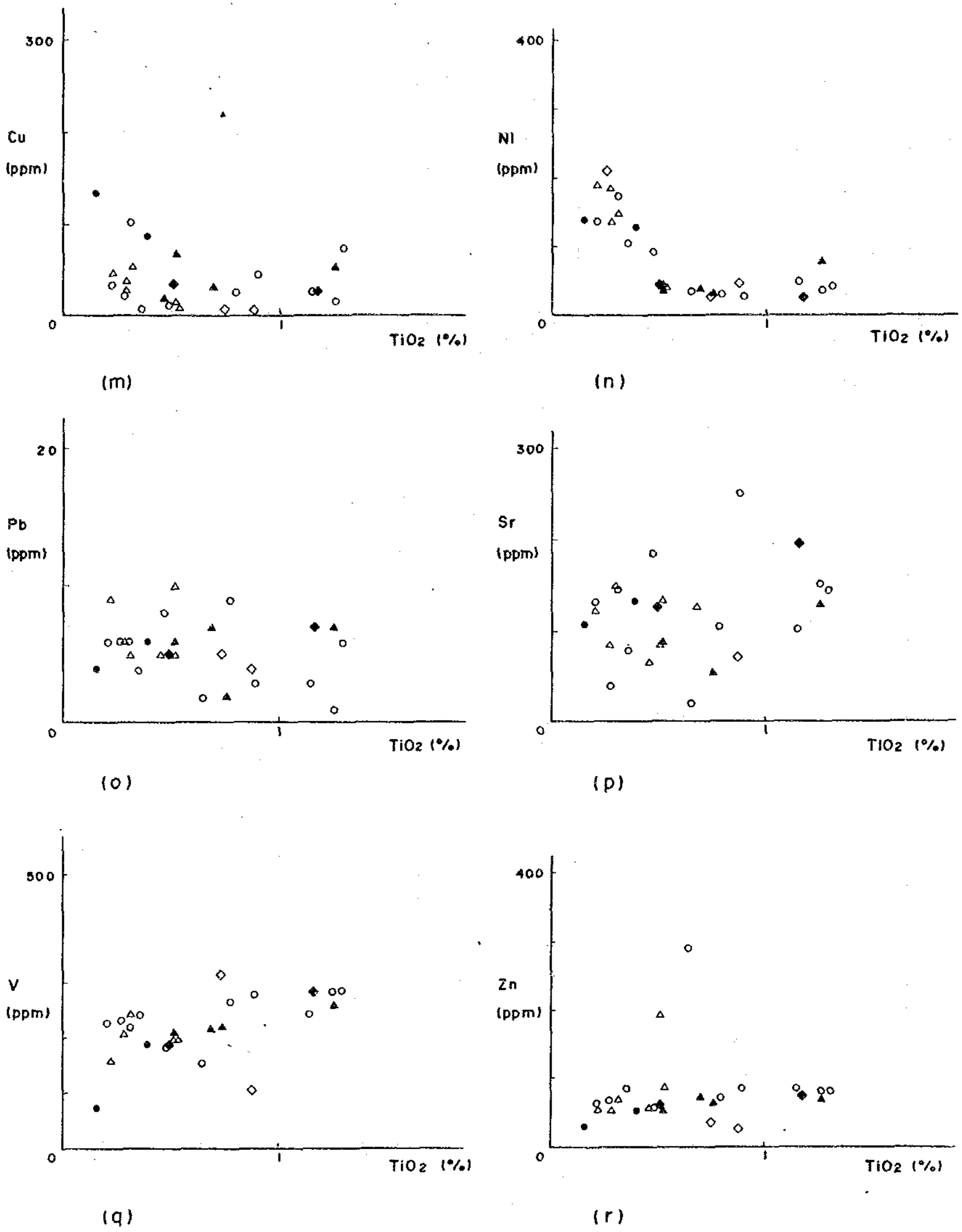


Fig. II-3-3 TiO_2 Diagram (3)

other hand, CaO, K_2O, Na_2O, Pb, Sr, Ag and Ba are scatted in the diagrams due to alteration and metamorphism, so that these components are not suitable to use for petrochemical examination.

Variation diagrams of immobile components and FeO*/MgO ratio, which is used generally as a scale of the differentiation, are shown in Fig. II-3-2 and Fig. II-3-4. Following to increase of FeO*/MgO ratio, SiO_2, FeO*, TiO_2, P_2O_5 and V enrich gently and MgO, Cr, Ni and Cu deplete. The differentiation of the whole rocks do not reach to the maximum of TiO_2 (around 3.0 in FeO*/MgO ratio). This tendency corresponds with the SiO_2 contents (43 ~ 57%) and microscopic observation results.. The Cumulate Sequence,. High-level Gabbro, Sheeted-dyke Complex and Lower Volcanic Rocks are roughly plotted along one trend in TiO_2-FeO*/MgO diagram as well as FeO*-FeO*/MgO, MgO-FeO*/MgO and TiO_2-P_2O_5 diagrams, so that it suggests that these rocks are sequencial fractionations from same magma.

Lower Volcanic Rocks consist of Lower Extrusives I and overlying Lower Extrusives II. Syngenetic sedimentary deposits are formed at the top of the Lower Extrusives I and are covered by the Lower Extrusives II. Petrochemical correlation between them suggest sequential fractionations, because the ranges of the components mostly overlap each other. However, the Lower Extrusives II has a tendency of rich in Ni and Cr and slightly poor in Co, TiO_2 Fe_2O_3*, Cu and V. It indicates to be a fractionation of early stage of the differentiation. The diagrams of Co versus Cr, Cu and V Fig.II-3-5 show relatively clear differencies of plotted domains of them and it is possible to discriminate between them.

On the other hand, the Middle Volcanic Rocks and Late dyke, which are thought to be same origin, are characterized by slightly poor in TiO_2, P_2O_5, Cr, Ni and Co and different domain plotted in SiO_2-FeO*/MgO and FeO*-FeO*/MgO diagrams in comparison with the Lower Volcanic Rocks, Sheeted-dyke Complex and Gabbros.

The differential trends of these rocks are shown in Fig. II-3-2 (a), Fig. II-3-4 (b) and Fig. II-3-6. The Lower Volcanic Rocks are plotted at the domain of Abyssal tholeiite and Island-arc tholeiite series, but the Middle Volcanic Rocks are plotted at the domains of the Island-arc tholeiite series and Calc-alkali series in local.

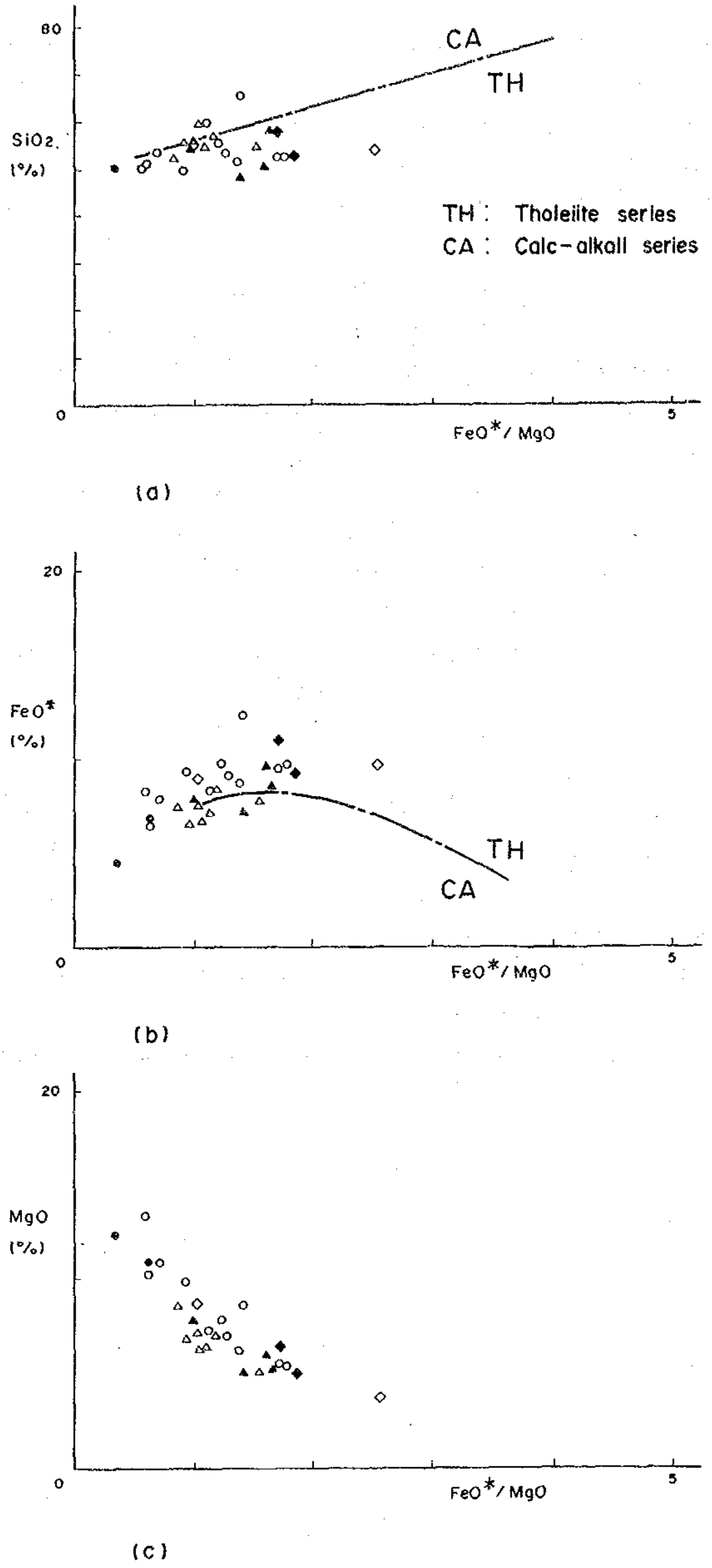
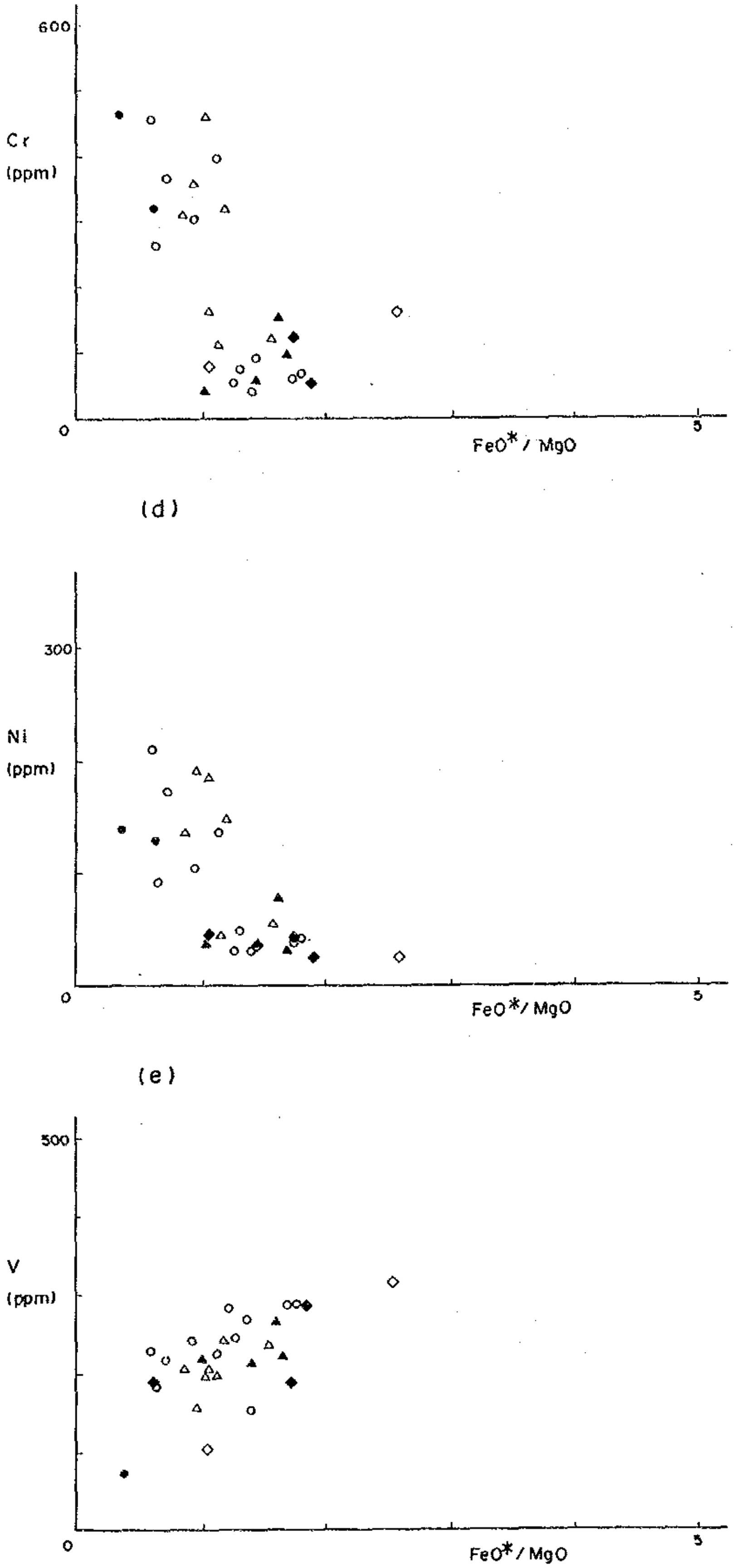


Fig. II-3-4 FeO*/MgO Diagrams (1)



(d)

(e)

(f)

Fig. II-3-4 FeO*/MgO Diagrams (2)

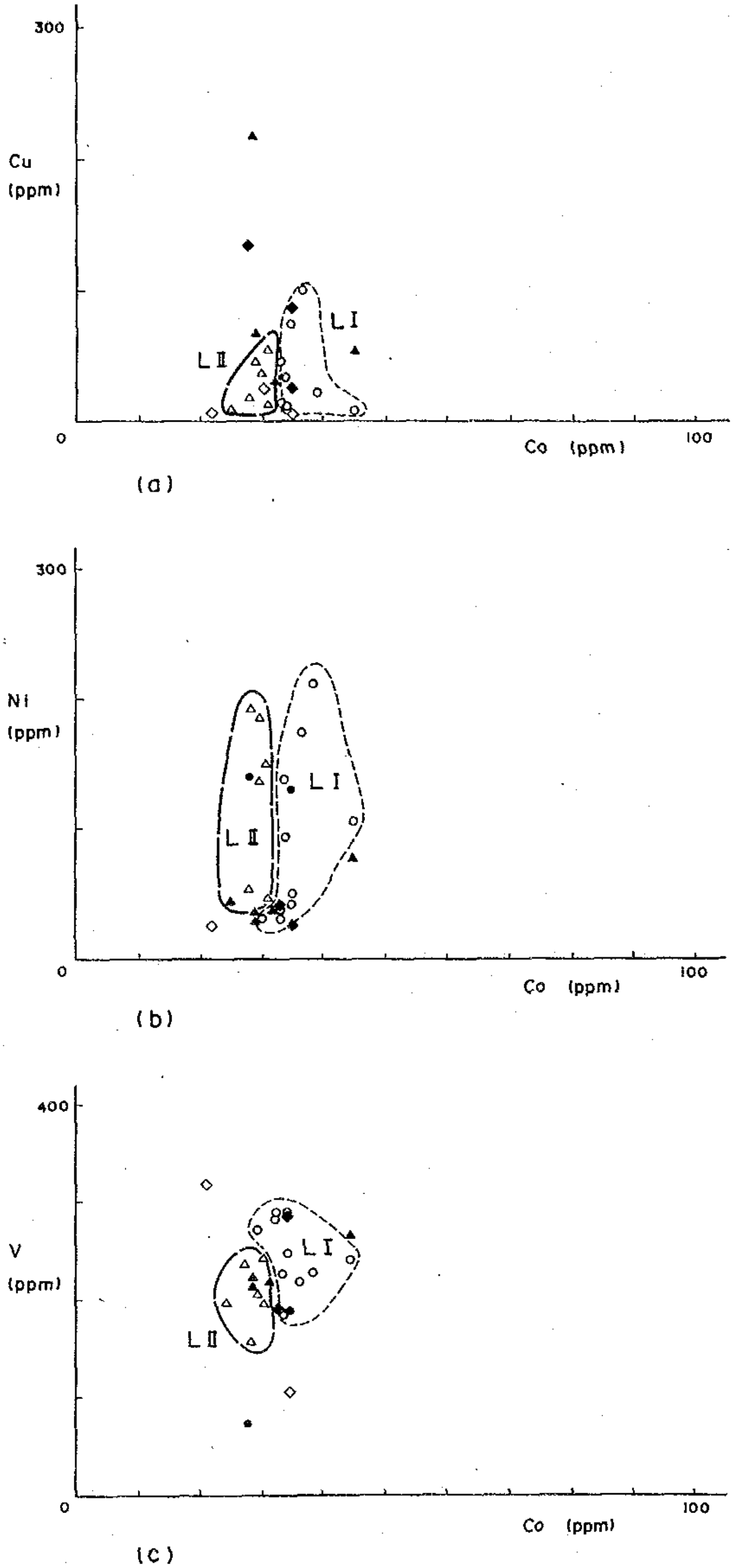
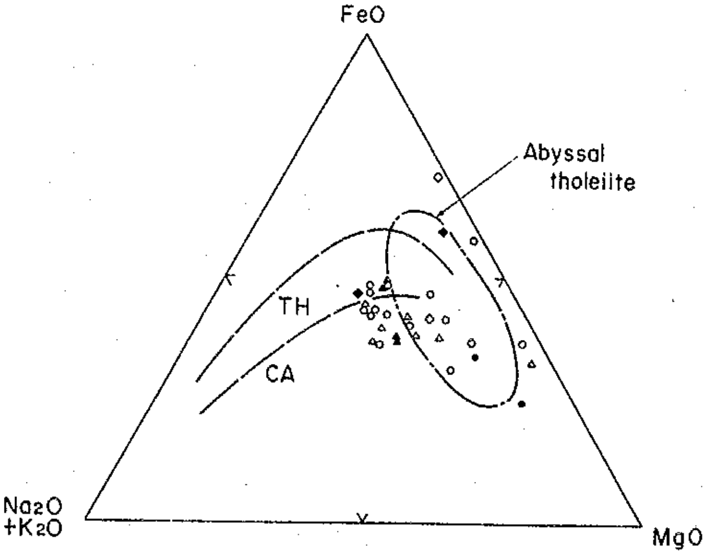


Fig. II-3-5 Cu-Co, Ni-Co and V-Co Diagram



TH : Tholeiite series
CA : Calc-alkali series

Fig. II-3-6 AMF Diagram

Chapter 4 Reconnaissance Survey for Preliminary Feasibility Study

4-1 Purpose and Survey Method

Oman Mining company LLC (OMCO) commenced the operation of copper mining and smelting in the Sohar area in 1983. About 1,500 tons copper of cathode have been produced and exported annualy since 1984. The cathode took the second position after "fish and fish preparations" in the non-petroleum section. The cathode exportation amount is about 28% of the non-petroleum seciton. However, the Sohar mine is presumed to be mined out in early 1990's.

Ministry of Petroleum and Minerals (MPM) and OMCO have made effort to find domestic copper ore deposits to substitute the Sohar mine in order to maintain the Sohar smelter production and exportation of copper cathode. They thought that the two known copper deposits in the Rakah area have potential for future development.

The purpose of the reconnaissance survey in phases is to obtain necessary data for a prliminary feasibility study to develop the known deposits in the Rakah area.

Data on the operation of Sohar Mine were obtained through the site reconnaissance survey, the Sohar mine's records and interviews with the staffs concerned. Location of mine facilities and transportation roads were investigated by the site reconnaissance. The information related to "Electric Power", "Communication" and "Water Supply" were obtained through the interviews with the governmental authorities. Other necessary general informations was obtained from the "Development Council (1987)" and other biliographies.

4-2 Survey Results and Obtained Data

4-2-1 Sohar Mine and Smelter

1. Mining Operation

The Sohar mine consists of three ore deposits: Lasail, Bayda and Aarja. The Bayda deposit was mined out in 1986 and lower part of the Lasail deposit is being extracted now. As to the mining method, sub-level caving method was applied in early stage of the mining operation, however, open-stoping is adopted at present. The development plan of the Aarja deposit is now under engineering stage. As to the mining method to be applied to the Aarja deposit, the original plan was changed and a combination of open cast and underground mining methods being studied.

Total tonnage of extracted ore for the two deposits, and average copper grade after commencement of the Sohar mine operation are shown in Table II-4-1. Annual tonnage of extracted ore has exceeded the initially planned figure (1,050,000 tons) after 1986, however, the ore grade have not reached the planned figures (Cu : 1.6-1.8%).

Table II-4-1 Annual Production from Lasail and Banda Mines in the Sohar Area

Year	Annual Tonnage to Crusher (ton)			Average Grade (% Cu)
	Lasail	Bayda	Total	
1983	544,089	247,742	791,831	1.60
1984	662,770	313,414	976,184	1.70
1985	843,560	126,511	970,071	1.71
1986	1,066,640	8,160	1,074,800	1.60
1987	1,096,311	–	1,096,331	1.59
1988 (1 ~ 9)	868,974	–	868,974	1.57
Total	5,082,364	695,827	5,778,191	

The following data for mining operation were collected:

(i) Tonnage of run of mine ore and copper grade
(ii) Size of main ramp and drifts
(iii) Performance of open-stope mining
(iv) Ventilation system
(v) Maintenance of mobile equipments
(vi) Consumption and price of principal materials
(vii) Consumption of drilling rod, bit and explosives

2. Mill Plant Operation

The mine ore is fed to a grinding circuit consisting of an autogenous mill and a pebble mill. It is said that operation performance of autogenous mill and pebble mill depends on the characteristics of ore. The Lasail mine ore extraced at the present time has proved excellent applicability for autogenous grinding and annual tonnage of milled ore has exceeded the initially planned figure since 1986 (Table II-4-2). The grinded ore is fed to a floatation circuit and the copper minerals are recovered. A part of gold in crude ore is also recovered in the copper concentrates. The following data of the mill plant were collected.

(i) Feed and product size distruibution of the primary mill and secondary mills, and work index of the ore
(ii) Circulating load of the mill circuit
(iii) Copper grade by size distruibution of the flotation feed, concentrate and tailing
(iv) Flotation pH

Table II-4-2 Monthly Production from Losail Mine in 1987

Month	Trammed Ore (t)	Milled Ore (t)	Concentrate (t)	Conc. Grade (Cu %)	Conc. Recovery (%)	Copper in Conc. (t)	Cathode (t)
January	94,061	97,357	7,163	20.83	92.7	1,492	1,369
February	83,150	79,969	5,317	20.75	93.4	1,103	1,260
March	94,304	91,744	6,790	21.68	93.9	1,472	1,291
April	91,188	83,272	5,774	21.43	93.4	1,237	1,329
May	98,372	93,559	7,351	20.89	93.2	1,536	1,546
June	83,460	83,144	5,707	20.95	91.9	1,196	1,328
July	90,344	91,956	6,417	20.51	92.9	1,316	1,204
August	88,661	87,435	6,045	22.22	93.7	1,343	1,232
September	85,399	84,282	5,398	22.15	94.0	1,196	1,235
October	93,348	89,764	5,398	21.67	93.7	1,170	1,230
November	97,218	90,624	5,983	20.96	93.0	1,254	1,102
December	96,826	90,851	7,101	20.87	93.9	1,482	1,364
Total	1,096,331	1,065,957	74,444	21.22	93.3	15,797	15,490

(v) Consumption and price of principal materials
  - Floatation reagents (by kind)
  - Lime
  - Ball
  - Liner for mill

3. Smelting and Refining Operation

The smelting and refining plants have an annual capacity of 20,000 tons cathode. However, since the plant is operated under its normal capacity, the copper content in the concentrates can not reach the planned figure (see Table II-4-2). Owing to this reason, the smelting and refining cost should be elevated, not only in fixed expenditure but also in direct operation expenditure comparing with the initially planned figures.

The copper recovery rate is approximately 97% and the gold recovery rate is not recorded. The electrolysis slime containing gold is transported outside the country and, according to the information, treated there with gold recovery rate of about 96%. Total smelting and refining costs including administration and support sections could not be calculated and therefore, the desired data were not obtained.

4. Other Data

The following data were also collected.

(i) Layout design

(ii) Organization, number of persons and personal expenditure

(iii) Main equipment specifications
  - Type
  - Principal specifications
  - Manufacturer
  - Motor voltage and power

(iv) Electric power consumption by activity (by section)

(v) Information concerned with construction works
  - Steel work cost
  - Concrete work cost
  - Excavation cost
  - Construction cost of building and house
  - Cost and acquisition of cement and aggregate

4-2-2 Rakah Area

Selection of the sites for mining and mill facilities is the most important matter at a time of planning the mine layout. The site determination of the mining facilities depends essentially on the location and extension of the orebodies, but these which are not clear yet in the present stage since the exploration works are still under execution. The type and size of facilities depend on the mining method, such as open pit, underground or combination of both methods, however, it has not been determined.

In this circumstance, the investigation works for the location of the mining facilites have not been carried out. However, for the selection of the mill site, some prliminary investigations were conducted.

In general, it is desirable to make the haulage distance of crude ore from mine to mill plant as short as possible. In the case of the project the ore deposits are found in two discrete areas of Area A and B. In such a case, the mill site shall be located near the larger orebody where larger output should be expected. This way is considered more economical from the viewpoint of transportaion cost. The haulage of crude ore, the transportation of the materials in the construction stage and the transportation of concentrates, operation materials and personnel in the operation stage should also be considered for the site planning. Investigations were carried out on the both Area A and B resulted in the preliminary selection of two or three localities suitable for the milll construction. General consideration items on mill site selection are as follows:

(i) Haulage and receipt of the ore from mining site
(ii) Topographical relation with tailing dam site
(iii) Distance from water intake
(iv) Soil bearing resistance (especially for crusher, mill, compressor, ore bin and thickener construction)
(v) Transportation to and from repair shop

4-2-3 Transportation Road for Mining Equipments and Materials

Having no better alternatives, Muscat is considered in this study as the only available port for landing construction materials imported from abroad.

The route described below is the one and only route in good condition for the transportation materials of from Muscat to Hayl as Safil (Hayl as Safil is considered tentatively as the mine site in this study, and the mine site shall be determined at the preliminary feasibility study stage).

Besides, for the transportation of imported materials, this route shall be used for, the transportation of a great part of domestic materials, such as aggregates for concrete works and fuel. Some quarry plants and other factories are found along the road. The operation materials shall be transported by the same way to the construction materials, because a great part of them is assumes to be imported. The route for the transportation is shown in Fig. II-4-1.

Route:	Muscat - Ibri - Yanqul - Hayl as Safil (Area A)	
Total length	Muscat - Hayl as Safil	378 km
Paved:	Muscat - Ibri	310 km
	Ibri - Yanqul	55 km
	Sub total	365 km
Graveled:	Yanqul - Hayl as Safil	13 km

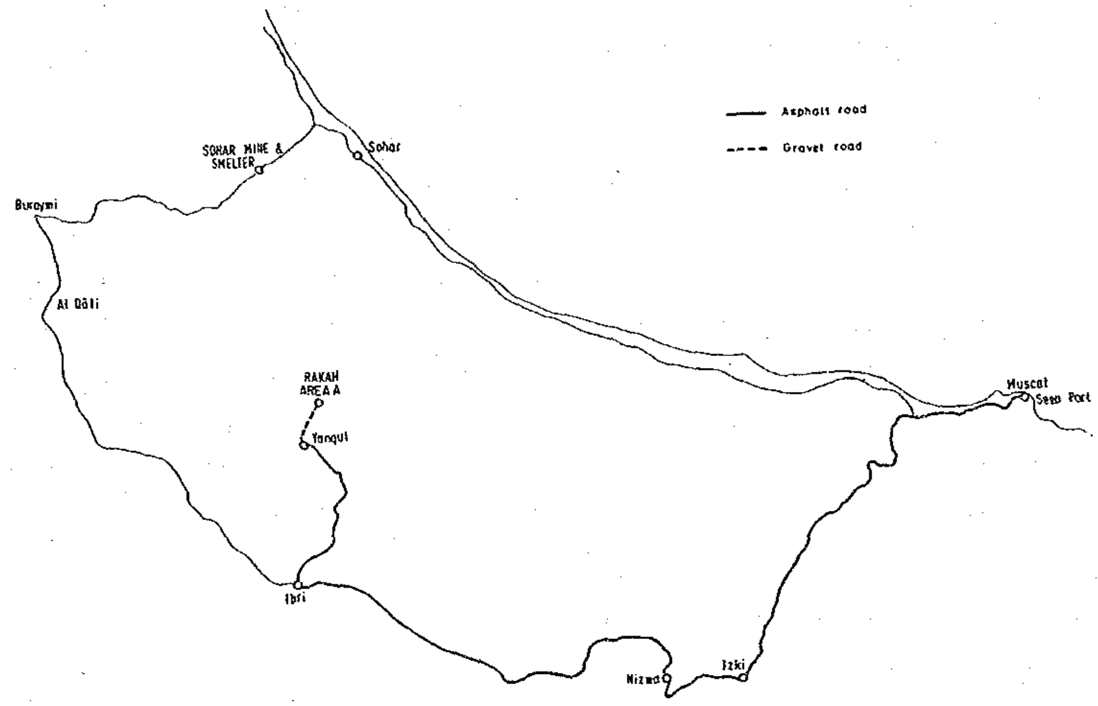


Fig. II-4-1 Proposed Road for Transportation of Constraction and Operation Materials

Muscat - Ibri

The road, starting from Muscat, leads to the highest point (700 m above sea level) with a small slope varying between 0% ~ 3%, and then changes to a moderate downward slope to Ibri. The road has a few number of small up and down hills and large curvatures. No traffic jam occurs since it presents few intersections except in town areas, good visibility free from obstacles, such as structures and power lines over the road, and having a few vehicles. Large size trucks can drive about 80 km/h on straight road.

Ibri - Yanqul

The road is almost flat in its whole length of 55 km and has the same conditions to that between Muscat and Ibri.

Yanqul - Hayl as Safil

This road has a small slope in its whole length. The road width is about 6.0 m in its widest portion and 4.0 m in the narrowest part. Besides being not paved, the road is covered with natural gravel of wadi giving the same effect as pavement with crushed stone. Down hills and small curvatures are encountered in several parts. Improvement of the road is required before the mine construction, since its condition is not suitable for large truck transportation.

Consequently, the transportation with large trucks or 8'×40' trailers (max. payload: approximate 35 tons) shall be feasible after the improvement works on the section between Yanqul and Hayl as Safil.

4-2-4 Transportation Road for Concentrates

After the commencement of operation of the Rakah project, the concentrates shall be sent to the Sohar smelter. There are various routes to the Sohar Smelter, which is located at a distance of 150 km, by the shortest way, from Rakah. Since the transportation cost of the concentrates is not so small to ignore comparing with the total production cost of copper metal. Appropriate selection of transportation method and routes are essential. Preliminary investigations of the transportation route were carried out, by assuming the use of large trucks or trailers.

1. Premise for Route Selection

Transportation quantity of the concentrates

The production rate of the project has not been decided yet. Assuming a daily mill rate of 1,500 tons, the concentrate quantity to be transported should be less than 100 tons in wet. This quantity is not so big to justify great expenditure for road construction or improvement works.

Transportation method

The preliminary selection of route was carried out assuming 10 tons trucks, but in case the preliminary selected route permits larger trucks transportation, the usage of trucks larger than 10 tons shall be considered and the transportation costs shall be compared.

Road construction for the project

As new road construction is expected to require large cost in comparison with transportation quantity, new road construction as well as large scale of improvement were not considered to be carried out at a cost of the project. Only improvement works on a small scale were considered.

Road construction by the Government

Informations related to new road construction and road upgrading by the Government were collected. The Government has a plan to imporve the roads in near future.

Summary of the route selection condition

An optimum route for the concentrate transportation shall be selected among the combinations of existing roads. New road construction and improvement having high probability to be made in earlier stage by the Government were taken into consideration. Small scale improvement works were also taken into account. As the transportaiton method, large trucks or trailers over 10 tons were considered.

2. Basis for Route Selection

Among the transportation costs, the costs related to road were not considered in this preliminary stage and only the expenses related to vehicles, were considered. Also, it is assumed that the total cost related to vehicle may be proportional to traveling time from the Rakah to the Sohar smelter for the same type of vehicle. Based on this assumption, two or three routes, which have shorter traveling times, were preliminarily selected.

3. Investigated Route

Route 1

Route 1 is from Haly as Safil to Sohar Smelter through Yanqul, Ibri and Al Qati. The total length is 288 km between them. Transportation route for the concentrates are shown in Fig. II-4-2.

Paved :	Yanqul --Ibri	55 km
	Ibri – Al Qati	117 km
	Al Qati – Sohar Smelter	103 km
	Total	275 km
Graveled :	Haly as Safil - Yanqul	13 km

Hayl as Safil – Yanqul

Mentioned in Article 4-2-3.

Yanqul – Ibri

Mentioned in Article 4-2-3.

Ibri – Al Qati

The road has a few number of small up and down hills and large curvatures. No traffic jam occurs due mainly to few existing vehicles, few intersections except in town area and good visibility free from obstacles such as structures and power lines over the road. Trucks can drive about 80 km/hr on straight section.

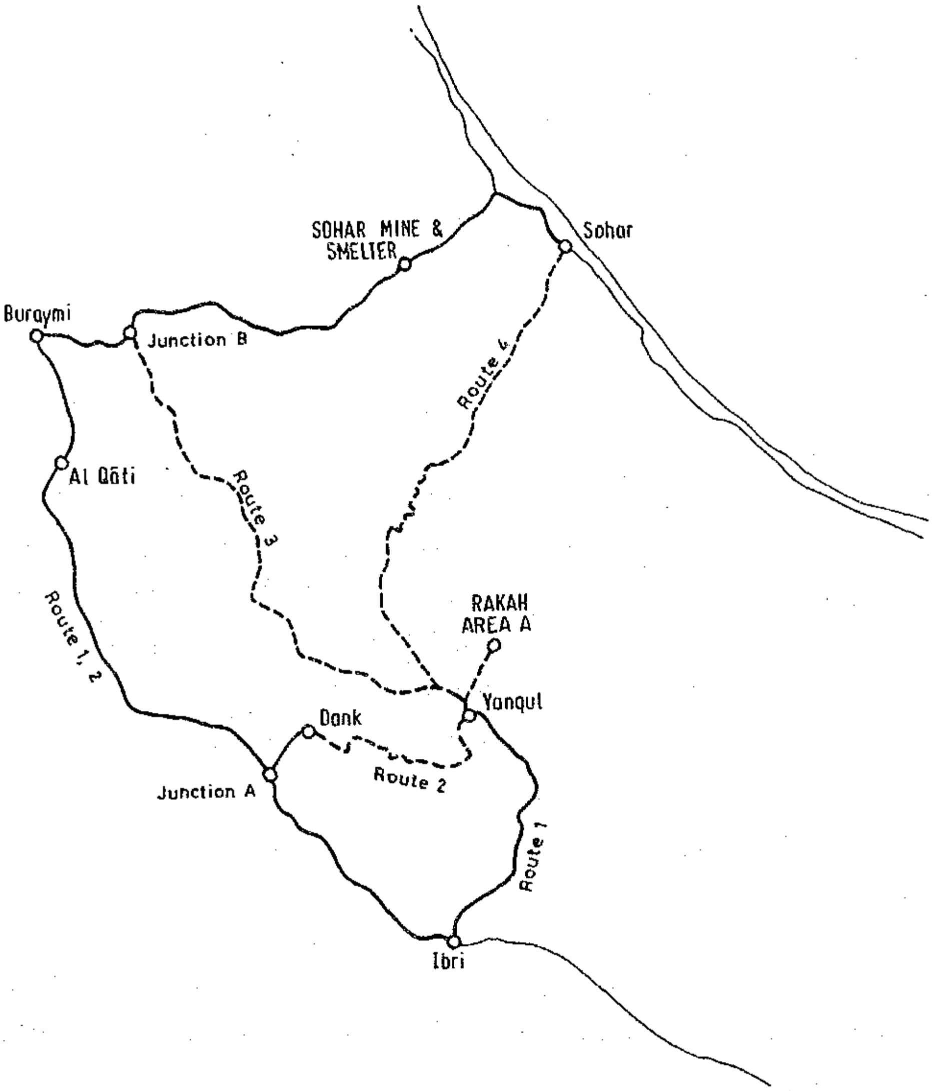


Fig. II-4-2 Transportation Road for Copper Concentrates

Al Qati – Sohar Smelter

No investigatoin was conducted. However, according to available information, the road condition of this section is as same as the section between Ibri and Al Qati.

Consequently, this route is under quite good condition except between Hayl as Safil and Yanqul and permits a 8'×40' trailer transportation (max. payload: about 35 tons). Although this route is longer than others, the road condition is quite good.

Route 2

Route 2 is from Haly as Safil to Sohar Smelter through Yanqul, Dank, Janction A and Al Qati. The total length is 241 km between them.

Paved :	Dank – Junction A	16 km
	Junction A – Al Qati	67 km
	Al Qati – Sohar Smelter	103 km
	Total	186 km
Graveled :	Hayl as Safil – Yanqul	13 km
	Yanqul – Dank	42 km
	Total	55 km

Hayl as Safil – Yanqul

Mentioned in Article 4-2-3.

Yanqul – Dank

This is a graveled road constructed in wadi and has a small down grade in its whole length. The road has a 6 m wide, with few number of up and down hills and large curvatures. It shall permit a 8'×40' trailer transportation (max. payload: approximate 35 tons) after some improvements. However, there is a possibility that the road may present flooding problems in the case of rainfall.

Dank – Junction A

This a paved road with 7.0 m wide 50 having two lanes. The road is almost flat in its whole length and has few number of up and down hills and large curvatures. No traffic jam occurs due mainly to the existence of few vehicles, few intersections except in town areas, and good visibility free from obstacles such as structures and power lines over the road. Speed of large size trucks is observed at about 80 km/hr on straight section.

Junction A – Al Qati

This section composes a part of the section Ibri – Al Qati described in the article Route 1. The road condition is almost as same as the section between Dank and Junction A.

Al Qati – Sohar Smelter

Mentioned in the article Route 1.

Consequently, the condition of the section Yanqul – Dank is good. Although it is not paved, the route permit a 8'×40' trailer transportation (max. payload : approximate 35 tons). The conditions of other sections in this route are quite good except between Hayl as Safil and Yanqul. Even though the Route 2 is 47 km shorter than the Route 1, the total length of graveled road is 42 km longer. If the governmental plan of road improvement is approved, this route is recommendes as the most suitable for the concentrate transportation route.

Route 3

Route 3 is from Haly as Safil to Sohar Smelter through Yanqul and Junction B. The total length is 172 km between them.

Paved :	Junction B – Sohar Smelter	60 km
Graveled :	Hayl as Safil – Yanqul	11 km
	Yanqul – Junction B	101 km
	Total	112 km

Hayl as Safil – Yanqul

Mentioned in the Article 4-2-3

Yanqul – Junction B

The site investigation was carried out on 40 km range of a total of 101 km, starting from Yanqul. This is a almost flat graveled road with an approximate 6.5 m wide. Up and down hills and curvatures were encountered frequently in its whole length. In several cases, the curvatures have small radius. A lot of road improvement works is required for transportation of large size trucks. Even after improvement works, the truck speed shall be limited to 50% or less comparing with paved roads.

Junction B – Sohar Smelter

This section composes a part of the section Al Qati - Sohar Smelter mentioned in the article 4-2-4 related to Route 1. No on-site investigation was carried out in this time.

The length of this route is shorter than the Routes 1 and 2. However, the total length of graveled sections, which are in bad conditions, amounts to 110 km. It is presumed that this route required more driving time, although it is 70 km shorter than the Route 2.

Route 4

Route 4 is from Hayl as Safil to Sohar Smelter through Yanqul and Sohar. The total length is 161 km between them.

Paved :	Sohar – Sohar Smelter	40 km
Graveled :	Hayl as Safil – Yanqul	11 km
	Yanqul – Sohar	110 km
	Total	121 km

Hayl as Safil – Yanqul

Mentioned in the Article 4-2-3.

Yanqul – Sohar

Site investigation was carried out on 3 km range of a total of 110 km, starting from Yanqul. This graveled road has a small up grade and 6.5 m wide. Up and down hills and curvatures were encountered frequently. Some of the curvatures had small radius. A lot of improvement works are needed for large size truck transportation. Even after improvement works, the truck speed shall be limited to 50% or less comparing with paved roads.

This route is the shortest among all the alternatives investigated during this study. On the other hand, it has the longest graveled section and large size trucks transportation may require more traveling time comparing with the other routes.

4. Governmental Plan for Road Improvement

The road from Al Qati to the Sohar Smelter crosses the territory of the United Arab Emirates. In order to avoid this situation, a bypass road is under construction. This road may shorten the concentrate transportation time. However, site reconnaissance was not carried out in this survey. As to the road improvement on the section Yanqul – Dank, the design has been completed and it is in the situation of waiting governmental decision.

4-2-5 Electric Power

The mill plant will certainly be the biggest consumer of electric power in the Rakah project. The demnad of electricity for the mill plan shall amount to 4,500 KVA in case of 1,500 tons/day of the mill feed rate. The demand of electricity for mining, administration and town site also should be considered. However, even taking into account the above, it is not possible to anticipate the definitive demand of electricity at this stage. The Ministry of Electricity and Water (MEW) gave the information regarding the possibility of power supply from the national power station and the unit price of electricity demand of 4,500 KVA.

The information obtained from MEW give below.

Power supply

The Yanqul sub-station has not sufficient capacity, but the Hayl substation is capable to supply enough energy to the project.

Construction cost of power line

The construction cost of power line extension was estimated by the MEW based on so called "Rule of Thumb" as shown below.

The construction cost should be beared by the project.

Section	Hayl – Yanqul	(appr, 10 km)	33 KV, 12 MW×1 line
Section	Yanqul – Hayl as Safil	(appr, 13 km)	11 KV, 6 MW×2 line
Total construction cost			About 300,000 R.O.

Unit price of electricity

8 months out of 12 months	0.016 R.O./KWH
4 months out of 12 months	0.024 R.O./KWH
Yearly average	0.019 R.O./KWH

4-2-6 Communication

The telephone networks of Oman consist of a microwave system connecting principal cities. The wire telephone is used for short distances. For external communication of the project site, the installation of wire telephone system from the Yanqul telephone station seems to be feasible. However, it has not been confirmed.

4-2-7 Water Supply

The mill plant shall be the biggest consumer of water in operation stage. The quantity of fresh water to be required is presumed appoximately 0.5 m^3 per one ton of ore to be treated. However, the rate of ore to be treated is not determined yet. The water consumption for mining administration and town services should also be considered. In any event, it is not possible to anticipate definitively the water consumption in this stage. Data and informations relating to water sources were requested to the Ministry of Enviornment (ME) assuming the water consumption of 2,000 tons per day.

As a result of the contact, it was informed that the ME had no data and informations relating to water sources in the Rakah area.

4-3 Discussion

1. Operation Data of Sohar Mine

(a) Mining and Beneficiation

Site reconnaissance for the Sohar mine was carried out and the data and informations were collected, concerned with the the method, performance and operating cost of both mining and beneficiation.

(b) Smelting Cost

Estimation (taking no account of some items such as freight and by-product income) of the smelter return to mine in ore (concentrate) trades, can be obtained to deduce the smelter charges from the value of recoverable metals.

In general, the quantity of recoverable metal is determined multiplying the metal contained in the concentrates by the scheduled recovery rate according to the contract. The smelter charges to be deducted are also scheduled in the contract. Because the product of Rakah project shall have a form of concentrates, the evaluation of copper concentrate in the preliminary feasibility study shall be conducted based on the conception above mentioned. Since the all product from the

Rakah project is planned to be supplied to the Sohar smelter, the future operation cost of Sohar smelter should have a great effect on the Rakah project evaluation. The present smelting cost may differ from future cost, nevertheless, it can offer a key on anticipation of the future cost.

In spite of the importance of the matter from the viewpoints mentioned here, the acquisition of the actual smelting cost (including cost of administration and support sections) could not be achieved.

2. Investigation of the Rakah Area

Investigation on the both areas, Area A and Area B, were carried out and two or three localities which seemed to be suitable for the mill construction were preliminarily selected.

A topographic map covering Area A and B is important to decide the location of mine facilities. This map shall be required for the preliminary feasibility study.

3. Transportation Road for Materials

It can be concluded that route from Muscat to project area through Izki, Nazwa and Ibri shall be able to serve suitably for materials transportation.

4. Transportation Road for Concentrates

A preliminary route selection was carried out based on a rough evaluation method. According to the results of the study, the transportation costs by Route 1 and 2 seems to be cheaper. For the next phase of this study, all cost related to vehicle (costs for vehicle acquisition, fuel, spare parts and other maintenance materials, operation and maintenance labour) should be estimated by vehicle type and be compared each other. It is desireable to check the adequacy of the estimation method adopted in the preliminary investigation (traveling time bases). In the case that road improvement or maintenance shall be carried out with the project account and it should be considered into the route selection studies.

5. Electric Power

If a 4500 KVA diesel power generator is contructed in the area, the construction and operation costs can be estimated in 500,000 R.O. and 0.044 R.O./KWH respectively.

Althuogh the above figures are a rough estimate obtained by the so-called "Rule of Thumb", the electrical energy purchase from MEW is cheaper than having a own power station.

6. Communication

For external communication of the project site, the installation of a wire telephone system from the Yanqul telephone station seems to be feasible, it shall be confirmed in the next phase of this study.

7. Water Supply

Data and information related to water sources were not obtained. It is necessary to investigate the water sources in the next phase.

PART III CONCLUSIONS AND RECOMMENDATIONS

Chapter 1 Conclusions

Objectives of the survey in this year (Phase I) are to examine the nature of mineralization for the two known ore deposits including the Hayl as Safil and Rakah deposits, and to clarify the potential for further explortion work in the Rakah area. In order to accomplish these objectives, geologic, geophysical and drilling surveys were carried out in both the area of Area A and B. Data collection and sites inspection for the preliminary feasibility study of mine development which is planned in Phase II were also carried out in this year. These results are conclusively summarized as below:

(i) The Rakah area is situated in the Samail Nappe and the geology consists of Samail Ophiolite and Supra-ophiolite Sediments. The Samail Ophiolite includes Tectonites, Cumulate Sequence, High-level Gabbro, Sheeted-dyke Complex and Samail Volcanic Rocks in ascending order. The Supra-ophiolite Sediments are composed of mainly olistostrome.

(ii) Geologic structure in the Rakah area is characterized with thrust faults, which formed in the stage of obduction. Each thrust sheet shows normal succession but upper formation are found at the lowr part and lower formations are at the upper part due to imbricated structure. Faults and folds are also found and these are formed mostly after the obduction.

(iii) Massive sulfide ore deposits in the Oman Mountains region are found in Samail Volcanic Rocks. The Samail Volcanic Rocks divided into Lower Volcanic Rocks, Middle Volcanic Rocks and Upper Volcanic Rocks, but the Upper Volcanic Rocks is not found in the Rakah area. The Lower Volcanic Rocks is also subdivided into Lower Extrusives I and II in ascending order. Petrochemical survey results indicate that the Lower and Middle Volcanic Rocks are originated from different series. Although the Lower Extrusives I and II are same fractionation series, the Lower Extrusives II is probably the earlier fractionation product compare with the Lower Extrusives I.

(iv) The Hayl as Safil and Rakah deposits are situated at the top of Lower Extrusives II. The both deposits consist of siliceous, massive and stockwork ores. The Hayl as Safil deposit is represented by thick stockwork ore zone with intense silicification and brecciation. The Rakah deposit consists of two mineralized zones. The stockwork ore zone is characterized by strong chloritization. The massive and siliceous ores in the Rakah deposit are found at the northwestern part of the deposit and shows close relation with sedimentary rocks consisting mainly of chert. High Au concentration was confirmed in the massive ore of the Rakah deposit. Ore minerals for both the deposits are pyrite, chalcopyrite, sphalerite covellite, chalcocite and bornite. Among these ore minerals, covellite, chalcocite and bornite were formed by secondary enrichment.

(v) Geophysical survey results by CP method in Area A indicate the Hayl as Safil deposit extends outside and has big potential. However, no potential area is found in Area A except the known mineralized zones and the surroudings.

(vi) Geophysical survey by CP method delineated the known ore deposits very clearly and the survey results indicated some extensions for outside. No other potential areas were found in Area B.

(vii) Drilling results in Area B suggest that insufficient drilling work has been completed for the lower mineralized zone. Good ore zones are also expected to continue outward in some places. Massive ore zone with high Au contents (18.30 m 8.96 g/t Au, 13.3 g/t Ag) is very important to evaluate the Rakah deposit.

Based on the above mentioned survey results, following parts are delineated as the potential area for further exploration work:

Area A: Beneath the southern half of Main Gossan and south of Main Gossan. Northeast and northwest of the Hayl as Safil deposit.

Area B: Lower mineralized zone. Southeastern and eastern extensions of the Rakah deposit. Massive ore zone and the surroundings with high Au concentration.

Data collection and site inspection for preliminary feasibility study resulted to collect enouth date for the study, to find suitable sites for mine facilities, and to select transportation roads for construction and operatoin materials and copper concentrates to the Sohar Smelter. The samples for beneficitation test were also collected in the survey. Based on these date and results, preliminary feasibility study will be completed in Phase II.

Chapter 2 Recommendations

Based on the results of surveys completed in Phase I, following work are recommendable for Phase II work.

(i) Drilling in Area A

Purpose : Confirmation of the expensions of the Hayl as Safil deposit.

Drill sites : Beneath the southern half of Main gossan. South of Main Gossan. Northeast and southeast of the Hayl as Safil deposit.

(ii) Drilling in Area B

Purpose : Confirmation of the extensions of the Rakah deposit. Exploration of the lower mineralized zone and confirmation of Au concentrated zone.

Drill sites : Southwestern and eastern extensions. Presumed center of the lower mineralized zone. The massive sulfide zone of the Rakah deposit.

(iii) Detailed geologic survey in the Rakah deposit area.

Purpose : Examine the Au contents in gossan and gossan dump.

Ore reserve estimation, beneficiation test and preliminary feasibility study are programed in Phaes II. Following points should be consider to carried out these works.

(i) Ore reserve estimation should be made using 0.20 to 0.25% Cu as the cutt-off grade and be calculated for each level and block. Highly Au concentrated zone should be calculated separately.

(ii) Beneficiation test should be carried out based on the difference of nature of ore.

(iii) In order to made final decision for the location of the mine facilities, road, power line and water pipe etc., topographic maps covering these locations are required in Phase II.

(iv) Because of no data for water sources in the area, survey for underground water sources should be carried out in Phase II.

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FIGURES

TABLES

PLATES

APPENDICES

APPENDICES

Appendix 1 Charged Potential in Rea A

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
550	300	60.3	11.8
500	300	64.8	12.7
550	250	54.3	13.1
500	250	59.4	13.0
550	200	48.1	13.2
500	200	54.8	14.0
550	150	40.7	13.1
500	150	47.7	13.7
550	100	32.6	15.0
500	100	35.8	14.4
550	50	25.5	15.7
500	50	26.8	15.7
550	0	20.8	17.2
500	0	23.2	21.2
550	-50	16.6	21.7
500	-50	17.6	18.8
550	-100	12.7	22.3
500	-100	13.8	24.3
550	-150	8.9	26.6
500	-150	9.7	26.5
550	-200	7.1	34.4
500	-200	7.1	34.1
650	-200	5.9	20.2
650	-150	8.5	18.8
700	-150	7.1	16.3
600	300	49.4	11.8
650	300	43.3	10.5
700	300	33.5	9.9
750	300	24.1	8.6
550	350	59.9	11.4
500	350	64.9	13.7
600	400	47.5	10.0
650	400	43.1	11.6
700	400	31.7	10.4
550	400	53.4	10.2
500	400	57.5	10.6
600	350	51.5	12.0
650	350	41.5	10.3
700	350	34.4	9.8
750	350	20.7	7.7
750	400	20.0	7.1
400	400	67.3	12.4
450	400	62.7	11.3
400	350	72.9	13.6
450	350	73.0	12.2
450	300	72.4	12.5
400	250	69.9	13.5
450	250	69.3	13.4
350	200	57.6	13.8
400	200	60.1	13.3
450	200	62.0	12.5
450	150	50.4	14.6
400	100	37.8	19.3
350	100	34.5	21.1
450	100	37.3	16.4
400	50	26.1	22.6
350	50	21.9	29.0
450	50	26.5	19.2
400	0	19.6	25.6
450	0	19.5	23.1
400	-50	14.5	27.1
450	-50	13.4	26.9
400	-100	10.8	32.3
400	300	71.2	11.9
300	400	34.1	13.2
350	400	50.2	11.8
250	400	19.0	12.0
300	350	45.1	11.4
250	350	32.0	12.1
350	350	57.1	11.9
300	300	52.6	12.9
250	300	39.3	12.6
350	300	63.2	12.8
300	250	54.3	14.2
250	250	43.9	13.7

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
350	250	59.9	13.2
300	200	56.2	14.6
250	200	50.3	14.7
350	150	58.2	15.5
400	150	58.3	13.9
250	450	18.5	11.7
250	500	14.1	8.6
300	500	19.2	7.9
250	550	9.9	6.7
300	450	20.5	10.4
400	450	43.4	10.4
350	450	34.5	10.2
400	500	25.4	7.9
350	500	23.3	8.6
400	550	14.5	7.2
350	550	14.4	7.3
400	600	10.6	6.5
350	600	9.3	6.8
300	600	9.2	7.4
300	550	13.3	7.8
250	600	9.4	6.9
200	600	7.2	8.6
150	600	7.0	7.2
100	600	5.8	7.4
100	500	11.0	8.8
150	500	12.0	8.0
200	500	13.4	8.6
600	450	37.6	8.7
650	450	36.0	8.3
700	450	29.9	7.6
550	450	49.2	9.9
500	450	42.4	9.4
450	450	44.0	9.9
600	500	27.3	6.2
650	500	28.4	7.4
700	500	21.2	6.4
750	500	17.6	5.7
550	500	33.0	7.6
500	500	34.4	8.6
450	500	30.2	8.6
600	550	26.5	7.5
650	550	21.6	6.6
700	550	17.4	5.9
750	550	15.4	5.7
550	550	26.4	7.8
500	550	23.9	7.9
450	550	22.5	8.2
600	600	20.1	6.3
650	600	17.9	5.8
700	600	15.7	5.3
750	600	14.4	5.1
550	600	18.4	6.8
500	600	19.3	7.5
450	600	18.9	7.6
600	650	14.2	5.6
650	650	13.5	4.7
700	650	13.5	5.0
750	650	11.6	4.5
550	650	15.8	7.0
500	650	15.3	6.8
450	650	16.2	7.9
600	700	9.7	4.4
650	700	11.0	4.8
700	700	10.2	4.6
750	700	8.8	3.8
550	700	9.5	4.3
500	700	12.0	6.2
450	700	14.0	6.3
600	750	10.5	5.5
650	750	9.7	4.5
700	750	9.3	4.5
550	750	6.8	3.0
500	750	12.0	6.1
450	750	13.3	5.9
600	800	10.3	4.9

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
650	800	8.9	4.3
700	800	9.1	4.3
550	800	10.0	5.5
500	800	10.5	5.8
450	800	10.3	4.9
250	700	13.5	7.2
250	650	14.3	7.6
350	750	10.0	5.5
350	700	8.3	4.9
350	650	16.5	8.4
300	650	15.7	8.0
300	700	14.2	7.8
300	750	10.8	6.1
250	750	11.4	6.1
300	900	7.6	5.0
400	850	8.6	4.3
400	900	7.6	4.6
500	850	7.1	4.1
450	850	9.0	4.2
500	900	7.3	4.2
450	900	6.0	3.3
600	900	7.0	4.0
700	900	5.0	2.6
800	900	5.1	2.5
600	1000	5.1	3.0
700	1000	4.0	2.2
800	1000	3.4	2.4
500	1000	5.7	3.7
400	1000	6.0	4.1
300	1000	5.1	3.6
600	1100	3.4	2.4
700	1100	3.4	2.5
800	1100	3.1	2.3
500	1100	3.8	2.9
400	1100	2.6	2.4
300	1100	2.6	2.1
600	1200	2.3	2.4
500	1200	2.8	2.1
400	1200	3.1	2.4
700	1200	1.9	1.8
800	1200	1.1	1.1
600	1300	1.5	1.3
700	1300	1.3	1.2
800	1300	1.3	1.1
500	1300	1.6	1.7
600	1400	1.1	.9
700	1400	.9	.8
800	1400	.8	.7
700	1500	.6	.5
800	800	8.3	3.8
900	800	6.0	3.1
1000	800	4.2	2.5
1100	800	3.0	1.9
900	900	4.7	2.6
1000	900	2.9	2.0
1100	900	2.6	1.6
900	1000	3.8	2.1
1000	1000	2.7	1.7
1100	1000	2.1	1.4
900	1100	2.3	1.7
1000	1100	1.9	1.3
1100	1100	1.5	.9
900	1200	1.8	1.2
1000	1200	1.5	1.0
900	1300	1.2	1.2
1200	1000	2.7	1.6
1200	900	2.9	1.5
1300	900	2.2	1.2
1200	800	2.5	1.2
1300	800	2.4	1.2
1400	800	2.2	1.1
1200	700	4.8	2.8
1300	700	3.0	2.2
1400	700	2.5	1.4
1500	700	1.3	1.2

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
1100	700	5.8	3.9
1000	700	9.5	5.9
1200	600	6.2	3.6
1300	600	5.2	2.9
1400	600	3.6	2.1
1500	600	2.4	1.5
1100	600	6.9	3.5
1000	600	8.9	4.4
1200	500	6.7	4.4
1300	500	5.1	3.3
1400	500	3.7	2.2
1500	500	2.5	1.9
1100	500	9.5	4.7
1000	500	12.6	5.7
1200	400	7.7	5.1
1300	400	6.0	3.4
1400	400	3.8	2.7
1100	400	9.2	5.0
1200	300	7.8	5.5
1300	300	5.8	4.4
1200	200	8.7	6.3
1100	200	9.8	7.1
900	700	7.4	4.1
800	700	8.0	3.7
900	600	10.8	6.0
800	600	14.0	8.1
800	550	17.2	8.2
900	500	13.4	7.8
850	500	15.5	7.0
800	500	17.3	7.5
900	450	11.7	5.9
800	450	19.1	8.2
750	450	18.8	7.5
900	400	14.6	6.8
850	400	14.6	7.3
950	400	13.3	6.7
1000	400	12.1	6.6
900	350	12.6	6.4
950	350	11.8	8.0
1000	350	10.2	6.6
850	450	16.0	6.9
800	400	19.0	9.0
850	350	16.6	7.9
800	350	19.4	8.3
900	300	13.9	8.6
950	300	12.5	8.0
1000	300	10.6	7.7
1050	300	9.9	6.7
1100	300	8.9	6.1
850	300	17.7	8.9
800	300	19.5	8.4
900	250	15.7	8.7
950	250	13.1	8.3
1000	250	11.8	7.8
850	250	17.6	9.0
800	250	21.2	10.4
900	200	15.2	8.7
950	200	13.3	8.5
1000	200	12.1	8.3
850	200	17.6	8.6
800	200	20.5	10.9
900	150	13.8	9.1
850	150	15.8	9.2
800	150	17.9	11.6
850	100	14.7	10.8
800	100	13.5	11.8
800	50	13.0	11.5
600	-250	7.2	27.3
700	-200	7.8	15.5
600	-200	9.7	28.1
600	-150	11.5	21.0
600	-100	12.7	21.6
650	-100	10.7	15.3
700	-100	10.1	14.3
600	-50	14.6	16.6

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
650	-50	14.2	15.2
700	-50	10.2	15.3
600	0	18.9	15.0
650	0	13.5	16.0
700	0	12.7	12.3
750	0	9.5	10.9
600	50	22.1	14.6
650	50	20.0	15.4
700	50	16.2	13.9
750	50	11.3	11.8
600	100	28.2	12.8
650	100	24.6	12.4
700	100	21.1	11.2
750	100	14.2	11.8
600	150	34.7	11.4
650	150	28.9	13.0
700	150	26.2	12.3
750	150	16.1	11.0
600	200	41.1	12.4
650	200	32.5	11.8
700	200	28.8	10.9
750	200	15.3	7.1
600	250	45.4	12.4
650	250	36.3	12.2
700	250	30.5	10.2
750	250	25.2	9.4
350	-150	12.1	48.3
350	-100	15.9	41.8
350	-50	17.7	40.1
350	0	23.1	34.3
300	-150	15.0	54.7
300	-100	18.1	45.4
300	-50	19.4	41.2
250	-150	16.1	51.1
250	-100	18.6	43.6
250	-50	19.6	42.1
200	-150	14.7	56.9
150	-150	14.3	76.0
150	-100	17.7	56.1
100	-150	13.2	82.5
100	-100	17.1	54.0
100	-50	18.7	49.6
100	0	22.1	40.9
50	-150	10.8	72.1
50	-100	13.7	64.3
50	-50	15.4	51.6
150	-50	20.0	46.6
250	100	34.2	29.1
0	-150	10.2	79.3
0	-100	11.3	64.3
0	-50	13.4	52.4
-50	-150	8.1	72.4
-50	-100	9.7	64.0
-50	-50	12.1	52.0
-50	0	11.8	36.4
0	0	15.6	39.7
50	0	18.7	39.2
-50	50	13.5	30.8
0	50	18.7	30.7
100	50	27.7	31.1
150	50	30.8	30.8
200	50	33.8	31.3
200	100	32.3	31.3
250	50	29.4	33.2
250	0	22.8	40.0
50	50	23.3	30.7
-50	100	15.1	29.4
0	100	19.4	30.3
50	100	26.2	30.5
100	100	29.7	29.6
-50	150	15.2	24.6
0	150	20.2	24.3
50	150	27.4	25.1
100	150	34.3	27.3
-50	200	16.4	18.3

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
0	200	20.4	21.8
50	200	25.5	21.9
100	200	31.7	21.9
150	200	42.5	21.6
200	200	40.2	20.5
-50	250	15.8	15.2
0	250	20.0	16.9
50	250	25.2	15.9
100	250	32.8	16.4
150	250	41.3	18.3
200	250	44.3	17.8
-50	300	12.9	12.2
0	300	18.6	14.0
50	300	23.9	13.2
100	300	28.9	13.3
150	300	32.2	15.0
200	300	39.1	14.1
-50	350	12.5	13.4
0	350	16.4	12.7
50	350	21.7	13.7
150	350	29.4	13.9
200	350	33.3	12.5
100	350	23.7	17.6
0	400	13.2	9.9
50	400	17.7	13.4
100	400	21.5	12.9
150	400	23.9	13.1
200	400	28.2	13.2
-50	450	9.5	11.8
0	450	11.1	11.0
50	450	13.0	13.8
100	450	16.6	11.2
150	450	17.3	11.3
200	450	18.9	12.6
50	500	12.4	11.5
0	500	8.1	10.4
-100	600	3.3	6.7
0	600	5.6	6.2
100	550	11.3	8.1
150	550	11.8	7.8
200	550	14.9	8.7
200	650	7.8	6.7
200	700	6.5	6.1
-100	700	1.1	5.6
0	700	3.0	5.2
100	700	4.5	6.2
0	800	1.0	4.9
100	800	1.5	5.2
100	900	1.2	3.4
200	800	3.5	7.4
200	900	2.6	3.6
-200	600	1.6	8.6
200	1000	1.5	3.4
-200	500	2.2	8.1
-300	500	1.9	8.3
-200	400	2.7	10.1
-300	400	1.8	8.5
-200	300	5.4	13.0
-300	300	2.5	9.1
-150	200	8.9	18.4
-150	250	8.9	18.4
-150	300	8.7	12.7
-200	200	6.8	17.7
-200	250	6.4	12.8
-250	200	4.5	14.8
-300	200	2.5	13.1
-150	150	9.3	22.0
-200	150	7.1	21.4
-250	150	5.5	20.9
-300	150	3.2	18.0
-150	100	9.1	26.7
-200	100	7.0	23.2
-250	100	5.3	23.1
-300	100	3.5	18.5
-350	100	.9	13.4

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
-150	50	8.9	32.6
-200	50	6.8	29.6
-250	50	4.8	27.1
-300	50	3.6	30.8
-350	50	1.9	27.6
-150	0	7.5	34.2
-200	0	5.1	35.1
-250	0	3.6	32.4
-300	0	3.3	29.8
-350	0	1.7	30.8
-150	-50	7.0	44.0
-200	-50	4.5	39.2
-250	-50	3.6	38.8
-300	-50	2.1	34.4
-350	-50	1.8	30.8
-150	-100	5.3	53.1
-200	-100	4.2	45.2
-250	-100	3.1	43.0
-300	-100	1.6	40.3
-150	-150	4.3	62.1
-200	-150	3.1	56.8
-250	-150	2.4	51.9
-150	-200	3.3	79.9
-200	-200	3.8	72.1
-300	-200	1.5	53.5
-400	-100	1.1	30.6
-400	0	1.5	25.2
-500	0	.9	17.4
-400	50	1.4	16.3
-400	100	1.1	10.6
-500	100	.9	8.3
-600	100	.8	6.9
-400	200	1.1	6.4
-500	200	1.0	8.8
-600	200	.9	4.7
-400	300	1.2	5.6
-500	300	1.0	4.9
-400	400	1.3	4.8
-300	-300	.8	62.3
-200	-300	1.6	82.4
-200	-400	3.4	87.4
-100	-250	3.2	94.0
-150	-250	2.3	87.6
-100	-300	2.4	106.0
-100	-400	1.2	139.4
-100	-500	.9	117.2
400	800	10.7	6.2
400	700	14.5	7.6
400	750	13.6	6.9
350	800	11.0	6.7
300	800	10.6	6.4
450	-200	9.6	35.2
400	-200	12.3	46.6
350	-200	9.2	52.2
300	-200	12.2	58.5
250	-200	13.0	69.1
200	-200	11.1	89.7
150	-200	9.6	116.2
100	-200	9.3	120.4
50	-200	9.1	112.5
0	-200	7.7	104.5
-50	-200	6.0	98.0
-100	-200	4.4	87.7
-100	500	6.5	8.8
-100	450	7.7	10.7
-100	400	8.5	10.0
-100	350	10.7	11.3
-100	300	12.1	11.4
-100	250	12.0	15.0
-100	200	11.9	17.7
-100	150	12.0	20.4
-100	100	11.5	26.6
-100	50	10.6	32.0
-100	0	10.6	37.7
-100	-50	7.5	53.7

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
-100	-100	6.1	63.0
-100	-150	5.5	67.3
0	-250	4.7	143.9
-50	-250	3.6	125.6
0	-300	4.0	213.4
-50	-300	3.0	134.3
0	-350	2.7	232.3
-50	-350	1.7	151.4
0	-400	1.6	220.8
50	-250	5.6	136.5
100	-250	5.6	200.1
200	-250	8.7	114.9
150	-250	6.5	152.7
250	-250	8.6	83.0
200	-300	5.8	106.3
150	-300	5.6	203.3
200	-350	3.7	118.1
150	-350	3.8	213.2
200	-400	2.8	157.8
300	-250	7.5	62.4
350	-250	6.5	55.0
300	-300	6.0	68.3
250	-300	6.4	109.0
350	-300	5.7	61.6
300	-350	4.8	79.6
250	-350	4.5	88.8
350	-350	3.8	68.0
300	-400	3.2	76.8
250	-400	3.2	98.0
350	-400	3.0	65.0
400	-250	6.1	44.4
450	-250	7.8	38.1
400	-300	5.1	46.2
450	-300	5.7	41.9
500	-300	6.9	36.1
400	-350	4.4	50.3
500	-250	9.3	35.4
600	-300	5.3	24.2
600	-400	3.6	29.4
500	-400	1.7	29.8
400	-400	4.7	58.0
600	-500	.6	31.6
500	-500	.7	37.0
500	-600	.6	33.8
400	-500	.8	55.7
400	-600	.6	45.5
400	-700	.5	33.5
300	-500	2.7	75.5
300	-450	3.5	75.5
300	-600	.8	60.7
300	-700	.9	41.0
300	-800	.6	30.4
250	-500	2.8	87.2
250	-450	3.9	85.8
200	-500	3.2	109.5
200	-450	4.1	107.0
200	-550	1.3	88.5
200	-600	1.2	63.8
200	-700	.7	49.4
200	-800	.6	37.9
150	-500	2.5	106.9
150	-450	4.4	181.6
150	-400	4.5	174.5
100	-500	3.3	185.3
100	-600	2.6	90.8
100	-700	2.5	49.8
100	-450	3.9	237.3
100	-400	4.4	281.3
100	-350	4.7	295.8
100	-300	4.9	234.4
50	-450	4.1	245.8
50	-400	4.4	281.3
50	-350	4.5	281.8
50	-300	4.8	218.1
0	-500	3.1	177.3

X	Y	Potential (mV/A)	
(m)	(m)	HS-14	HS-7
0	-600	.6	80.8
700	-400	2.6	11.2
900	100	12.8	10.6
1000	100	9.6	8.0
900	0	10.7	10.5
1000	0	9.0	10.6
800	0	12.0	13.3
900	-100	10.0	14.1
800	-100	11.2	12.4
1000	-100	8.0	8.9
900	-200	8.6	13.3
800	-200	9.5	15.4
800	-300	6.9	14.0
700	-300	7.7	19.4
400	650	15.7	7.6
-50	400	10.1	13.9
450	-100	13.0	29.4
400	-150	9.9	38.8
450	-150	9.6	36.4

Appendix 2 Electric Field in Area A

X	Y	HS-14		HS-7		X	Y	HS-14		HS-7		X	Y	HS-14		HS-7	
(m)	(m)	|E|	φ	|E|	φ	(m)	(m)	|E|	φ	|E|	φ	(m)	(m)	|E|	φ	|E|	φ
325	575	37	92	2	179	275	375	36	288	2	222	850	675	3	198	0	189
325	525	15	89	5	39	225	325	8	218	3	118	850	750	7	168	3	166
275	575	44	62	7	132	225	275	30	222	3	176	850	575	4	195	4	149
275	525	25	44	1	202	175	375	2	182	8	137	825	525	12	171	6	169
225	575	38	57	5	94	175	425	27	77	3	222	825	475	5	188	4	230
225	525	28	55	4	143	475	275	17	204	12	158	725	275	8	197	4	208
175	575	28	28	4	84	525	275	22	231	7	161	675	275	5	239	2	232
175	525	34	45	2	65	525	325	25	215	2	263	775	375	12	286	6	309
125	575	29	18	8	143	575	275	12	262	4	278	725	375	22	286	10	283
125	525	42	15	3	225	475	325	48	265	9	174	675	375	28	175	12	167
75	575	25	16	3	159	475	425	61	182	9	170	675	325	6	207	2	248
75	525	31	9	5	182	475	375	49	218	5	187	725	325	23	120	12	120
25	575	16	9	7	139	525	425	40	204	3	228	775	325	3	103	2	62
25	525	15	34	23	144	525	375	31	193	5	151	825	275	4	151	1	175
-25	575	16	26	23	132	575	425	30	244	4	234	950	350	4	179	2	166
-25	525	20	9	13	309	575	375	17	181	1	173	875	425	4	200	1	11
-75	575	14	359	3	131	625	425	33	302	5	317	950	425	6	117	5	102
-75	525	13	18	20	160	625	375	25	350	6	13	875	550	6	275	1	280
-125	575	15	325	24	128	625	325	22	360	3	45	875	475	12	147	3	174
-125	525	14	11	7	183	575	325	14	195	2	126	950	550	3	172	1	161
-175	575	11	305	34	141	625	275	17	2	3	322	950	475	5	238	3	253
-175	525	9	1	26	182	625	225	8	286	8	137	950	650	5	134	3	126
-175	675	11	324	16	106	650	175	1	213	6	228	950	750	2	183	1	164
-125	675	9	32	15	144	650	125	5	240	2	161	950	850	3	166	0	223
-125	750	11	333	7	184	525	125	3	285	3	133	1050	650	4	146	2	127
325	625	22	71	5	83	525	175	5	262	2	245	1050	750	1	136	1	339
325	675	34	101	2	106	525	225	5	336	0	43	1050	850	1	236	0	100
325	725	32	85	5	95	475	625	35	171	8	172	1050	550	3	162	2	138
325	775	12	162	5	236	475	675	33	141	4	141	1050	450	6	175	3	166
375	575	36	128	4	208	475	725	40	138	6	227	1050	350	5	200	3	196
375	525	30	146	13	143	475	575	68	144	9	153	1150	650	2	177	0	279
425	625	37	156	7	231	475	525	36	220	3	216	1150	750	3	169	1	162
425	675	46	122	12	159	475	475	47	174	5	158	1150	850	4	158	2	155
425	725	40	99	14	131	525	625	5	236	6	318	1150	550	2	159	2	149
425	575	25	126	1	145	525	675	34	133	4	128	1150	450	2	292	1	264
425	525	53	165	4	164	525	725	18	137	3	128	1250	650	2	153	2	149
375	625	37	112	9	140	525	775	8	172	6	267	1250	550	2	158	1	216
375	675	25	77	5	22	525	575	30	139	5	81	1250	750	2	128	2	132
375	725	47	101	7	75	525	525	36	172	4	124	1250	850	1	281	0	280
375	775	8	252	7	254	525	475	30	209	1	188	1350	650	1	155	1	156
425	775	11	312	13	296	575	625	27	143	5	143	1350	750	1	176	1	173
425	425	83	169	8	151	575	675	19	131	4	137	1350	850	1	168	1	190
425	475	66	165	5	152	575	725	9	129	2	158	1450	750	1	161	1	160
375	425	19	181	6	130	575	775	4	221	7	255	850	850	7	145	3	150
375	475	45	142	6	239	575	575	27	181	3	167	850	950	4	128	1	131
325	475	26	86	1	226	575	525	18	207	2	162	850	1050	3	137	1	129
275	425	5	23	6	177	575	475	13	202	2	155	850	1150	1	169	1	119
275	475	35	73	4	157	625	625	22	160	3	145	950	950	3	116	1	131
225	375	11	313	3	140	625	675	17	154	4	155	950	1050	1	117	1	130
225	425	34	349	3	72	625	725	9	149	1	147	950	1150	1	211	0	142
225	475	35	45	6	301	625	775	11	156	9	256	1050	950	3	145	1	130
175	475	41	13	7	157	625	575	11	213	2	74	1050	1050	2	140	1	144
125	425	69	1	20	152	625	525	14	168	3	135	1050	1150	1	228	1	201
125	375	81	352	20	162	625	475	9	188	1	20	1150	950	1	143	1	139
125	475	45	7	10	132	675	625	16	172	5	145	1150	1050	1	132	1	128
75	425	40	358	16	135	675	675	8	180	1	286	1250	950	1	156	0	105
75	375	45	342	35	141	675	725	13	149	2	122	950	1250	1	105	0	59
75	475	37	358	15	128	675	825	10	168	2	182	850	1250	0	100	0	330
25	425	22	1	13	140	675	575	22	165	10	153	850	1350	1	161	0	151
25	475	27	332	15	153	675	525	11	190	2	193	750	1250	6	141	4	159
-25	425	18	13	5	174	675	475	8	156	7	146	750	1350	1	140	3	141
-25	475	25	326	31	115	725	625	6	302	4	338	750	1450	3	103	1	140
-75	425	15	329	20	151	725	675	5	149	1	155	750	1150	7	162	5	155
325	425	7	324	6	341	725	725	6	123	3	102	750	1050	14	148	8	153
425	325	72	230	11	153	750	775	4	110	1	72	650	1250	4	144	2	136
425	375	79	227	6	201	725	575	9	182	4	182	650	1350	5	144	2	132
425	275	51	268	4	259	725	525	8	90	6	94	650	1450	3	133	2	137
375	325	55	228	6	344	725	475	7	111	1	163	650	1150	3	148	1	356
375	275	63	225	2	100	775	625	3	106	4	120	650	1050	4	74	3	28
375	375	59	247	6	267	775	675	3	154	1	177	550	1250	3	107	3	126
325	325	44	234	5	177	775	750	2	111	1	130	550	1350	3	88	2	111
325	275	52	241	2	206	775	575	16	310	12	315	550	1450	2	95	1	100
325	375	34	233	4	134	775	525	18	106	10	96	550	1150	8	133	2	168
275	325	20	254	6	142	775	475	11	157	3	188	550	1050	10	140	3	142
275	275	39	246	4	202	850	625	7	139	3	125	450	1250	4	119	4	113

|E| : Intensity(unit; mV/A·100m) of Electiric Field
φ : Azimuth(unit; Degree) of Electiric Field

X	Y	HS-14		HS-7	
(m)	(m)	|E|	ϕ	|E|	ϕ
450	1350	5	112	2	100
450	1150	3	77	1	200
350	1250	4	93	2	106
250	1150	3	130	3	141
750	950	7	257	5	255
750	850	2	40	1	314
650	950	5	186	3	163
650	850	11	152	8	155
575	850	11	154	3	94
550	950	6	203	4	153
550	875	9	128	5	218
525	825	7	122	2	69
475	950	6	338	7	16
475	825	21	145	9	145
475	775	15	185	11	195
425	925	19	164	8	174
425	875	6	2	3	131
450	975	5	78	2	164
450	1050	6	81	4	118
375	925	9	23	7	286
375	975	9	47	8	133
375	1050	10	37	3	90
475	875	27	115	9	117
425	825	17	89	7	116
375	875	18	116	7	111
375	825	11	98	3	25
325	925	7	132	9	166
325	975	8	111	1	94
325	1025	4	122	6	139
350	1075	4	81	3	130
350	1150	2	73	2	150
325	875	16	106	4	164
325	825	7	95	2	255
275	925	12	125	2	106
275	975	6	115	2	115
275	1050	8	126	2	102
275	875	8	88	1	114
275	825	16	115	10	144
225	925	8	75	1	81
225	975	5	98	1	137
225	1050	5	105	3	129
225	875	10	91	2	343
225	825	12	78	9	101
175	950	8	49	2	149
175	875	11	46	2	169
175	825	14	38	10	107
125	875	9	60	6	173
125	825	18	344	4	97
75	850	2	32	3	69
-225	650	9	21	22	82
-175	750	6	249	5	301
-175	625	14	65	36	132
-125	625	11	68	8	76
-75	625	9	47	27	128
-75	675	12	10	3	95
-75	750	6	294	7	356
-25	625	18	5	5	117
-25	675	12	88	7	329
-25	750	9	353	12	202
25	625	23	59	4	246
25	675	24	7	13	99
25	725	17	43	8	42
25	775	15	295	14	283
75	625	23	19	7	205
75	675	22	40	12	153
75	725	25	45	12	142
75	775	15	313	4	273
125	625	27	29	5	164
125	675	16	53	5	99
125	725	26	73	3	306
125	775	3	276	9	210
175	625	27	76	3	246
175	675	16	69	7	162
175	725	33	75	10	136
175	775	20	263	17	223
225	625	31	63	2	91
225	675	17	43	3	60
225	725	44	83	12	101
225	775	46	314	22	289
275	625	37	52	1	43
275	675	36	31	7	118
275	725	23	46	3	66
275	775	4	285	12	266
-125	375	15	31	39	124
-75	375	18	70	33	100
-25	375	25	25	49	114
25	375	19	118	35	121
-125	325	17	48	47	136
-75	325	12	68	26	126
0	325	12	53	22	148
-125	275	10	26	30	206
-75	275	4	29	8	230
-25	275	7	7	16	168
-100	225	8	319	26	128
-125	175	12	354	99	136
-75	200	5	338	49	153
-125	125	12	326	126	169
-75	125	10	300	32	244
-25	125	13	323	28	180
25	150	26	336	25	181
-125	75	14	312	71	249
-75	75	12	297	52	141
-25	75	18	323	33	168
0	200	18	356	27	173
150	300	27	359	28	151
-125	25	4	3	64	143
-75	25	9	323	43	162
-25	25	8	333	45	163
-125	-25	9	308	37	220
-75	-25	10	327	41	182
-25	-25	4	254	53	182
25	-25	14	295	22	210
25	25	15	316	31	176
25	75	18	335	29	175
75	-25	18	286	5	176
75	25	16	279	1	182
75	125	12	302	5	170
100	175	15	317	5	199
75	225	16	109	7	270
150	225	15	335	20	158
75	300	21	38	16	153
25	300	23	353	25	157
75	75	18	303	2	241
125	-25	15	272	17	191
125	25	23	276	20	182
125	75	13	289	19	171
125	150	16	344	8	201
175	-25	18	284	22	177
175	25	24	272	9	198
175	75	24	255	13	215
175	150	12	139	19	172
225	-25	14	262	16	229
225	25	18	265	17	181
225	75	21	266	20	180
225	125	37	276	19	177
225	175	9	118	12	162
225	225	37	292	22	115
275	-25	17	235	12	211
275	25	18	255	11	160
275	75	26	261	9	192
275	125	32	246	12	211
275	175	33	198	11	171
275	225	17	176	19	133
325	-25	19	266	7	304
325	25	20	247	5	149
325	75	19	246	2	351
325	125	21	212	16	338
325	175	26	248	5	140
325	225	20	181	7	137
375	-25	15	238	3	56
375	25	21	240	10	199
375	75	15	206	13	266
375	175	23	215	5	120
375	225	18	166	3	29
375	125	21	249	20	141
425	25	17	245	12	287
425	75	20	219	2	49
425	125	18	206	6	184
425	175	27	214	6	185
425	225	44	135	5	118
525	-25	8	228	7	157
475	25	12	212	10	257
475	75	12	260	12	132
475	125	19	188	8	183
475	175	19	197	12	200
475	225	19	176	14	168
550	75	10	152	10	104
550	25	15	253	8	208
650	-50	5	227	2	157
650	50	4	185	3	226
575	125	19	185	3	156
575	175	19	213	4	238
575	225	31	147	7	95
675	225	23	259	4	230
750	225	24	258	5	300
750	50	4	218	2	255
750	150	6	215	2	170
850	150	3	262	5	233
850	250	12	263	7	165
950	250	9	257	2	262
550	-150	7	262	2	302
450	-150	10	265	4	177
450	-250	2	275	3	263
350	-175	12	248	5	168
350	-250	5	257	7	261
225	-125	10	272	2	90
275	-125	11	265	23	149
350	-125	12	250	8	146
225	-175	7	258	17	189
275	-175	9	249	19	273
250	-225	8	253	13	231
250	-275	7	269	9	221
175	-125	9	261	13	156
175	-175	7	262	13	188
175	-225	7	241	21	185
175	-275	8	254	19	211
125	-125	8	274	16	178
125	-175	7	273	13	243
125	-225	6	276	7	183
125	-275	6	262	16	264
150	-325	9	260	19	242
75	-125	6	276	20	174
75	-175	7	275	24	205
75	-225	7	282	16	213
75	-275	4	261	44	163
75	-325	7	241	49	193
25	-125	12	295	13	246
25	-175	10	306	19	171
25	-225	7	310	20	207
25	-275	2	319	9	291
25	-325	5	275	11	163
-25	-125	3	315	47	225
-25	-175	9	284	22	230
-25	-225	3	269	22	184
-25	-275	7	309	21	224
-25	-325	1	248	12	270
-75	-125	6	334	46	228
-75	-175	4	284	34	233
-75	-225	4	296	16	207
-75	-275	5	287	22	204
-125	-125	6	310	35	210
-125	-175	6	314	43	205
-125	-225	3	314	35	209
-175	-125	5	311	66	203
-175	-175	3	145	59	207

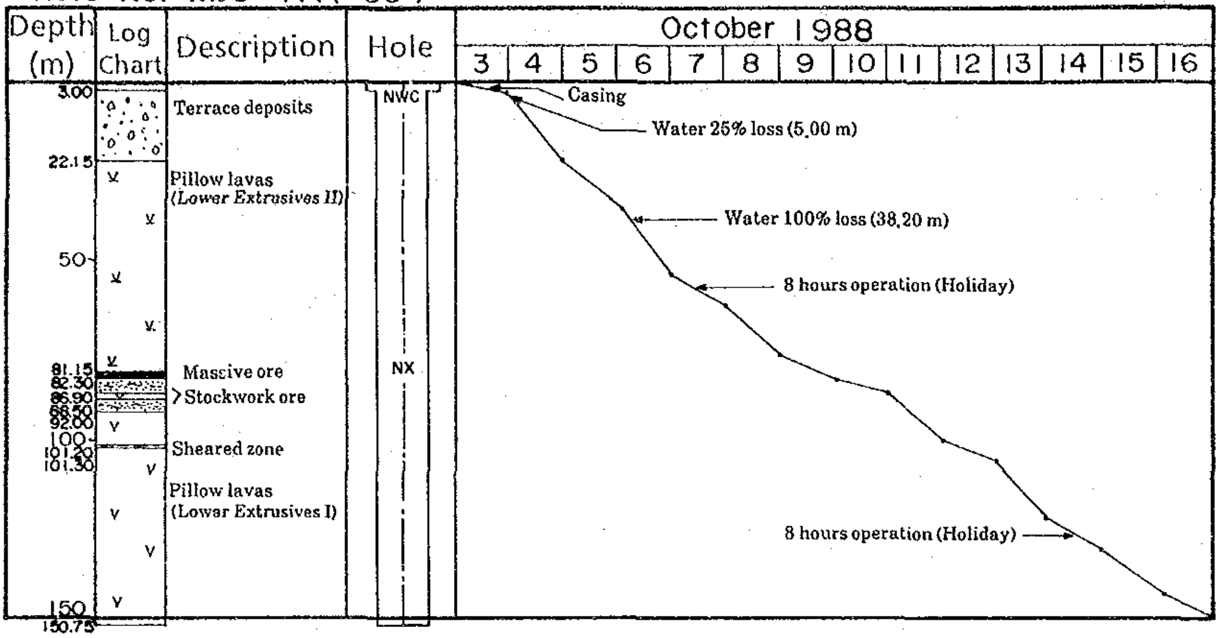
|E| : Intensity(unit; mV/A·100m) of Electiric Field
ϕ : Azimuth(unit; Degree) of Electiric Field

X	Y	HS-14		HS-7	
(m)	(m)	|E|	φ	|E|	φ
-150	-250	4	274	39	235
-50	-350	1	306	19	241
25	-375	1	248	36	212
50	-450	1	270	20	220
75	-375	2	239	43	244
150	-375	1	95	12	234
150	-450	1	303	4	282
150	-550	0	321	5	212
250	-350	3	277	11	262
250	-450	☐	257	8	149
350	-350	2	274	6	258
-250	-250	2	311	37	246
-250	-150	4	338	44	246
-350	-150	5	130	89	265
-225	-75	5	340	109	259
-225	-125	4	319	34	220
-275	-75	3	320	105	247
-350	-50	2	341	212	255
-450	-50	5	276	160	284
825	425	7	171	8	146
725	425	3	155	5	118
775	425	10	174	4	125
850	375	7	169	4	157
850	325	5	195	3	199
-175	475	8	89	6	42
-175	425	13	131	47	124
-175	375	14	313	23	125
-175	325	16	40	22	95
-175	275	14	10	62	145
-175	225	16	337	122	145
-175	175	20	345	151	143
-175	125	13	356	113	173
-175	75	4	349	154	190
-175	25	10	331	90	198
-175	-25	9	322	90	194
-175	-75	6	305	78	207
550	-50	6	206	4	215
475	-75	7	235	7	213
425	-75	6	246	13	279
375	-75	10	220	8	240
325	-75	6	209	3	261
275	-75	13	271	12	182
225	-75	15	272	9	191
175	-75	11	269	17	237
125	-75	12	277	23	205
75	-75	11	288	19	167
25	-75	4	269	20	167
-25	-75	19	304	55	174
-75	-75	13	291	32	186
-125	-75	9	283	23	230
-225	25	11	342	136	169
-225	-25	9	335	113	214
-275	25	6	294	365	183
-275	-25	4	301	398	266
-325	25	10	297	212	249
-325	-25	6	322	418	262
-375	25	13	287	246	281
-225	75	12	0	231	249
-225	125	13	346	315	149
-225	225	8	3	138	128
-225	175	13	324	179	134
-225	275	15	15	85	124
-275	225	10	350	31	342
-275	175	3	347	539	123
-325	225	8	341	107	112
-325	175	6	1	453	95
-375	225	4	336	376	128
-225	325	17	11	28	118
-225	375	9	8	37	105
-275	325	5	12	30	131
-275	275	8	8	164	123
-275	375	4	38	57	113
-325	325	5	41	55	134
-325	275	6	349	75	24
-325	375	7	343	64	110
-375	325	6	4	41	76
-375	275	4	2	79	114
-375	375	9	287	15	313
-225	425	22	344	23	71
-225	475	8	321	14	137
-275	425	4	330	16	113
-275	475	8	330	24	124
-275	550	8	19	20	97
-325	450	4	307	22	129
-225	550	8	154	15	108
-275	650	9	316	11	12
-350	650	3	33	32	106
-350	550	9	342	10	79
-375	450	7	123	83	137
-450	550	2	3	18	143
-450	450	8	1	38	83
-550	450	0	4	31	49
-475	350	5	50	40	90
-425	350	5	232	43	161
-550	350	4	5	43	46
-650	350	1	95	42	21
-475	275	4	6	47	97
-425	275	5	161	42	103
-475	225	4	25	90	96
-425	225	7	174	220	23
-525	250	8	8	108	39
-575	250	1	73	99	4
-650	250	1	343	33	31
-750	250	0	34	28	33
-475	175	8	339	299	358
-425	175	1	65	300	95
-375	175	10	121	168	23
-475	125	4	52	376	57
-550	150	3	66	197	16
-650	150	4	86	82	0
-425	125	3	316	284	52
-375	125	1	332	431	82
-325	125	6	81	411	127
-275	125	1	135	286	154
-425	75	2	37	146	13
-375	75	0	56	2	0
-325	75	1	327	261	192
-275	75	0	286	413	189
-450	50	3	187	89	349
-550	50	6	320	194	354
125	950	8	59	8	140
150	1100	6	34	2	76
50	950	6	39	0	304
25	850	5	36	9	142
-50	950	4	70	13	125
-50	850	3	56	4	299
-150	850	4	28	7	145
-250	750	3	144	16	139
675	425	5	204	1	268
425	-25	11	258	15	117
-75	475	3	293	19	116
-125	425	3	19	24	159
-125	475	12	359	41	125

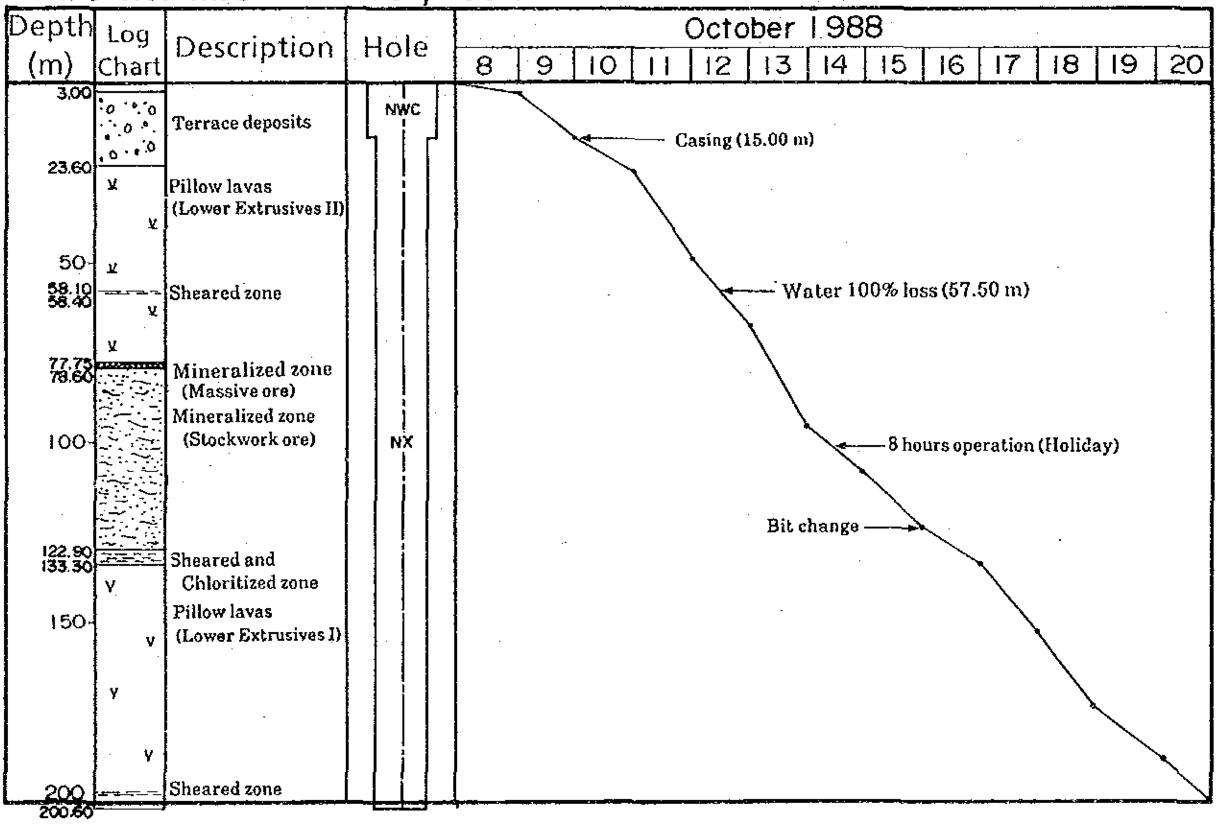
|E| : Intensity (unit: mV/A·100m) of Electiric Field
φ : Azimuth (unit: Degree) of Electiric Field

Appendix 3 Progress of Each Drill Hole in Area A

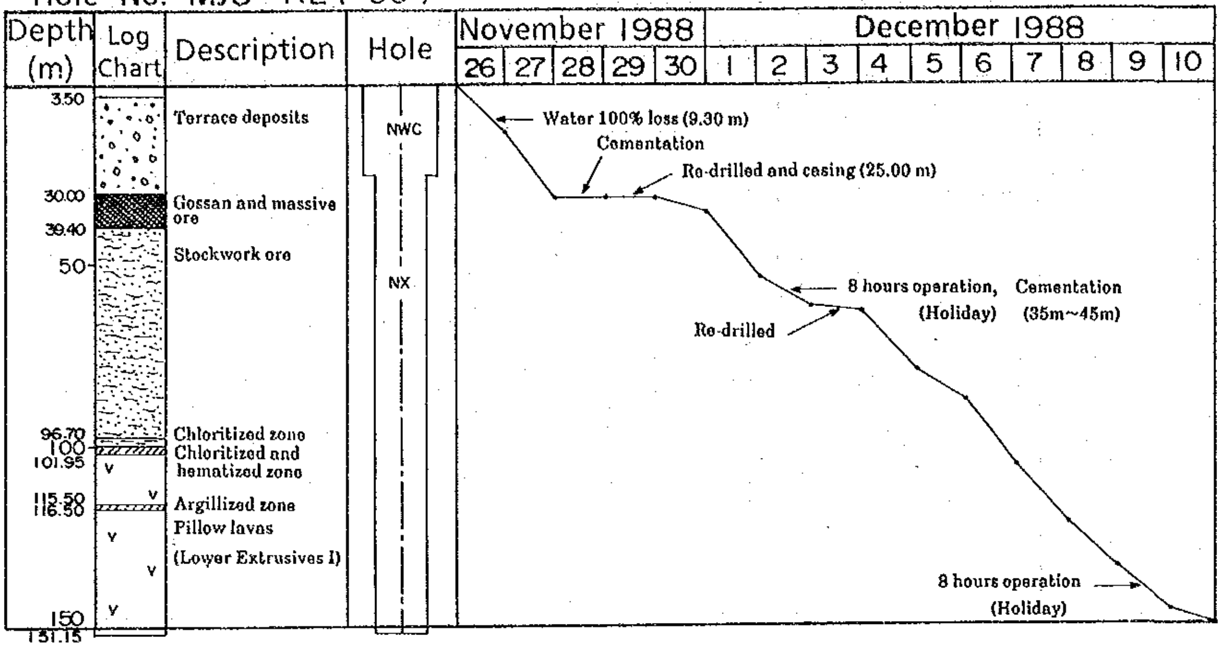
Hole No. MJO-A4(-90°)



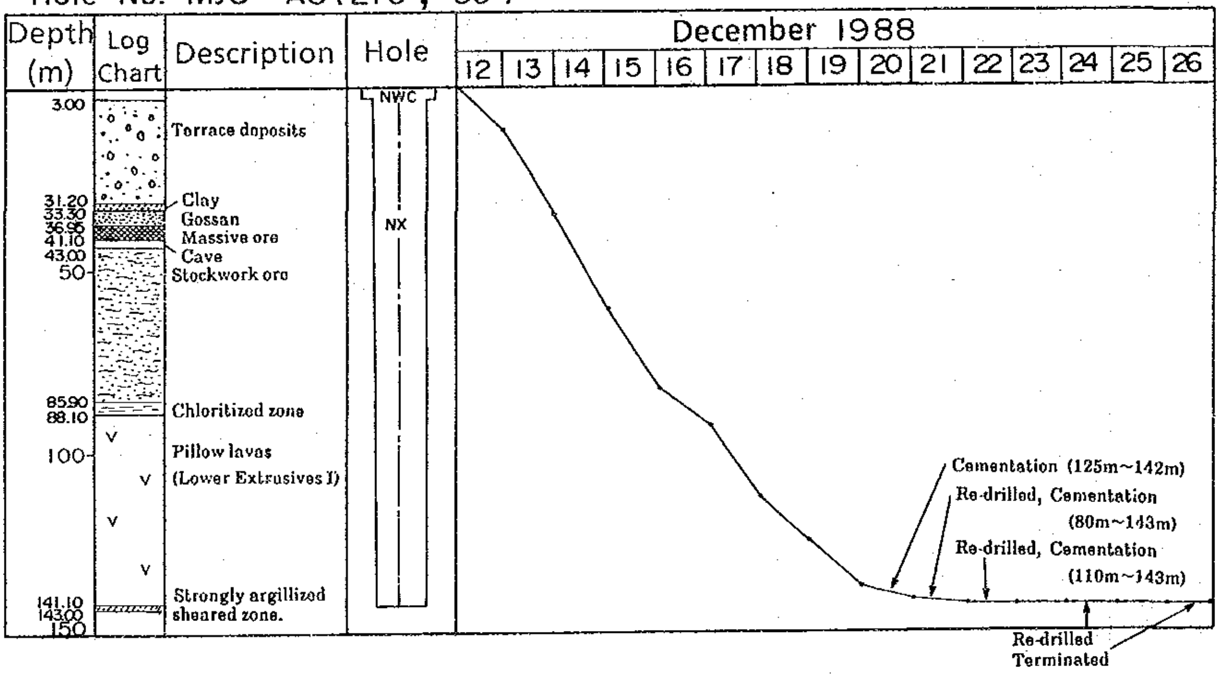
Hole No. MJO-A1 (270°, -50°)



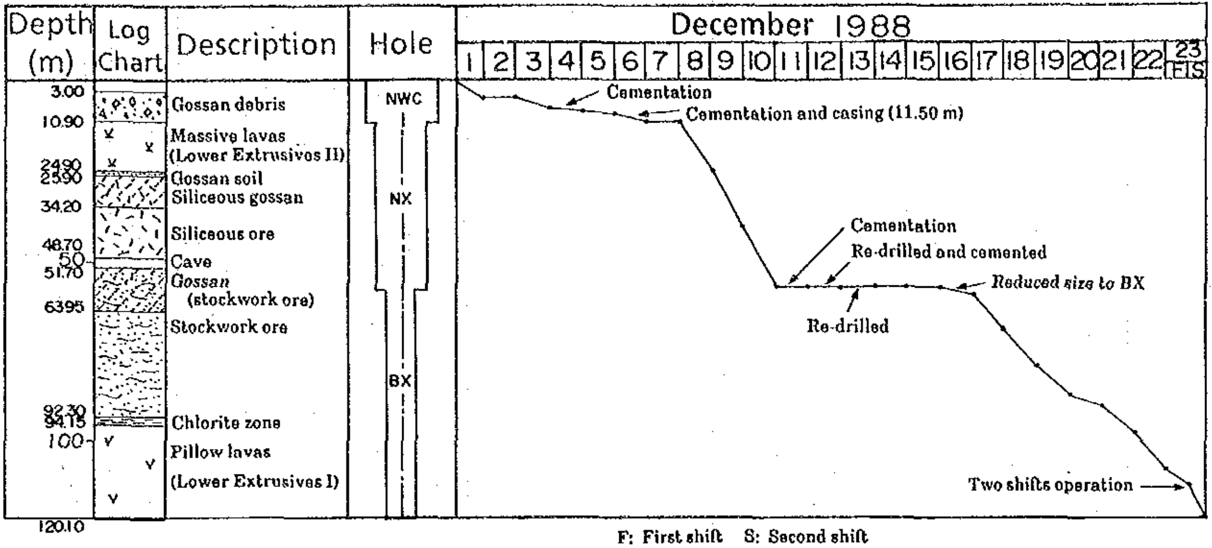
Hole No. MJO-A2 (-90°)



Hole No. MJO-A3 (270°, -50°)

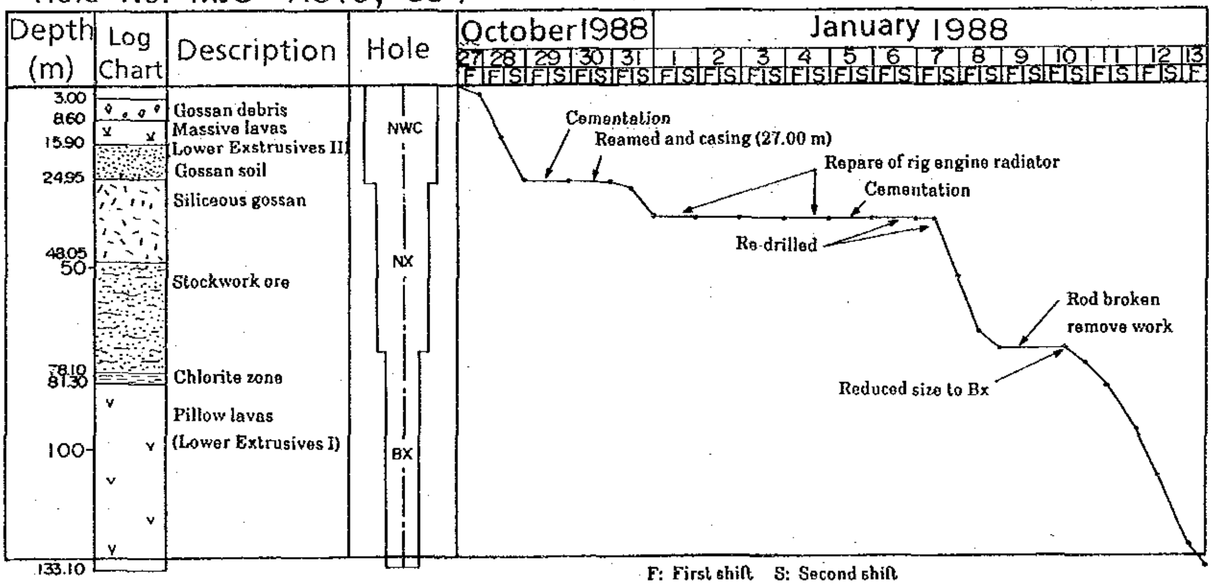


Hole No. MJO - A5(-90°)



F: First shift S: Second shift

Hole No. MJO - A6(0°,-50°)



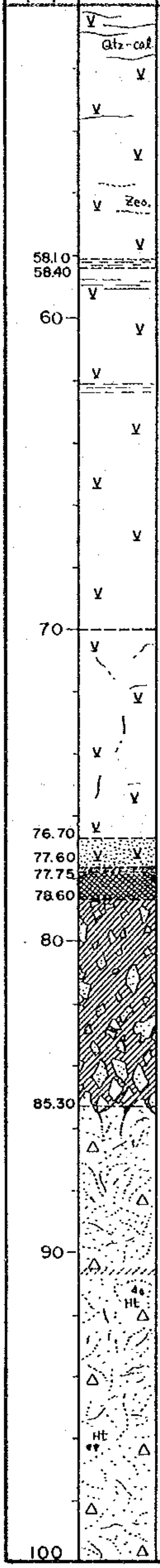
F: First shift S: Second shift

Appendix 4 Geologic Core Log for Drill Holesin Area A

Hole No. MJO - A 1 (From 0.00 m to 50.00 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
	 	Casing. No recovery.								
3.00		Terrace deposits. Gravel and sand Rounded to subrounded Pebble to granule in size.								
10		Locally cemented with calcite.								
20		Completely cemented with calcite.								
23.60		Light brownish green brecciated Poillow lava. Fractures filled with hematite and calcite. Weakly weathered.								
27.40		Light green pillow breccia. Hematite dominant in matrix.								
28.60		Light brownish green pillow lava weakly brecciated. Vesicles filled with calcite.								
30		34.70~35.00 Sheared zone with calcite, hematite and clay 38.40~39.40 Dominant hematite zone								
39.40		Green chloritized massicve lava with calcite stringers.								
40										
43.15		Green~dark green chloritized pillow breccia with dominant hematite in matrix.								
45.70		Dark green and light green pillow lava. Chloritized. 47.60~48.70 Brecciated								
50										

Hole No. MJO - A1 (From. 50.00 m to 100.00 m)



Depth (m)	Lithology and Alteration	Mineralization
58.10 58.40	Sheared zone with quartz and hematite veinlets. Chloritized.	
	Dark green chloritized pillow lava. 58.70 Sheared 3 cm 58.90 Sheared 2 cm 62.10~70.00 Green in color	
70	Dark green~dark brownish green brecciated strongly chloritized pillow lava. Hematite in matrix and along fractures.	
76.70	Light yellowish green brecciated strongly argillized pillow lava.	
77.60	Hematite-clay zone.	
77.75	Massive sulfide zone.	Pyrite≫chalcopyrite massive ore with angular hematite and silicified rocks fragment.
78.60	Stockwork zone with sulfides. Fragment : strongly silicified.	Stockwork ore. Sulfide 30~80 Vol. % in strongly silicified rocks.
85.30	Light green strongly silicified and brecciated zone with stockwork mineralization. Argillized in part. 90.50~90.70 Clay zone	Pyrite>chalcopyrite with quartz veinlets and disseminations. Stockwork zone. Minor hematite fragment in places.

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
77.75 78.60	0.85	2.0	2.6	1.08	<0.01	0.06
78.60 80.60	2.00	2.2	5.1	0.68	<0.01	0.07
80.60 82.60	2.00	1.9	8.0	0.64	<0.01	0.29
82.60 84.60	2.00	1.1	8.5	0.76	<0.01	0.50
84.60 86.60	2.00	1.0	3.1	0.33	<0.01	0.27
86.60 88.60	2.00	0.1	0.7	0.40	<0.01	0.06
88.60 90.60	2.00	Tr	1.1	0.53	<0.01	0.40
90.60 92.60	2.00	0.1	1.2	0.90	<0.01	0.27
92.60 94.60	2.00	Tr	Tr	0.89	<0.01	0.15
94.60 96.60	2.00	Tr	Tr	0.69	<0.01	0.13
96.60 98.60	2.00	Tr	Tr	0.36	<0.01	0.18
98.60	2.00	Tr	Tr	0.38	<0.01	0.10

Hole No. MJO－A1 (From 100.00 m to 150.00 m)

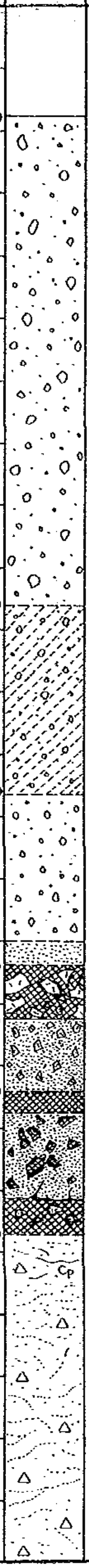
Depth (m)	Chart	Lithology and Alteration	Mineralization
			
110			
120			
125.00		125.00~125.15 Dark brown brecciated clay zone	
125.15			
126.60		126.60~127.20 Brecciated strongly clhloritized zone	126.00~127.20 Pyrite disseminations
127.20			
129.90		Sheared zone with hematite, chlorite and gray clay.	
130			
130.15		Strongly chloritized phyllitic zone.	Pyrite disseminations. 132.30~133.20 Siliceous stockwork ore
133.30		Dark green chloritized, weakly brecciated pillow lava.	Quartz-hematite stringers No sulfide minerals.
136.70		Light green aphanitic pillow lava. Weakly chloritized. Fractures filled with hematite and calcite.	
139.70			
140		Same as 133.30~136.70 Hematite in fractures	Calcite-quartz stringers.
149.20		Dark brownish green pillow lava and pillow breccia. Hematite and chlorite.	Calcite stringers.
150			

Depth (m)	D.L. (m)	Au. (g/t)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)
100.60	2.00	Tr	Tr	0.51	<0.01	0.11
102.60	2.00	Tr	Tr	0.66	<0.01	0.14
104.60	2.00	Tr	0.3	0.36	<0.01	0.18
106.60	2.00	Tr	Tr	0.41	<0.01	0.16
108.60	2.00	0.8	1.6	0.52	<0.01	0.30
110.60	2.00	0.2	4.1	0.29	<0.01	0.68
112.60	2.00	0.9	2.3	0.51	<0.01	0.66
114.60	2.00	0.6	3.1	1.38	<0.01	0.69
116.60	2.00	0.3	3.3	0.37	<0.01	1.20
118.60	2.00	0.3	1.6	0.41	<0.01	0.14
120.60	2.00	0.1	1.8	0.64	<0.01	0.21
122.60	2.00	0.5	1.7	0.75	<0.01	0.56
124.60	2.00	0.6	3.5	0.69	<0.01	0.73
126.60	2.00	1.1	3.0	0.63	<0.01	1.36
128.60	1.55	0.8	4.3	1.00	<0.01	1.08
130.15						
132.30	0.90	1.9	3.2	0.49	<0.01	0.95
133.20						

Hole No. MJO－A1 (From 150.00 m to 200.60 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
155.70		Gray clay zone								
155.75		Light green (fragment) and reddish-brown (matrix) brecciated pillow lava. Chloritized, hematized and weakly sheared.								
160										
161.60		Light green weakly chloritized pillow lava. Fractures and matrix filled with hematite.								
170										
180										
182.80		Green chloritized and weakly brecciated pillow lava. Fractures filled with hematite 185.40～185.70 Weakly sheared								
187.00		Dark green strongly chloritized pillow lava. Fractures filled with hematite. Vesicles filled with chlorite and zeolites.								
190										
		196.70～197.30 Sheared and brecciated zone Chloritized and argillized 198.20～198.50 Brecciated zone								
200		200.60 End of hole								
200.60										

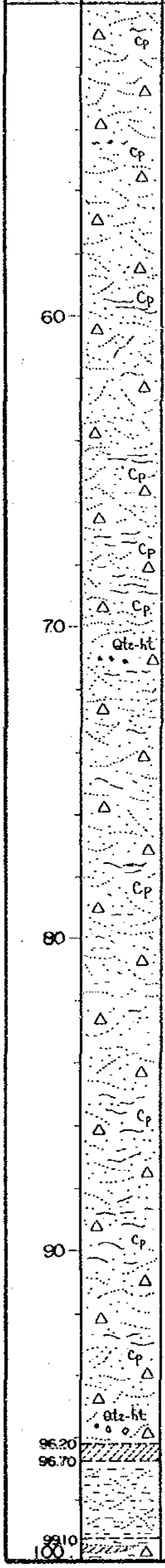
Hole No. MJO-A2 (From 0.00 m to 50.00 m)



Depth (m)	Lithology and Alteration	Mineralization
	Casing. No recovery.	
3.50	Gravel and sand (terrace deposits) Gravel :gabbro dominant (boulder to pebble)	
19.20	Gravel and sand. Gravel :gabbro dominant Cemented with calcite.	
25.30	Gravel and sand. Cemented with calcite in part	
30	Reddish brown gossan soil.	Mostly hematite
30.70	Siliceous ore. Intensely silicified and brecciated rock.	Matrix : coarse-grained pyrite with minor cholcopyrite and hematite.
32.45	Reddish-brown weathered ore zone.	Hematite and gathite with angular siliceous fragments.
34.80	Massive ore zone.	
35.50	Weathered massive ore zone.	Massive sulfide and hematite-gathite with minor siliceous fragments.
38.20	More sulfides.	
39.40	Strongly silicified and brecciated zone with sulfide mineralization (stockwork ore). 39.40~81.5 Matrix of breccia filled with hematite in places	Pyrite > chalcopyrite stringers, spots and disseminations Quartz veinlet network and brecciated quartz fragments. Fractures filled with quartz.
40		
50		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
30.00	2.00	1.5	8.4	0.55	<0.01	0.04
32.00	2.00	2.9	7.7	1.13	<0.01	0.03
34.00	1.50	2.0	8.8	0.17	<0.01	0.02
35.50	2.00	1.1	4.3	0.42	<0.01	0.02
37.50	1.90	2.5	10.5	1.11	0.01	0.07
39.40	2.00	1.2	11.0	0.77	<0.01	0.38
41.40	2.00	0.6	4.0	0.33	<0.01	0.28
43.40	2.00	Tr	Tr	0.24	<0.01	0.29
45.40	2.00	0.7	3.5	0.25	<0.01	0.21
47.40	2.00	0.7	2.0	0.63	<0.01	0.21
49.40						

Hole No. MJO－A2 (From 50.00 m to 100.00 m)



Lithology and Alteration

50.40~62.30
Hematite dominant in matrix

96.20–96.70 Light green clay zone.
Dark green strongly chloritized rock.
99.10 Mixture of chloritized and hematized zones.

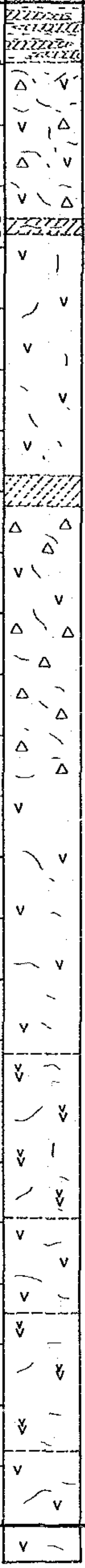
Mineralization

51.70 Sphalerite in spots

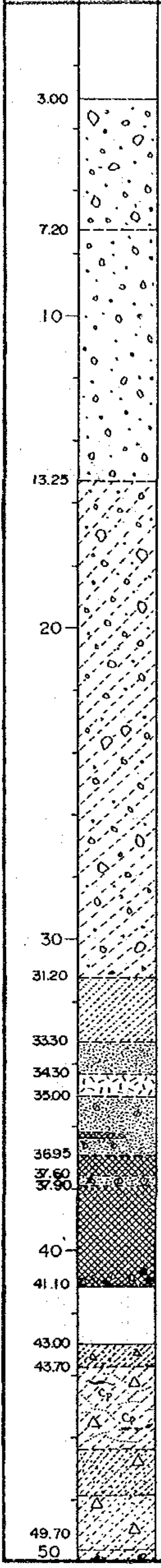
Pyrite diss eminations
Pirite stringers and disseminations.

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
51.40	2.00	0.5	1.8	1.03	<0.01	0.06
53.40	2.00	Tr	Tr	1.09	<0.01	0.13
55.40	2.00	0.2	1.0	1.36	<0.01	0.18
57.40	2.00	0.4	0.7	0.72	<0.01	0.09
59.40	2.00	0.4	1.8	2.12	<0.01	0.14
61.40	2.00	0.1	1.3	0.97	<0.01	0.09
63.40	2.00	0.2	1.5	0.77	<0.01	0.26
65.40	2.00	0.2	2.0	0.67	<0.01	0.35
67.40	2.00	0.1	1.5	0.60	<0.01	0.18
69.40	2.00	0.3	1.2	0.77	<0.01	0.28
71.40	2.00	0.1	1.5	0.46	<0.01	0.15
73.40	2.00	Tr	Tr	0.33	<0.01	0.11
75.40	2.00	0.2	0.9	0.38	<0.01	0.07
77.40	2.00	Tr	Tr	0.35	<0.01	0.05
79.40	2.00	0.2	0.6	0.56	<0.01	0.20
81.40	2.00	0.3	0.6	0.40	<0.01	0.06
83.40	2.00	Tr	Tr	0.42	<0.01	0.08
85.40	2.00	0.5	2.1	0.76	<0.01	0.19
87.40	2.00	0.6	3.6	4.92	<0.01	0.33
89.40	2.00	0.3	2.6	1.08	<0.01	0.50
91.40	2.00	0.3	1.8	0.71	<0.01	0.65
93.40	2.00	0.2	1.8	1.15	<0.01	0.43
95.40	2.00	Tr	Tr	0.24	<0.01	0.17
96.20	0.80	Tr	Tr	0.08	<0.01	0.10

Hole No. MJO-A2 (From 100.00 m to 151.15 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
101.95		Light green~green strongly chloritized and brecciated pillow lava. Minor hematite in places. Quartz in matrix and stringers.								
107.00 107.50		Reddish brown hematite zone with quartz stringers.								
110		Green chloritized and weakly brecciated pillow lava. with quartz stringers. Hematite in matrix.								
115.50		Light green argillized zone.								
116.50		Dark green~dark brown hematized and chloritized pillow lava to pillow breccia with quartz stringers. 116.50~117.90 Strongly brecciated zone 120.00~125.30 Pillow breccia strongly hematized								
120										
130										
134.40		Green chloritized doleritic massive lava. Hematite and quartz stringers and veinlets.								
139.90 140		Dark green~dark brown chloritized pillow lava with quartz stringers.								
143.00		Green massive lava with quartz and calcite stringers. Vesicles filled with calcite.								
147.55		Same as 139.90~143.00								
150		151.15 End of hole								
151.15										

Hole No. MJO-A3 (From 0.00 m to 50.00 m)



Depth (m)	Lithology and Alteration	Mineralization
0.00	Casing. No recovery	
3.00	Terrace deposits. Gravel and sand. Gabbro boulder dominant.	
7.20	Gravel and sand. Locally cemented with calcite. Mostly cobble to granule in size	
13.25	Gravel and sand. Cemented with calcite. Gabbro boulder in places.	
31.20	Clay zone. Light yellowish gray and locally reddish brown.	
33.30	Dark reddish brown gossan soil.	
34.30	Red siliceous gossan with hematite.	Brecciated with siliceous fragment.
35.00	Reddish brown gossan, possible massive ore	36.20~36.40 Fine-grained massive ore
36.95	Massive ore.	36.95~37.60 Pirite ≫ chalcopyrite brecciated. Fine-grained.
37.60	Brecciated zone with siliceous fragments.	
37.90	Brecciated massive ore. Lower part: siliceous fragments	37.90~41.10 Pyrite > chalcopyrite. · Fine grained.
41.10	Cave. No recovery	
43.00	Gray brecciated clay zone.	Pyrite disseminations.
43.70	Light argillized, brecciated zone. Silicified in part. Hematite in matrix locally. 46.40~47.90 Strongly argillized and brecciated	Pyrite disseminations. Chalcopyrite-pyrite fragments in matrix.

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
36.20						
	1.70	5.2	18.2	1.89	0.01	0.06
37.90						
	1.60	1.8	20.3	9.44	0.01	0.03
39.50						
	1.60	1.1	17.1	12.44	<0.01	0.05
41.10						
43.00						
	2.00	1.0	8.1	2.37	<0.01	0.04
45.00						
	2.00	0.3	8.5	2.24	<0.01	0.04
47.00						
	2.00	0.9	11.1	2.80	0.01	0.04
49.00						
	2.00	2.4	12.1	2.43	<0.01	0.04

Hole No. MJO-A3 (From 50.00m to 100.00m)

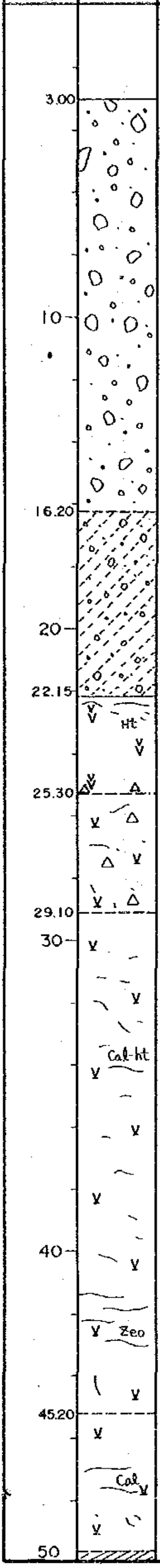
Depth (m)	Lithology and Alteration	Mineralization
	Light gray argillized and hematized zone with siliceous and sulfides fragments.	Sulfide fragment: Pyrite Sulfides: 35 vol%
51.35	Light green silicified and brecciated zone with mineralization. Locally argillized. Quartz-hematite fragments in places.	Chalcopyrite-pyrite quartz stockwork zone 53.00 Bornite-chalcopyrite spots 52.60~53.80 Chalcopyrite rich Pyrite: 20 vol% Chalcopyrite: 6 vol% 62.10~64.00 Sulfides (pyrite): 50 vol% 66.10~66.30 Sulfides (pyrite): 70 vol% 71.60~74.40 Sulfides (pyrite): 50~60 vol% 76.10~77.10 Sulfides (pyrite and chalcopyrite): 75 vol%
77.10	reddish brown strongly hematized and brecciated zone with sulfides and siliceous fragments. Matrix: Mostly hematite 79.80~80.30 Hematitic clay	
80.60	Light green brecciated and strongly silicified zone. Lower part: Strongly brecciated and weakly chloritized 81.60~81.80 Strongly chloritized zone	80.60~81.40 Sulfides (pyrite): 60 vol% 81.60~81.80 Pyrite disseminations
85.90	Sttrongly chloritized zone with hematite bands. Dark green	Weak pyrite disseminations
88.10	Light green~green pillow lavas chloritized with quartz-hematite veinlets and calcite stringers weakly brecciated. Variole like texture visible.	
93.20	Dark green and dark brown weakly brecciated pillow lavas chloritized. Variole-like texture visible. Hematite in fracture and calcite stringers.	

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
51.00	2.00	1.1	17.4	3.39	<0.01	0.05
53.00	2.00	0.4	10.6	3.04	<0.01	0.06
55.00	2.00	0.5	8.9	1.69	<0.01	0.05
57.00	2.00	0.3	4.9	1.58	<0.01	0.06
59.00	2.00	0.5	6.5	1.26	<0.01	0.14
61.00	2.00	0.4	8.5	0.33	<0.01	0.21
63.00	2.00	0.2	8.8	3.26	<0.01	0.09
65.00	2.00	0.8	8.6	2.97	<0.01	0.08
67.00	2.00	0.6	5.6	1.61	<0.01	0.12
69.00	2.00	0.3	4.8	1.75	<0.01	019
71.00	2.00	0.4	6.0	1.00	<0.01	0.42
73.00	2.00	2.1	7.7	1.14	<0.01	0.79
75.00	2.10	1.0	20.7	4.37	0.01	0.18
77.10	1.80	2.4	12.4	0.43	<0.01	0.02
78.90	1.70	2.8	4.4	0.82	<0.01	0.01
80.60	2.00	0.7	11.5	1.98	0.01	0.29
82.60	2.00	1.0	3.4	0.65	<0.01	0.11
84.60	1.30	0.7	4.8	0.34	<0.01	0.14
85.90						

Hole No. MJO-A3 (From 100.00 m to 143.00 m)

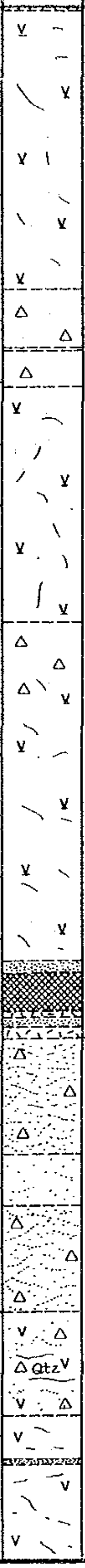
Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
107.80		Light green chloritized pillow lavas. Hematite in matrix and fractures. Calcite stringers variole-like texture in places.								
110										
120										
122.10		Strongly argillized sheared zone.								
122.30		Light green and locally dark green pillow lavas. Hematite dominant in fractures variole-like texture visible.								
130										
140										
141.10		141.10~141.70 Strongly argillized sheared zone. 141.70~143.00 Weakly argillized. 142.70~142.80 Sheared and fractured.								
141.70										
143.00		143.00 m End of hole								
150										

Hole No. MJO－A4 (From 0.00 m to 50.00 m)



Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Casing. No recovery.								
3.00		Gravel and sand (terrace deposits) Gravel : peridotite > gabbro Matrix : sand and calcite.								
16.20		Terrace deposits. Rounded to subangular pebble to granule. Matrix : completely cemented with calcite								
22.15		Dark green medium-grained basaltic massive lava with epidote. Calcite-hematite stringers. Bottom : argillized and brecciated								
25.30		Light brownish-green argillized and weathered pillow lava. Weakly brecciated.								
29.10		Light green~green pillow lava with closely packed pillows. Zeolite and epidote spots and in vesicles. Weakly weathered								
45.20		Dark bluish-green weakly chloritized and brecciated pillow lava 49.60~49.80 Sheared zone with calcite 49.85~50.05 Hyaloclastite with dominant hematite								
50										

Hole No. MJO - A4 (From 50.00 m to 100.00 m)

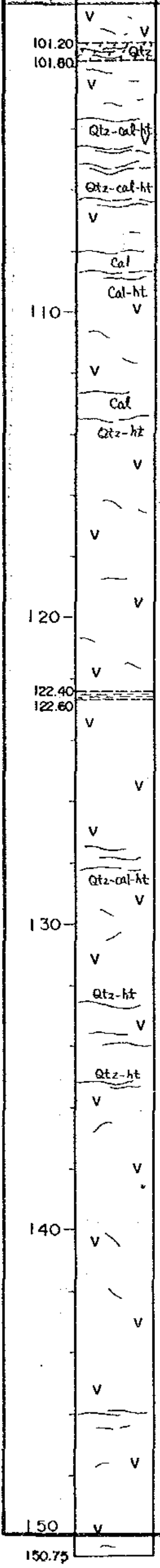


Depth (m)	Lithology and Alteration	Mineralization
50.05		
59.00 60	Light bluish-green chloritized pillow breccia. Vesicles filled with zeolite. Calcite stringers. 60.80~60.85 Sheared zone with chlorite, calcite	
62.10	Light green weakly chloritized and weakly brecciated pillow lava. (same as 45.20~59.00)	
69.80 70	Dark green weakly brecciated and strongly chloritized pillow lava. Upper part : brecciated Lower part : comparatively massive Quartz, hematite and zeolites stringers. Vesicles filled with zeolites. Bottom part : weakly argillized	
80 80.75	Pyrite-clay zone.	80.75~81.15 Pyrite in gray clay with hematite 81.15~82.20 Massive medium to fine-grained pyrite ≫ chalcopyrite zone with minor clay 82.30~82.50 Dense pyrite and chalco pyrite in siliceous fragment 82.50~82.80 Dense pyrite dissemination in gray clay sheared. 82.50~83.20 Same as 82.30~82.50 83.20~86.90 and 88.50~92.00 Pyrite >chalcopyrite stockwork zone with quartz-hematite
81.15	Massive ore.	
82.30	Siliceous ore	
82.50	Pyrite-clay zone	
82.80	Silicious ore	
83.20	Stockwork zone: Green~light green brecciated and weakly silicified zone (pillow lava)	
86.90	Poor mineralized zone.	
88.50 90	Same as 83.20~86.90.	
92.00	Green~light green bracciated Chloritized and weakly silicified pillow lava.	92.00~95.30 Pyrite disseminations
95.30	Brownish-green weakly chloritized and brecciated pillow lava with hematite in matrix. 96.70~96.80 Quartz and clay zone.	No sulfide minerals. 98.50~101.20 Very weak pyrite disseminations
100		

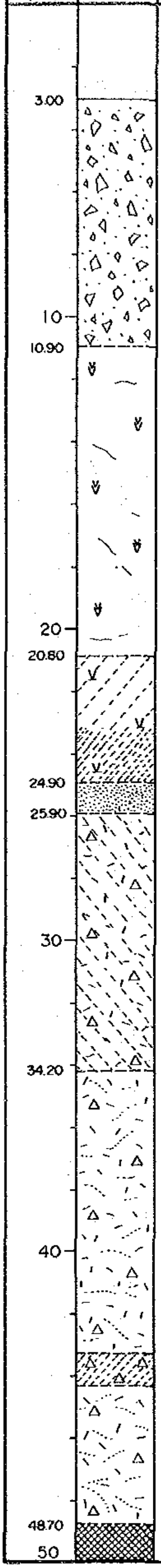
Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
80.75 82.30	1.55	1.2	4.5	3.24	0.01	0.34
82.30 83.20	0.90	2.2	11.6	3.81	<0.01	0.54
83.20 85.00	1.80	0.1	2.6	0.60	<0.01	0.55
85.00 86.90	1.90	0.4	5.8	1.67	<0.01	0.27
86.90 88.50						
88.50 90.30	1.80	0.2	5.2	1.19	<0.01	0.28
90.30 92.00	1.70	0.1	2.8	1.17	<0.01	0.09

Hole No. MJO - A4 (From 100.00 m to 150.75 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
101.20 101.80		Strongly chloritized sheared and argillized zone.								
		Dark green chloritized and weakly silicified pillow lava. Weakly brecciated. Many quartz, calcite and hematite vein to stringers. Hematite in matrix.								
122.40 122.60		Strongly chloritized sheared and argillized zone.								
		Dark green~green chloritized and weakly silicitied pillow lava. Weakly brecciated. Calcite-quartz with minor hematite veins, veinlets and stringers. 136.60~126.90 Hematite dominant zone in matrix 145.90 Hematite-quartz vein 4 cm 150.75 End of hole								



Hole No. MJO - A5 (From 0.00 m to 50.00 m)



Depth (m)	Lithology and Alteration	Mineralization
	Casing. No recovery.	
3.00	Gossan debris (Overburden)	
10.90	Light green doleritic massive lavas. Weakly brecciated locally. Hematite band and in fractures. Calcite stringers. 19.90~20.80 Weathered	
20.80	Light green argillized and chloritized pillow lavas. Weakly sheared and weathered. 23.00~24.90 Strongly argillized and weathered	Weak pyrite disseminations.
24.90	Reddish brown gossan soil. Hematite, limonite and clay.	
25.90	Siliceous gossan. Brecciated siliceous fragments with gray clay. Cemented with hematite. Dominant limonite and hematite.	
34.20	Light green~white strongly brecciated, silicified and argillized zone. Quartz stringers and fragments. Hematite dominant in matrix. Weakly weathered. 43.30~44.30 Strongly brecciated and argillized zone	Pyrite disseminations. Pyrite and chalcopyrite disseminated breccia.
48.70	Massive sulfides with siliceous fragments.	Pyrite > Chalcopyrite
50		

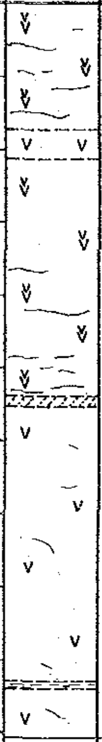
Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
34.20						
	2.00	0.3	3.7	0.78	<0.01	0.01
36.20						
	2.00	0.4	1.4	0.68	<0.01	<0.01
38.20						
	2.00	0.3	1.6	0.51	<0.01	0.06
40.20						
	2.00	2.2	1.8	0.19	<0.01	0.35
42.20						
	2.00	Tr	Tr	0.83	<0.01	0.19
44.20						
	2.00	1.9	2.6	2.23	<0.01	0.01
46.20						
	2.50	1.8	6.9	5.37	<0.01	0.01
48.70						
	1.50	1.8	14.1	10.53	<0.01	0.06

Hole No. MJO－A5 (From 50.00m to 100.00m)

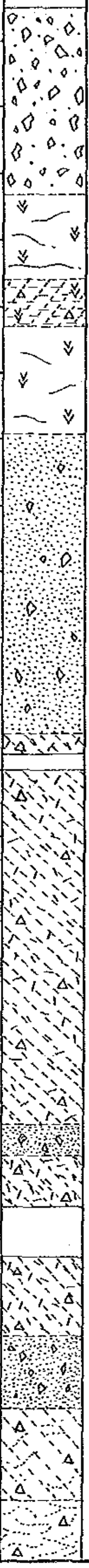
Depth (m)	Lithology and Alteration	Mineralization
51.70	White strongly brecciated siliceous zone with quartz-hematite veins and stringers. Weakly weathered.	Pyrite disseminations. Quartz-pyrite veins
53.40	Cave	
56.70	Brecciated silicified zone Weathered. Hematite and limonite in matrix.	Siliceous gossan. Pyrite disseminations and veins.
60		
63.95	Strongly silicified brecciated zone. Quartz-hematite breccia in places.	Pyrite disseminations and breccia. (Stockwork ore zone) Sulfides: 15~35 vol% 70.00~73.50 Sulfides (pyrite): 30~60 vol%
70		
80		
8390	Dark green strongly brecciated and chloritized zone.	Pyrite disseminations and stringers.
8490	Same as 63.95~83.90	
8970	Light green strongly silicified and brecciated volcanics.	Pyrite disseminations. Pyrite-chalcopyrite-quartz boxwork.
90		
9230	Dark brown (upper) and dark green (lower) hematized and chloritized zone with quartz stringers.	
94.15	Dark green chloritized pillow lavas with quartz-hematite and calcite stringers.	
98.70		
100		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
50.20						
	1.50	1.3	8.9	9.56	<0.01	0.04
51.70						
	1.70	1.5	4.6	2.08	<0.01	0.02
53.40						
56.70						
	3.50	0.8	1.1	0.29	<0.01	0.01
60.20						
	3.75	1.6	4.5	0.64	<0.01	0.01
63.95						
	2.05	1.1	17.0	3.06	<0.01	0.01
66.00						
	2.00	1.4	37.2	3.90	0.01	0.04
68.00						
	2.00	0.6	12.9	0.98	<0.01	0.03
70.00						
	2.00	1.5	10.0	0.36	<0.01	0.06
72.00						
	2.00	2.2	11.8	0.79	0.01	0.05
74.00						
	2.00	2.9	16.1	0.65	<0.01	0.12
76.00						
	2.00	0.4	2.6	0.44	<0.01	0.09
78.00						
	2.00	0.3	2.2	0.16	<0.01	0.08
80.00						
	2.00	0.1	2.0	0.98	<0.01	0.48
82.00						
	2.00	0.4	3.3	0.13	<0.01	0.67
84.00						
	2.00	0.2	3.1	0.66	<0.01	0.53
86.00						
	2.00	0.4	4.5	0.68	<0.01	0.99
88.00						
	2.00	0.4	1.6	0.31	<0.01	0.43
90.00						
	2.30	0.4	0.8	0.10	<0.01	0.07
92.30						

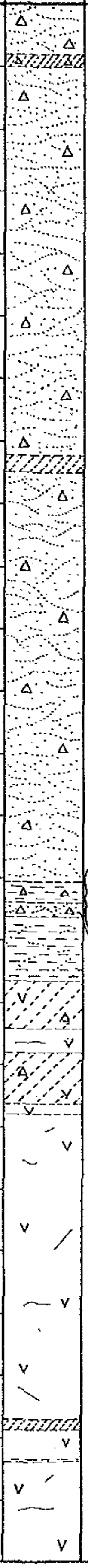
Hole No. MJO-A5 (From 100.00m to 120.10m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Light green~green massive lavas with quartz-calcite stringers and veinlets. 101.00, 102.80 Quartz-calcite veinlets 103.40~104.20 Pillow lavas weakly brecciated 107.25, 108.40 Quartz-calcite veinlets								
110 110.70 111.00		Green argillized, chloritized and brecciated zone with hematite in matrix.								
		Green~brownish green weakly chloritized pillow lavas. Hematite in fractures and matrix. Variole-like structure in part. 118.60~118.75 Strongly chloritized								
120 120.10		120.10 m End of hole								

Hole No. MJO-A6 (From 0.00 m to 50.00m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Casing. No recovery.								
3.00		Gossan debris. (Overburden)								
8.60 10 11.20 12.60		Green~yellowish green doleritic mossive lavas. Weathered and argillized. 10.80 Hematite-calcite vein. 10.60~11.20 Hematized. 11.20~12.60 Strongly argillized, chloritized and sheared.								
15.90 20										
24.95		*Brecciated siliceous gossan.*	*Limonite and hematite.*							
25.50 26.00 30		Many cavities. Poor core recovery. 25.50~26.00 Cave.								
36.70		Light brown and dark brown gossan soil with angular siliceous breccia.	Limonite and goethite							
37.70		Brecciated siliceous gossan. Many cavities 39.20~40.70 Cave.	Limonite.							
39.20 40 40.70										
43.10		Light brown gossan soil with siliceous breccia.	Goethite and limonite.							
45.30		Dark brown~reddish brown silicified, brecciated gossan.	Limonite and hematite.							
48.05 50		Strongly silicified, chloritized and brecciated zone. (stockwork ore)	Pyrite disseminations and veinlets. Pyrite: 10 vol.%							

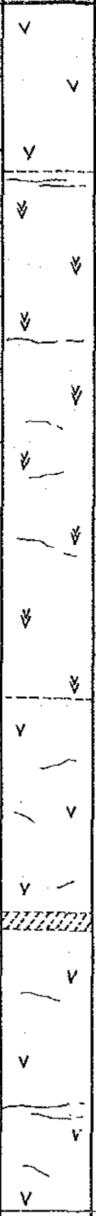
Hole No. MJO-A6 (From 50.00m to 100.00m)



Depth (m)	Lithology and Alteration	Mineralization
51.60 52.00	Gray brecciated and strongly argillized zone.	
	Light green silicified, chloritized and brecciated zone. (Stockwork ore) Hematite in matrix. 54.50~57.10 Hematite dominant in matrix.	Pyrite disseminations. Pyrite-chalcopyrite disseminated breccia. Pyrite: 6~7 vol.%
60		
64.50 65.00	64.50~65.00 Argillized zone.	
70		
	72.65 Reduced the size to BX.	
78.10 78.80 79.30	Dark green strongly chloritized and brecciated zone with quartz and hematite breccia.	Pyrite disseminations.
80	Silicified stockwork ore.	Pyrite disseminations and stringers.
81.30	Dark reddish brown strongly hematized volcanics. 81.30~82.80 and 83.60~85.30 Brecciated and argillized. Dark green strongly chloritized zone.	
85.60	Dark brownish green hematized pillow lavas. Matrix: strongly chloritized. A few calcite and quartz stringers.	
90		
95.40 95.70	Gray clay zone. 96.70 Sheared zone 5 cm. 97.70~104.60 Quartz-calcite veinlets and stringers. Hematite stringers.	
100		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
52.00						
	2.00	0.7	2.3	0.54	<0.01	0.41
54.00						
	2.00	0.3	3.7	0.44	<0.01	0.22
56.00						
	2.00	0.3	2.1	0.42	<0.01	0.24
58.00						
	2.00	0.4	1.8	0.44	<0.01	0.38
60.00						
	2.00	0.3	1.9	0.37	<0.01	0.37
62.00						
	2.00	0.7	2.2	1.14	<0.01	0.15
64.00						
	2.00	0.8	2.3	0.91	<0.01	0.31
66.00						
	2.00	0.1	1.7	0.74	<0.01	0.13
68.00						
	2.00	Tr	Tr	0.58	<0.01	0.11
70.00						
	2.65	Tr	Tr	0.36	<0.01	0.08
72.65						
	2.00	0.1	1.0	0.43	<0.01	0.05
74.65						
	2.00	0.1	0.7	0.31	<0.01	0.06
76.65						
	2.65	Tr	Tr	0.37	<0.01	0.06
79.30						

Hole No. MJO-A6 (From 100.00m to 133.10m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
104.60		Light green~light greenish blue massive lava with quartz and calcite stringers. 104.80 Quartz veins. 109.30 Quartz vein.								
110										
119.00		Dark green~dark brownish green chloritized pillow lava. Hematite in matrix and fractures. Quartz-calcite-hematite stringers and veinlets.								
120		124.90~125.35 Brecciated weakly argillized zone.								
130		130.20 *Quartz-hematite vein.*								
133.10		133.10m End of hole.								
140										
150										

Appendix 5 Charged Potential in Area B

X	Y	Potential (mV/A)	
(m)	(m)	MJO-B1	MJO-B5
0	1000	22.7	23.2
-100	1000	21.8	22.4
100	1000	23.7	24.8
0	1100	19.2	19.7
100	1100	20.0	20.6
200	1000	23.9	24.8
300	1000	22.4	23.4
200	900	26.8	28.0
100	900	27.4	28.3
300	900	26.7	28.1
300	800	30.5	32.5
200	800	31.2	32.9
100	800	31.8	33.1
200	700	35.9	37.9
100	700	35.5	37.4
300	700	36.7	39.4
400	700	34.0	36.3
400	800	30.2	32.4
400	900	27.0	28.7
500	700	32.5	34.8
500	800	28.7	30.5
500	900	25.5	27.7
600	700	30.1	32.5
600	800	26.9	28.8
700	700	29.1	31.3
700	800	26.2	28.1
800	700	27.5	29.3
800	800	24.7	26.5
900	600	26.8	28.8
800	600	29.6	32.2
900	700	24.5	26.4
1000	700	23.1	24.9
1100	600	22.2	23.8
1000	600	24.1	25.9
1200	600	21.0	22.3
1000	500	25.8	27.9
1100	500	23.8	25.4
1200	500	22.1	23.8
1100	400	25.3	27.2
1100	300	26.9	28.9
1000	400	28.4	30.8
1000	300	30.5	32.7
200	600	46.1	49.3
100	600	47.9	50.4
300	600	42.2	44.7
400	600	39.4	42.5
200	500	52.8	56.5
100	500	58.9	62.3
300	500	50.5	55.1
300	400	54.4	59.1
400	500	47.9	52.5
400	400	51.5	56.4
500	600	37.4	40.5
500	500	44.4	47.9
500	400	48.5	52.8
600	500	42.4	46.0
600	400	45.0	49.2
600	600	33.9	36.5
700	600	32.0	34.5
700	500	38.2	41.7
700	400	40.9	44.8
800	500	34.1	37.1
800	400	37.5	41.0
900	500	29.1	31.2
200	450	58.3	62.4
150	450	61.7	65.7
100	450	64.9	68.5
200	400	63.4	68.2
150	400	66.1	70.4
100	400	71.3	75.1
250	400	58.9	63.1
200	350	66.7	71.8
250	350	62.3	67.7
300	350	59.3	64.5
350	350	55.0	60.1

X	Y	Potential (mV/A)	
(m)	(m)	MJO-B1	MJO-B5
250	300	67.9	74.1
300	300	64.6	70.3
350	300	60.0	65.7
400	300	53.2	58.7
500	300	50.8	55.3
300	250	65.9	73.1
350	250	63.1	69.8
400	250	58.4	64.4
450	250	55.5	60.9
500	250	51.9	56.9
350	200	65.7	72.8
400	200	59.6	65.4
450	200	56.7	62.1
500	200	58.1	59.3
550	200	51.6	56.2
600	200	50.5	55.0
400	150	63.7	70.2
450	150	60.8	66.8
500	150	56.2	61.7
550	150	54.4	59.6
600	150	51.8	56.3
400	100	74.0	82.2
450	100	64.2	70.6
400	50	76.7	85.3
450	50	67.7	74.5
500	50	62.2	68.7
550	50	58.7	64.2
500	100	60.1	66.3
550	100	56.2	61.9
600	50	55.1	60.1
600	0	54.7	59.9
550	0	58.2	63.9
500	0	61.1	67.3
450	0	69.6	76.9
400	0	77.5	86.3
600	-50	57.1	62.8
550	-50	60.7	66.4
500	-50	65.4	71.7
450	-50	73.0	79.8
400	-50	80.8	89.3
600	-100	57.4	62.2
550	-100	62.1	67.7
500	-100	65.9	71.9
450	-100	72.7	79.6
400	-100	81.6	89.6
600	-150	57.1	61.3
550	-150	60.9	66.6
500	-150	65.7	71.5
450	-150	72.1	78.0
400	-150	81.7	89.3
600	-200	57.6	61.9
550	-200	59.7	64.5
500	-200	66.3	71.1
450	-200	71.5	77.8
400	-200	83.1	90.5
550	-250	60.1	64.3
500	-250	66.2	70.8
450	-250	71.5	76.6
400	-250	80.3	86.3
600	-300	55.6	59.4
500	-300	62.8	67.0
400	-300	74.8	79.8
500	-400	55.4	58.6
400	-400	65.7	68.6
600	-500	46.9	49.1
500	-500	51.4	53.3
400	-500	58.1	60.0
600	-600	43.1	44.9
700	-600	39.5	40.8
700	-500	43.2	44.9
600	-400	47.7	50.0
700	-400	45.5	47.5
800	-400	40.5	42.3
700	-300	48.6	51.5
800	-300	41.7	43.9

X	Y	Potential (mV/A)	
(m)	(m)	MJO-B1	MJO-B5
700	-200	50.9	54.4
800	-200	42.3	44.5
700	-100	49.7	53.5
800	-100	44.8	48.1
600	100	53.2	58.3
700	100	46.8	51.0
700	0	48.8	52.6
800	0	44.1	47.7
800	100	44.1	47.6
700	200	45.8	49.7
600	300	46.7	50.7
800	300	41.0	44.4
800	200	42.6	46.0
900	100	40.5	43.7
1000	200	34.7	37.2
700	300	43.9	48.0
900	300	35.6	38.4
900	400	33.6	36.2
900	200	36.1	38.7
1000	100	35.1	38.0
1000	0	35.9	38.5
900	0	40.2	43.5
900	-100	41.2	43.9
900	-200	38.6	40.9
300	200	70.6	77.7
250	200	78.8	87.3
250	250	74.7	82.1
200	200	88.2	98.0
200	250	79.1	87.0
200	300	74.3	80.6
150	200	95.6	105.3
150	250	86.7	94.1
150	300	77.4	83.4
100	200	104.5	113.1
100	250	92.7	99.1
100	300	80.0	85.8
100	350	75.1	80.0
150	350	70.7	75.5
50	300	85.3	89.6
50	450	70.7	73.3
50	-100	154.7	165.6
50	-150	152.8	159.5
0	-150	167.7	162.7
-50	-150	182.1	161.7
-100	-150	196.9	160.4
-150	-150	202.7	159.0
-200	-150	192.7	152.3
-250	-150	157.1	130.3
-300	-150	147.8	123.6
-350	-150	119.3	103.2
-500	-100	82.5	74.7
-400	-100	101.5	90.9
-400	-50	102.5	92.3
-350	-100	117.1	102.4
-350	-50	117.3	104.1
-400	-200	97.3	86.3
-300	-100	145.8	123.2
-300	-50	138.7	118.7
-300	-200	142.1	120.0
-250	-100	151.5	124.3
-250	-50	151.8	128.8
-250	-200	148.8	124.2
-200	-100	184.7	147.9
-200	-50	169.7	143.9
-150	-50	183.8	155.8
-150	-100	196.9	162.5
-200	-200	169.7	138.2
-200	-250	155.9	129.3
-200	-300	129.7	112.3
-150	-200	192.1	152.1
-150	-250	169.0	139.7
-100	-200	194.5	157.3
-100	-250	166.5	141.5
-100	-300	141.5	125.1
-100	-100	195.1	165.9

X (m)	Y (m)	Potential (mV/A)	
		MJO-B1	MJO-B5
-100	-50	183.5	166.5
-50	-200	164.3	146.5
-50	-250	153.0	138.9
-50	-300	138.2	126.5
-50	-100	183.8	166.1
-50	-50	181.7	166.7
0	-200	157.5	151.6
0	-250	147.3	140.3
0	-300	136.3	130.4
0	-100	176.6	170.3
0	-50	171.2	171.6
50	-50	156.9	166.8
50	-200	145.6	148.4
50	-250	139.1	139.9
50	-300	129.1	128.2
100	-200	132.1	140.4
100	-250	128.3	134.3
100	-300	119.4	123.8
100	-400	98.1	98.8
100	-150	140.8	154.8
100	-100	145.4	161.2
100	-50	144.2	160.2
150	-200	120.5	130.4
150	-250	115.9	124.5
150	-300	113.1	119.7
150	-150	131.5	145.9
150	-100	132.0	147.5
150	-50	129.3	145.3
200	-200	112.2	121.5
200	-250	111.4	119.1
200	-300	107.9	114.9
200	-400	87.1	89.8
200	-150	113.5	124.5
200	-100	118.5	132.0
200	-50	115.9	130.4
250	-200	105.5	115.1
250	-150	102.5	112.3
250	-100	106.8	119.1
250	-50	104.9	118.1
250	-250	103.1	111.1
250	-300	96.9	102.9
300	-300	87.3	92.4
300	-400	73.5	76.4
300	-500	65.6	66.8
350	-250	86.9	93.5
300	-250	95.4	102.5
300	-200	98.0	106.2
300	-150	96.6	106.3
300	-50	96.3	107.4
350	-200	92.0	99.7
350	-150	92.3	100.9
350	-100	93.1	102.4
350	-50	89.7	99.4
50	0	157.3	167.3
0	0	166.6	170.8
-50	0	171.7	165.7
-100	0	173.0	162.2
-150	0	159.3	145.3
-200	0	148.1	132.1
-250	0	135.5	119.3
-300	0	128.0	112.8
-350	0	112.7	101.1
-400	0	104.5	94.1
-500	0	82.0	75.3
-400	50	96.7	88.8
-400	100	86.3	80.6
-400	150	80.4	75.7
-350	50	104.7	95.5
-350	100	97.9	91.2
-350	150	90.3	84.7
-300	50	114.1	104.1
-300	100	106.9	99.5
-300	150	98.8	92.5
-250	50	120.2	109.5
-250	100	105.3	98.5
-250	150	102.6	98.4
-200	50	123.2	114.9
-200	100	113.1	108.9
-200	150	106.8	103.3
-150	50	140.3	133.4
-150	100	122.8	120.0
-150	150	110.4	110.3
-100	50	153.7	151.3
-100	100	133.5	133.1
-100	150	117.3	117.5
-50	50	149.2	152.4
-50	100	133.4	137.1
-50	150	118.1	121.3
0	50	153.4	158.3
0	100	129.0	139.4
0	150	114.7	121.7
50	50	138.5	149.5
50	100	127.9	138.7
50	150	116.5	125.1
100	0	137.0	150.5
150	0	120.8	135.9
200	0	110.4	124.2
250	0	102.9	115.5
300	0	93.6	104.0
350	0	85.4	95.5
350	50	83.8	93.5
350	100	79.2	88.1
350	150	69.8	77.3
300	50	91.9	103.1
300	100	89.7	100.5
300	150	81.8	91.1
300	-100	97.2	106.8
250	50	99.0	111.6
250	100	100.4	112.9
250	150	86.7	96.7
200	50	107.6	121.3
200	100	105.0	118.0
200	150	99.4	111.2
150	150	104.6	116.2
150	50	110.7	124.5
150	100	107.4	120.3
100	50	125.2	138.1
100	100	115.8	128.1
100	150	108.6	119.6
0	200	106.7	111.6
-50	200	105.3	107.7
-100	200	105.2	105.9
-150	200	104.2	102.9
-200	200	103.5	100.9
-250	200	94.4	90.9
-300	200	85.9	81.3
-350	200	80.6	75.9
-400	200	78.1	73.3
-350	250	75.4	72.1
-300	250	81.7	78.1
-300	300	73.3	71.0
-250	250	87.2	84.9
-250	300	77.8	76.3
-250	350	71.1	69.1
-200	250	93.5	92.4
-200	300	83.7	82.7
-200	350	77.6	76.8
-150	250	97.2	96.7
-150	300	86.2	86.1
-150	350	81.1	81.2
-100	250	95.2	96.3
-100	300	88.4	90.5
-100	350	83.6	84.8
-50	250	93.5	96.6
-50	300	86.2	89.1
-50	350	83.6	85.6
0	250	93.3	97.5
0	300	85.9	88.7
0	350	82.7	85.9
50	200	107.7	115.0
50	250	94.4	100.5
0	900	26.3	27.1
-100	900	25.9	26.2
0	800	31.3	32.3
-100	800	31.3	31.6
0	700	38.7	39.5
-100	700	40.6	40.8
-200	700	40.3	40.2
0	600	50.7	51.9
-100	600	51.8	52.4
-200	600	50.0	49.8
0	500	64.8	67.2
-100	500	64.0	64.7
-200	500	58.7	58.1
-300	500	55.2	54.4
0	450	75.1	77.3
-50	450	71.8	73.7
-100	450	71.9	73.0
-150	450	65.1	65.1
0	400	78.7	81.2
-50	400	77.9	80.3
-100	400	75.3	76.5
-150	400	74.4	74.8
-200	400	73.0	72.4
-300	400	67.8	66.6
50	350	79.7	83.5
50	400	77.4	80.5

Appendix 6 Electric Field in Area B

X	Y	MJO-B1		MJO-B5		X	Y	MJO-B1		MJO-B5		X	Y	MJO-B1		MJO-B5	
(m)	(m)	|E|	φ	|E|	φ	(m)	(m)	|E|	φ	|E|	φ	(m)	(m)	|E|	φ	|E|	φ
1050	50	9	196	10	205	175	475	37	132	34	133	275	275	67	128	60	131
1050	150	9	183	11	180	175	525	16	43	16	138	225	225	79	134	77	136
950	250	7	177	8	182	175	575	23	137	24	136	275	225	39	137	40	142
950	150	9	171	9	176	175	650	21	113	18	112	325	225	60	140	55	144
950	350	11	184	12	186	125	425	85	136	83	136	225	175	69	140	67	147
850	350	10	175	11	179	125	475	32	130	29	131	275	175	72	141	64	146
850	250	11	171	12	175	75	425	56	107	56	106	325	175	44	156	42	161
850	150	11	172	12	177	75	475	39	123	35	124	225	125	89	143	80	151
750	250	12	190	13	197	75	525	25	122	25	118	275	125	84	155	71	159
750	150	9	186	11	186	75	575	27	125	24	119	325	125	34	152	31	158
750	350	17	156	19	156	125	525	33	135	32	136	375	125	35	131	33	137
750	450	10	159	11	159	125	575	20	120	21	122	375	175	37	139	31	144
850	450	9	154	11	153	75	650	22	120	20	116	325	75	47	137	36	148
750	550	11	148	12	152	25	650	18	81	18	87	525	75	61	145	38	142
850	550	9	152	8	149	25	575	22	82	20	85	-75	75	48	76	23	75
750	650	8	162	10	162	25	525	19	69	19	69	-125	75	61	81	39	37
750	750	8	152	9	148	25	475	52	103	49	104	-125	25	87	59	41	23
750	850	10	133	10	134	25	425	48	96	47	96	-125	-25	73	83	23	347
650	950	9	130	9	129	-25	650	33	116	34	116	-125	-75	75	97	28	347
650	850	9	126	11	130	-25	575	26	125	22	125	-125	-125	41	135	19	338
650	1050	5	118	6	114	-25	525	38	132	35	130	-125	-175	64	231	40	237
550	1050	7	131	8	129	-25	475	50	114	43	110	-125	-225	180	261	114	255
550	1150	6	134	6	135	-25	425	51	113	50	108	-125	-275	47	258	33	267
450	1050	10	130	12	129	-75	650	23	94	22	82	-125	-325	143	266	102	268
350	1050	10	120	11	117	-75	575	30	107	28	104	-50	-450	62	310	41	272
650	250	27	159	31	158	-75	525	23	98	21	93	-75	-375	78	274	58	277
650	150	31	172	33	175	-75	475	41	88	38	89	-25	-375	136	327	60	279
650	350	15	153	14	158	-75	425	53	95	50	92	-75	-325	143	270	104	275
650	450	14	160	16	162	-125	650	17	83	16	74	-25	-325	140	310	74	258
550	250	18	161	18	169	-125	575	24	72	27	78	-150	-350	112	275	85	278
550	150	32	151	33	154	-125	525	29	87	25	85	-75	-275	46	219	23	194
550	350	22	162	27	166	-125	475	39	85	33	76	-25	-275	99	319	59	240
450	350	12	143	12	146	-125	425	57	91	57	89	-175	-275	44	310	28	311
550	450	23	158	27	155	-175	650	20	99	19	98	-75	-225	166	270	120	281
450	450	12	140	13	138	-175	575	14	61	17	51	-25	-225	105	301	89	238
650	550	15	144	18	145	-175	525	40	96	33	87	-175	-225	113	292	76	293
550	550	18	164	19	166	-175	475	31	83	33	88	-75	-175	96	219	75	255
450	550	13	140	15	144	-175	425	70	97	64	95	-25	-175	81	300	84	225
550	650	24	154	26	156	-225	625	24	95	21	87	-25	-125	37	2	75	225
450	650	12	123	14	126	-225	525	37	88	33	87	-75	-125	66	172	37	207
650	650	10	153	11	153	-225	475	32	90	30	78	-175	-175	161	316	99	315
650	750	9	141	10	144	-225	425	55	72	53	67	-225	-175	95	317	68	310
550	750	19	146	21	147	-250	650	22	74	21	73	-275	-150	134	347	91	339
450	750	11	128	12	130	-275	550	30	47	27	45	-175	-125	54	348	43	323
550	850	17	132	19	130	-275	450	49	47	45	45	-225	-125	116	6	63	352
450	850	11	220	16	129	-350	550	32	47	30	46	-175	-75	152	85	56	74
550	950	10	125	10	126	-350	450	41	48	38	42	-225	-75	155	26	80	9
475	250	86	176	30	174	-450	650	12	79	11	77	-275	-75	126	7	82	355
525	175	45	152	27	143	-450	550	18	48	17	39	-75	-75	81	136	3	336
475	125	97	169	34	155	-450	450	30	41	27	38	-25	-75	121	4	21	184
425	225	41	139	39	139	-550	650	16	43	15	45	-175	-25	95	21	80	341
425	175	30	149	26	155	-350	650	25	15	24	15	-225	-25	63	27	39	350
425	125	50	141	41	144	-350	750	18	59	16	52	-275	-25	75	7	65	343
450	275	118	136	33	143	-250	750	22	71	20	69	-75	-25	37	106	21	278
375	225	33	126	27	131	-150	750	26	98	25	95	-25	-25	133	23	25	258
375	275	27	138	28	145	-150	850	13	56	9	352	-175	25	78	50	58	16
375	325	88	163	35	140	-50	750	15	100	14	100	-225	25	65	39	57	2
425	425	37	150	14	143	-50	850	11	100	1	203	-275	25	66	33	51	13
325	275	39	150	38	150	125	650	21	113	21	118	-75	25	113	104	25	75
325	325	42	139	37	142	150	750	9	109	9	110	-25	25	160	26	24	99
325	375	51	126	45	129	50	750	15	114	13	108	-25	75	172	22	33	85
350	450	32	167	10	124	50	850	12	91	0	243	-175	75	77	62	68	36
350	550	34	158	13	119	150	850	12	113	11	112	-225	75	63	59	51	34
275	325	18	115	21	130	250	750	11	120	10	115	-275	75	70	44	63	21
275	375	34	124	34	127	350	650	29	163	8	119	-175	125	72	53	88	35
275	425	36	151	34	148	350	850	34	151	17	120	-225	125	65	73	58	58
325	475	39	147	24	125	250	850	20	103	19	102	-275	125	55	35	56	22
275	550	11	132	12	133	150	950	21	130	13	159	-350	150	60	27	66	20
225	375	40	113	40	112	350	750	31	163	12	132	-125	125	52	64	55	54
225	425	19	111	17	107	350	950	31	101	15	111	-75	125	67	95	69	94
225	475	11	231	15	114	450	950	41	133	18	133	-25	125	126	36	89	123
225	525	54	133	20	128	250	950	4	110	4	102	-175	175	69	37	89	30
250	575	9	131	8	132	50	950	13	85	17	127	-225	175	32	44	40	43
250	650	18	129	17	129	225	325	40	134	33	133	-275	175	30	63	34	44
175	425	31	145	29	145	225	275	56	117	55	118	-125	175	90	89	107	86

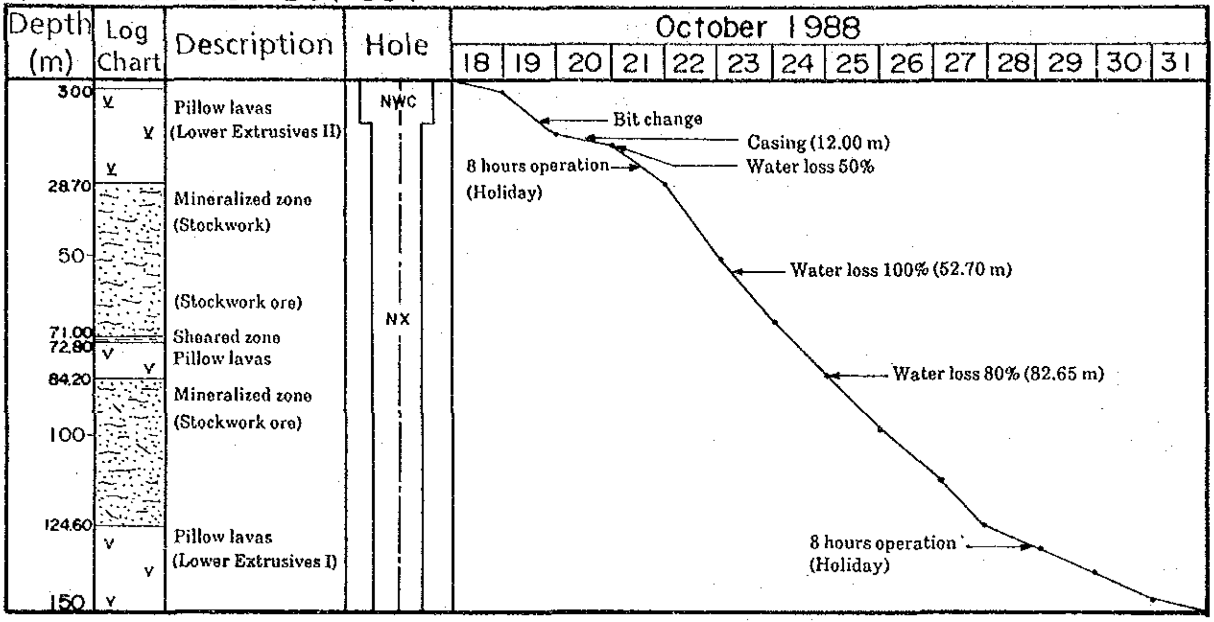
|E| : Intensity (unit: mV/A·100m) of Electiric Field
φ : Azimuth (unit; Degree) of Electiric Field

X	Y	MJO-B1		MJO-B5	
(m)	(m)	|E|	φ	|E|	φ
-75	175	69	101	78	98
-25	175	103	40	88	122
-175	225	34	79	35	65
-225	225	62	274	42	73
-275	225	46	293	64	71
-350	250	52	357	71	28
-125	225	61	65	71	58
-75	225	60	102	65	97
-25	225	100	34	69	117
-175	275	62	256	47	107
-125	275	70	288	45	42
-75	275	50	259	62	95
-25	275	107	330	55	104
-225	275	102	153	47	65
-275	275	69	57	66	52
-275	350	62	38	60	32
-350	350	48	30	45	26
-450	350	33	44	29	35
-225	375	50	52	48	49
-225	325	54	73	49	68
-175	325	37	104	33	89
-125	325	26	81	27	84
-25	325	43	113	43	113
-175	375	53	88	46	83
-125	375	64	86	58	82
-75	375	72	106	66	103
-25	375	59	116	54	111
25	75	166	133	123	137
25	25	96	145	65	165
25	-25	139	167	71	201
25	-75	116	176	57	198
25	-125	141	216	103	235
25	-175	164	204	108	217
25	-225	119	220	81	232
25	-275	95	208	54	217
25	-325	104	242	65	244
25	-375	68	226	44	232
75	-450	83	234	56	237
75	-375	79	217	53	219
125	-375	78	243	58	245
175	-375	61	257	47	255
75	-325	70	234	48	244
125	-325	71	230	53	232
175	-325	77	221	59	222
75	-275	57	220	35	229
125	-275	50	169	35	172
175	-275	81	196	63	208
75	-225	91	191	61	206
125	-225	49	250	52	269
175	-225	55	207	45	213
75	-175	119	239	97	252
125	-175	69	237	62	243
175	-175	29	228	37	252
75	-125	132	218	112	233
125	-125	98	221	82	233
175	-125	56	228	52	224
75	-75	124	167	91	184
125	-75	97	180	81	194
175	-75	73	183	61	198
75	-25	98	195	82	201
125	-25	96	164	80	188
175	-25	79	165	68	182
75	25	171	149	104	155
125	25	86	176	89	178
175	25	49	193	53	199
75	75	102	128	79	133
125	75	100	133	86	142
175	75	71	138	58	151
25	125	120	126	96	130
25	175	87	134	82	134
25	225	49	111	46	108
25	275	61	113	61	109
25	325	50	102	43	96
25	375	48	101	47	102
75	375	51	123	49	124
125	375	65	151	61	151
175	375	44	124	42	122
75	325	50	105	50	105
125	325	78	127	78	127
175	325	99	133	96	134
-75	325	26	102	22	82
75	275	44	79	43	81
125	275	105	142	102	142
175	275	56	148	55	149
75	225	54	107	51	109
125	225	43	141	43	143
175	225	101	131	98	132
175	175	62	150	60	155
75	175	27	136	26	143
125	175	23	140	24	151
75	125	104	123	84	126
125	125	60	131	57	138
175	125	35	135	37	152
225	25	80	185	72	194
225	-25	71	187	59	199
225	-75	60	181	49	191
225	-125	42	188	34	206
225	-175	60	184	44	193
225	-225	70	232	59	239
225	-275	57	244	50	251
225	-325	44	226	33	236
300	-375	27	213	20	221
325	-325	47	234	35	237
275	-275	60	213	49	224
350	-275	31	238	29	248
275	-225	68	214	57	221
325	-225	53	221	48	221
425	-225	54	226	44	241
275	-175	63	200	53	204
325	-175	39	203	34	209
375	-175	35	217	31	225
275	-125	67	170	53	178
325	-125	34	203	33	222
375	-125	42	201	37	209
275	-75	42	166	29	183
325	-75	32	155	29	167
375	-75	49	180	42	185
275	-25	44	179	38	187
325	-25	15	175	18	174
375	-25	35	171	27	183
275	25	45	188	46	199
325	25	20	169	15	197
375	25	30	143	26	153
225	75	82	166	73	173
275	75	55	170	55	172
950	50	25	155	17	167
950	-50	23	183	16	189
850	50	21	136	16	157
850	-50	16	180	15	187
750	50	35	129	25	143
750	-50	28	168	25	172
800	-150	22	182	20	185
650	50	48	138	38	154
650	-50	34	174	32	178
650	-150	30	191	27	195
550	50	63	132	51	145
550	-50	37	184	35	191
550	-150	31	212	29	219
600	-250	29	201	27	202
475	25	67	157	26	130
525	-25	53	202	38	208
475	-75	48	179	10	200
525	-125	57	226	47	237
425	25	23	160	20	169
425	-25	37	187	33	188
425	-75	25	217	26	228
425	-125	56	185	49	190
450	-175	44	191	24	209
450	-250	41	202	22	220
375	75	31	116	23	131
425	75	55	138	45	143

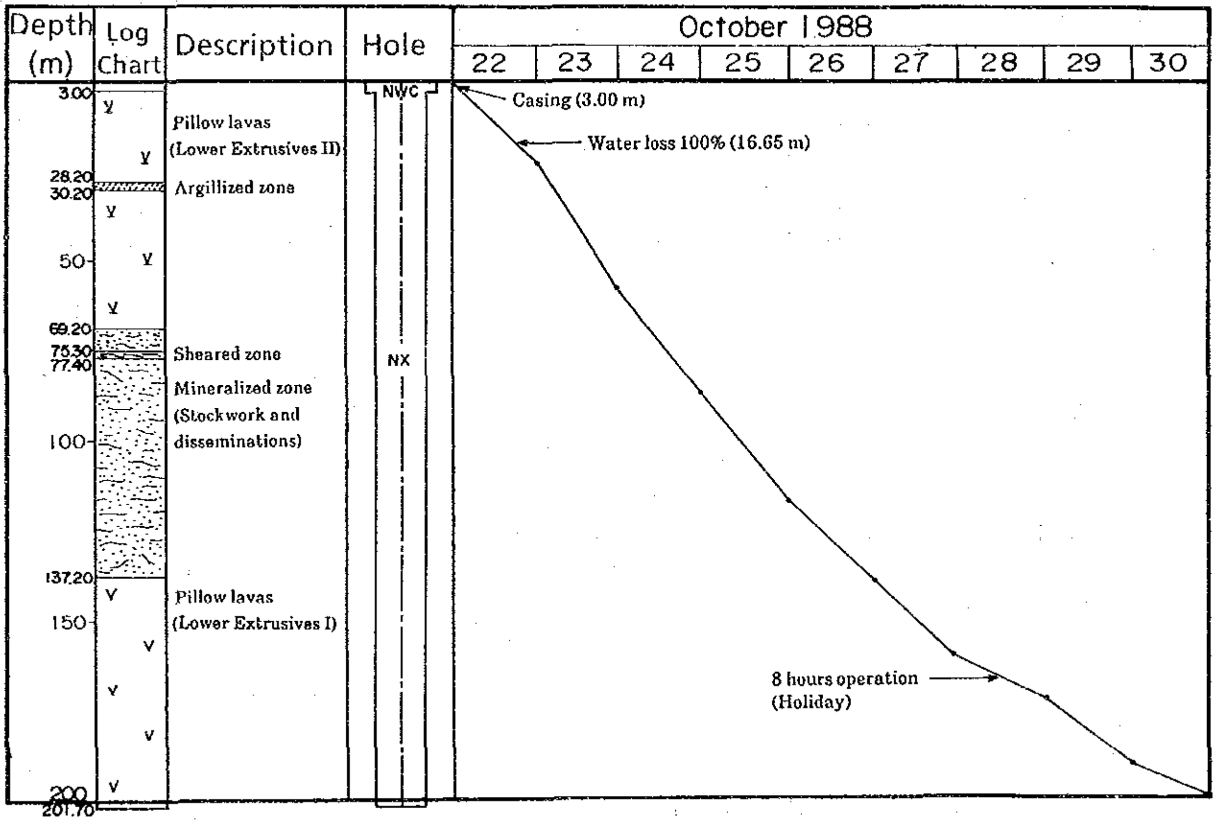
|E| : Intensity (unit; mV/A·100m) of Electiric Field
φ : Azimuth (unit; Degree) of Electiric Field

Appendix 7 Progress of Each Drill Hole in Area B

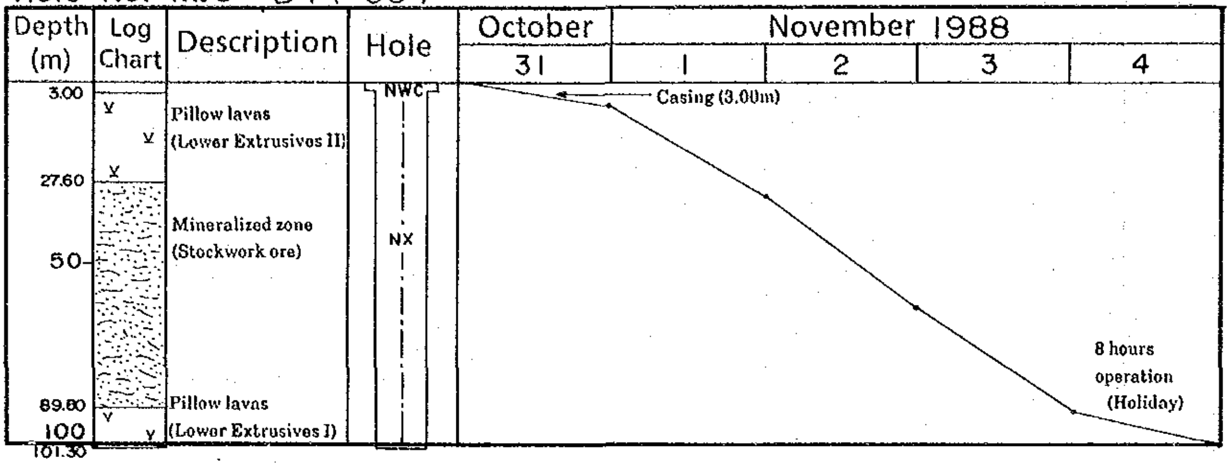
Hole No. MJO - B5(-90°)



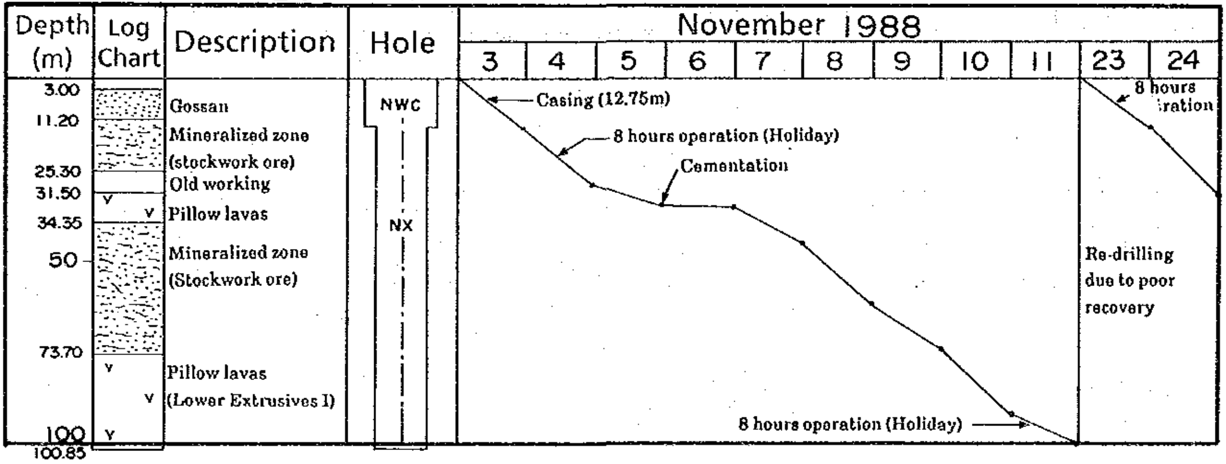
Hole No. MJO -B3 (-90°)



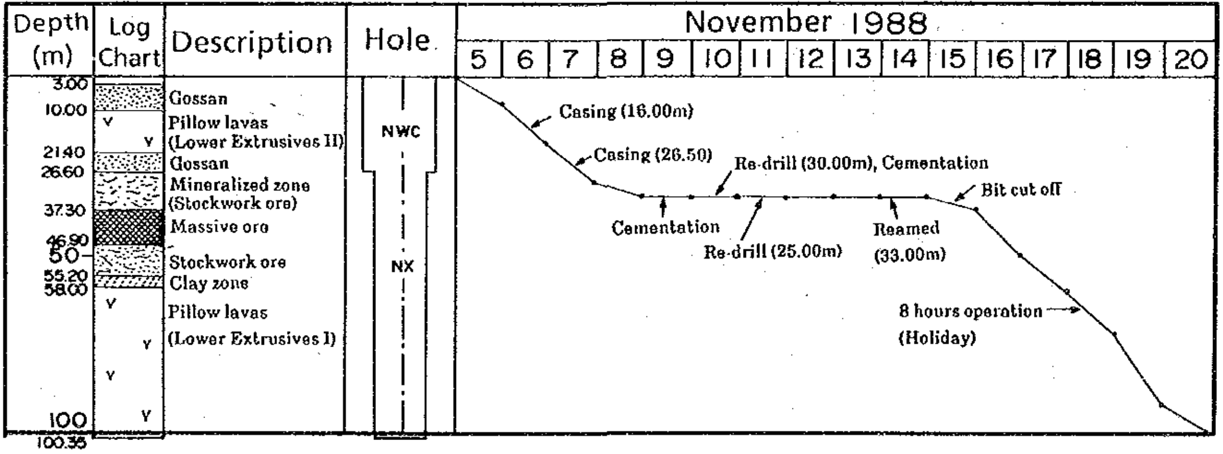
Hole No. MJO－B4 (－90°)



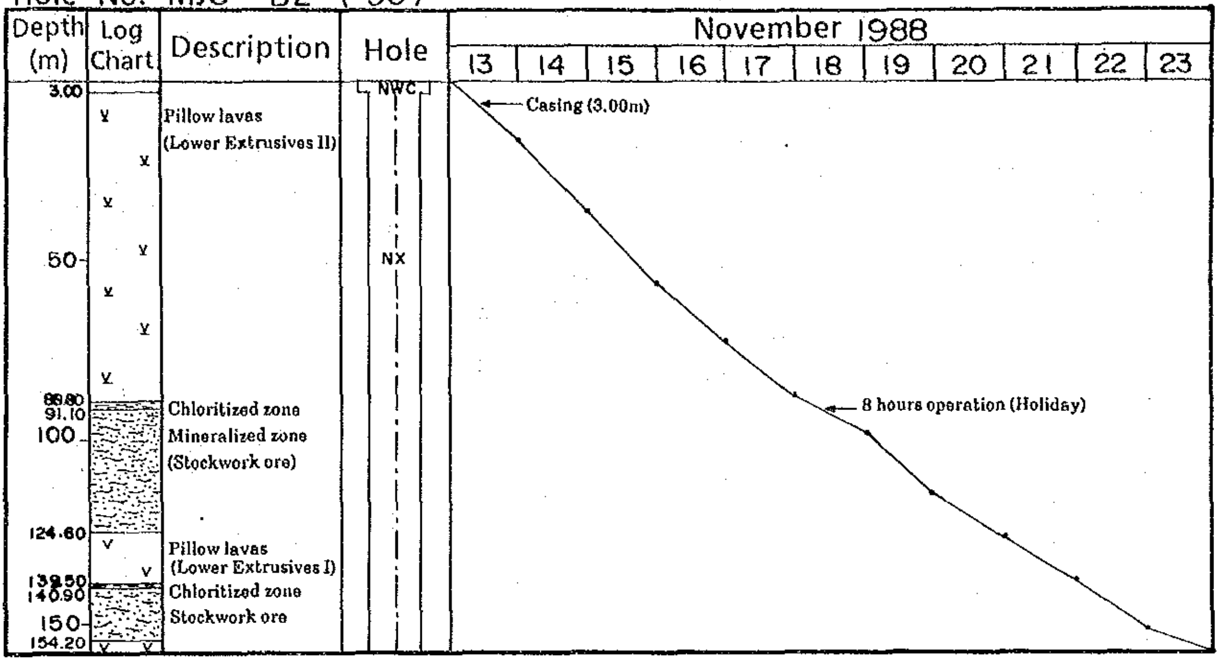
Hole No. MJO－B6 (－90°)



Hole No. MJO－B 1 (－90°)



Hole No. MJO - B2 (-90°)



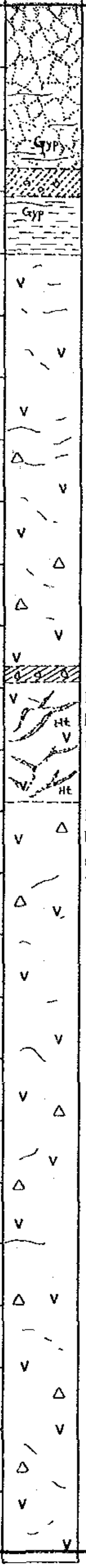
Appendix 8 Geologic Core Log for Drill Holes in Area B

Hole No. MJO-B I (From 0.00 m to 50.00 m)

Depth (m)	Lithology and Alteration	Mineralization
	Casing. No recovery.	
3.00		
3.80	Reddish-brown gossan soil. Light weathered and argillized zone with dominant copper oxide minerals along fractures.	
7.90	No recovery. Silicified argillized and weathered zone (slim).	7.90, 22.00, 32.00 Possibly old working
10	Light green argillized and weathered pillow lava. Chloritized and fractured. Lower part: hematite in matrix and fractures	
20		
21.40	Brown gossan soil.	
22.00	White siliceous gassan. Wheathered and porous. 25.30~32.05 Core recovery 22%	
26.60	Light gray strongly silicified and brecciated zone with mineralization.	Siliceous ore zone. Pyrite along fractures. 34.40~37.80 Increase sulfides downward. Matrix filled with pyrite≫ chalcopyrite
30		
37.80	Massive sulfide zone. 39.70~40.10 Siliceous fragement Chalcanthite ($CuSo_4.5H_2O$) along fractures. 44.00~46.90 Brecciated	Massive ore. Very fine-grained pyrite-chalcopyrite. Porous in places.
40		
46.90	Light gray strongly silicified and brecciated zone with mineralization.	Siliceous ore zone. Matrix filled with pyrite > chalcopyrite. Fine-grained.
50		

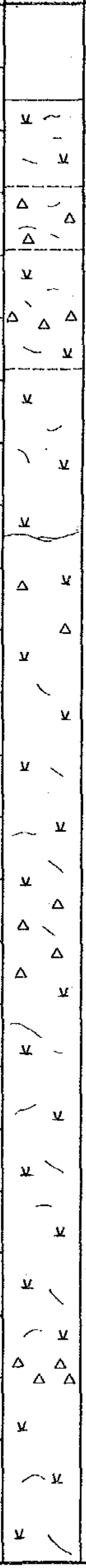
Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
3.80	2.00	Tr	Tr	0.51	<0.01	0.03
5.80	2.10	Tr	Tr	1.04	<0.01	0.09
7.90						
26.60	2.00	0.3	1.8	0.87	<0.01	0.04
28.60	2.00	0.4	1.7	0.67	<0.01	0.03
30.60	2.00	0.3	5.6	0.62	0.01	0.03
32.60	2.00	0.9	12.5	3.12	0.02	0.11
34.60	2.00	6.5	16.0	1.85	0.04	0.07
36.60	1.20	8.7	25.9	1.10	0.05	0.13
37.80	1.00	9.0	24.1	0.96	0.07	0.11
38.80	1.00	16.8	35.8	3.32	0.10	0.12
39.80	1.00	8.9	29.9	0.59	0.05	0.10
40.80	1.00	13.2	14.9	2.45	0.04	0.06
41.80	1.00	13.0	3.7	1.69	0.02	0.04
42.80	1.00	7.1	8.0	1.86	0.02	0.07
43.80	1.00	9.3	5,5	1.67	0.03	0.05
44.80	1.00	12.2	12.3	0.89	0.04	0.29
45.80	1.10	10.4	7.5	2.06	0.05	0.24
46.90	2.00	11.4	5.8	0.74	0.01	0.13
48.90	2.00	6.6	8.4	1.95	0.03	0.18

Hole No. MJO − B1 (From. 50.00 m to 100.35 m)

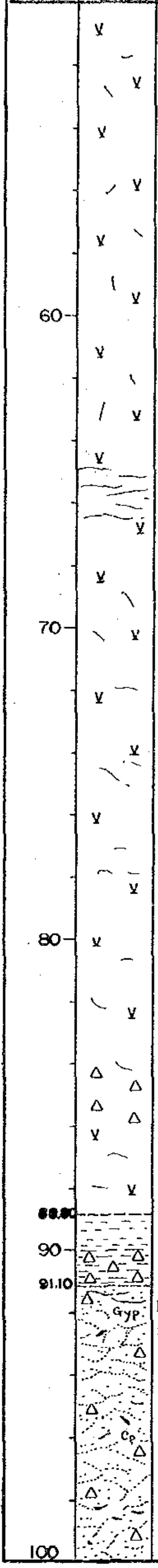


Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn. (%)
			52.00~58.10 satin spar (gypsum) stringers and veinlets	50.90	2.00	1.8	5.2	0.61	0.02	0.78
				52.90	2.30	1.0	4.1	0.59	0.02	0.36
55.20		Gray brecciatted clay zone with silicitied small frogments.	Pyrite disseminations.	55.20						
56.10		Dark green strongly chloritized zone. Sheared.								
58.00		Green~dark green pillow lava with quartz stringers. Chloritized and brecciated in places. 58.00~61.00 Strongly chloritized 63.80~64.70 Hematite in matrix								
60										
70										
71.35		Hematite zone with volcanic fragment.								
71.80		Dark green strongly chloritized pillow lava with dominant hematite in matrix and fractures.								
75.70		Dark green chloritized and weakly brecciated pillow lava with quartz stringers and minor hematite veins. Variole-like texture in places.								
80										
90		90.00m Fracture with limonite								
100		100.35m End of hole								
100.35										

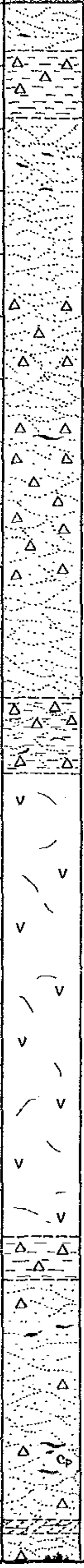
Hole No. MJO - B2 (From 0.00m to 50.00m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Casing. No recovery.								
3.00		Light green pillow lava with calcite stringers. Hematite in matrix and fractures.								
5.80		Light brownish-green pillow breccia with calcite stringers. Hematite in matrix and fractures.								
7.80		Same as 3.00~5.80								
10		9.70~10.20 Brecciated. Matrix filled with calcite								
11.60		Green~dark green and reddish-brown in places chloritized pillow lava to pillow breccia. Many calcite stringers. Hematite in matrix.								
		15.80 Sheared zone 17.00 Calcite-hematite vein 4 cm								
20		18.00~88.80 Variole-like texture in places								
30										
40		43.80~44.20 Brecciated. Matrix filled with calcite								
50										

Hole No. MJO – B2 (From 50.00m to 100.00m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
60–70		Reddish-brown parts increase for downward.								
		65.00~66.50 Many calcite stringers in matrix								
70–80		74.00~78.20 Hematite and calcite dominant in matrix								
80–88.80		84.00~85.70 Brecciated								
88.80		Dark green strongly chloritized zone.								
90		89.95~91.10 Brecciated sheared zone								
91.10		Light green chloritized and silicified mineralized zone. Brecciated.	Stockwork of pyrite and chalcopyrite stringers and veinlets. Gypsum stringers at top along fractures.	91.10	2.00	0.2	1.2	0.13	<0.01	0.22
				93.10	2.00	0.6	1.3	0.86	<0.01	0.42
				95.10	2.00	0.6	2.3	0.91	0.01	0.57
				97.10	2.00	1.0	1.2	0.62	<0.01	0.44
100				99.10	2.00	0.5	1.1	0.88	<0.01	0.16

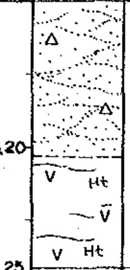
Hole No. MJO-B2 (From 100.00 m to 150.00 m)



Depth (m)	Lithology and Alteration	Mineralization
101.50	Gray sheared and brecciated zone. Chloritized and silicified.	Pyrite, chalcopyrite spots in matrix. Pyrite disseminations and stringers.
103.70	Dark gray silicified and chloritized zone with mineralization. Breciated.	Pyrite and chalcopyrite stringers, veinlets and disseminations. Gypsum along fractures.
	109.50~111.70 Strongly brecciated	
110		
	113.70~118.30 Strongly brecciated	
120		
122.20	Gray silicified and strongly chloritized zone.	Pyrite-chalcopyrite veinlets. Pyrite stringers and disseminations.
124.60	Light yellowish-green chloritized and weakly silicified pillow lava. Hematite in matrix and fractures. Minor quartz stringers. Brecciated in places.	
130		
139.50	Strongly chloritized brecciated zone.	
140		
140.90	Gray silicified, chloritized and brecciated zone with mineralization. Quartz veinlets.	Pyrite, chalcopyrite stockwork vein and stringer.
148.60	148.60~149.00 Gray clay zone with quartz stringers	
149.00		
150		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
101.10						
	2.00	0.1	1.4	0.97	<0.01	0.24
103.10						
	2.00	Tr	Tr	0.22	<0.01	0.14
105.10						
	2.00	0.4	1.5	0.37	<0.01	0.04
107.10						
	2.00	Tr	Tr	0.25	<0.01	0.07
109.10						
	2.00	Tr	Tr	0.26	<0.01	0.04
111.10						
	2.00	Tr	0.1	0.09	<0.01	0.06
113.10						
	2.00	0.2	0.1	0.55	<0.01	0.12
115.10						
	2.00	Tr	Tr	0.25	<0.01	0.04
117.10						
	2.00	Tr	Tr	0.07	<0.01	0.04
119.10						
	2.00	Tr	Tr	0.03	<0.01	0.06
121.10						
	2.00	0.1	0.5	0.03	<0.01	0.18
123.10						
	1.50	1.1	2.0	0.72	<0.01	0.40
124.60						
140.90						
	2.00	0.2	0.3	0.65	<0.01	0.05
142.90						
	2.00	Tr	Tr	0.29	<0.01	0.03
144.90						
	2.00	0.6	1.1	1.39	<0.01	0.05
146.90						
	2.00	Tr	Tr	0.29	<0.01	0.11
148.90						
	2.00	Tr	Tr	0.33	<0.01	0.02

Hole No. MJO - B2 (From 150.00m to 157.25m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
				150.90						
					2.00	0.1	0.3	0.12	<0.01	0.06
				152.90						
					1.30	Tr	Tr	0.04	<0.01	0.21
154.20		Green chloritized and weakly brecciated pillow lava with quartz-hematite veins.		154.20						
157.25		157.25m End of hole								
160										
170										
180										
190										
200										

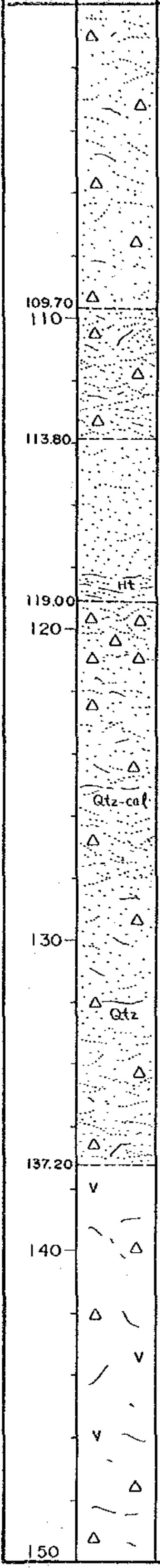
Hole No. MJO - B3 (From 0.00 m to 50.00 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Casing. No recover								
3.00		Reddish-brown and light green doloritic weathered pillow lava. Weakly brecciated. Hematite in matrix.								
7.70		Light green and reddish-brown in part weakly chloritized pillow breccia and pillow lava. Vesicles filled with calcite and zeolites. Hematite, calcite stringers.								
10										
19.00										
20		Light green weakly brecciated doloritic pillow lava. Hematite in matrix. Calcite stringers.								
28.20		28.20~28.60 and 30.00~30.20 Light green argillized zones								
28.60										
30										
30.20		Reddish-brown weakly chloritized pillow lava. Vericles filled with calcite and zeolites. Calcite-quartz-hematite stringers and veinlets. 31.60 Calcite-hematite vein 5 cm 32.10~32.50 Pillow breccia 39.30~39.7 0 Pillow breccia								
40										
48.40										
50										

Hole No. MJO - B3 (From 50.00 m to 100.00 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Light green weakly chloritized pillow and massive lavas. Few hematite stringers along fractures.	Quartz stringers and veinlets.							
			58.40 Quartz veinlets (2 cm)							
60										
68.90 69.20		Hematite-quartz zone. Weakly sheared								
70		Light greenish gray~gray silicified, chloritized and brecciated zone with mineralization (pillow lava).	Stockwork mineralized zone. Many quartz and calcite veins, veinlets and stringers with pyrite. Pyrite disseminations. Minor chalcopyrite.							
		74.35~74.75 Sheared								
75.30		75.30~77.40 Sheared, brecciated and strongly chloritized zone with calcite stringers.								
77.40				77.40 79.40	2.00	0.2	1.7	0.02	0.02	0.01
80				79.40 81.40	2.00	Tr	Tr	0.01	<0.01	<0.01
90										
		95.10~96.10 Hematite in matrix								
			97.60 Gypsum along fractures 97.90 Quartz-hematite stringers							
100										

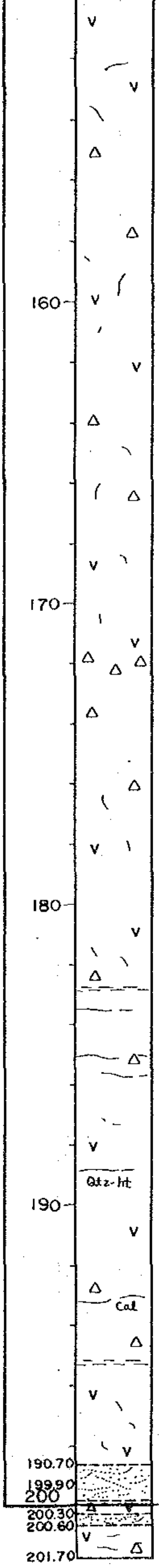
Hole No. MJO-B3 (From 100.00 m to 150.00 m)



Depth (m)	Lithology and Alteration	Mineralization
109.70	Greenish gray~gray brecciated, silicified and strongly chloritized zone (pillow lava).	Pyrite-quartz veins dominant with minor chalcopyrite.
113.80	Gray silicified and chloritized zone (massive lava).	A few pyrite stringers and weak pyrite disseminations.
119.00	Gray~greenish gray silicified, chloritized and brecciated zone (pillo lava). 119.00~133.40 Light gray strongly silicified and brecciatedd 124.80~133.40 Dark green strongly chloritized	Pyrite-quartz stringers along fractures and in matrix. Pyrite disseminations. 119.00~121.15 More pyrite dissem. 126.00~128.10 More pyrite in matrix and fractures. 131.90 Quartz vein, 3 cm
137.20	Light brownish green brecciated pillow lava. Weakly chloritized and hematitized. Matrix and fractures filled with hematite and minor quartz.	No sulfide minerals

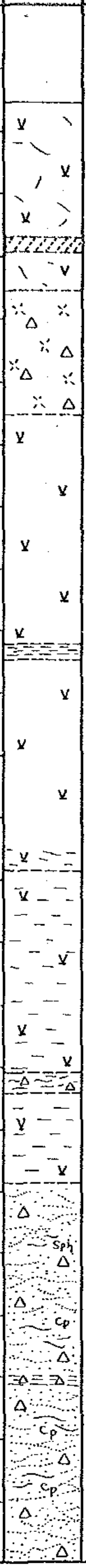
Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
109.70 111.70	2.00	Tr	Tr	0.04	< 0.01	0.45
111.70 113.80	2.10	Tr	Tr	0.01	< 0.01	0.01
119.00 121.00	2.00	Tr	Tr	0.01	<0.01	<0.01
126.00 128.10	2.10	Tr	Tr	0.01	<0.01	<0.01
132.30 134.80	2.50	Tr	Tr	0.01	<0.01	<0.01
134.80 137.20	2.40	Tr	Tr	0.01	<0.01	<0.01

Hole No. MJO - B3 (From 150.00 m to 201.70 m)



Depth (m)	Chart	Lithology and Alteration	Mineralization	Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
		Strongly brecciated.								
		182.70~182.80 Sheared zone with quartz and hematite	183.50, 185.00, 185.50 Quartz-hematite veinlets							
		195.10~195.20 Sheared zone with quaartz and hematite								
		198.70~199.90 and 200.30~200.60 Dark green brecciated, silicified and strongly chloritized zone. Sheared at top and bottom	198.70~199.90 and 200.30~200.60 Pyrite stringers and disseminations							
		199.90~200.30 and 200.60 121.70 Dark green brecciated and chloritized pillow lava with quartz-calcite-hematite stringers	199.40 Minor chalcopyrite.							
		201.70 End of hloe								

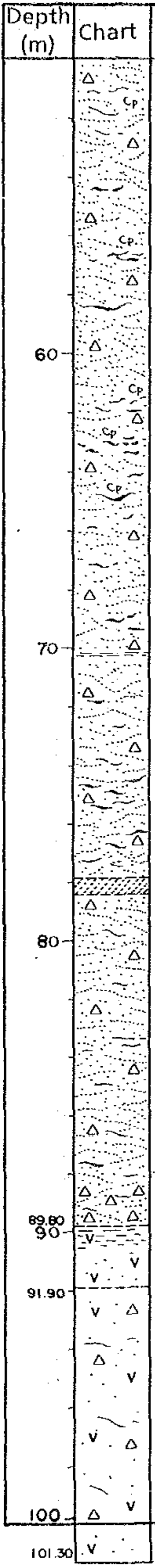
Hole No. MJO－B4 (From 0.00 m to 50.00 m)



Depth (m)	Lithology and Alteration	Mineralization
	Casing. No recovery.	
3.00	Light green weathered pillow lava.	
7.40	Argillized zone with limonite.	
7.80	Light brown weathered pillow lava. Argillized in part	8.95~11.10 Green copper mineral spots and along fractures
9.10 10	Green hyaloclastic pillow breccia. Strongly chloritized. Minor hematite along fractures.	
13.00 20	Light green~light brownish green brecciated pillow lava. Chloritized. Fructures filled with hemetite. 20.40~27.60 Calcite stringers	
27.60 30	Dark green brecciated pillow lava. Strongly chloritized and weakly sheared. 30.20~36.10 Fractures filled with hematite. 34.10~34.80 Strongly brecciated sheared zone.	
37.70 40	Light greenish gray~gray silicified and chloritized zone. Mineralized and brecciated. 44.00~44.30 Sheared and strongly brecciated	Pyrite > chalcopyrite-quartz stringers. Pyrite > chalcopyrite disseminations (stockwork zone). 39.40~39.60 Sphalerite-pyrite-quartz stringers
50		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
37.70	2.00	Tr	Tr	0.03	<0.01	0.18
39.70	2.00	0.1	0.8	0.24	<0.01	0.12
41.70	2.00	0.1	1.6	0.66	<0.01	0.18
43.70	2.00	0.4	0.7	0.56	<0.01	0.19
45.70	2.00	0.1	1.2	0.44	<0.01	0.17
47.70	2.00	0.1	0.9	0.27	<0.01	0.19
49.70						

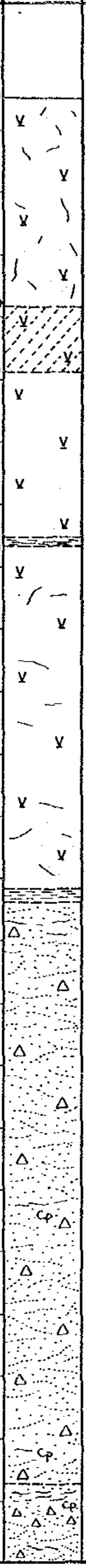
Hole No. MJO- B4 (From 50.00 m to 101.30 m)



Lithology and Alteration	Mineralization
	66.30~69.50 Gypsum along fractures and in pyrite-chalcopyrite veinlets
70.15 Sheared zone, 5 cm	
	74.50 Gypsum along fractures
77.85~78.40 Argillized	
88.30~89.80 Strongly brecciated	
Dark green strongly chloritized pillow lava. 89.90~90.50 Sheared	Weak pyrite disseminations.
Gray and green brecciated pillow lava. Silicified and chloritized with epidote spots.	Weak pyrite dissminations, Quartz stringers and quartz-hematite stringers.
101.30 End of hole	

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
51.70	2.00	0.1	1.8	0.87	< 0.01	0.31
53.70	2.00	0.3	1.1	0.63	< 0.01	0.10
55.70	2.00	0.1	2.5	0.82	< 0.01	0.13
57.70	2.00	0.1	1.6	0.75	< 0.01	0.17
59.70	2.00	0.2	1.6	1.03	< 0.01	0.08
61.70	2.00	1.2	0.8	1.08	< 0.01	0.18
63.70	2.00	0.1	2.7	1.23	< 0.01	0.26
65.70	2.00	0.9	4.8	2.27	< 0.01	0.22
67.70	2.00	0.2	1.7	0.44	< 0.01	0.35
69.70	2.00	0.6	2.9	0.84	< 001	0.47
71.70	2.00	1.2	2.1	0.72	< 0.01	0.61
73.70	2.00	0.5	1.4	0.78	< 0.01	0.28
75.70	2.00	0.6	1.8	0.82	< 0.01	0.45
77.70	2.00	0.8	1.1	0.64	< 0.01	0.60
79.70	2.00	0.7	1.0	0.57	< 0.01	0.48
81.70	2.00	Tr	0.1	0.77	< 0.01	0.34
83.70	2.00	0.5	2.2	1.27	< 0.01	0.37
85.70	2.00	0.7	1.8	1.33	< 0.01	0.35
87.70	2.00	0.5	1.4	0.91	< 0.01	0.18
89.80	2.10	0.3	0.9	0.79	< 0.79	0.18

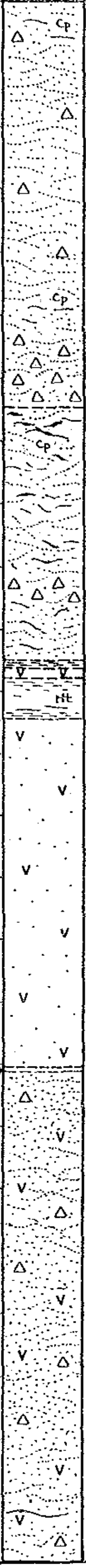
Hole No. MJO-B5 (From 0.00 m to 50.00 m)



Depth (m)	Lithology and Alteration	Mineralization
0.00	Casing. No recovery.	
3.00	Purplish green pillow lava. Weathered, fractured and weakly argillized.	
9.70	Greenish gray pillow lava argillized and weathered.	
11.70	Purpilsh green weathered pillow lava. Fractures filled with limonite	
17.00	Sheared zone with quartz-hematite veins.	
17.30	Dark green weakly brecciated pillow lava. Chloritized. Fractures filled with hematite and quartz.	
28.30	Strongly chloritized sheared zone.	Weak pyrite disseminations.
28.70	Green~greenish gray brecciated zone (pillow lava). Chloritized and weakly silicified. Argillized in part. 31.00~31.30 Light green bleached and argillized	Pyrite-quartz with minor chalcopyrite veinlets and quartz stringers. Pyrite disseminations. 29.35~29.50 Sphalerite-pyrite stringers 38.50~38.60 Chalcopyrite > pyrite stringers
47.40	Greenish gray brecciated zone (pillow lava). Chloritized, weakly silicified and argillized.	Stockwork ore zone chalcopyrite-pyrite veinlets and stringers.
50		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
28.70 30.70	2.00	Tr	Tr	0.11	<0.01	0.41
37.70 39.70	2.00	Tr	Tr	0.51	<0.01	0.04
43.40 45.40	2.00	Tr	Tr	0.39	<0.01	0.07
45.40 47.40	2.00	Tr	Tr	0.35	<0.01	0.16
47.40 49.40	2.00	0.1	1.1	1.17	<0.01	0.19

Hole No. MJO-B5 (From 50.00 m to 100.00 m)



Depth (m)	Lithology and Alteration	Mineralization
	48.00~48.60 Strongly brecciated clay zone	45.60 Gypsum stringers
60		
	61.10~62.90 Strongly brecciated and chloritized	
62.90	Greenish-gray weakly brecciated zone (pillow lava). Chloritized, argillized and silicified.	Stockwork ore zone chalcopyrite » pyrite veins and veinlets. Weak pyrite disseminations.
	68.40~69.30 Strongly brecciated	
70		
71.00	Sheared zone with quartz, chlorite and gypsum.	
71.30		
71.60	Light Green chloritized pillow lava.	
	Sheared zone with chlorite.	
72.90	Light green pillow lava, weakly brecciated. Chloritized. Quartz stringers and hematite along fractures.	Scarce pyrite disseminations. Quartz stringers.
80		
84.10	Brecciated zone with quartz-hematite veins.	
84.20	Greenish gray~dark gray brecciated zone (pillow lava). Strongly silicified and chloritized Epidote in spots.	Intense pyrite disseminations. Very fine-grained pyrite. Many quartz stringers and veinlets.
90		
		88.50 Quartz vein
100		

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
	2.00	Tr	Tr	1.38	<0.01	0.18
51.40						
	2.00	0.4	1.5	1.36	<0.01	0.06
53.40						
	2.00	0.2	1.5	0.98	<0.01	0.06
55.40						
	2.00	0.4	1.2	0.71	<0.01	0.04
57.40						
	2.00	0.1	2.1	1.60	<0.01	0.05
59.40						
	2.00	0.6	1.8	1.66	<0.01	0.14
61.40						
	1.50	0.2	0.8	0.72	<0.01	0.08
62.90						
	2.00	0.7	1.7	3.54	<0.01	0.16
64.90						
	2.00	Tr	Tr	2.25	<0.01	0.06
66.90						
	2.00	0.1	0.6	1.81	<0.01	0.06
68.90						
	2.10	Tr	Tr	0.82	<0.01	0.06
71.00						
88.90						
	2.00	Tr	Tr	0.01	<0.01	0.01
90.90						
	2.00	Tr	Tr	0.01	<0.01	0.01
92.90						
	2.00	Tr	Tr	0.01	<0.01	0.01
94.90						

Hole No. MJO - B5 (From 100.00 m to 150.00 m)

Depth (m)	Lithology and Alteration	Mineralization
		102.00~106.30 Weak pyrite disseminations
106.30	Dark green~dark greenish gray brecciated zone. Silicified and strongly chloritized. Weakly sheared.	Stockwork ore. Cholcopyrite ≫ pyrite veinlets and spots. Pyrite disseminations.
110		
120		
124.60	Dark brownish green~greenish gray brecciated pillow lava. Chloritized. Fractures and matrix filled with hematite.	Quartz stringers.
130		
140		
145.70	Sheared zone with quartz-hematite.	
145.90	Same as 124.60~145.70	
1 50	150.00 End of hole	

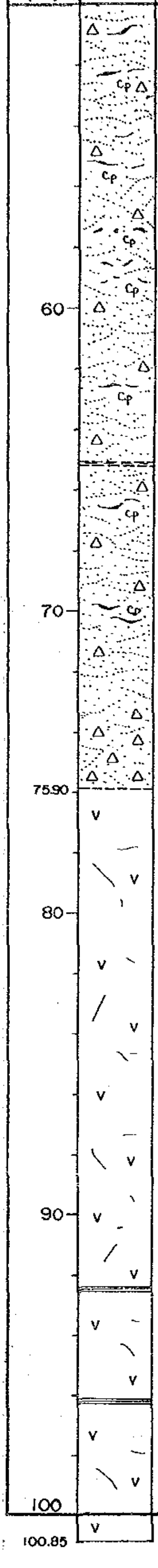
Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
106.30						
	2.00	0.1	1.3	2.07	<0.01	0.04
108.30						
	2.00	Tr	Tr	0.37	<0.01	0.03
110.30						
	2.00	1.0	1.1	1.91	<0.01	0.09
112.30						
	2.00	0.5	0.8	1.16	<0.01	0.03
114.30						
	2.00	0.5	0.5	0.76	<0.01	0.03
116.30						
	2.00	0.1	0.7	0.39	<0.01	0.03
118.30						
	2.00	Tr	Tr	0.50	<0.01	0.04
120.30						
	2.00	Tr	Tr	1.25	<0.01	0.04
122.30						
	2.30	Tr	Tr	1.42	<0.01	0.04
124.60						

Hole No. MJO – B6 (From 0.00 m to 50.00 m)

Depth (m)	Chart	Lithology and Alteration	Mineralization
		Casing. No recovery.	
3.00		Weathered and argillized zone with siliceous fragment. Dominant copper oxide minerals.	
4.50		Reddish-brown gossan soil. No copper minerals.	
10			
11.20		Greenish gray silicified, argillized and chloritized zone. Brecciated. 11.05~17.85 Poor recovery D.L. 6.80, C.L. 3.35 49%	Stockwork zone. Pyrite-chalcopyrite stringers and disseminations.
20		29.90~31.30 More argillized zone Poor recovery D.L. 10.40, C.L. 4.35 42%	
25.30		Gray~greenish gray clay zone with siliceous fragments. Possibly old working. 25.80 Gypsum stringer 27.00 Wood chip	
30		0.00~31.30m Re-drilling	
31.50		Light green~gray silicified and chloritized pillow lava with quartz stringers. Brecciated in part.	Pyrite disseminations. 31.80 Gypsum stringers Very weak mineralization with quartz stringers
37.00		Yellowish green strongly chloritized pillow lava. Brecciated.	37.90 Gypsum stringers
39.10 39.35		Light gray argillized sheared zone.	Weak pyrite disseminations.
40		Gray silicified, chloritized and brecciated zone. 43.40~44.00 Weakly sheared zone with many quartz stringers	Pyrite stringers and disseminations. Quartz stringer and veinlets. 42.70 Sphalerite-pyrite stringer 44.10~44.30 Sphalerite-pyrite stringers
50			

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
3.00						
	1.50	Tr	Tr	1.34	<0.01	0.70
4.50						
11.20						
	2.00	Tr	2.0	1.48	<0.01	0.19
13.20						
	2.00	Tr	1.2	2.69	<0.01	0.07
15.20						
	2.00	Tr	Tr	3.17	<0.01	0.07
17.20						
	2.00	0.7	2.2	2.96	<0.01	0.12
19.20						
	2.00	1.0	3.6	2.15	<0.01	0.22
21.20						
	2.00	1.3	3.0	5.48	<0.01	0.18
23.20						
	2.10	0.7	3.8	6.51	<0.01	0.20
25.30						
39.35						
	2.00	Tr	Tr	0.02	<0.01	0.10
41.35						
	2.00	Tr	Tr	0.04	<0.01	0.27
43.35						
	2.00	0.1	0.9	0.05	<0.01	0.38
45.35						
	2.00	Tr	Tr	0.01	0.01	0.10
47.35						
	2.00	Tr	Tr	0.11	<0.01	0.90
49.35						

Hole No. MJO – B6 (From 50.00 m to 100.85 m)



Lithology and Alteration

52.05~52.10
Strongly brecciated and chloritized sheared zone

57.40~57.50
Brecciated zone

65.00~65.05
Sheared zone with chlorite

Green chloritized pillow lava. Hematite in fracture and matrix. Weakly brecciated. Quartz and calcite stringers.

92.40~92.50
Reddish brown metalliferous sediments

96.00
Quartz-hematite vein 7cm

96.15~96.25
Reddish-brown metalliferous sediments

100.85m End of hole

Mineralization

52.00~61.00
Chalcopyrite > pyrite stringers

57.40~57.50
Chalcopyrite-pyrite ore breccia

71.40~75.90
Mineralization weak

Depth (m)	D.L. (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
51.35	2.00	Tr	0.5	0.51	<0.01	0.08
53.35	2.00	Tr	Tr	0.84	<0.01	0.04
55.35	2.00	Tr	Tr	1.80	<0.01	0.03
57.35	2.00	0.2	0.9	1.05	<0.01	0.03
59.35	2.00	1.2	0.8	1.97	<0.01	0.07
61.35	2.00	Tr	0.1	0.78	<0.01	0.04
63.35	2.00	0.2	1.3	0.70	<0.01	0.04
65.35	2.00	Tr	Tr	0.44	<0.01	0.02
67.35	2.00	0.1	0.2	0.77	<0.01	0.01
69.35	2.00	Tr	0.1	0.09	<0.01	0.05
71.35	2.00	Tr	Tr	0.10	<0.01	0.03
73.35	2.00	Tr	Tr	0.05	<0.01	0.07
75.90	2.55	0.2	0.4	0.04	<0.01	0.04