

Roan Group.

- Pyrrhotite rim of dolomitic lens contained in shales of the Mwashia Group and boudinage or intensely disseminated pyrite in the shales.
- Pyrite-pyrrhotite rim of fragments contained in sedimentary rocks of the Kundelungu Group, and discontinuous thin beds and dissemination of pyrrhotite in the Group.

Chapter 4 Comprehensive Analysis of the Survey Results

4-1 Geologic Structure, Characteristics of Mineralization and Mineralization Control

It was shown by the work of Phase I that the shale-type copper mineralization of the Copperbelt was controlled mainly by the topography and the depth of the sea at the time of ore deposition. The noted characteristics were that the deposits were formed in relatively stagnant local depressions of the basement and the palaeo-basement highs generally contain low grade ores or are barren. The results of the drilling of the present Phase II also confirm the above control of mineralization by palaeo-seafloor topography (Fig. 1-10). Also, the zonal distribution of sulfide minerals - bornite -> chalcopyrite -> chalcopyrite-pyrrhotite-pyrite -> pyrite-pyrrhotite - from the coast outwards show that the palaeo-marine environment gradually became reducing toward offshore (Fig. 1-9).

The geological profiles, the contour map of the upper surface of the basement map and the ore shale isopach map sulfide zonal distribution map (Fleischer, 1983) were revised on the basis of the results of the survey of the present phase (Figs. 1-7, 1-8, 1-9, 1-10). The major modification of the contour map of the upper surface of the basement map is as follows. (1) The NW-SE extending basement high on the northwest side of the Northern Area Shoot has been shifted southwestward. (2) The northeastern part of the basement high extending in the NE-SW direction on the southeastern side of the Northern Area Shoot extends further northwestward. It is inferred from Profile I-I' (Fig. 1-7) that this basement high extends further to the western side of the MJZC-1.

MJZC-6 and MJZC-7 are located on the southwestern limb of

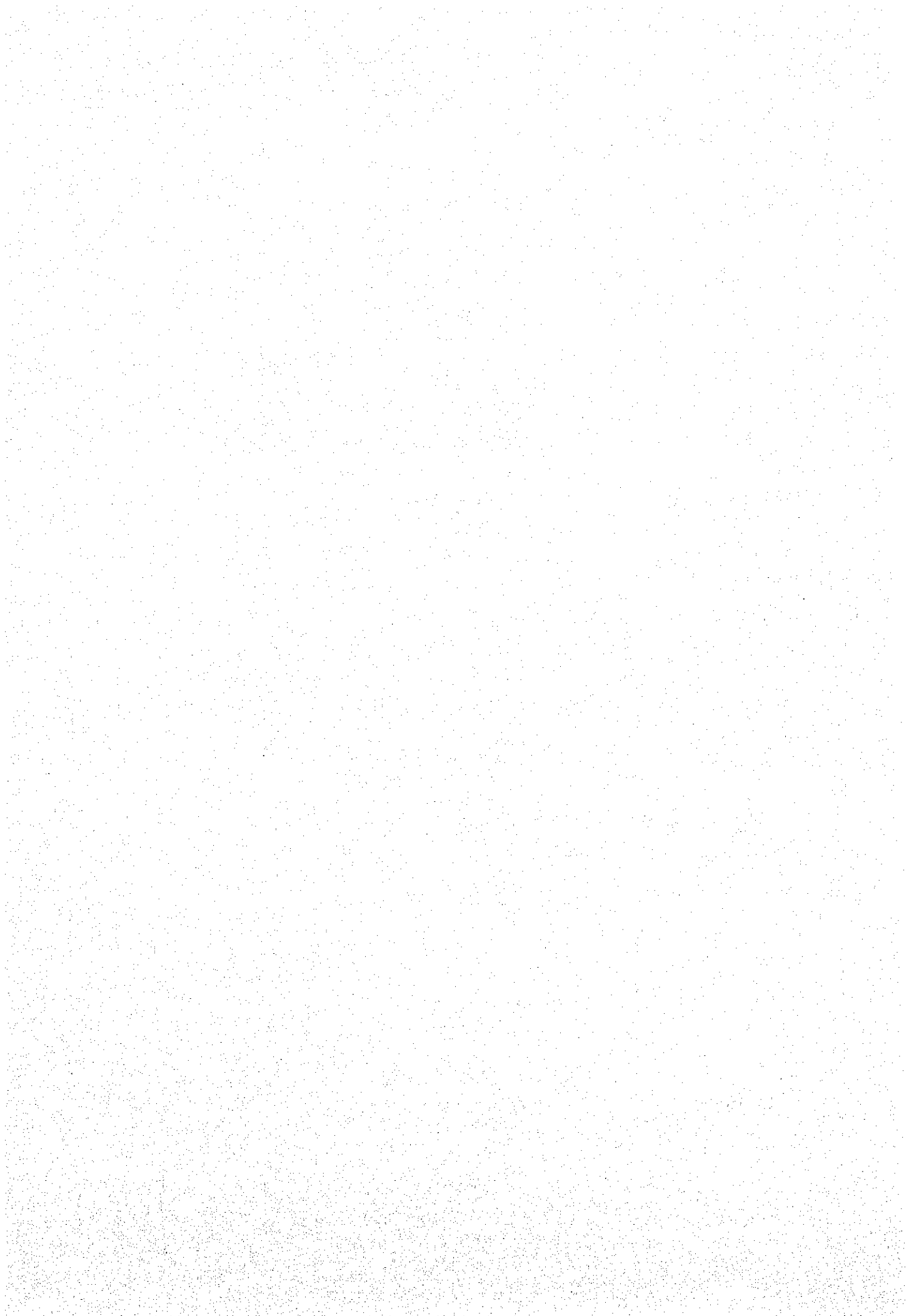
the basement high on the northwestern side of the Northern Area Shoot. It is shown in both boreholes that; "Ore shale" is not well developed in the "Ore shale horizon" because of the dolomitic nature of the strata, bornite occurs in spite of the relatively weak copper mineralization and the "Footwall Formation" is very thin. It is believed from the above that this present basement high is a palaeo-basement high at the time of ore deposition. The ore shale isopach map (Fig. 1-8) and the sulfide zonal distribution map (Fig. 1-9) indicate that the ore shoot consisting of chalcopyrite whose one end is confirmed by NN-75 exists to the south of MJZC-6 and MJZC-7.

The basement is highly raised at MJZC-8, and the development of the ore bodies is poor. The existence of bioherm and the underdeveloped "Footwall Formation" indicate that this is a palaeo-basement high. Geological profile G-G' (Fig. 1-7), however, shows that the basement is folded together with the overlying strata and the present irregularity of the basement surface is strongly affected by the folding after the deposition of "ore shale".

In MJZC-5, "ore shale" is thickly developed and the deposit consists mainly of chalcopyrite and pyrrhotite and the copper grade is relatively high. This deposit is located on the anticline (Fig. 1-7) and it is inferred that it is the northwestern extension of the Northern Area Shoot. Anticlinal structure formed by folding after the deposition of the "ore shale" occurs on the southwestern side of the basement depression of the Northern Area Shoot extending in the NW-SE direction. And relatively prospective deposits are confirmed on this anticline (NN-48, NN-55).

In MJZC-1, the mineralization in the "ore shale" is mainly pyrrhotite and poor in copper, but a mineralized zone consisting of chalcopyrite is developed in the "Footwall Conglomerate" and "Footwall Quartzite". In the Copperbelt, mineralization is often developed in the footwall conglomerate and this is being mined in the Chibuluma mine.

Gabbro isopach contour, high gravity anomalies and ore shoots mapped during Phase I are revised by the results of the present phase (Figure 1-11). This shows that, as pointed out in the Phase I Report, ore shoots do not occur in high gravity zones and below gabbroic bodies.



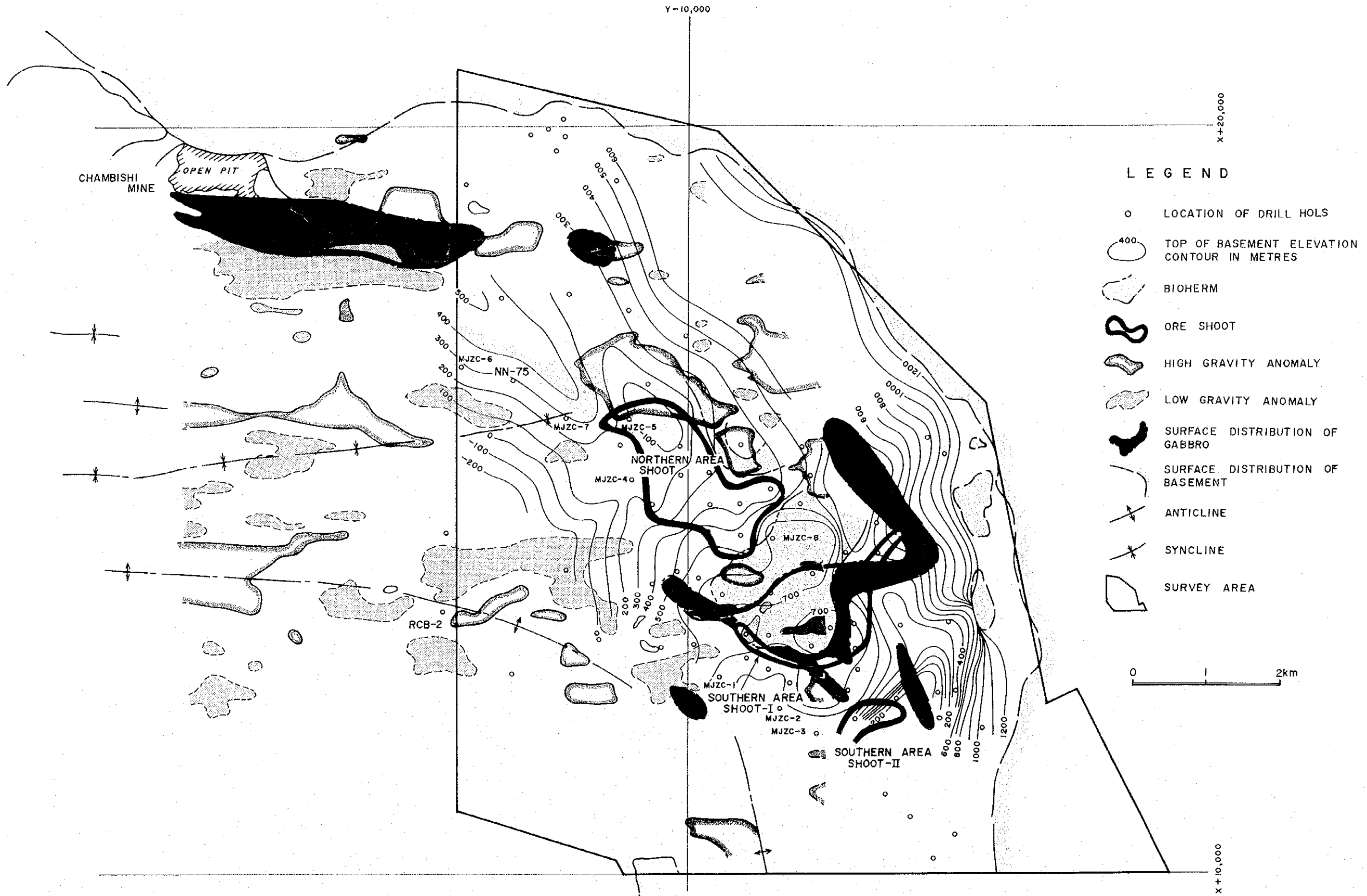


Fig. 1-10 Integrated Interpretation Map

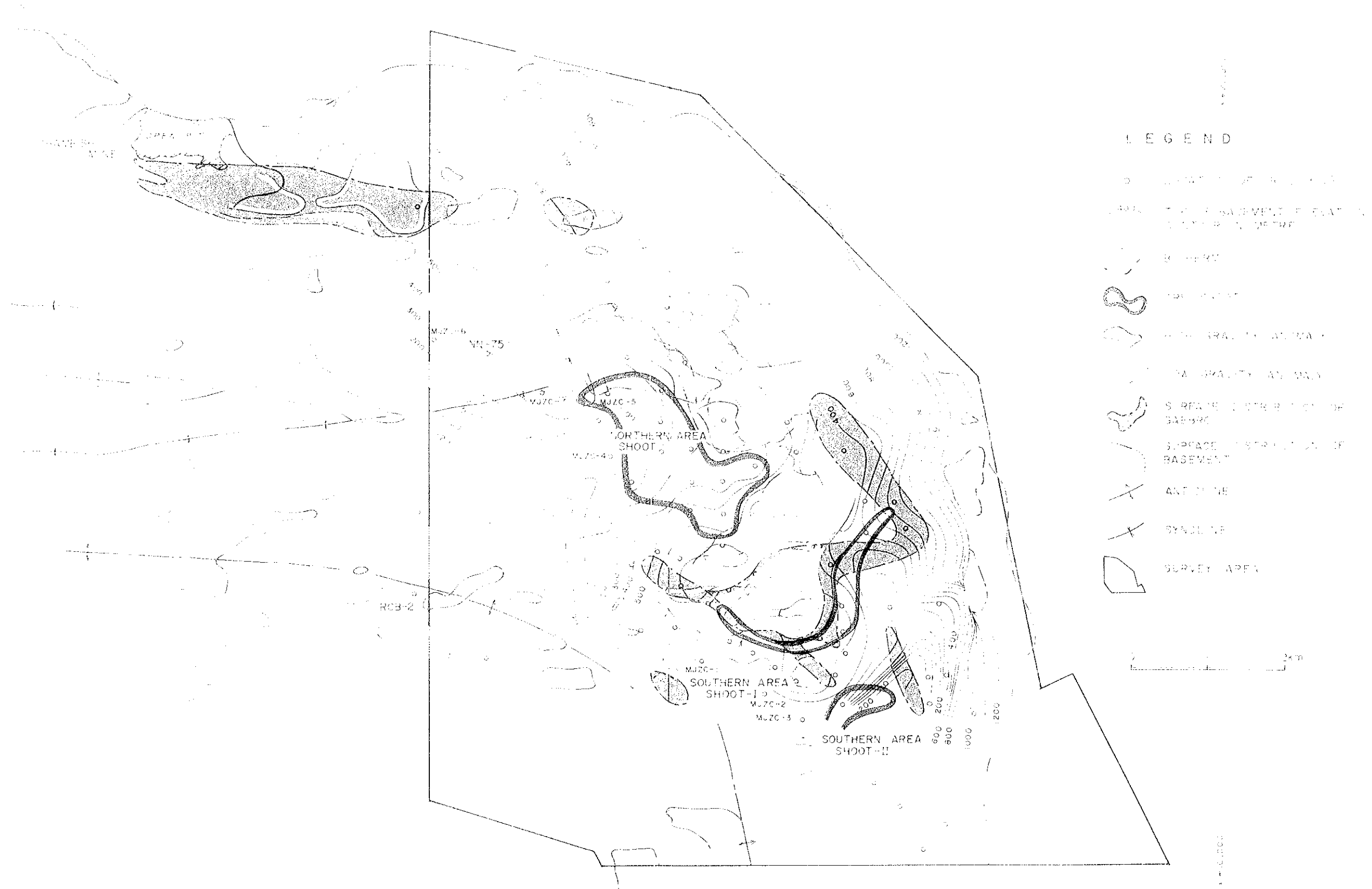
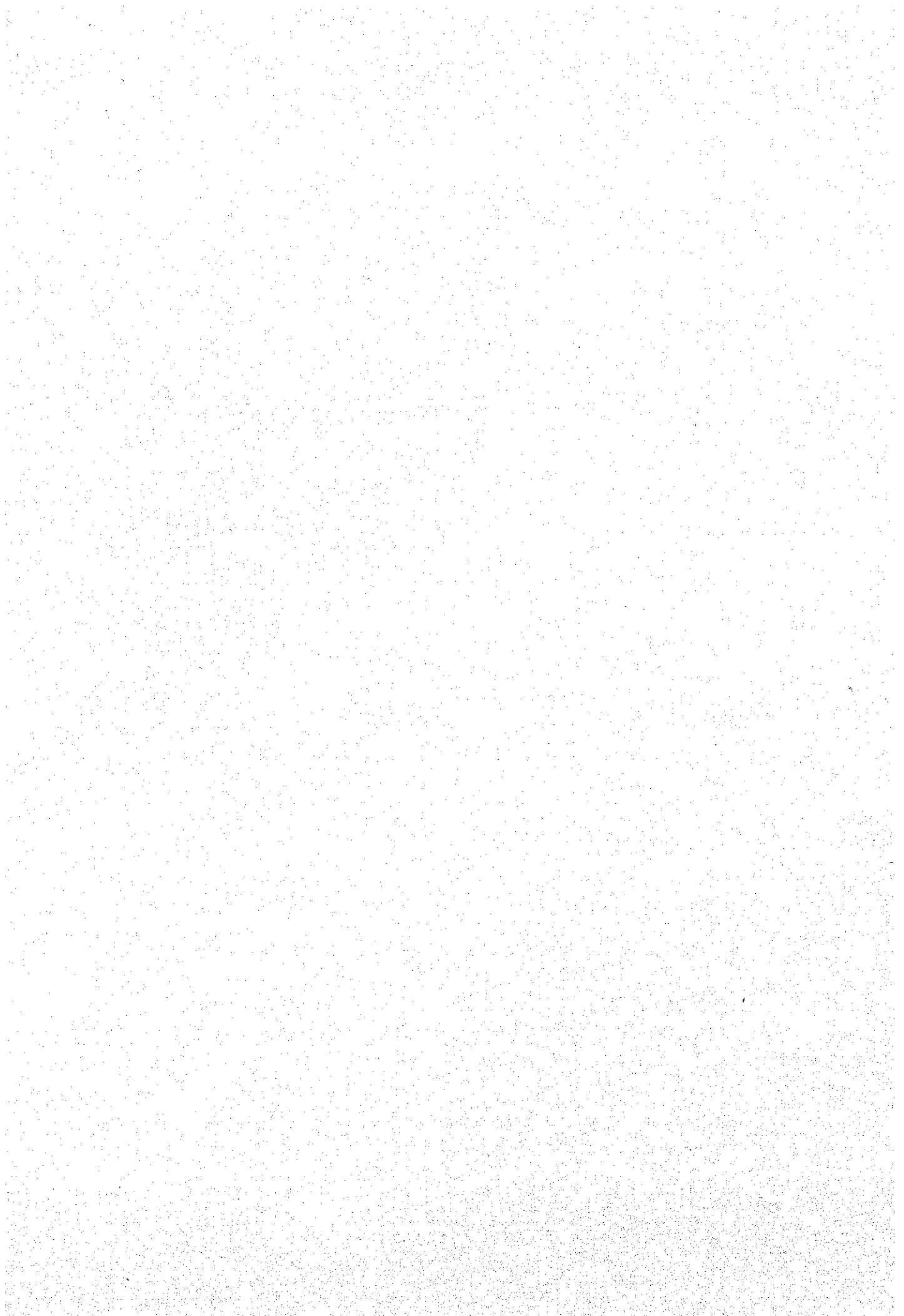


Fig. 1-10 Integrated Interpretation Map



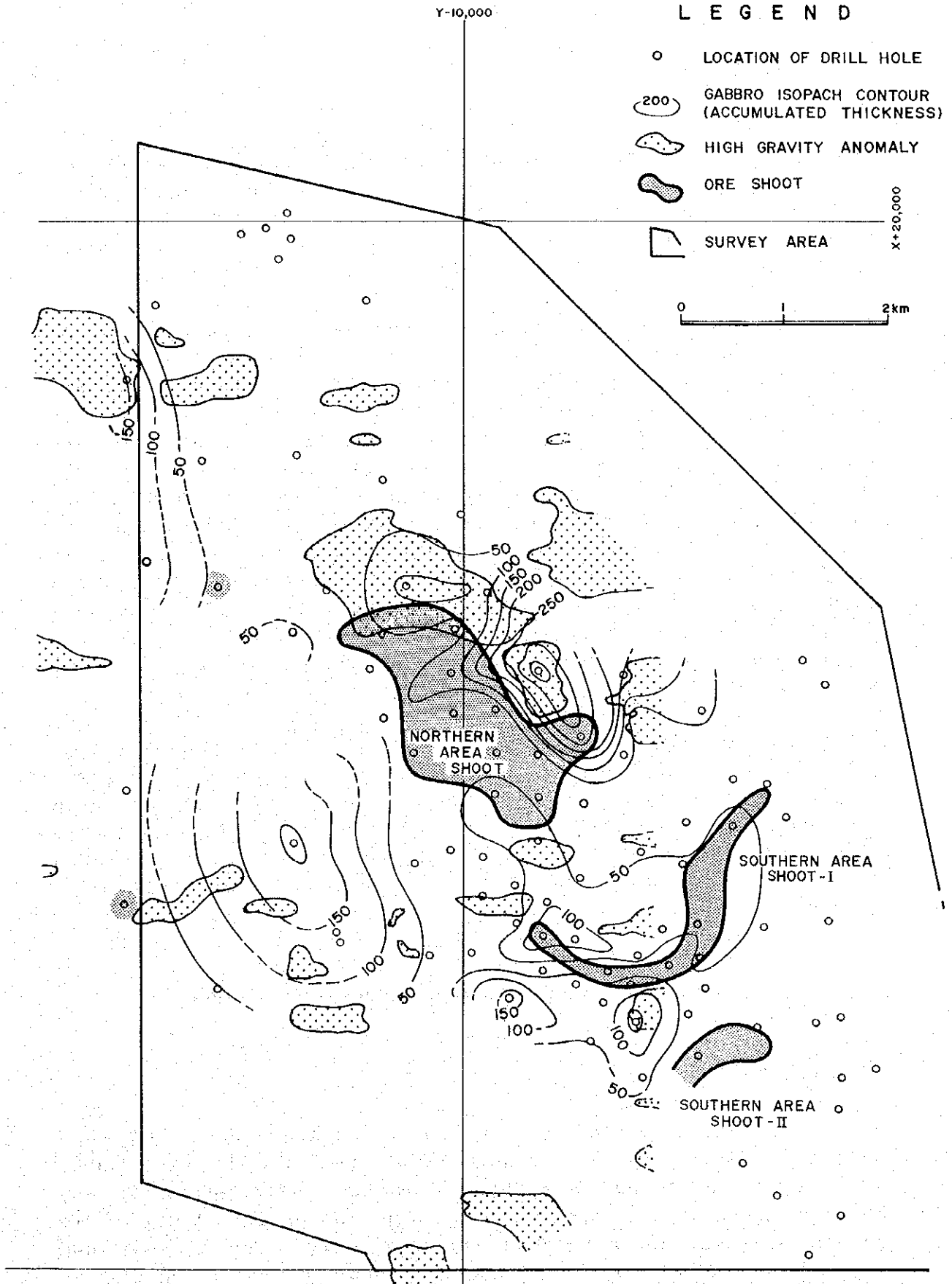


Fig.1-11 Supplementary Interpretation Map

4-2 Mineral Potential

Zones of high potential for shale-type copper mineralization are in the limbs of palaeo-basement highs at the time of ore deposition, particularly in the local basement depressions parallel to the palaeo-coastlines. Also ore shoots were not formed where thick gabbroic bodies occur and in gravity highs in this area.

It is clear from the data obtained by the present survey that the palaeo-basement highs at the time of ore deposition are distributed on the southeastern side, northern side and northwestern side of the Northern Area Shoot in this area. The drilling carried out this year confirmed that the palaeo-basement high in the northwest is quite extensive. High grade ore (width 10.72m, Cu 2.11%, Co 0.09%) have been confirmed on the southern limb of this palaeo-basement high by N-75. The gabbroic body clarified from this borehole is not very thick. It is also clarified by the drilling this year that the Northern Area Shoot extends to MJZC-5, and there is a possibility that this extends further westward through the south of MJZC-7. From the above, the mineral potential in the unexplored zone to the south of NN-75 is considered to be high.

In the southern part of this area, relatively good ore has been located by MJZC-2 drilled last year and also a Chibuluma-type mineralized zone was confirmed by MJZC-1 of this year. The unexplored zone to the south of these two boreholes is devoid of high gravity parts and the occurrence of a hitherto unknown deposit or the extension of the Southern Area Shoot-II is a possibility.

Chapter 5 Conclusions and Recommendations

5-1 Conclusions

Drilling was carried out during the second-phase of the Chambishi Southeast area mineral exploration. All five boreholes drilled during this phase attained their objectives by penetrating the ore horizon. The four boreholes designed to obtain basement data reached the basement. The geology and mineralization of the vicinity of known deposits were thus

clarified and the following conclusions were reached.

1. MJZC-5 drilled in the northwestern part of this area encountered relatively good ore (width 3.10m T-Cu 1.93% T-Co 0.03%, width 2.64m T-Cu 2.32% T-Co 0.03%). This orebody is believed to be the northwestern extension of the Northern Area Shoot which is the major ore shoot of this area. From this, extension of the northern part of the Northern Area Shoot in the west-northwest direction has become a possibility to be considered seriously.

2. MJZC-6 and MJZC-7 drilled to the west-northwest of MJZC-5 encountered relatively low grade ores and they are considered to be located near the palaeo-basement high at the time of ore deposition. The ore shoot confirmed by NN-75 located between these two boreholes is inferred to be developed in the local depression to the south of NN-75, MJZC-6 and MJZC-7, namely on the southern limb of the palaeo-basement high.

3. MJZC-1 drilled in the southern part of the area encountered relatively low-grade ore. This mineralization, however, is developed immediately below the "Ore Shale" and is believed to be of the same type as that of the currently operating Chibuluma mine. To the east of MJZC-1, MJZC-2 confirmed relatively high-grade ore last year. This brings out the possibility that ore shoot may exist in the unexplored areas to the south of the above two boreholes.

4. MJZC-8 drilled in the southeastern part of the Northern Area Shoot encountered only weakly mineralized zone. This is most likely located at the crest of the palaeo-basement high and is considered to be barren.

5-2 Recommendations for the Third Phase

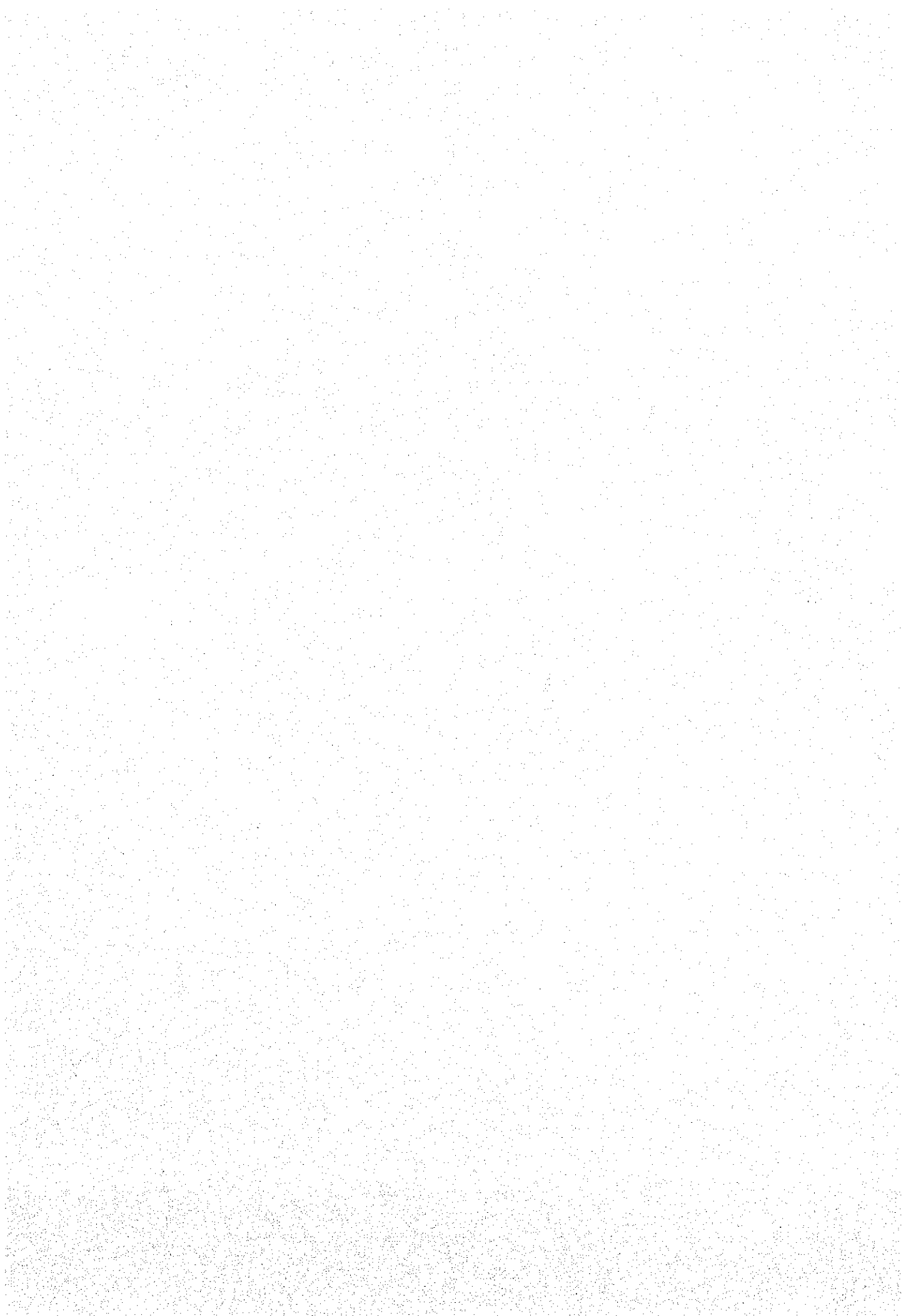
It is concluded from the results of the drilling reported above that the most promising area for discovering new ore deposits is; the area northwest of the Northern Area Shoot, namely south of NN-75, south of MJZC-6 and south of MJZC-7. Next in line of prospectivity is the area south of MJZC-1 and MJZC-2.

The Northern Area Shoot, the most important deposit of the project area, however, has not been prospected sufficiently and

drilling along the periphery of the deposit is necessary in order to evaluate the ore reserve of this deposit accurately.

With the above consideration, drilling plan as shown in Figure 1-12 has been formulated for the third phase. The planned depth of the drilling is that of the basement for new areas, but for those with known basement depth, the figures are those designed to reach the footwall of the orebodies.

It is thus recommended that drilling be carried out with high priority for the search for new deposits and that the ore reserves of this area be accurately evaluated by integrated study of the drilling results.



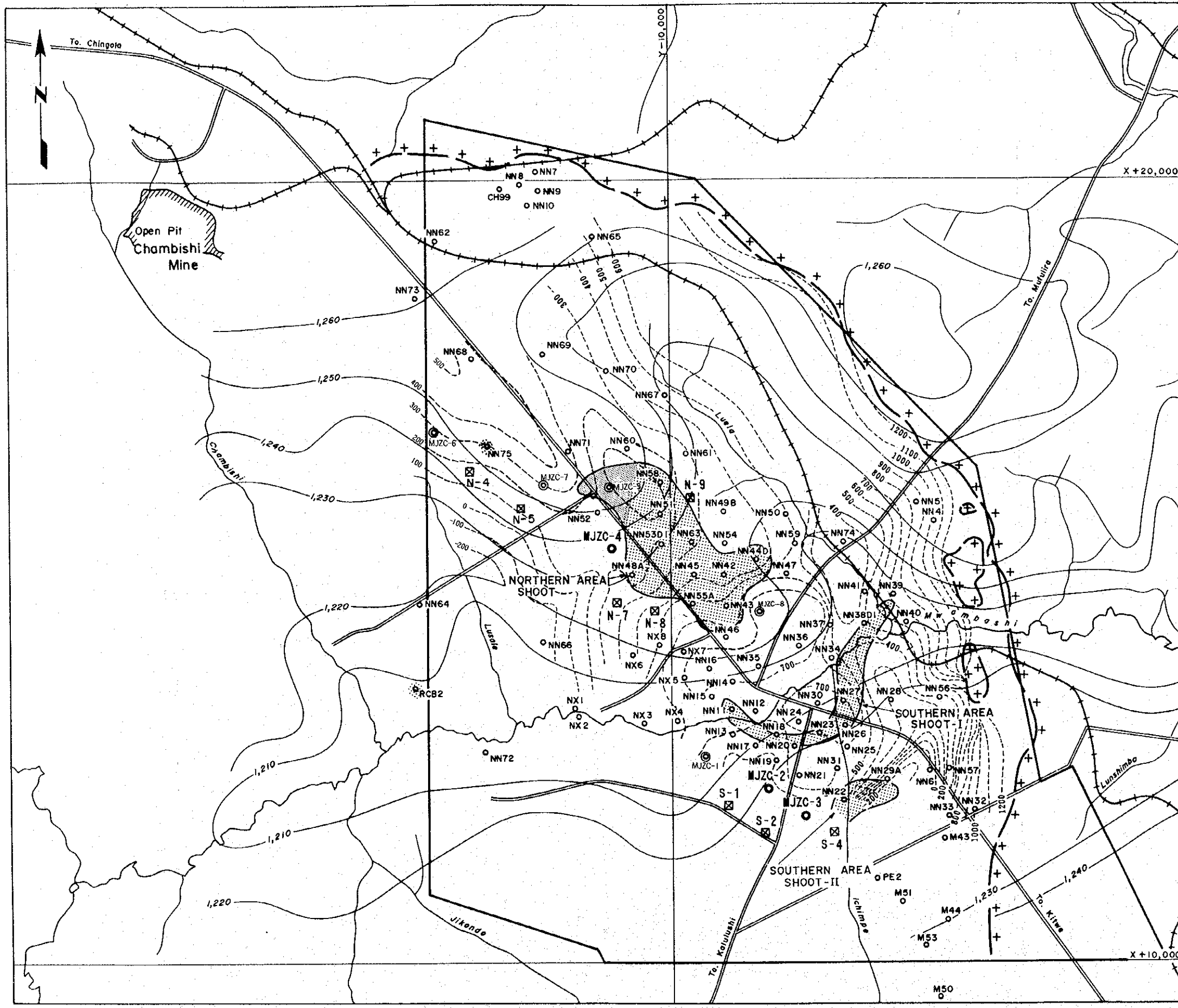
Priority	Drill Hole No.	Inclination	Drilling Length (m)
1	N-4	-90	1,100 (B)
2	N-5	-90	1,100 (B)
3	S-1	-90	1,100 (B)
4	S-2	-90	1,100 (B)
5	N-7	-90	800 (F)
6	N-8	-90	800 (B)
7	N-9	-90	1,000 (F)
8	S-4	-90	1,400 (B)
	Total		8,400

B: To the Basement
 F: To the footwall of the ore horizon

LEGEND

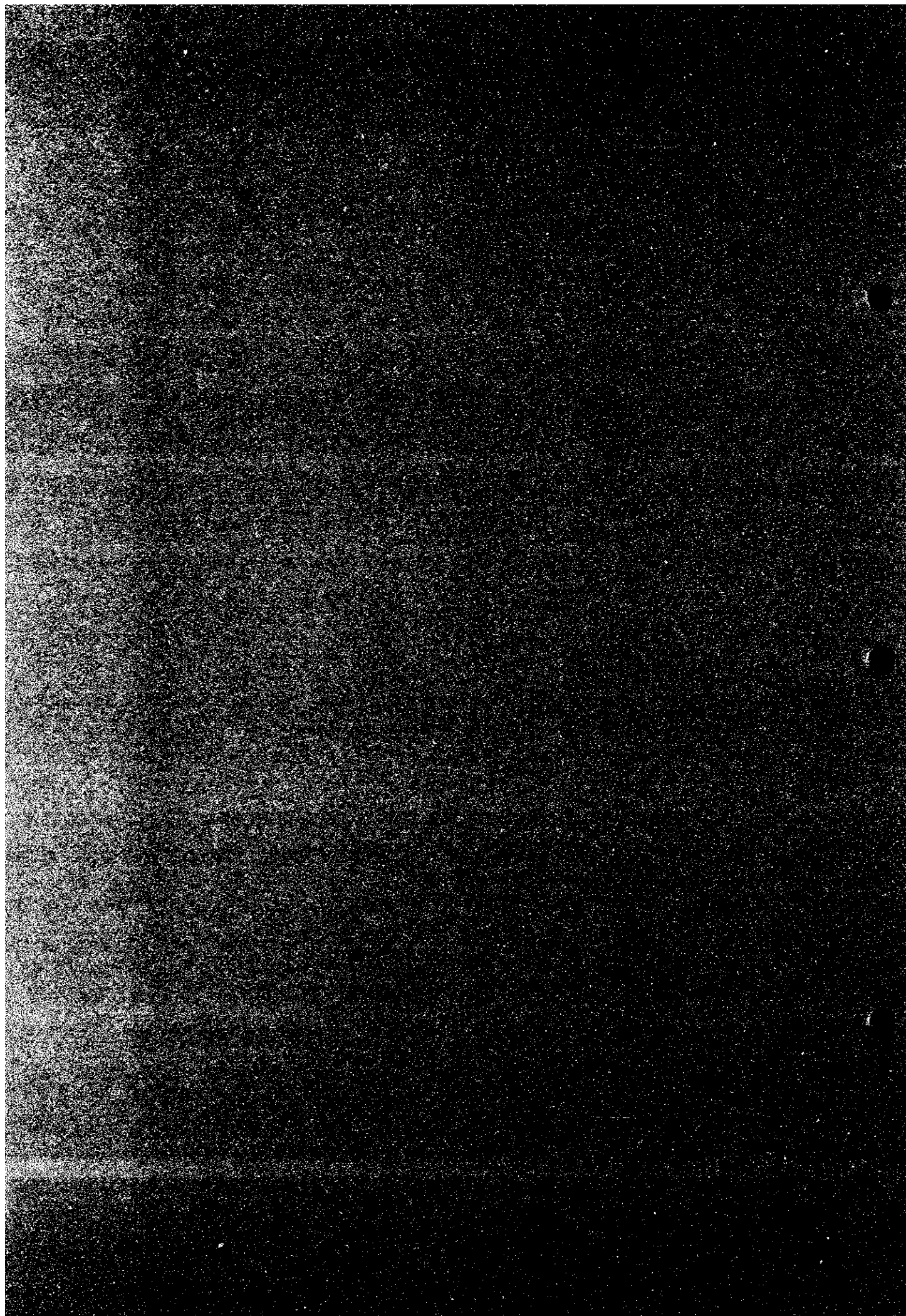
- ☒ LOCATION OF DRILLHOLES RECOMMENDED
- LOCATION OF EXISTING DRILL HOLES
- TOPOGRAPHIC ELEVATION CONTOUR IN METRES
- - - TOP OF BASEMENT ELEVATION CONTOUR IN METRES
- ☞ ORE SHOOT (T-Cu>2%)
- + + SURFACE DISTRIBUTION OF BASEMENT
- ▭ SURVEY AREA

Fig.1-12
 Drill Holes Recommended for 2nd and 3rd phase exploration



PART II

DETAILED DISCUSSIONS



PART II DETAILED DISCUSSIONS

Chapter 1 MJZC - 1

1-1 Progress of Drilling

The location and the collar elevation of MJZC-1 are as follows.

Co-ordinates		Collar Elevation	Drilling Length	Inclination
X	Y			
+12,650.6	-9,549.9	1,198.5m	650.85m	-90°

Summary of the drilling, record of the drilling operation and the drilling progress are shown in Tables 2-1-1 and 2-1-2, and Figure 2-1-1, respectively.

For the near surface zone to 33.78m, non-core drilling was made by 117mm tricone bit, but the rocks were hard and tricone bits could not be used, and NW casing pipes were inserted to 33.78m. Truck-mounted WL with NQ bit and CHD rod was used for coring to the bottom (650.85m). Cuttings were collected at 1 m intervals during non-core drilling.

Water was pumped from a river at a distance of 300m through a pipeline drawn by BQ rod.

Half of the circulation was lost at 140m and total circulation loss occurred at 190m depth. Blind drilling was done, but it was recovered near 480m depth. Below this depth, Drillprop was used for protecting the wall. Rod grease and cutting oil were used for preventing vibration during drilling.

This borehole was completed in short time because an experienced operator arrived from South Africa.

Borehole deviation was measured at 100 m intervals. Measurement showed northwestward deviation similar to the previous ones in the vicinity (Appendices).

Table 2-1-1 Summary of the Drilling Operation on MJZC-1

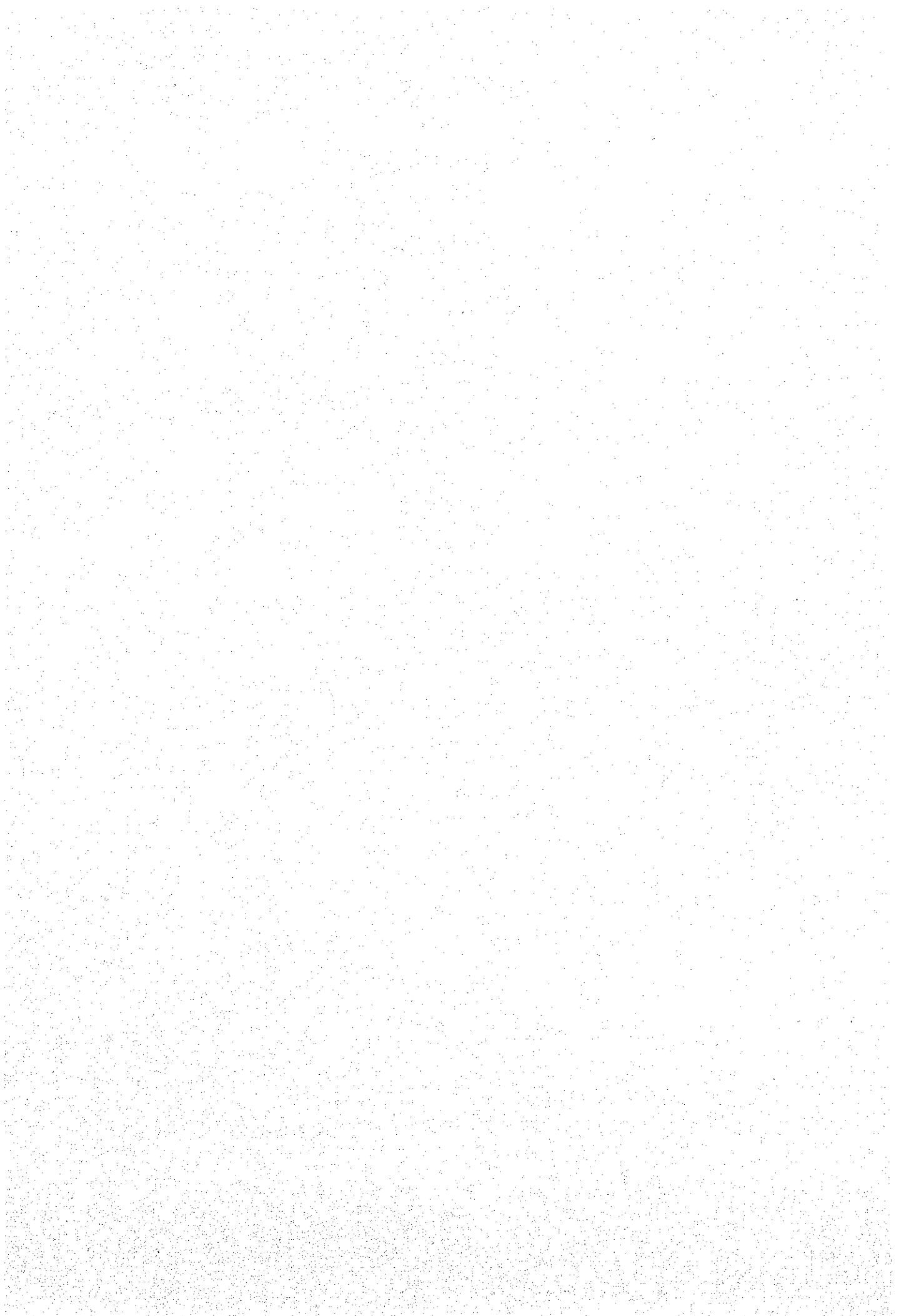
Operation	Survey Period				Total Man Day		
	Period	Day	Work Day	Off Day	Engineer	Worker	
Preparation	06. 11. 1994~08. 11. 1994	2. 50	2. 50	0. 00	9. 00	24. 00	
Drilling	08. 11. 1994~30. 11. 1994	21. 50	Drilling 16. 50	4. 00	61. 00	181. 00	
			Recovering 1. 00	0. 00	5. 00	10. 00	
Dismantling	01. 12. 1994~06. 12. 1994	6. 00	5. 00	1. 00	17. 00	38. 00	
Total	06. 11. 1994~06. 12. 1994	30. 00	25. 00	5. 00	92. 00	253. 00	
Drilling Length	m		m	Core Recovery of 100m Hole			
Length Planned	800. 00	Overburden	33. 78	Depth of Hole (m)	Core Recovery (%)	Core Recovery Cumulated (%)	
Increase/Decrease in Length	-149. 15	Core Length	602. 32				
Length Drilled (N/C Drilling) (Core Drilling)	650. 85	Core Recovery	97. 61	0. 00- 100. 00	88. 31	88. 31	
	33. 78			100. 00- 200. 00	96. 25	93. 09	
	617. 07			200. 00- 300. 00	97. 33	94. 68	
Working Hours	h	%	%	300. 00- 400. 00	99. 72	96. 06	
Drilling	241. 00	51. 72	34. 01	400. 00- 500. 00	99. 69	96. 84	
Other Working	187. 00	40. 13	26. 39	500. 00- 600. 00	100. 00	97. 40	
Recovering	38. 00	8. 15	5. 36	600. 00- 700. 00	100. 00	97. 61	
Subtotal	466. 00	100. 00	65. 75				
Reassemblage	24. 00		3. 39				
Dismantlement	20. 00		2. 82				
Water Supply	168. 70		23. 80				
Road Construction	6. 00		0. 85				
Transportation	24. 00		3. 39	Efficiency of Drilling			
Grand Total	708. 70		100. 00	Total Length / Drilling Period	m 650. 85	day 21. 50	m/day 30. 27
Casing Pipe Inserted				Total Length / Total Drilling Shifts	m 650. 85	shift 35. 00	m/shift 18. 60
				Drilling Length / Each Bit (m)			
Size	Meterage (m)	Meterage / Drilling Length ×100 (%)	Recovery (%)	Bit Size	Drilled Length	Core Length	
mm	0. 00	0. 00		mm	0. 00	N/C	
HW	0. 00	0. 00		117mm	33. 78	N/C	
NW	33. 78	5. 19	100. 00	mm	0. 00	N/C	
BX	0. 00	0. 00		HQ	0. 00	0. 00	
				NQ	617. 07	602. 32	
				BQ	0. 00	0. 00	

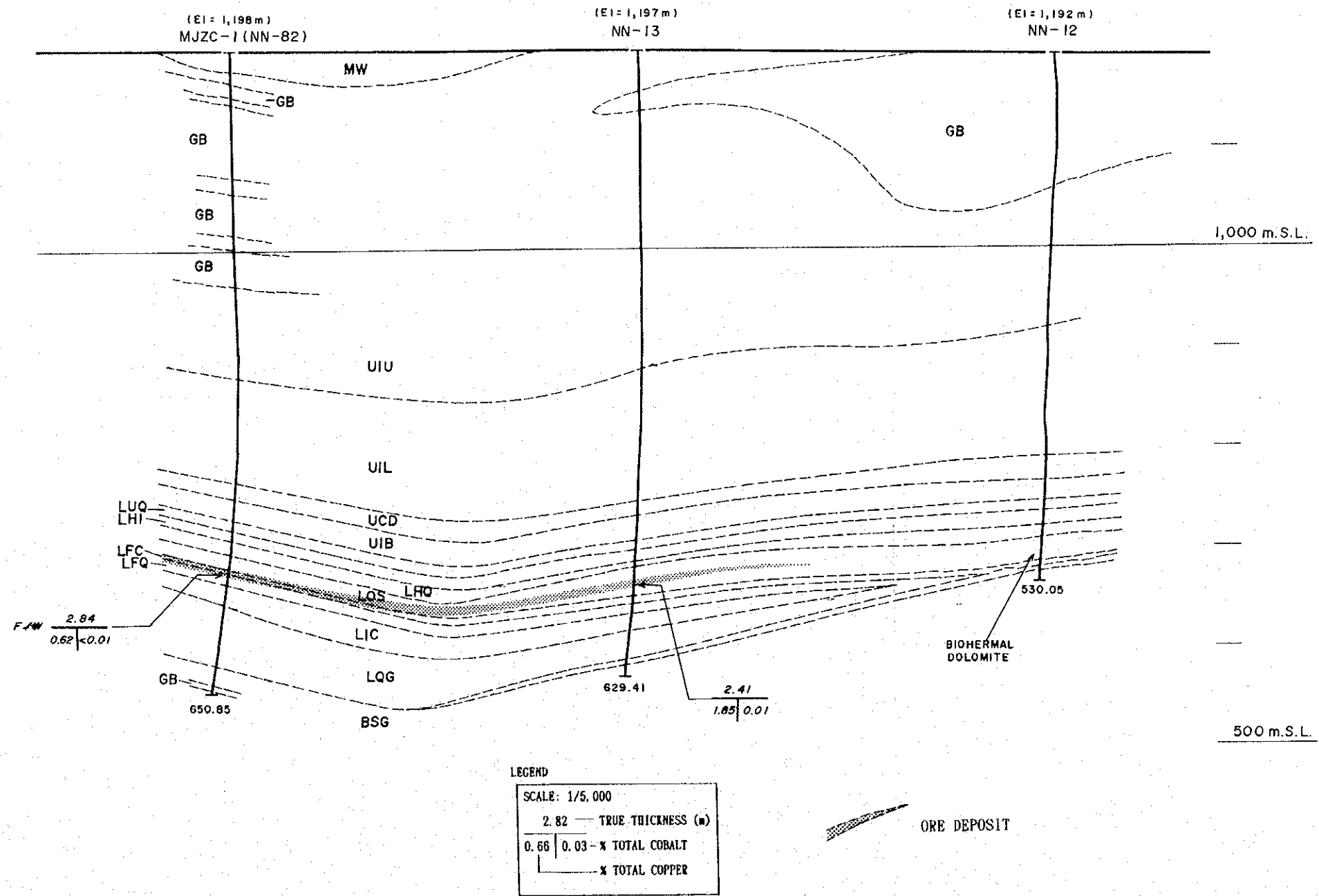
Table 2-1-2 Record of the Drilling Operation on MJZC-1

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Nov 6	Rd-con	-	0.00	0.00	0.00	0.00	1.00	2.00	6.00
7	Tra	Reas	0.00	0.00	0.00	0.00	2.00	4.00	12.00
8	Tra-Reas	33.78	33.78	33.78	0.00	1.00	2.00	5.00	11.00
9	In-cp	Day off	33.78	0.00	0.00	0.00	1.00	3.00	5.00
10	21.10	12.65	67.53	33.75	26.33	2.00	2.00	3.00	10.00
11	36.00	23.63	127.16	59.63	59.31	2.00	2.00	3.00	10.00
12	30.37	17.69	175.22	48.06	46.67	2.00	2.00	3.00	10.00
13	Day off	Day off	175.22	0.00	0.00	0.00	0.00	2.00	2.00
14	36.21	18.10	229.53	54.31	51.95	2.00	2.00	3.00	10.00
15	6.00	5.15	240.68	11.15	10.60	2.00	2.00	3.00	10.00
16	7.72	6.90	255.30	14.62	13.79	2.00	2.00	3.00	10.00
17	42.73	45.50	343.53	88.23	86.94	2.00	2.00	3.00	10.00
18	8.38	21.17	373.08	29.55	29.43	2.00	2.00	3.00	10.00
19	24.45	Day off	397.53	24.45	24.35	1.00	1.00	3.00	6.00
20	Maint	Day off	397.53	0.00	0.00	0.00	1.00	3.00	5.00
21	Out. In-Rd	30.00	427.53	30.00	29.94	2.00	2.00	3.00	10.00
22	35.23	12.77	475.53	48.00	47.69	2.00	2.00	3.00	10.00
23	30.00	18.00	523.53	48.00	48.00	2.00	2.00	3.00	10.00
24	Maint	6.00	529.53	6.00	6.00	2.00	2.00	3.00	10.00
25	24.00	24.00	577.53	48.00	48.00	2.00	2.00	3.00	10.00
26	24.00	16.40	617.93	40.40	40.40	2.00	2.00	3.00	10.00
27	Day off	Day off	617.93	0.00	0.00	0.00	0.00	2.00	2.00
28	Out. In-Rd	6.20	624.13	6.20	6.20	2.00	2.00	3.00	10.00
29	6.10	Day off	630.23	6.10	6.10	1.00	1.00	3.00	6.00
30	19.25	1.37	650.85	20.62	20.62	2.00	2.00	3.00	10.00
Dec 1	Out. In-Rd	-	650.85	0.00	0.00	0.00	1.00	3.00	6.00
2	Dis	-	650.85	0.00	0.00	0.00	1.00	3.00	6.00
3	Surv	-	650.85	0.00	0.00	0.00	1.00	3.00	6.00
4	Day off	-	650.85	0.00	0.00	0.00	0.00	2.00	2.00
5	Dis-Tra	-	650.85	0.00	0.00	0.00	1.00	4.00	11.00
6	Dis-Tra	-	650.85	0.00	0.00	0.00	1.00	2.00	7.00
Total	351.54	299.31	650.85	650.85	602.32	35.00	46.00	92.00	253.00

Abbreviations:

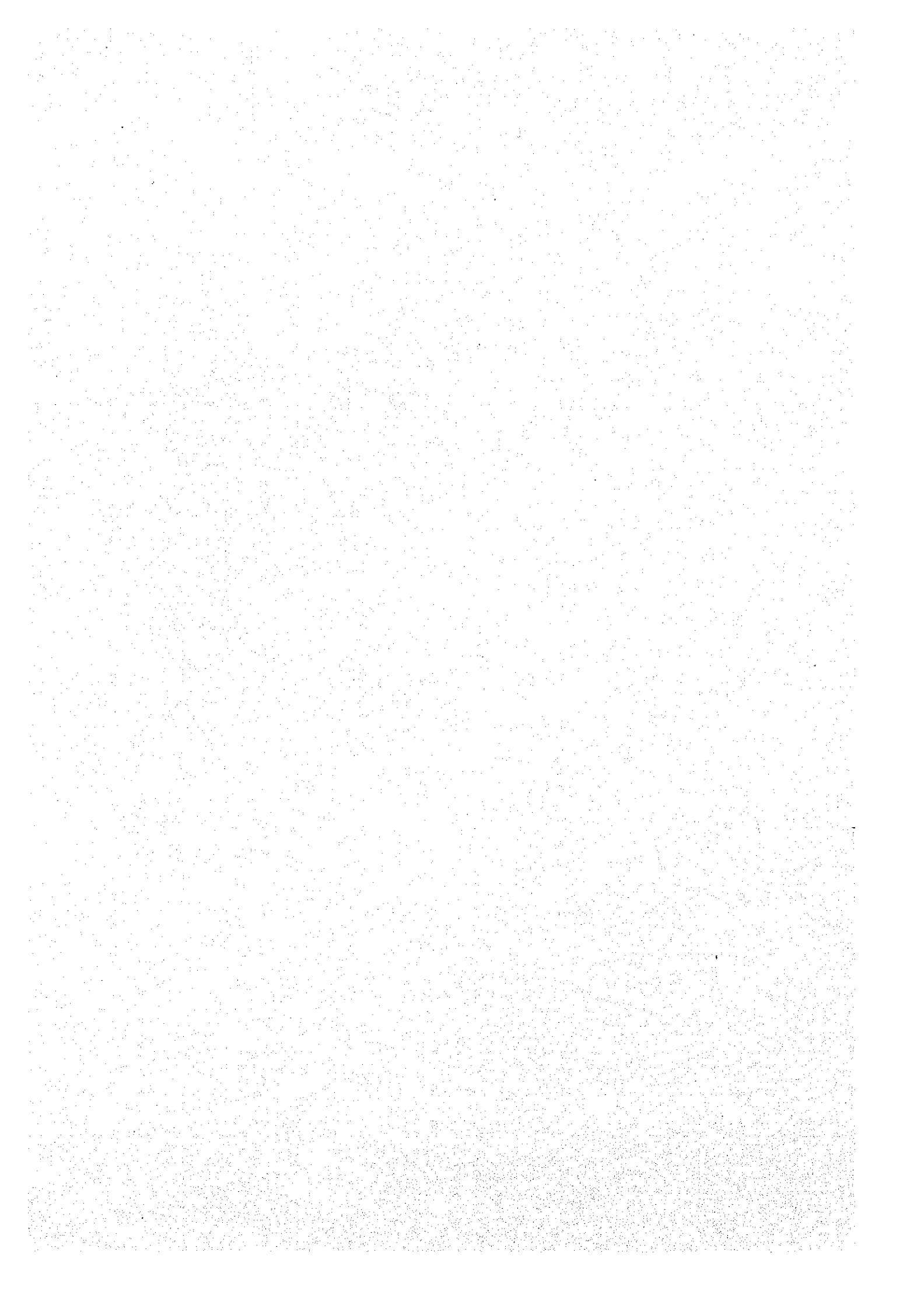
Band: Banding bit, Cem: Cementing, Dis: Dismantlement, Dr-cem: Dredging cemento, Exc-rd: Exchanging rod, In-cp: Inserting casing pipe, In-rd: Inserting rod, Maint: Maintenance of machines, Out-cp: Taking out casing pipe, Out-rd: Taking out rod, P-d: Preparation for drilling, Rd-con: Rod construction, Rd-ex: Rod examination, Ream: Reaming, Reass: Reassemblage, Recov: Recovering, Search: Searching pump, Surv: Surveying of hole deviation, Tra: Transportation, Wash: Washing, Wedge: Wedging, Wt-e/m: Waiting for equipment/material, Wt-hd: Waiting for hardening





Symbols for geologic units refer to Fig. 1-6

Fig. 2-1-2 Geological Profile of Drill Hole (MJZC-1)



1-2 Geology and Mineralization

The geologic log is appended. Basal conglomerate is not developed immediately over the basement rocks at this hole. But the geology of the borehole is similar to that of the survey area, which is described in 3-2 of PART I. Geological description of the borehole is as follows.

Basement: 622.50 to 650.85 m. White to grey granite constitutes the basement and the upper part (622.50-643.10m) is fractured. The main component minerals are quartz, potash feldspar, plagioclase, biotite and muscovite, and the accessory minerals are sphene, opaque minerals, carbonates, apatite and zircon. It also contains epidote and chlorite as the altered minerals. Bleached alteration zones occur in parts of the basement and also anhydrite veinlets are dispersed. A thin amphibolite intercalation occurs immediately below the upper fractured zone. This amphibolite is considered to be a mafic igneous intrusion. coarse crystalline quartz veins are developed at the lower boundary of the amphibolite.

Lower Roan Group

"Feldspathic Quartzite and Grit": 556.00 to 622.50m. The upper part is composed of dark grey to pinkish grey pebbly quartzite with pelitic bands. The middle part is composed of conglomerate consisting of granite pebbles. The lower part is composed of pelitic rocks locally containing granite pebbles. Gypsum and anhydrite veinlets occur scattered throughout upper to middle part and in the lower part quartz and dolomite veinlets are observed.

"Intermediate Conglomerate": 536.00 to 556.00m. The conglomerate is black and contains various types of pebbles such as quartzite, biotite schist, chert, granite, gneiss, sandstone and pelitic rocks.

"Footwall Quartzite": 523.50 to 536.00m. The upper part is white pebbly quartzite with granite pebbles. The middle to lower part is dark gray pelitic quartzite rich in biotite with many intercalations of thin argillite. Chalcopyrite dissemination is observed between 523.50 - 530.60m.

"Footwall Conglomerate": 520.90 to 523.50m. This consist of gray conglomerate with quartzite, black schist and pelitic

pebbles. Chalcopyrite dissemination is observed.

"Ore Shale Horizon": 504.10 to 520.90m. It consists mainly dolomitic argillites with grey and black thinly laminated layers. The basal part of this formation is made up of pelitic dolomites. The interval of 508.30 to 520.90m is the sulfide mineralized zone rich in pyrrhotite with minor amount of chalcopyrite and pyrite. The sulfides occur in thin lenses parallel to the bedding planes, irregular veinlets and as dissemination in the rims of dolomitic concretions. Results of ore assay are shown in Table 2-6-3.

"Hangingwall Quartzite and Argillite": 489.80 to 504.10m. The upper part consists of mainly grey to white pelitic quartzites with many thin argillite beds and thin pelitic dolomite beds. The lower part consists of pelitic and dolomitic sandstone with intercalation of thin pelitic dolomite beds.

"Interbedded Argillite and Quartzite": 479.40 to 489.80m. It is mainly composed of dark grey pelitic to dolomitic sandstone with intercalation of thin argillite, anhydritic dolomite and quartzite. Lenses of anhydrites are observed.

"Upper Quartzite": 469.70 to 479.40m. It is composed of pink quartzite with pelitic and micaceous bands.

Upper Roan Group

"Interbedded Argillite, Dolomite and Quartzite": 447.90 to 469.70m. The upper part consists mainly of dolomitic sandstone with intercalation of thin dolomite beds. The lower part consists of alternation of thin bedded dolomite and argillite.

"Cherty Dolomite": 431.70 to 447.90m. It mainly consists of massive white dolomite with silica lenses, anhydrite and muscovite. In the upper part, greenish grey argillite (Marker Shale) is intercalated. While, in the lower part, dark grey pelitic dolomite is intercalated. Very fine-grained chalcopyrite is disseminated between 442.50 and 443.00m.

"Arenite, Argillite and Dolomite with Anhydrite": 326.70 to 431.70m. The upper part consists of greenish grey dolomitic argillite and pelitic dolomite alternation, the middle part of grey sandy and dolomitic argillite and pelitic dolomite, the lower part of greenish grey sandy to gritty argillite with

intercalation of thin dolomite and quartzite. There are many lenses of anhydrite and gypsum in this formation.

"Interbedded Argillite and Dolomite with Tectono-Breccias": 47.48 to 53.50m, 127.50 to 142.40m, 187.00 to 199.80m, 233.00 to 326.70m. The upper part consists of dolomite, greenish grey dolomitized argillite, dark green micaceous argillite, greyish white pelitic quartzite, greyish white dolomitic sandstone and grey conglomeratic silicified rock and the lower part of alternation of green micaceous to dolomitic argillite and dolomite. This formation is generally limonitized (dissemination, veinlets) and the upper part is partly silicified.

"Mwashia Group": 00.00 to 33.78? m. The surface laterite is considered to be derived from micaceous argillite and is believed to belong to Mwashia Group from the surface geology.

"Gabbro": Gabbroic bodies occur at many parts in intervals of 33.78 to 47.48m, 53.50 to 127.50m, 142.40 to 187.00m, 199.80 to 233.00m. These are dark green altered massive bodies rich in biotite accompanied by grey intensely silicified rocks. In these gabbroic bodies, calcite, biotite, silica, dolomite, veinlets are developed.

1-3 Discussions

It is seen from the cross sections (Figs. 1-7, 2-1-2) that this borehole differs from NN-13 and NN-12 to the northeast in that dolomite is not developed in the "Ore Shale horizon", and the "Footwall Formation" is thick. It is, therefore, considered that this site was offshore at a distance from the coast during the formation of the ore deposit.

The mineralization of the "Ore Shale" of this borehole belongs to the chalcopyrite-pyrrhotite zone, but the copper grade is low with high pyrrhotite content and thus it is believed that the hole is relatively close to the pyrite-pyrrhotite zone considered to occur to the southwest of this site. Also there is a chalcopyrite mineralized zone (width 2.85m T-Cu 0.62% T-Co <0.01%) in the "Footwall Formation" immediately below the "Ore Shale" mentioned above. The mineralization of the upper part of the "Footwall Formation" and that of the "Ore Shale" is believed to be of the same series and the difference between

the two probably is the result of the different depositional environment of the two formations. Namely, the "Ore Shale" of this site was too strongly reducing for copper deposition because of the rapid deepening of the sea at the time of deposition. During the later part of the "Footwall Formation" deposition to that of the "Ore Shale", relatively large amount of copper probably was brought to the vicinity of this borehole site and the precipitation of copper minerals is believed to have been controlled by the sea bottom topography of that time.

Chapter 2 MJZC - 5

2-1 Progress of Drilling

The location and the collar elevation of MJZC-5 are as follows.

Co-ordinates		Collar Elevation	Drilling Length	Inclination
X	Y			
+16,100.29	-10,799.30	1,246.1m	1,100.15m	-90°

Summary of the drilling, record of the drilling operation and the drilling progress are shown in Tables 2-2-1 and 2-2-2, and Figure 2-2-1, respectively.

For the near surface zone to 37.00 m, non-core drilling was made by 212mm percussion bit, further to 55.00m by 114mm percussion bit and 165mm casing pipes were inserted to 43.00m because of the increase of water flow out (approximately 60 lit/min.). Percussion drilling was continued by 114mm bit to 184m where percussion was given up due to the increase of water flow out, changed to skid-mounted WL, and casing pipes were inserted to 183.00m. Core drilling was done by NQ bit to 1,100.15m by WL. Rod grease and cutting oil were used in order to prevent vibration during operation. Cuttings were collected at 1 m interval for non-core drilling.

Water was transported from a dammed reservoir in 4,500 lit. tanks by a tractor taking one hour round trip.

Fractured zones collapsed at 368-374 m and 510-525 m depths and these zones were cemented and secured.

The bit burned at 804.68m depth, became impossible to drill further, the hole was wedged (1.5') at 774.8m and drilling continued to 1,100.15m.

After wedging, CHD rods which are thicker than NQ were used to avoid rod breakage.

Borehole deviation was measured every 100m. The measurement showed that the borehole deviated northwestward similar to those of previous holes in the vicinity (Appendices).

Table 2-2-1 Summary of the Drilling Operation on MJZC-5

Operation	Survey Period				Total Man Day		
	Period	Day	Work Day	Off Day	Engineer	Worker	
Preparation	05.08.1994~08.08.1994	3.50	3.50	0.00	6.00	40.00	
Drilling	08.08.1994~11.12.1994	125.50	Drilling 102.50	16.00	336.00	706.00	
			Recovering 7.00	0.00	34.00	62.00	
Dismantling	12.12.1994~15.12.1994	4.00	4.00	0.00	15.00	31.00	
Total	05.08.1994~15.12.1994	133.00	117.00	16.00	391.00	839.00	
Drilling Length	m		m	Core Recovery of 100m Hole			
Length Planned	1100.00	Overburden	12.00	Depth of Hole (m)	Core Recovery (%)	Core Recovery Cumulated (%)	
Increase/Decrease in Length	0.15	Core Length	894.79				
Length Drilled (N/C Drilling)	1100.15	Core Recovery	97.67	0.00- 100.00	0.00	0.00	
(Core Drilling)	184.00			100.00- 200.00	87.00	87.00	
	916.15			200.00- 300.00	98.10	96.57	
Working Hours	h	%	%	300.00- 400.00	94.95	95.82	
Drilling	543.50	31.02	24.52	400.00- 500.00	93.67	95.14	
Other Working	487.00	27.80	21.97	500.00- 600.00	100.00	96.31	
Recovering	721.50	41.18	32.54	600.00- 700.00	95.67	96.18	
Subtotal	1752.00	100.00	79.03	700.00- 800.00	99.81	96.77	
Reassemblage	13.00		0.59	800.00- 900.00	99.73	97.19	
Dismantlement	12.00		0.54	900.00-1000.00	99.24	97.44	
Water Supply	343.00		15.47	1000.00-1100.00	99.55	97.67	
Road Construction	24.00		1.08				
Transportation	73.00		3.29	Efficiency of Drilling			
Grand Total	2217.00		100.00	Total Length / Drilling Period	m 1100.15	day 125.50	
Casing Pipe Inserted					m/day 8.77		
Size	Meterage	Meterage / Drilling Length ×100	Recovery	Total Length / Total Drilling Shifts	m 1100.15	shift 132.00	m/shift 8.33
	(m)	(%)	(%)	Drilling Length / Each Bit (m)			
mm	0.00	0.00		Bit Size	Drilled Length	Core Length	
165mm	44.00	4.00	100.00	212mm	37.00	N/C	
HW	0.00	0.00		mm	0.00	N/C	
NW	183.00	16.63	13.11	114mm	147.00	N/C	
BX	0.00	0.00		HQ	0.00	0.00	
				NQ	916.15	894.79	
				BQ	0.00	0.00	

Table 2-2-2 Record of the Drilling Operation on MJZC-5 (1)

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Aug 5	Rd-con	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
6	Rd-con	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
7	Tra	Tra	0.00	0.00	0.00	0.00	2.00	2.00	16.00
8	Tra		11.00	11.00	0.00	1.00	2.00	4.00	16.00
9	26.00	Wash	37.00	26.00	0.00	2.00	2.00	6.00	10.00
10	10.00	15.00	62.00	25.00	0.00	2.00	2.00	6.00	10.00
11	22.00	73.00	157.00	95.00	0.00	2.00	2.00	5.00	10.00
12	24.00	3.00	184.00	27.00	0.00	2.00	2.00	5.00	10.00
13	Tra	Day off	184.00	0.00	0.00	0.00	1.00	3.00	5.00
14	In-op	Day off	184.00	0.00	0.00	0.00	1.00	4.00	16.00
15	In-rd	9.00	193.00	9.00	7.82	2.00	2.00	4.00	16.00
16	26.10	22.79	241.89	48.89	47.99	2.00	2.00	4.00	16.00
17	31.78	13.86	287.53	45.64	44.74	2.00	2.00	4.00	16.00
18	35.36	18.00	340.89	53.36	52.36	2.00	2.00	4.00	16.00
19	18.00	27.00	385.89	45.00	44.09	2.00	2.00	4.00	12.00
20	22.00	22.11	430.00	44.11	39.97	2.00	2.00	4.00	10.00
21	1.13	4.96	436.09	6.09	5.93	2.00	2.00	4.00	8.00
22	21.70	9.10	466.89	30.80	30.03	2.00	2.00	4.00	8.00
23	18.00	12.00	496.89	30.00	29.80	2.00	2.00	4.00	8.00
24	18.00	Out-rd	514.89	18.00	12.80	2.00	2.00	4.00	8.00
25	8.46	5.54	528.89	14.00	11.55	2.00	2.00	4.00	8.00
26	0.10	Day off	528.99	0.10	0.10	1.00	1.00	3.00	4.00
27	Day off	Day off	528.99	0.00	0.00	0.00	0.00	0.00	0.00
28	Day off	Day off	528.99	0.00	0.00	0.00	0.00	2.00	2.00
29	Dr-cem	Dr-cem	528.99	0.00	0.00	0.00	2.00	3.00	8.00
30	Dr-cem	Day off	528.99	0.00	0.00	0.00	1.00	3.00	5.00
31	Dr-cem	Dr-cem	528.99	0.00	0.00	0.00	2.00	3.00	8.00
Sep 1	Cem	Wt-hd	528.99	0.00	0.00	0.00	2.00	3.00	8.00
2	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
3	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
4	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
5	Dr-cem	Dr-cem	528.99	0.00	0.00	2.00	2.00	3.00	8.00
6	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
7	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
8	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
9	Dr-cem	Dr-cem	528.99	0.00	0.00	2.00	2.00	3.00	8.00
10	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
11	Day off	Day off	528.99	0.00	0.00	0.00	0.00	2.00	2.00
12	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
13	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
14	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
15	Cem	Wt-hd	528.99	0.00	0.00	1.00	1.00	5.00	10.00
16	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
17	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
18	Day off	Day off	528.99	0.00	0.00	0.00	0.00	2.00	2.00
19	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
20	Cem	Wt-hd	528.99	0.00	0.00	2.00	2.00	4.00	9.00
21	Wt-hd	Wt-hd	528.99	0.00	0.00	0.00	0.00	2.00	2.00
22	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
23	Dr-cem	Dr-cem	528.99	0.00	0.00	2.00	2.00	3.00	8.00
24	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
25	Cem	Wt-hd	528.99	0.00	0.00	1.00	1.00	7.00	9.00
26	Dr-cem	Wt-e/m	528.99	0.00	0.00	1.00	1.00	3.00	5.00
27	Dr-cem	Dr-cem	528.99	0.00	0.00	2.00	2.00	3.00	8.00
28	Dr-cem	Dr-cem	528.99	0.00	0.00	2.00	2.00	3.00	8.00
29	Dr-cem	1.28	530.27	1.28	1.28	2.00	2.00	3.00	8.00
30	5.53	Day off	535.80	5.53	4.26	1.00	1.00	3.00	5.00
Oct 1	Day off	Day off	535.80	0.00	0.00	0.00	0.00	2.00	2.00
2	Day off	Day off	535.80	0.00	0.00	0.00	0.00	2.00	2.00
3	Maint	18.09	553.89	18.09	18.09	2.00	2.00	3.00	8.00
4	16.52	3.94	574.35	20.46	20.07	2.00	2.00	3.00	8.00
5	2.63	9.77	586.75	12.40	12.35	2.00	2.00	3.00	8.00
6	18.14	8.78	613.67	26.92	26.75	2.00	2.00	3.00	8.00
7	18.22	17.46	649.35	35.68	35.68	2.00	2.00	3.00	8.00
8	18.37	6.69	674.41	25.06	24.87	2.00	2.00	3.00	8.00
9	Day off	Day off	674.41	0.00	0.00	0.00	0.00	2.00	2.00
10	24.04	18.44	716.89	42.48	42.48	2.00	2.00	3.00	8.00
11	17.48	14.00	748.37	31.48	31.35	2.00	2.00	3.00	8.00
12	19.14	12.00	779.51	31.14	31.00	2.00	2.00	3.00	8.00
13	0.28	5.10	784.89	5.38	5.38	2.00	2.00	3.00	8.00

Table 2-2-2 Record of the Drilling Operation on MJZC-5 (2)

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
14	17.99	Band	802.88	17.99	17.99	2.00	2.00	3.00	8.00
15	Recov	Day off	802.88	0.00	0.00	1.00	1.00	4.00	6.00
16	Day off	Day off	802.88	0.00	0.00	0.00	0.00	2.00	2.00
17	Recov	Recov	802.88	0.00	0.00	2.00	2.00	4.00	10.00
18	Recov	Recov	802.88	0.00	0.00	2.00	2.00	4.00	9.00
19	Recov	Wt-e/m	802.88	0.00	0.00	1.00	1.00	4.00	6.00
20	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
21	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
22	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
23	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
24	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
25	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
26	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
27	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
28	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
29	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
30	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
31	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
Nov 1	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
2	Recov	Wt-e/m	802.88	0.00	0.00	0.00	1.00	3.00	5.00
3	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
4	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
5	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
6	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
7	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
8	Wt-e/m	Wt-e/m	802.88	0.00	0.00	0.00	0.00	2.00	2.00
9	Recov	Recov	802.88	0.00	0.00	0.00	1.00	3.00	5.00
10	Recov	Day-off	802.88	0.00	0.00	0.00	1.00	3.00	5.00
11	Day-off	Day-off	802.88	0.00	0.00	0.00	0.00	2.00	2.00
12	Recov	Day-off	802.88	0.00	0.00	0.00	1.00	3.00	5.00
13	Day-off	Day-off	802.88	0.00	0.00	0.00	0.00	2.00	2.00
14	Recov	Day-off	802.88	0.00	0.00	0.00	1.00	3.00	5.00
15	Recov	Wedge	802.88	0.00	0.00	0.00	2.00	5.00	8.00
16	Wedge	R-D(2.55)	802.88	0.00	0.00	1.00	2.00	4.00	8.00
17	R-D(3.40)	R-D(6.00)	802.88	0.00	0.00	2.00	2.00	3.00	8.00
18	R-D(6.96)	Maint	802.88	0.00	0.00	2.00	2.00	3.00	8.00
19	R-D(3.64)	Out. In-Rd	802.88	0.00	0.00	2.00	2.00	3.00	8.00
20	Day-off	Day-off	802.88	0.00	0.00	0.00	0.00	2.00	2.00
21	R-D(4.77)	6.24	809.12	6.24	6.24	2.00	2.00	3.00	8.00
22	Out. In-Rd	14.37	823.49	14.37	14.37	2.00	2.00	3.00	8.00
23	3.63	Out. In-Rd	827.12	3.63	3.20	2.00	2.00	3.00	8.00
24	8.37	12.63	848.12	21.00	20.67	2.00	2.00	3.00	8.00
25	12.03	12.10	872.25	24.13	24.13	2.00	2.00	3.00	8.00
26	21.00	6.38	899.63	27.38	27.38	2.00	2.00	3.00	8.00
27	Day-off	Day-off	899.63	0.00	0.00	0.00	0.00	2.00	2.00
28	Exc-WL	Out. In-Rd	899.63	0.00	0.00	2.00	2.00	3.00	8.00
29	14.52	6.00	920.15	20.52	20.52	2.00	2.00	3.00	8.00
30	6.00	Maint	926.15	6.00	6.00	2.00	2.00	3.00	8.00
Dec 1	6.00	6.00	938.15	12.00	12.00	2.00	2.00	3.00	8.00
2	6.00	Out. In-Rd	944.15	6.00	6.00	2.00	2.00	3.00	8.00
3	17.65	6.34	968.15	24.00	24.00	2.00	2.00	3.00	8.00
4	Band	Recov	968.15	0.00	0.00	2.00	2.00	3.00	8.00
5	6.00	Out. In-Rd	974.15	6.00	5.70	2.00	2.00	3.00	8.00
6	3.29	2.71	980.15	6.00	6.00	2.00	2.00	3.00	8.00
7	3.51	7.65	991.31	11.16	11.01	2.00	2.00	3.00	8.00
8	23.70	9.80	1024.81	33.50	33.50	2.00	2.00	3.00	8.00
9	15.34	14.26	1054.41	29.60	29.60	2.00	2.00	3.00	8.00
10	9.74	6.00	1070.15	15.74	15.74	2.00	2.00	3.00	8.00
11	18.00	12.00	1100.15	30.00	30.00	2.00	2.00	3.00	8.00
12	Surv	-	1100.15	0.00	0.00	1.00	1.00	4.00	5.00
13	Dis	-	1100.15	0.00	0.00	0.00	1.00	4.00	9.00
14	Dis-Tra	-	1100.15	0.00	0.00	0.00	1.00	4.00	9.00
15	Tra	-	1100.15	0.00	0.00	0.00	1.00	3.00	8.00
Total	615.76	484.39		1100.15	894.79	132.00	157.00	391.00	839.00

Abbreviations:

Band: Banding bit, Cem: Cementing, Dis: Dismantlement, Dr-cem: Dredging cements, Exc-rd: Exchanging rod, In-cp: Inserting casing pipe, In-rd: Inserting rod, Maint: Maintenance of machines, Out-cp: Taking out casing pipe, Out-rd: Taking out rod, P-d: Preparation for drilling, Rd-con: Roda construction, Rd-ex: Rod examination, Ream: Reaming, Reass: Reassemblage, Recov: Recovering, Search: Searching pump, Surv: Surveying of hole deviation, Tra: Transportation, Wash: Washing, Wedge: Wedging, Wt-e/m: Waiting for equipment/material, Wt-hd: Waiting for hardening

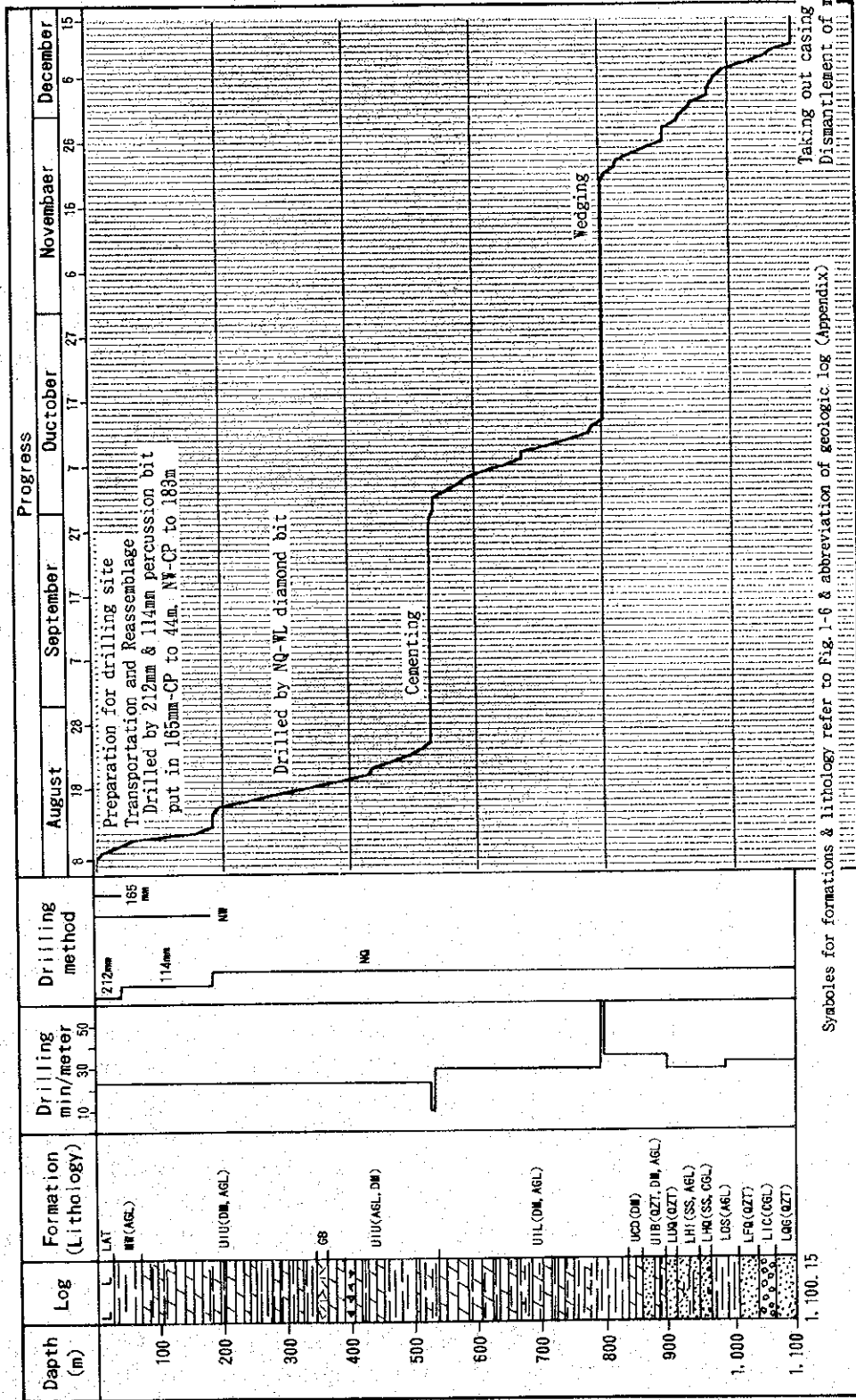


Fig. 2-2-1 Drilling Progress of MJZC-5

2-2 Geology and Mineralization

The geologic log is appended. The geology of this borehole compared to that of the survey area described in 3-2 of PART I, lacks the "Footwall Conglomerate" immediately below the "ore shale horizon", but otherwise it agrees well. Description of the borehole is as follows.

Lower Roan Group

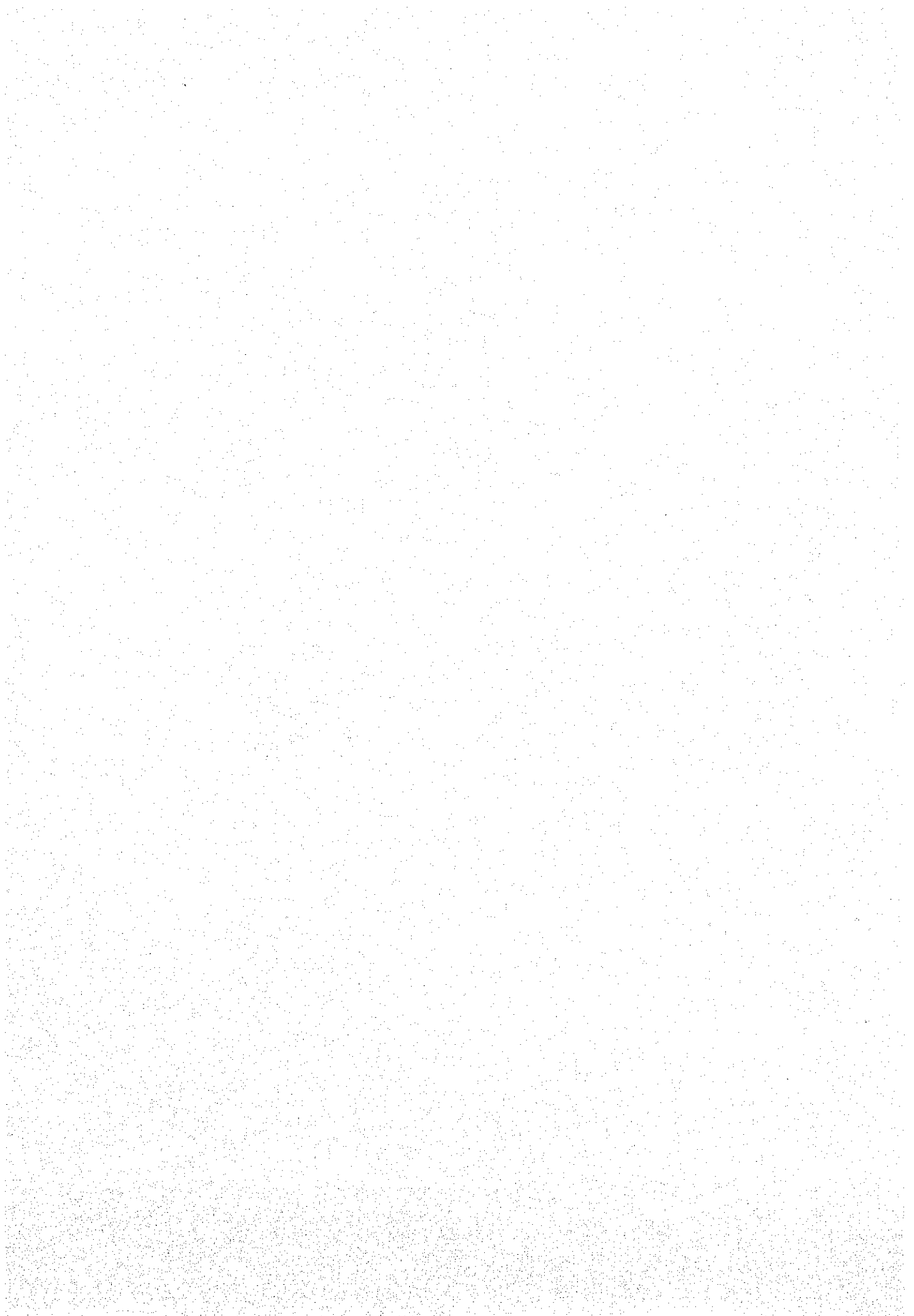
"Feldspathic Quartzite and Grit": 1,065.20 to 1,100.15m. This unit is composed of dark grey pelitic pebbly conglomerate and pinkish grey pebbly quartzite with intercalation of argillite lamination. The pebbles are all granite. Biotite and anhydrite occur in the quartzite.

"Intermediate Conglomerate": 1,037.60 to 1,065.20m. The upper part is composed of pebbles and lower part of cobbles to boulders. It contains pebbly quartzite. The nature of pebbles, cobbles and boulders are; biotite schist, granite and micaceous argillite while the matrix includes anhydrite, biotite and dolomite.

"Footwall Quartzite": 1,005.10 to 1,037.60m. The upper part consists of white grey massive quartzite partly containing anhydrite, dolomite or biotite. The lower part is composed of dark grey pelitic and dolomitic quartzite with grit. Anhydrite is developed at the boundary with the footwall.

"Ore Shale Horizon": 967.00 to 1,005.10m. It mainly consists of sandy and dolomitic argillites with very thin layers of dark grey lamination. There is dolomite intercalation in the basal part. The interval of 967.00 to 972.20m is a pyritized zone and 972.20 to 1,005.10m is a chalcopyrite-pyrrhotite-pyrite zone. The ores of the shoot occur as; thin lenses to laminations of chalcopyrite-pyrrhotite-dolomite, dissemination of fine-grained chalcopyrite and chalcopyrite along the rim of dolomite lenses. Results of ore assay are shown in Table 2-6-3. The cobalt mineral of this borehole was identified to be cobalt pentlandite (Table 2-6-2).

"Hangingwall Quartzite and Argillite": 949.60 to 967.00m. It consists mainly of grey pelitic, dolomitic and quartzitic sandstone with thin dolomite and argillite band intercalation. Fine conglomerate and thin quartzite occur in the lowermost



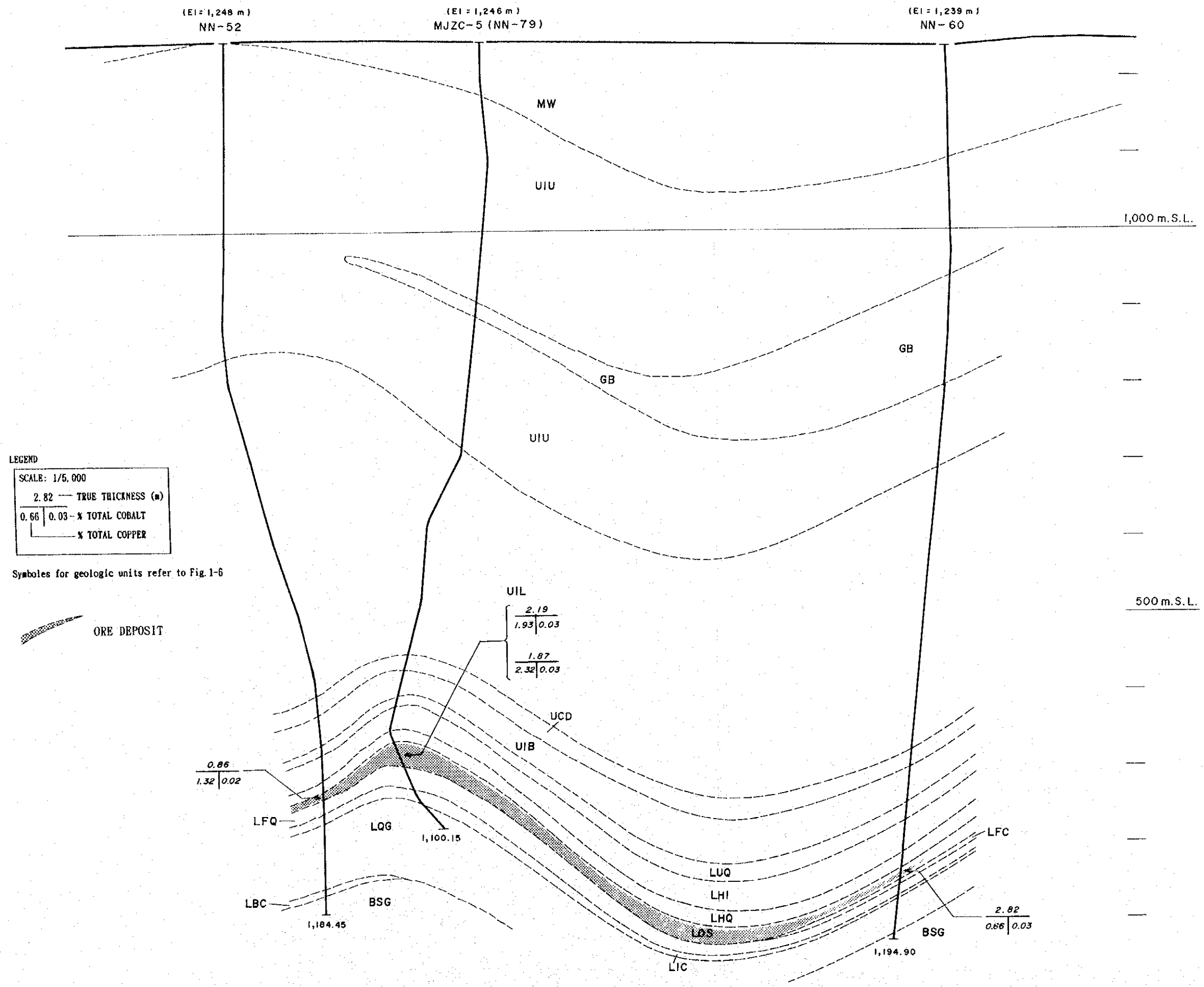
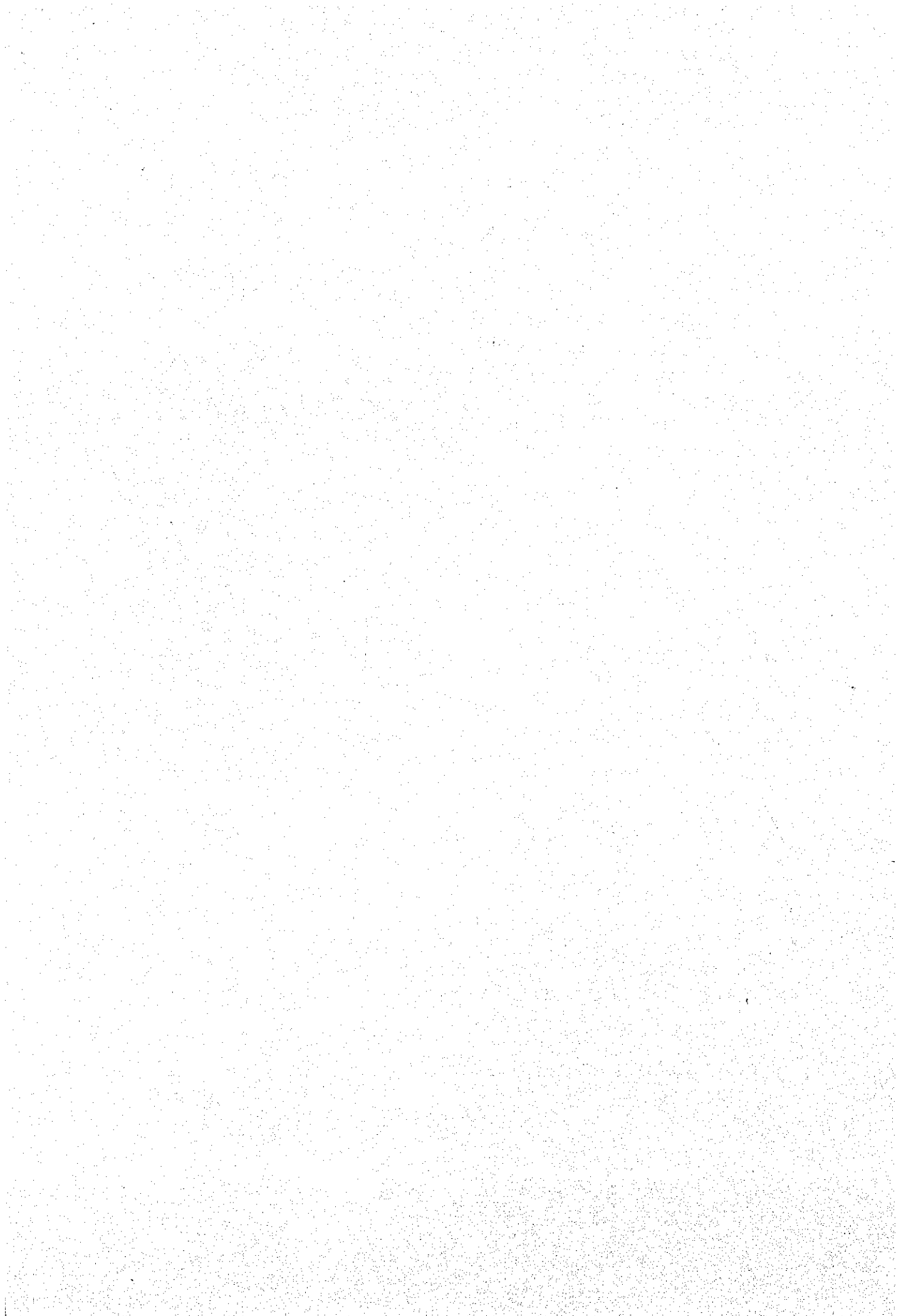


Fig. 2-2-2 Geological Profile of Drill Hole (MJZC-5)



part. Also patches of anhydrite are observed.

"Interbedded Argillite and Quartzite": 914.10 to 949.60m. It is mainly composed of dark grey to dark green dolomitic sandstone and grey argillitic quartzite with intercalations of thin dolomite and argillitic rocks.

"Upper Quartzite": 898.60 to 914.10m. It is composed of greyish white coarse quartzite with pelitic and biotite bands. Pyrite dissemination is observed.

Upper Roan Group

"Interbedded Argillite, Dolomite and Quartzite": 860.10 to 898.60m. The upper part is composed of dark grey pelitic quartzite and grey dolomitic sandstone with intercalation of thin dolomite layers and argillite bands. Pyrite dissemination is observed in the lower parts.

"Cherty Dolomite": 838.30 to 860.10m. It mainly consists of massive white dolomite and with local silicified parts and silica lenses. In the upper part, dark green to grey sandy argillite (Marker Shale) is intercalated. Generally, patches and lenses of anhydrite occur in this unit and weak dissemination of minute chalcopyrite-pyrite is observed at 851.5-859.3m.

"Arenite, Argillite and Dolomite with Anhydrite": 538.20 to 838.30m. The upper part is composed mainly of pale green to purple anhydritic dolomite with intercalation of thin argillite. The middle part is an alternating zone of dark green to grey gritty argillite and dolomite. The lower part consists of dark green to grey sandy to gritty argillite with lenses of quartzite. This unit has been strongly anhydritized (veinlets, patches, lenses) as a whole.

"Interbedded Argillite and Dolomite with Tectono-Breccias": 71.00 to 343.70m, 362.50 to 538.20m. The upper part is composed mainly of dolomite with thin argillites, the middle part of alternation of argillite and dolomite with altered conglomerate, the lower part of argillite with thin dolomite. Pyrite dissemination is frequently observed between 136.0 and 366m, and pyrrhotite dissemination with minor chalcopyrite content occur between 273.6 and 285.3m. Silicification is observed frequently at 322.2 to 501.0m and the silicified rocks at 472.0 to 501.0m are strongly brecciated. Limonitization probably by

weathering occurs in zones shallower than 157m and at 373.0 to 532.8m. Sheared zones are developed between 362.50 and 373.90m and also 510.50 and 524.60m.

"Mwashia Group": 12.00 to 71.00m. It consists of black shale and grey silt. The shale is calcareous and accompanied by pyrite dissemination.

"Gabbro": 374.70 to 362.50m. The bodies are dark green massive and is strongly argillized, carbonatized and biotized.

2-3 Discussions

The mineralized zone confirmed by this borehole has relatively high grade (width 3.10m T-Cu 1.93% T-Co 0.03%, width 2.64m T-Cu 2.32% T-Co 0.03%) and is located in the anticlinal structure as seen in the cross section (Figs. 1-7, 2-2-2). The central part of the Northern Area Shoot occurs in the southeastern extension of the synclinal structure which is on the northeastern side of this structure. It has been clarified by NN-55 and NN-48 that the southwestern part of the Northern Area Shoot is situated in the anticlinal part, and it is inferred that the ores of this borehole is in the same structural position as in the previous two holes.

The ores of the above three boreholes including the present one belongs to the chalcopyrite-pyrrhotite-pyrite zone and the grade appears to be somewhat lower than that of the central part of the Northern Area Shoot. As the mineralized zone confirmed by the present borehole is considered to be the northwestern extension of the Northern Area Shoot, the possibility of the shoot extending further northwestward of this hole is should be considered.

Chapter 3 MJZC - 6

3-1 Progress of Drilling

The location and the collar elevation of MJZC-6 are as follows.

Co-ordinates		Collar Elevation	Drilling Length	Inclination
X	Y			
+16,799.74	-13,079.83	1,237.3m	1,014.96m	-90°

Summary of the drilling, record of the drilling operation and the drilling progress are shown in Tables 2-3-1 and 2-3-2, and Figure 2-3-1, respectively.

Drilling was started with 212mm percussion bit, but due to the large water flow out (60 lit/min) from 32m depth, 165mm casing pipes were inserted to 41.00m, drilled further to 189.88 m by 114mm bit where percussion was given up due to the increase of water flow out and NW casing pipes were inserted to that depth. Then the method was changed to skid-mounted WL and core drilling was done by NQ bit to 1,014.96m. Rod grease and cutting oil were used in order to prevent vibration during operation. Cuttings were collected at 1 m interval for non-core drilling.

Water was transported from a dammed reservoir in 4,500 lit. tanks by a tractor taking one and a half hour round trip.

The bit burned at 872.04m depth, but recovered after the burn out, the rod was changed from NQ to CHD.

Borehole deviation was measured every 100m. The measurement showed that the borehole deviated northwestward similar to those of previous holes in the vicinity (Appendices).

3-2 Geology and Mineralization

The geologic log is appended. The geology of this borehole compared to that of the survey area described in 3-2 of PART I, lacks the "Footwall Conglomerate", "Intermediate Conglomerate", "Feldspathic Quartzite and Grit" and "Basal Conglomerate" but

Table 2-3-1 Summary of the Drilling Operation on MJZC-6

Operation	Survey Period				Total Man Day	
	Period	Day	Work Day	Off Day	Engineer	Worker
Preparation	11.08.1994~12.08.1994	2.00	2.00	0.00	2.00	16.00
Drilling	13.08.1994~06.11.1994	133.00	Drilling 113.50	15.00	219.00	458.00
			Recovering 4.50	0.00	9.00	32.00
Dismantling	07.11.1994~10.11.1994	4.00	4.00	0.00	12.00	12.00
Total	11.08.1994~10.11.1994	139.00	124.00	15.00	242.00	518.00
Drilling Length	m		m	Core Recovery of 100m Hole		
Length Planned	1100.00	Overburden	12.00	Depth of Hole (m)	Core Recovery (%)	Core Recovery Cumulated (%)
Increase/Decrease in Length	-85.04	Core Length	813.76			
Length Drilled	1014.96	Core Recovery	98.63	0.00- 100.00	0.00	0.00
(N/C Drilling)	189.88			100.00- 200.00	92.59	92.59
(Core Drilling)	825.08			200.00- 300.00	98.25	97.73
Working Hours	h	%	%	300.00- 400.00	97.60	97.67
Drilling	395.50	34.21	25.30	400.00- 500.00	99.03	98.11
Other Working	513.00	44.38	32.82	500.00- 600.00	100.00	98.57
Recovering	247.50	21.41	15.83	600.00- 700.00	96.38	98.14
Subtotal	1156.00	100.00	73.96	700.00- 800.00	100.00	98.44
Reassemblage	14.00		0.90	800.00- 900.00	98.94	98.51
Dismantlement	38.00		2.43	900.00-1000.00	99.33	98.62
Water Supply	325.00		20.79	1000.00-1100.00	99.33	98.63
Road Construct	24.00		1.54	Efficiency of Drilling		
Transportation	6.00		0.38	Total Length /	m	day
Grand Total	1563.00		100.00	Drilling Period	1014.96	133.00
Casing Pipe Inserted				Total Length /	m	shift
Size	Meterage	Meterage /	Recovery	Total Drilling	1014.96	87.70
	(m)	Drilling Length	(%)	Shifts		11.57
		×100		Drilling Length / Each Bit (m)		
		(%)		Bit Size	Drilled Length	Core Length
200mm	0.00	0.00		200mm	41.00	N/C
165mm	41.00	4.04	100.00	165mm	0.00	N/C
HW	0.00	0.00		150mm	148.88	N/C
NW	189.88	18.71	74.72	HQ	0.00	0.00
BX	0.00	0.00		NQ	825.08	813.76
				BQ	0.00	0.00

Table 2-3-2 Record of the Drilling Operation on MJZC-6 (1)

Date	Drilling Length (m)		Total Cumulated	Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2		Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Aug 11	Rd-con	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
12	Rd-con	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
13	41.00	9.00	50.00	50.00	0.00	1.70	2.00	3.00	10.00
14	63.00	14.00	127.00	77.00	0.00	2.00	2.00	6.00	10.00
15	Day off	Day off	127.00	0.00	0.00	0.00	0.00	0.00	0.00
16	Day off	Day off	127.00	0.00	0.00	0.00	0.00	0.00	0.00
17	20.00	25.88	172.88	45.88	0.00	2.00	2.00	3.00	10.00
18	17.00	Day off	189.88	17.00	0.00	1.00	1.00	2.00	8.00
19	Reass	In-cp	189.88	0.00	0.00	1.00	2.00	4.00	8.00
20	32.12	34.00	256.00	66.12	65.37	2.00	2.00	4.00	8.00
21	Day off	Day off	256.00	0.00	0.00	0.00	0.00	0.00	0.00
22	13.88	7.26	277.14	21.14	20.39	2.00	2.00	4.00	8.00
23	7.50	5.43	290.07	12.93	12.25	2.00	2.00	4.00	8.00
24	3.77	15.90	309.74	19.67	19.35	2.00	2.00	4.00	8.00
25	21.40	15.50	346.64	36.90	36.30	2.00	2.00	4.00	8.00
26	16.20	3.33	366.17	19.53	19.10	2.00	2.00	4.00	8.00
27	4.99	Day off	371.16	4.99	4.80	1.00	1.00	3.00	4.00
28	Day off	Day off	371.16	0.00	0.00	0.00	0.00	2.00	2.00
29	16.98	13.80	401.94	30.78	29.60	2.00	2.00	3.00	8.00
30	22.20	1.40	425.54	23.60	23.03	2.00	2.00	3.00	8.00
31	6.10	Recov	431.64	6.10	6.00	2.00	2.00	3.00	8.00
Sep 1	Maint	Wt-e/m	431.64	0.00	0.00	1.00	1.00	3.00	5.00
2	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
3	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
4	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
5	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
6	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
7	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
8	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
9	Wt-e/m	Wt-e/m	431.64	0.00	0.00	0.00	0.00	2.00	2.00
10	Wt-e/m	22.50	454.14	22.50	22.35	1.00	1.00	2.00	5.00
11	Wt-e/m	Day off	454.14	0.00	0.00	0.00	0.00	2.00	2.00
12	29.27	19.27	502.68	48.54	48.39	2.00	2.00	3.00	8.00
13	20.46	7.80	530.94	28.26	28.21	2.00	2.00	3.00	8.00
14	Maint	Wt-e/m	530.94	0.00	0.00	1.00	1.00	3.00	5.00
15	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
16	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
17	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
18	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
19	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
20	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
21	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
22	Wt-e/m	Wt-e/m	530.94	0.00	0.00	0.00	0.00	2.00	2.00
23	20.84	7.36	559.14	28.20	25.07	2.00	2.00	3.00	8.00
24	10.52	Wt-e/m	569.66	10.52	10.50	1.00	1.00	3.00	5.00
25	Wt-e/m	Wt-e/m	569.66	0.00	0.00	0.00	0.00	2.00	2.00
26	Wt-e/m	Wt-e/m	569.66	0.00	0.00	0.00	0.00	2.00	2.00
27	Wt-e/m	Wt-e/m	569.66	0.00	0.00	0.00	0.00	2.00	2.00
28	8.40	23.68	601.74	32.08	31.66	2.00	2.00	3.00	8.00
29	26.40	25.97	654.11	52.37	52.37	2.00	2.00	3.00	8.00
30	16.03	Day off	670.14	16.03	16.03	1.00	1.00	3.00	5.00

Table 2-3-2 Record of the Drilling Operation on MJZC-6 (2)

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Oct 1	Day off	Day off	670.14	0.00	0.00	0.00	0.00	2.00	2.00
2	Day off	Day off	670.14	0.00	0.00	0.00	0.00	2.00	2.00
3	24.00	12.00	706.14	36.00	36.00	2.00	2.00	3.00	8.00
4	12.00	19.74	737.88	31.74	30.74	2.00	2.00	3.00	8.00
5	11.91	13.35	763.14	25.26	25.20	2.00	2.00	3.00	8.00
6	6.00	1.40	770.54	7.40	7.40	2.00	2.00	3.00	8.00
7	Recov	22.60	793.14	22.60	22.60	2.00	2.00	3.00	8.00
8	24.00	18.00	835.14	42.00	42.00	2.00	2.00	3.00	8.00
9	Day off	Day off	835.14	0.00	0.00	0.00	0.00	2.00	2.00
10	18.00	5.93	859.07	23.93	23.70	2.00	2.00	3.00	8.00
11	12.97	Band	872.04	12.97	12.97	2.00	2.00	3.00	8.00
12	Recov	Recov	872.04	0.00	0.00	2.00	2.00	3.00	8.00
13	Recov	Recov	872.04	0.00	0.00	2.00	2.00	3.00	8.00
14	Recov	1.73	873.77	1.73	1.73	2.00	2.00	3.00	8.00
15	Rd-ex	Day off	873.77	0.00	0.00	1.00	1.00	3.00	5.00
16	Day off	Day off	873.77	0.00	0.00	0.00	0.00	2.00	2.00
17	Rd-ex	Rd-ex	873.77	0.00	0.00	2.00	2.00	4.00	9.00
18	Recov	Recov	873.77	0.00	0.00	2.00	2.00	3.00	8.00
19	5.58	8.46	887.81	14.04	13.60	2.00	2.00	3.00	8.00
20	12.19	Surv	900.00	12.19	12.19	2.00	2.00	4.00	8.00
21	Surv	3.03	903.03	3.03	3.03	2.00	2.00	3.00	8.00
22	Day off	Day off	903.03	0.00	0.00	0.00	0.00	2.00	2.00
23	Day off	Day off	903.03	0.00	0.00	0.00	0.00	2.00	2.00
24	Day off	Day off	903.03	0.00	0.00	0.00	0.00	2.00	2.00
25	4.12	15.27	922.42	19.39	19.39	2.00	2.00	3.00	8.00
26	10.03	10.70	943.15	20.73	20.73	2.00	2.00	3.00	8.00
27	18.00	5.80	966.95	23.80	23.80	2.00	2.00	3.00	8.00
28	Exc-rd	Exc-rd	966.95	0.00	0.00	2.00	2.00	3.00	8.00
29	Search	Day off	966.95	0.00	0.00	0.00	1.00	2.00	8.00
30	Day off	Day off	966.95	0.00	0.00	0.00	0.00	2.00	2.00
31	Exc-rd	Exc-rd	966.95	0.00	0.00	0.00	2.00	3.00	8.00
Nov 1	Exc-rd	Exc-rd	966.95	0.00	0.00	0.00	2.00	3.00	8.00
2	In-rd	In-rd	966.95	0.00	0.00	0.00	2.00	3.00	8.00
3	Wash	2.55	969.50	2.55	2.55	2.00	2.00	3.00	8.00
4	21.46	19.62	1010.58	41.08	40.98	2.00	2.00	3.00	8.00
5	4.38	Day-off	1014.96	4.38	4.38	1.00	1.00	3.00	5.00
6	Day-off	Day-off	1014.96	0.00	0.00	0.00	0.00	2.00	2.00
7	Surv	Out-cp	1014.96	0.00	0.00	0.00	2.00	3.00	8.00
8	Dis	Day-off	1014.96	0.00	0.00	0.00	1.00	4.00	11.00
9	Trans	Day-off	1014.96	0.00	0.00	0.00	1.00	3.00	9.00
10	Trans	-	1014.96	0.00	0.00	0.00	1.00	2.00	8.00
Total	602.70	412.26		1014.96	813.76	87.70	103.00	242.00	518.00

Abbreviations:

Band: Banding bit, Cem: Cementing, Dis: Dismantlement, Dr-cem: Dredging cemente,
 Exc-rd: Exchanging rod, In-cp: Inserting casing pipe, In-rd: Inserting rod,
 Maint: Maintenance of machines, Out-cp: Taking out casing pipe, Out-rd: Taking out rod
 P-d: Preparation for drilling, Rd-con: Roda construction, Rd-ex: Rod examination,
 Ream: Reaming, Reass: Reassembly, Recov: Recovering, Search: Searching pump,
 Surv: Surveying of hole deviation, Tra: Transportation, Wash: Washing, Wedge: Wedging,
 Wt-e/m: Waiting for equipment/material, Wt-hd: Waiting for hardening

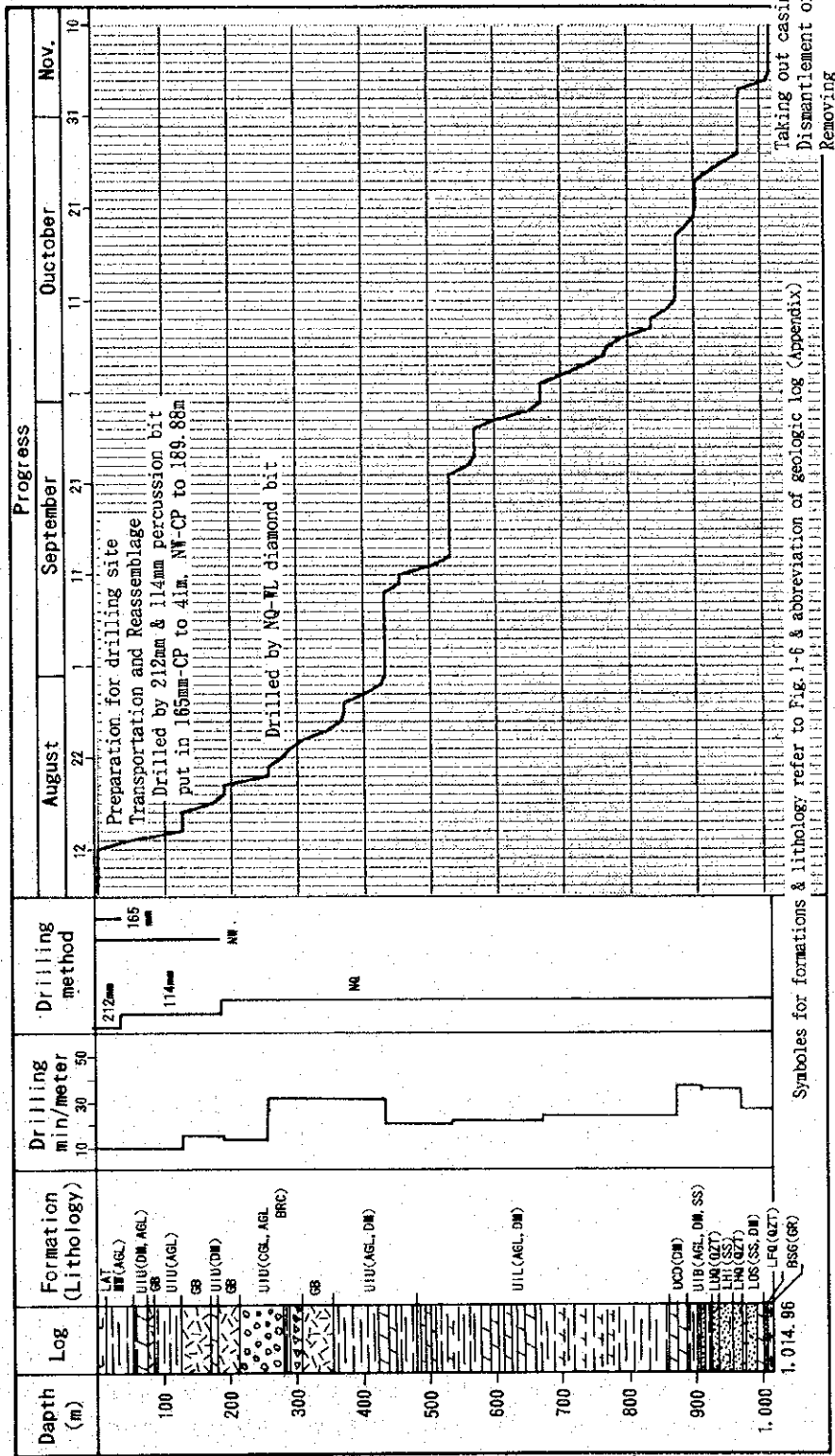


Fig. 2-3-1 Drilling Progress of MJZC-6

otherwise it agrees well. Description of the borehole is as follows.

"Basement": 1,006.60 to 1,014.96m. The rock is grey granite. The major components of this rock are; quartz, potash feldspar, plagioclase, biotite and muscovite, and the accessory components are; sphene, opaque minerals, apatite and zircon. Also carbonate minerals, epidote and chlorite occur as altered products.

Lower Roan Group

"Footwall Quartzite": 1,002.90 to 1,006.60m. This is composed of grey pelitic quartzite and white quartzite with intercalation of pelitic bands. Chalcopyrite-bornite dissemination is observed in this unit.

"Ore Shale Horizon": 969.50 to 1,002.90m. It mainly consists of white dolomite and grey dolomitic sandstone with thin layers of dark grey sandy argillite lamination. Chalcopyrite-bornite dissemination is observed at 974.80 to 995.20m. Results of ore assay are shown in Table 2-6-3. The cobalt mineral of this borehole was identified to be cobalt pentlandite (Table 2-6-2).

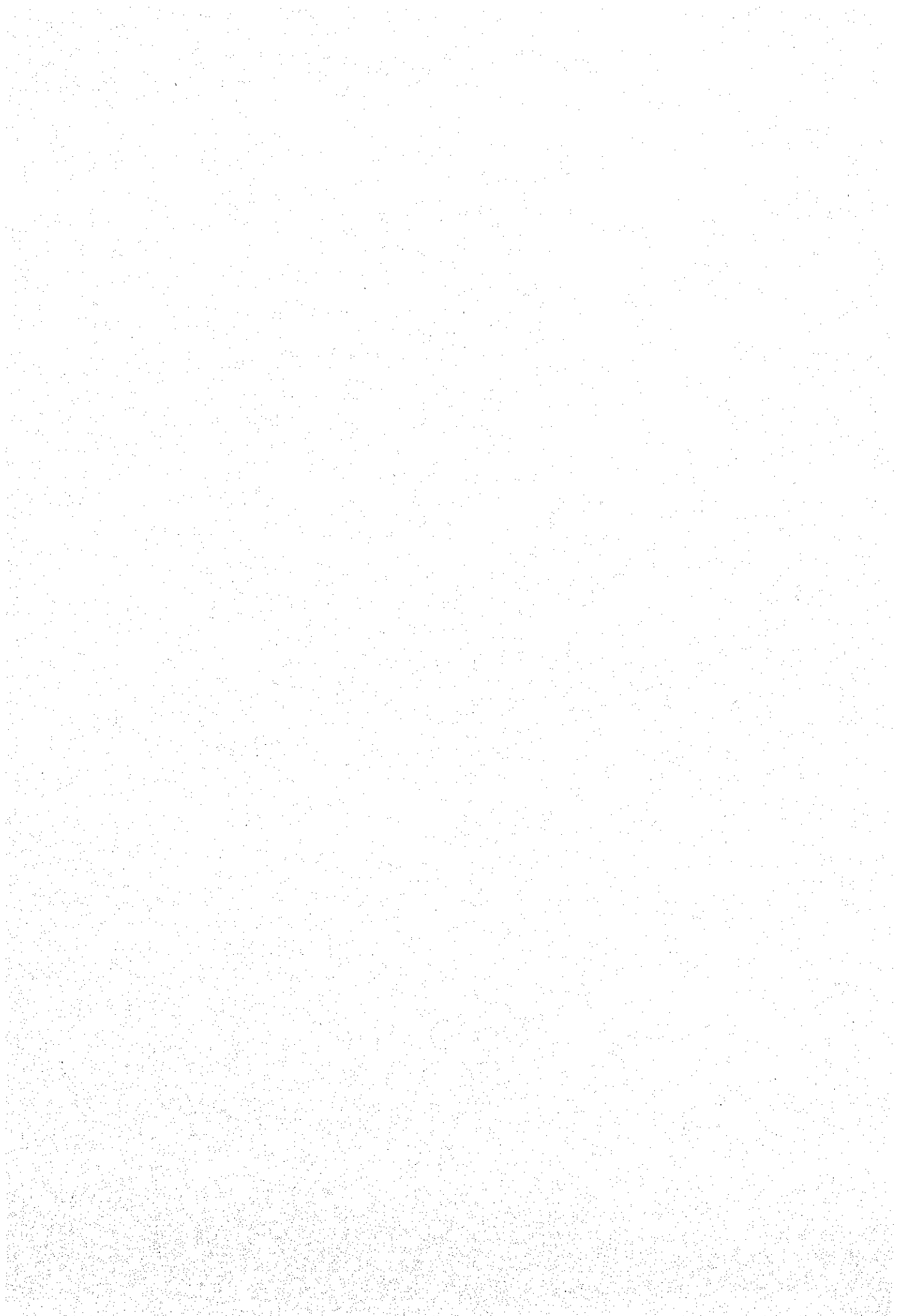
"Hangingwall Quartzite and Argillite": 956.30 to 969.50m. This is grey pelitic to micaceous quartzite with argillite bands. The lower part consists of dolomitic rocks. Quartz veinlets occur scattered throughout the unit.

"Interbedded Argillite and Quartzite": 933.90 to 956.30m. It is mainly composed of grey micaceous to dolomitic sandstone with intercalation of thin quartzite and dolomite.

"Upper Quartzite": 922.10 to 933.90m. This unit consists of greyish white pelitic and micaceous quartzite with pelitic bands.

Upper Roan Group

"Interbedded Argillite, Dolomite and Quartzite": 888.90 to 922.10m. The upper part is composed mainly of dark grey gritty and dolomitic sandstone and the lower part of thin alternation of dark grey sandy argillite white micaceous dolomite pelitic and micaceous sandstone pelitic quartzite. Weak chalcopyrite dissemination is observed in the argillite of the lower part.



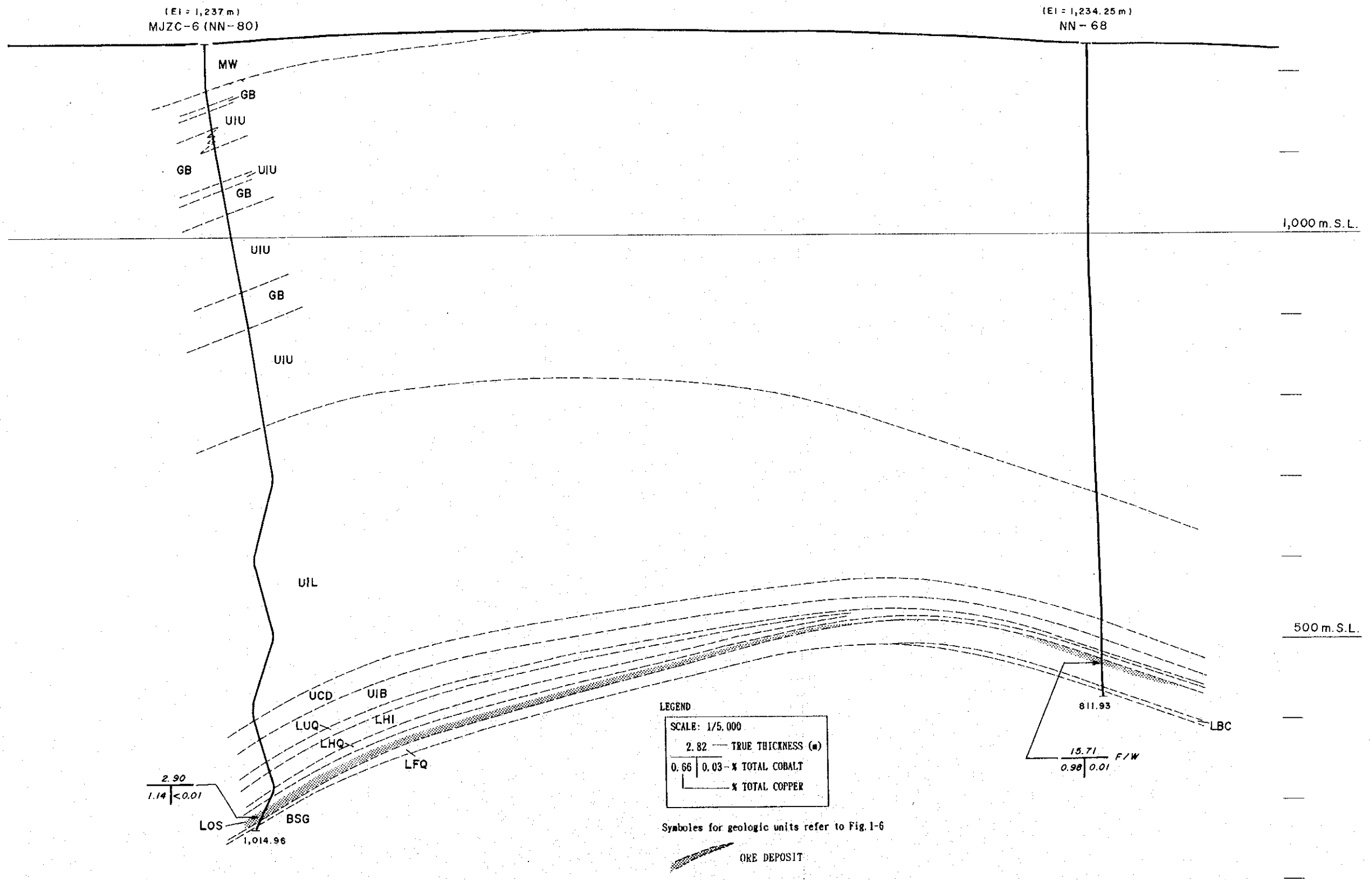
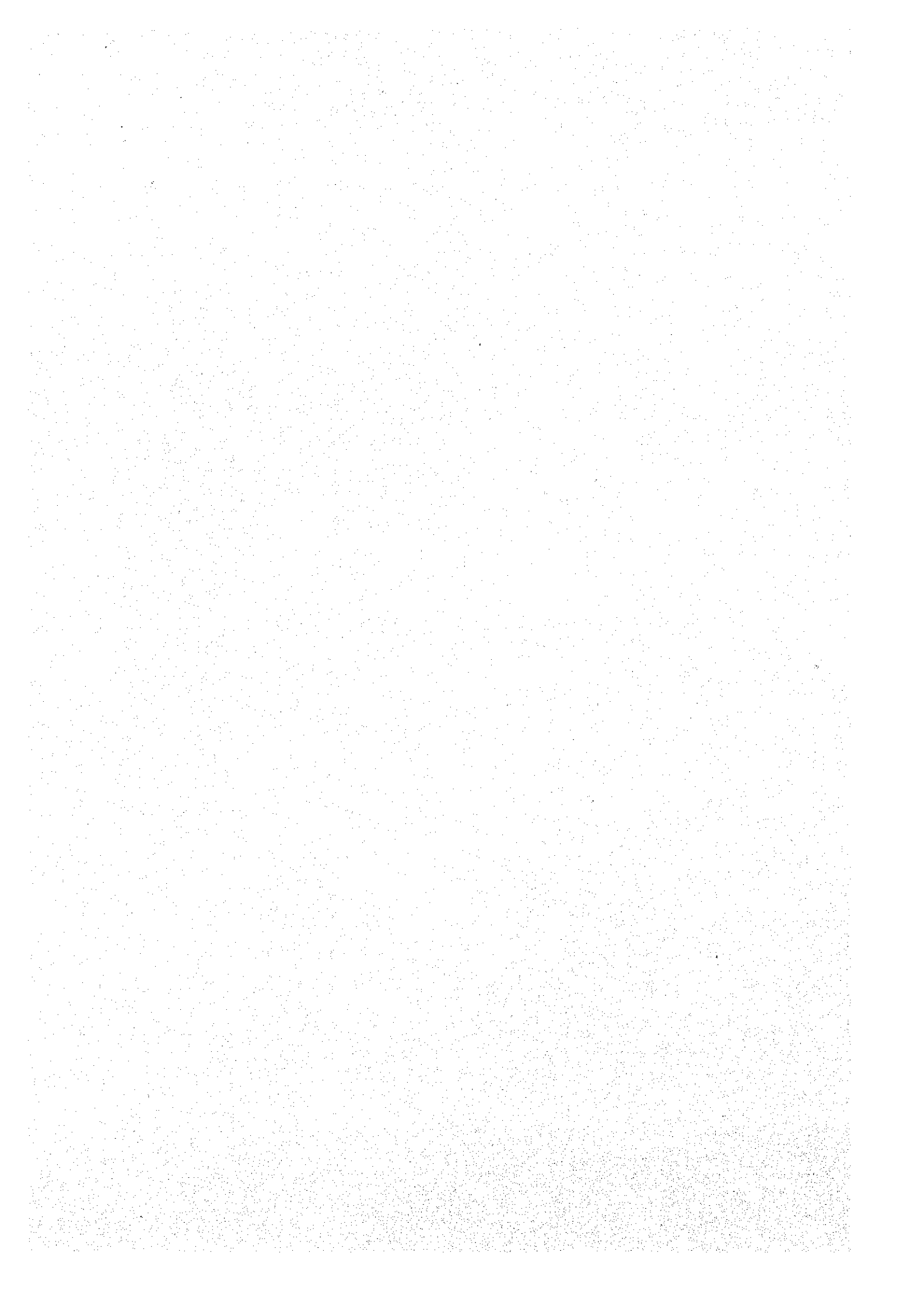


Fig. 2-3-2 Geological Profile of Drill Hole (MJZC-6)



"Cherty Dolomite": 816.20 to 888.90m. It mainly consists of massive white dolomite. In the upper part, dark green to grey sandy argillite (Marker Shale) is intercalated. Generally, patches and lenses of anhydrite occur locally in this unit. Chalcopyrite-bornite dissemination occurs at 874.20-875.60m and dissemination of minute chalcopyrite grains at 884.50-887.20m.

"Arenite, Argillite and Dolomite with Anhydrite": 480.10 to 816.20m. The upper part is composed mainly of alternation of green to grey micaceous to dolomitic argillite and dolomite with intercalation of sandy to quartzitic lenses. The lower part consists of dark green to grey sandy to gritty argillite. There are thin laminated dolomite layers considered to be stromatolite (758.05-759.25, 764.70-766.00, 774.90-777.40m). This unit has been anhydritized (veinlets, patches, lenses) as a whole. Weak pyrite dissemination is observed frequently in the upper part.

"Interbedded Argillite and Dolomite with Tectono-Breccias": 55.00 to 77.00, 85.00 to 128.00, 171.00 to 182.00, 213.40 to 310.40, 355.70 to 480.10m. The upper part is composed mainly of alternation of dark grey dolomitic argillite and dolomite, the middle part of pale green argillized conglomerate and silicified breccia with thin dolomite layers, the lower part of alternation of dark green to dark grey argillite and dolomite and the upper part of argillite is strongly fractured. There are several layers of gabbroic bodies. Limonitization probably by weathering occurs in zones shallower than 309m.

"Mwashia Group": 12.00 to 55.00m. The major rocks of this group are grey phyllitic to shaly argillite.

"Gabbro": 77.00 to 85.00, 128.00 to 171.00, 182.00 to 213.40, 310.40 to 355.70m. The bodies are dark green to black, altered, coarse-grained, crystalline and massive and contains biotite. Dolomite veinlets are developed.

3-3 Discussions

This borehole is located on the limb of the rise of the basement (Figs. 1-7, 2-3-2). As the "Ore Shale horizon" is dolomitic and the "Footwall Formation" is thin, it is inferred

that the basement of this part was palaeo-basement high at the time of the deposition of the ore deposit. Although the copper grade of this deposit is low (width 3.35m T-Cu 1.14% T-Co <0.01%), the mineralization most probably belongs to the bornite zone of the zonal distribution of sulfides (Fig. 1-9), the deposit is concluded to have formed near the shore.

To the east of this borehole, NN-75 has confirmed the existence of chalcopyrite shoot in "Ore Shalè". This shoot is considered from the results of the present work to have the possibility of extending to the south of the this borehole.

Chapter 4 MJZC - 7

4-1 Progress of Drilling

The location and the collar elevation of MJZC-7 are as follows.

Co-ordinates		Collar Elevation	Drilling Length	Inclination
X	Y			
+16,120.07	-11,649.91	1,247.4m	985.00m	-90°

Summary of the drilling, record of the drilling operation and the drilling progress are shown in Tables 2-4-1 and 2-4-2, and Figure 2-4-1, respectively.

Drilling was started with 212mm percussion bit, but due to the large water flow out (50-60 lit/min) from 36m depth, 165mm casing pipes were inserted to 49.00m, drilled further to 131.60 meters by 114mm bit where percussion was given up due to the increase of water flow out and NW casing pipes were inserted to that depth. Then the method was changed to truck-mounted WL and core drilling was done by NQ bit to 985.00m. At 260.63m, the upper wall deteriorated and HW casing was inserted for 54m, NW casing was extended to 144m depth. Rod grease and cutting oil were used in order to prevent vibration during operation. Cuttings were collected at 1 m interval for non-core drilling.

Water was transported from a dammed reservoir in 4,500 lit. tanks by a tractor taking an hour and 20 minutes round trip.

Soft sheared zones were encountered at; 411.7-412.5, 415.5-422.0, 495.5-498 and 538.0-544.1 m. At each sheared zone, the wall was cemented in order to prevent collapse.

NQ rods were used to 760.94m and CHD rods in deeper parts.

Borehole deviation was measured every 100m. The measurement showed that the borehole deviated east-southeastward (Appendices).

Table 2-4-1 Summary of the Drilling Operation on MJZC-7

Operation	Survey Period				Total Man Day	
	Period	Day	Work Day	Off Day	Engineer	Worker
Preparation	16.08.1994~17.08.1994	2.00	2.00	0.00	2.00	16.00
Drilling	18.08.1994~17.11.1994	92.00	Drilling 75.00	17.00	251.00	638.00
			Recovering 0.00	0.00	0.00	0.00
Dismantling	18.11.1994~21.11.1994	4.00	4.00	0.00	14.00	39.00
Total	16.08.1994~21.11.1994	98.00	81.00	17.00	267.00	693.00
Drilling Length	m		m	Core Recovery of 100m Hole		
Length Planed	1100.00	Overburden	16.00	Depth of Hole (m)	Core Recovery (%)	Core Recovery Cumulated (%)
Increase/Decrease in Length	-115.00	Core Length	828.75			
Length Drilled (N/C Drilling)	985.00	Core Recovery	97.11	0.00- 100.00	0.00	0.00
(Core Drilling)	131.60			853.40	100.00- 200.00	84.49
Working Hours	h	%	%	200.00- 300.00	91.98	88.94
Drilling	545.00	36.19	25.28	300.00- 400.00	98.71	92.58
Other Working	602.50	40.01	27.95	400.00- 500.00	97.58	93.94
Recovering	358.50	23.80	16.63	500.00- 600.00	100.00	95.23
Subtotal	1506.00	100.00	69.85	600.00- 700.00	98.91	95.88
Reassemblage	20.00		0.93	700.00- 800.00	99.24	96.38
Dismantlement	26.00		1.21	800.00- 900.00	99.63	96.80
Water Supply	522.00		24.21	900.00-1000.00	84.94	97.12
Road Construction	24.00		1.11			
Transportation	58.00		2.69	Efficiency of Drilling		
Grand Total	2156.00		100.00	Total Length / Drilling Period	m 985.00	day 92.00
Casing Pipe Inserted					m/day 10.71	
Size	Meterage	Meterage / Drilling Length ×100	Recovery	Total Length / Total Drilling Shifts	m 985.00	shift 117.67
	(m)	(%)	(%)	Drilling Length / Each Bit (m)		m/shift 8.37
200mm	0.00	0.00		Bit Size	Drilled Length	Core Length
165mm	49.00	4.97	100.00	200mm	49.00	N/C
HW	54.00	5.48	100.00	165mm	0.00	N/C
NW	144.00	14.62	79.17	150mm	82.60	N/C
BX	0.00	0.00		HQ	0.00	0.00
				NQ	853.40	828.75
				BQ	0.00	0.00

Table 2-4-2 Record of the Drilling Operation on MJZC-7 (1)

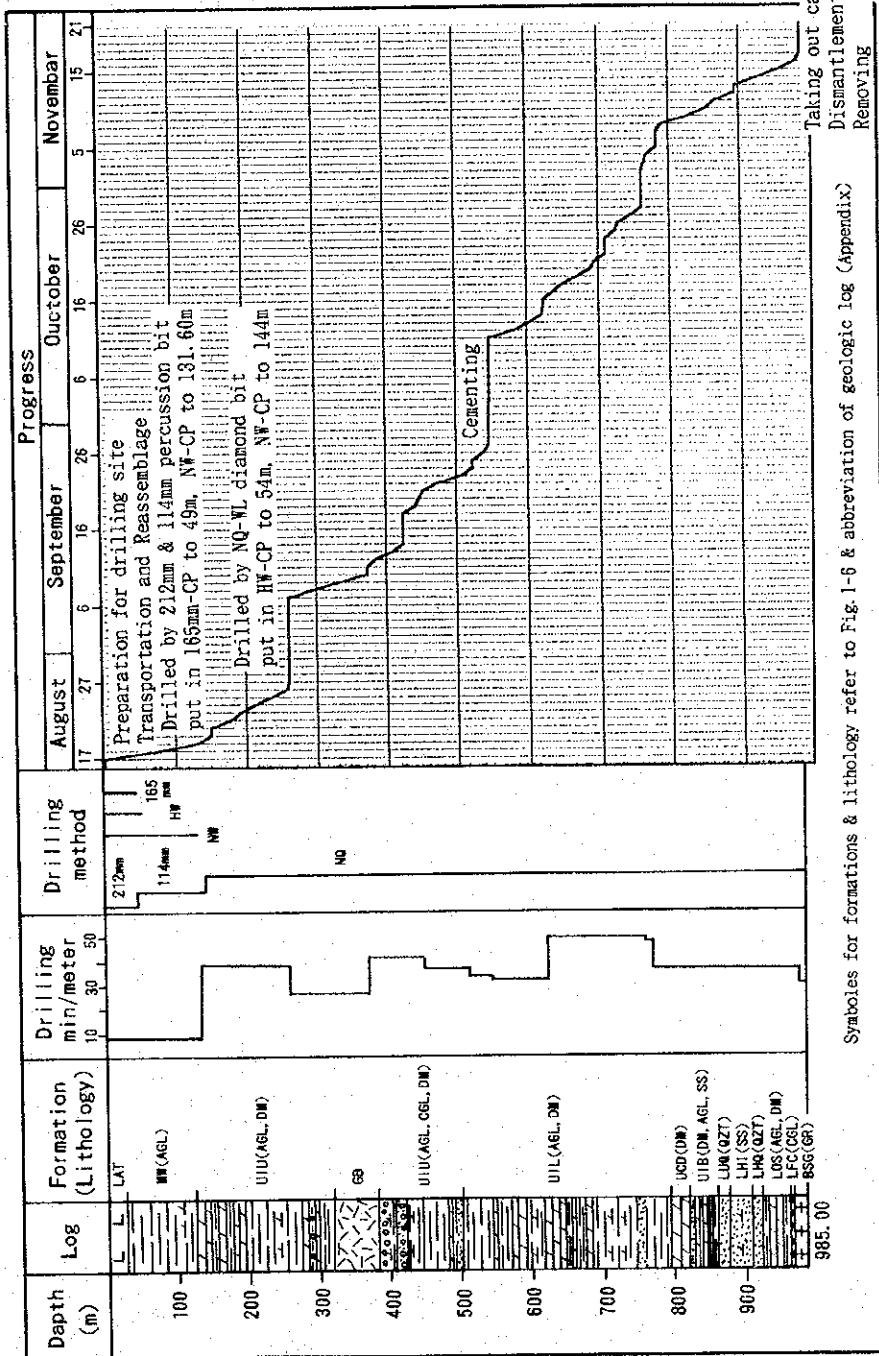
Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
16	P-d	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
17	P-d	-	0.00	0.00	0.00	0.00	1.00	1.00	8.00
18	49.00	29.00	78.00	78.00	0.00	1.67	2.00	3.00	10.00
19	53.60	Tra	131.60	53.60	0.00	1.00	1.50	3.00	10.00
20	In-cp	18.40	150.00	18.40	11.70	1.00	2.00	3.00	12.00
21	Day off	Day off	150.00	0.00	0.00	0.00	0.00	0.00	0.00
22	16.43	12.00	178.43	28.43	27.00	2.00	2.00	3.00	10.00
23	6.00	8.62	193.05	14.62	14.27	2.00	2.00	3.00	10.00
24	9.38	11.92	214.35	21.30	19.17	2.00	2.00	3.00	10.00
25	11.65	9.43	235.43	21.08	17.78	2.00	2.00	3.00	10.00
26	12.10	10.40	257.93	22.50	21.50	2.00	2.00	3.00	10.00
27	2.20	Day off	260.13	2.20	2.20	1.00	1.00	2.00	5.00
28	Day off	Day off	260.13	0.00	0.00	0.00	0.00	2.00	2.00
29	Wash	0.50	260.63	0.50	0.30	2.00	2.00	3.00	10.00
30	Wash	Day off	260.63	0.00	0.00	1.00	1.00	3.00	5.00
31	In-cp	Out-cp	260.63	0.00	0.00	2.00	2.00	3.00	8.00
Sep 1	Ream	Out-cp	260.63	0.00	0.00	2.00	2.00	3.00	9.00
2	Out-cp	Day off	260.63	0.00	0.00	1.00	1.00	3.00	5.00
3	Day off	Day off	260.63	0.00	0.00	0.00	0.00	2.00	2.00
4	Day off	Day off	260.63	0.00	0.00	0.00	0.00	2.00	2.00
5	Ream	Ream	260.63	0.00	0.00	2.00	2.00	3.00	8.00
6	Ream	In-cp	260.63	0.00	0.00	2.00	2.00	3.00	9.00
7	In-cp	0.50	261.13	0.50	0.50	2.00	2.00	3.00	10.00
8	12.75	20.37	294.25	33.12	32.95	2.00	2.00	3.00	10.00
9	24.98	15.26	334.49	40.24	36.89	2.00	2.00	3.00	10.00
10	12.00	26.21	372.70	38.21	38.04	2.00	2.00	3.00	10.00
11	Day off	Day off	372.70	0.00	0.00	0.00	0.00	2.00	2.00
12	11.15	0.97	384.82	12.12	11.69	2.00	2.00	3.00	10.00
13	10.23	14.66	409.71	24.89	24.20	2.00	2.00	3.00	10.00
14	10.34	3.56	423.61	13.90	12.56	2.00	2.00	3.00	10.00
15	Cem	Day off	423.61	0.00	0.00	1.00	1.00	3.00	6.00
16	Day off	Day off	423.61	0.00	0.00	0.00	0.00	2.00	2.00
17	Dr-cem	Day off	423.61	0.00	0.00	1.00	1.00	3.00	6.00
18	Day off	Day off	423.61	0.00	0.00	0.00	0.00	2.00	2.00
19	6.88	10.10	440.59	16.98	16.90	2.00	2.00	3.00	10.00
20	2.86	2.55	446.00	5.41	5.40	2.00	2.00	3.00	10.00
21	6.44	Maint	452.44	6.44	6.31	1.00	1.00	3.00	6.00
22	11.53	8.52	472.49	20.05	19.84	2.00	2.00	3.00	10.00
23	18.00	18.00	508.49	36.00	35.35	2.00	2.00	3.00	10.00
24	Maint	15.00	523.49	15.00	14.90	2.00	2.00	3.00	9.00
25	Day off	Day off	523.49	0.00	0.00	0.00	0.00	2.00	2.00
26	6.00	8.77	538.26	14.77	14.49	2.00	2.00	3.00	10.00
27	8.09	Maint	546.35	8.09	8.03	1.00	1.00	3.00	10.00
28	Cem	Day off	546.35	0.00	0.00	1.00	1.00	3.00	6.00
29	Dr-cem	Day off	546.35	0.00	0.00	1.00	1.00	3.00	6.00
30	Day off	Day off	546.35	0.00	0.00	0.00	0.00	2.00	2.00
Oct 1	Day off	Day off	546.35	0.00	0.00	0.00	0.00	2.00	2.00
2	Day off	Day off	546.35	0.00	0.00	0.00	0.00	2.00	2.00
3	Dr-cem	0.85	547.20	0.85	0.85	2.00	2.00	3.00	10.00
4	Cem	Day off	547.20	0.00	0.00	2.00	2.00	3.00	9.00
5	Day off	Day off	547.20	0.00	0.00	0.00	0.00	2.00	2.00
6	Day off	Day off	547.20	0.00	0.00	0.00	0.00	2.00	2.00

Table 2-4-2 Record of the Drilling Operation on MJZC-7 (2)

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Oct 7	Day off	Day off	547.20	0.00	0.00	0.00	0.00	2.00	2.00
8	Day off	Day off	547.20	0.00	0.00	0.00	0.00	2.00	2.00
9	Day off	Day off	547.20	0.00	0.00	0.00	0.00	2.00	2.00
10	Dr-cem	Dr-cem	547.20	0.00	0.00	2.00	2.00	3.00	8.00
11	Dr-cem	Dr-cem	547.20	0.00	0.00	2.00	2.00	3.00	8.00
12	18.29	16.60	582.09	34.89	34.79	2.00	2.00	3.00	8.00
13	10.76	9.96	602.81	20.72	20.17	2.00	2.00	3.00	8.00
14	13.68	4.16	620.65	17.84	17.83	2.00	2.00	3.00	8.00
15	2.70	Day off	623.35	2.70	2.70	1.00	1.00	3.00	5.00
16	Day off	Day off	623.35	0.00	0.00	0.00	0.00	2.00	2.00
17	11.14	2.21	636.70	13.35	13.26	2.00	2.00	3.00	8.00
18	Rd-ex	11.65	648.35	11.65	11.05	2.00	2.00	3.00	8.00
19	10.14	12.00	670.49	22.14	22.08	2.00	2.00	3.00	8.00
20	12.00	6.00	688.49	18.00	18.00	2.00	2.00	3.00	8.00
21	Wash	6.00	694.49	6.00	6.00	2.00	2.00	3.00	8.00
22	9.56	5.44	709.49	15.00	15.00	2.00	2.00	3.00	8.00
23	Day off	Day off	709.49	0.00	0.00	0.00	0.00	2.00	2.00
24	Day off	Day off	709.49	0.00	0.00	0.00	0.00	2.00	2.00
25	6.00	7.51	723.00	13.51	13.51	2.00	2.00	3.00	8.00
26	Wash	4.49	727.49	4.49	4.49	2.00	2.00	3.00	8.00
27	8.86	9.14	745.49	18.00	18.00	2.00	2.00	3.00	8.00
28	8.86	6.59	760.94	15.45	15.45	2.00	2.00	3.00	8.00
29	Search	Day off	760.94	0.00	0.00	0.00	1.00	2.00	8.00
30	Day off	Day off	760.94	0.00	0.00	0.00	0.00	2.00	2.00
31	Mac-ex	Day off	760.94	0.00	0.00	0.00	1.00	3.00	5.00
Nov 1	Out-rd	Exc-rd	760.94	0.00	0.00	0.00	2.00	3.00	8.00
2	In-rd	In-rd	760.94	0.00	0.00	2.00	2.00	3.00	8.00
3	4.22	Out-rd	765.16	4.22	4.22	2.00	2.00	3.00	8.00
4	Mait	3.25	768.41	3.25	3.25	2.00	2.00	3.00	8.00
5	7.30	6.16	781.87	13.46	13.20	2.00	2.00	3.00	8.00
6	Day-off	Day-off	781.87	0.00	0.00	0.00	0.00	2.00	2.00
7	Dis	Tra	781.87	0.00	0.00	0.00	2.00	3.00	13.00
8	Reass	6.89	788.76	6.89	6.89	1.00	2.00	3.00	12.00
9	16.40	22.34	827.50	38.74	38.63	2.00	2.00	3.00	8.00
10	13.46	12.33	853.29	25.79	25.75	2.00	2.00	3.00	8.00
11	11.67	Out. In-Rd	864.96	11.67	11.67	2.00	2.00	3.00	8.00
12	5.60	23.76	894.32	29.36	29.36	2.00	2.00	3.00	8.00
13	Day-off	Day-off	894.32	0.00	0.00	0.00	0.00	2.00	2.00
14	21.89	9.17	925.38	31.06	31.04	2.00	2.00	3.00	8.00
15	17.35	12.23	954.96	29.58	29.55	2.00	2.00	3.00	8.00
16	14.97	9.03	978.96	24.00	24.00	2.00	2.00	3.00	8.00
17	6.04	Surv	985.00	6.04	6.04	1.00	2.00	4.00	8.00
18	Out-rd	Out-cp	985.00	0.00	0.00	0.00	2.00	3.00	8.00
19	Dis	Tra	985.00	0.00	0.00	0.00	2.00	4.00	9.00
20	Tra	Tra	985.00	0.00	0.00	0.00	2.00	5.00	16.00
21	Tra	-	985.00	0.00	0.00	0.00	1.00	2.00	6.00
Total	532.50	452.50		985.00	828.75	117.67	136.50	267.00	693.00

Abbreviations:

Band: Banding bit, Cem: Cementing, Dis: Dismantlement, Dr-cem: Dredging cemente, Exc-rd: Exchanging rod, In-cp: Inserting casing pipe, In-rd: Inserting rod, Mac-ex: Machine exchange, Maint: Maintenance of machines, Out-cp: Taking out casing pipe, Out-rd: Taking out rod, P-d: Preparation for drilling, Rd-con: Roda construction, Rd-ex: Rod examination, Ream: Reaming, Reass: Reassemblage, Recov: Recovering, Search: Searching pump, Surv: Surveying of hole deviation, Tra: Transportation, Wash: Washing, Wedge: Wedging, Wt-e/m: Waiting for equipment/material, Wt-hd: Waiting for hardening



Symbols for formations & lithology refer to Fig. 1-8 & abbreviation of geologic log (Appendix)

Taking out casing pipe
Dismantlement of machine
Removing

Fig. 2-4-1 Drilling Progress of MJZC-7

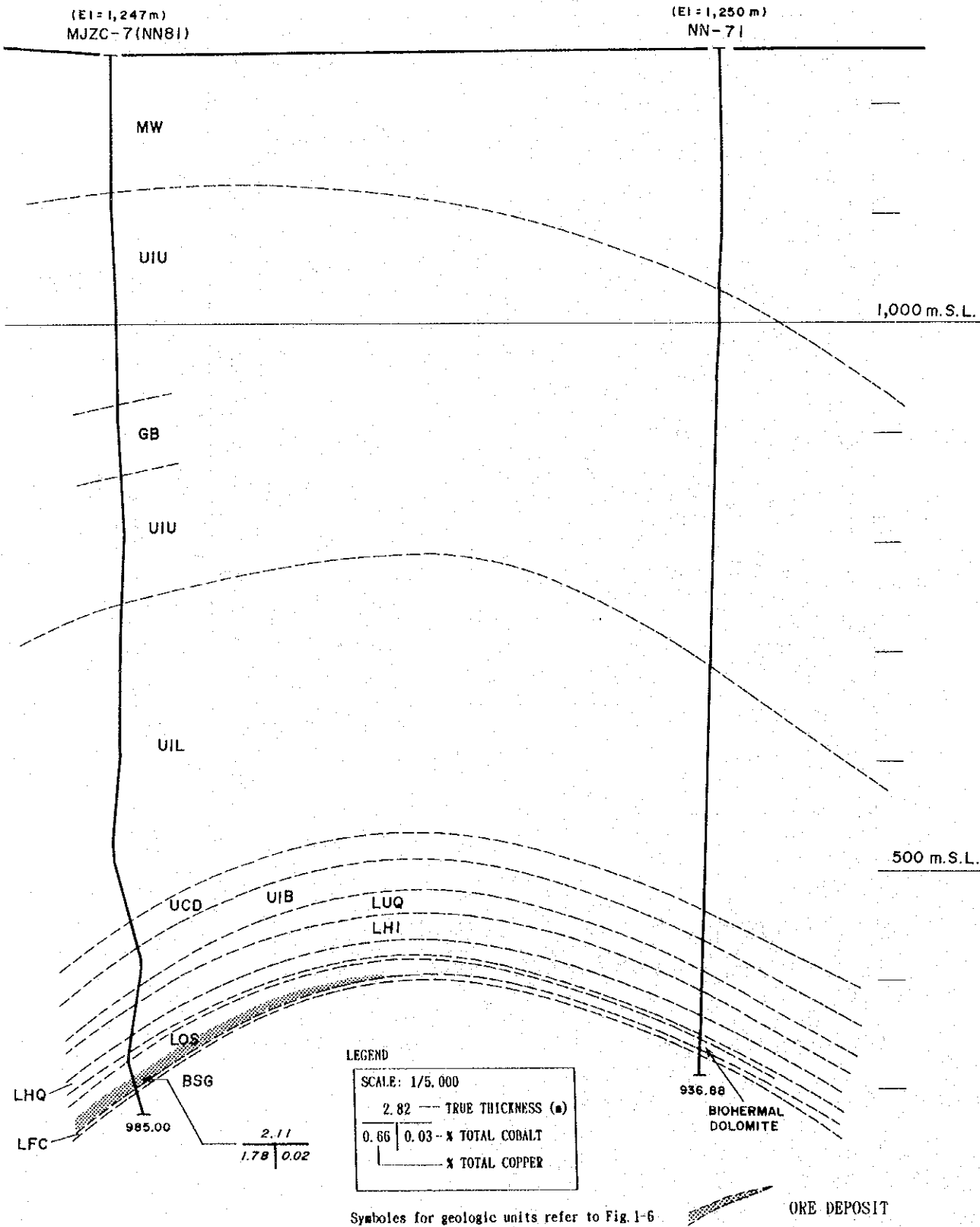


Fig. 2-4-2 Geological Profile of Drill Hole (MJZC-7)

4-2 Geology and Mineralization

The geologic log is appended. The geology of this borehole compared to that of the survey area described in 3-2 of PART I, lacks the "Footwall Quartzite", "Intermediate Conglomerate", "Feldspathic Quartzite and Grit" and "Basal Conglomerate" below the ore horizon, but otherwise it agrees well. Description of the borehole is as follows.

"Basement": 965.10 to 985.00m. The rock is white to grey granite rich in quartz and biotite. There are many small shear fractures in this rock and biotite bands are formed along these fractures.

Lower Roan Group

"Footwall Conglomerate": 963.50 to 965.10m. Greyish white conglomerate. The pebbles are quartz and anhydrite and the matrix is rich in biotite.

"Ore Shale Horizon": 923.80 to 963.50m. The unit consists of alternation of dark grey dolomitic argillite and dolomite. Chalcopryrite dissemination is observed at 923.80-927.40, 940.60-945.10, 948.00-956.90, 957.40-960.60, 961.80-963.50 m; and bornite occur disseminated at 959.20-963.50m. Results of ore assay are shown in Table 2-6-3.

"Hangingwall Quartzite and Argillite": 906.90 to 923.80m. This is composed of grey quartzite, dark grey dolomitic sandstone and white coarse-grained quartzite. Chalcopryrite dissemination occurs below 922.50m.

"Interbedded Argillite and Quartzite": 876.20 to 906.90m. It is composed of grey pelitic and dolomitic sandstone and quartzitic sandstone with intercalation of thin dolomite, quartzite and pelitic bands. Patches and lenses of anhydrite occur in sandstone and dolomite.

"Upper Quartzite": 860.30 to 876.20m. This unit consists of greyish white quartzite. The upper part is coarse crystalline and the lower part contains pelitic bands.

Upper Roan Group

"Interbedded Argillite, Dolomite and Quartzite": 821.50 to 860.30m. The upper part is composed of grey dolomitic sand-

stone, pelitic dolomite and sandy argillite and the lower part of thin alternation of white micaceous dolomite dark grey dolomitic sandstone dark grey sandy argillite greyish white quartzite. Weak pyrite dissemination and quartz-anhydrite veinlets are observed locally.

"Cherty Dolomite": 796.00 to 821.50m. The main component of this units is white massive dolomite and the upper part contains grey pelitic argillite (Marker Shale). Patches of anhydrite occur locally.

"Arenite, Argillite and Dolomite with Anhydrite": 500.50 to 796.00m. The upper part is composed mainly of alternation of greenish grey to dark grey sandy to micaceous argillite and dolomite with intercalation of grit to quartzite lenses in argillite. The lower part consists of greenish grey to dark grey sandy to gritty argillite with small amount of thin dolomite and quartzite layers. Anhydritized patches, veinlets and lenses occur throughout the unit. A large amount of muscovite and anhydrite occur in the upper dolomite. Also dissemination of pyrite occur scattered in the upper part.

"Interbedded Argillite and Dolomite with Tectono-Breccias": 126.00 to 318.70, 382.90 to 5000.50m. The upper part is composed mainly of alternation of dark grey dolomitic argillite and dolomite with intercalation of black shale, the middle part of alternation of white conglomerate dolomite dark grey to black argillite greyish white quartzite, and the lower part of grey argillite with dolomite intercalation. The argillite in the lower part contains sandy to quartzitic parts irregularly and is silicified and fractured. In the upper part, pyrite dissemination and veinlets, anhydrite veinlets and bands, and quartz veinlets occur locally. Small groups of faults are developed at 206.00-226.00m. Gabbroic bodies occur in this unit. Weak limonitization probably by weathering occurs locally in zones shallower than 300m.

"Mwashia Group": 27.00 to 126.00m. The major rocks of this group are phyllitic black shale with dolomitic shale in the lower parts.

"Gabbro (Amphibolite)": 318.70 to 382.90m. The bodies are dark green to black, altered, coarse-grained, crystalline and massive. They are rich in amphibole, plagioclase and biotite.

Veinlets of calcite-quartz-biotite-chalcopyrite-pyrite are developed in these bodies.

4-3 Discussions

This borehole is located on the limb of the rise of the basement (Figs. 1-7, 2-4-2). As the "Ore Shale horizon" is dolomitic and the "Footwall Formation" is very thin, it is inferred that the basement of this part was palaeo-basement high at the time of ore deposition. Although the copper content of this deposit is relatively low (width 2.98m T-Cu 1.78% T-Co 0.02%) and the deposit is believed to belong to the chalcopyrite zone of the sulfide zonal distribution (Fig. 1-9), the deposit is concluded to have formed relatively close to the shore because of the occurrence of bornite.

Chalcopyrite veinlets are strongly developed in the gabbro (amphibolite) encountered in this hole (321-366m). The source of this copper is not clear, but it is possible that they were regenerated by the concentration of copper migrated from the "Ore Shale horizon". The writers have pointed out the possibility of movement of metal elements of the "Ore Shale horizon" by diagenesis and metamorphism. If the copper in these veinlets were derived from the "Ore Shale horizon", it would indicate the relatively high concentration of the metal in this horizon.

MJZC-5 has confirmed the existence of relatively high grade ore to the east of this borehole. This deposit may extend northwestward on the southern side of this hole, and it is possible that it continues to the ore shoot confirmed by NN-75.

Chapter 5 MJZC - 8

5-1 Progress of Drilling

The location and the collar elevation of MJZC-8 are as follows.

Co-ordinates		Collar Elevation	Drilling Length	Inclination
X	Y			
+14,484.18	-8,833.52	1,210.03m	490.26m	-90°

Summary of the drilling, record of the drilling operation and the drilling progress are shown in Tables 2-5-1 and 2-5-2, and Figure 2-5-1, respectively.

Drilling was started with 212mm percussion bit to 44.27m depth, 165mm casing pipes inserted to that depth, and continued with 152mm percussion drill. But due to the large water flow out (200 lit/min) at 18m and 350 lit/min at 55m, percussion was given up at 61m. Then the method was changed to truck-mounted WL, HW casing inserted to 54 m, core drilling was done by NQ bit to 985.00m. At 260.63m, the upper wall deteriorated and HW casing was inserted for 54m, drilled by NX-C diamond shoe bit to 72.89m, NW casing inserted to that depth, and drilled to the bottom (490.26m) by NQ bit and CHD rod. Rod grease and cutting oil were used in order to prevent vibration during operation. Cuttings were collected at 1 m interval for non-core drilling.

Water was transported from a dammed reservoir in 4,500 lit. tanks by a tractor taking one hour round trip.

There is a weathered zone from the surface to 380m in this borehole where the units are soft. The hole was drilled without interruption in order to prevent the collapse of the soft parts. Vicinity of 280m collapsed after drilling to 428.22m and bentonite mud was used after washing.

Borehole deviation was measured every 100m. The measurement showed that the borehole deviated westward as in the cases of previous drilled holes in the vicinity (Appendices).

Table 2-5-1 Summary of the Drilling Operation on MJZC-8

Operation	Survey Period				Total Man Day		
	Period	Day	Work Day	Off Day	Engineer	Worker	
Preparation	18. 11. 1994~20. 11. 1994	3. 00	3. 00	0. 00	10. 00	23. 00	
Drilling	13. 11. 1994~13. 12. 1994	25. 00	Drilling 25. 00	1. 00	80. 00	189. 00	
Dismantling	15. 11. 1994~17. 11. 1994		Recovering 0. 00	0. 00	0. 00	0. 00	
	14. 12. 1994~16. 12. 1994	6. 00	5. 00	0. 00	17. 00	38. 00	
Total	13. 11. 1994~16. 12. 1994	34. 00	33. 00	1. 00	107. 00	250. 00	
Drilling Length	m		m	Core Recovery of 100m Hole			
Length Planned	600. 00	Overburden	59. 00	Depth of Hole (m)	Core Recovery (%)	Core Recovery Cumulated (%)	
Increase/Decrease in Length	-109. 74	Core Length	394. 99				
Length Drilled (N/C Drilling)	490. 26	Core Recovery	92. 02	0. 00- 100. 00	93. 77	93. 77	
(Core Drilling)	61. 00			100. 00- 200. 00	97. 51	96. 46	
	429. 26			200. 00- 300. 00	96. 16	96. 33	
Working Hours	h	%	%	300. 00- 400. 00	74. 63	89. 93	
Drilling	269. 00	49. 72	32. 99	400. 00- 500. 00	90. 12	92. 02	
Other Working	248. 00	45. 84	30. 41				
Recovering	24. 00	4. 44	2. 94				
Subtotal	541. 00	100. 00	66. 34				
Reassemblage	13. 00		1. 59				
Dismantlement	15. 00		1. 84				
Water Supply	203. 50		24. 95				
Road Construction	6. 00		0. 74				
Transportation	37. 00		4. 54				
Grand Total	815. 50		100. 00	Efficiency of Drilling			
Casing Pipe Inserted				Total Length / Drilling Period	m	day	m/day
Size	Meterage (m)	Meterage / Drilling Length ×100 (%)	Recovery (%)	Total Length / Total Drilling Shifts	m	shift	m/shift
				Drilling Length / Each Bit (m)			
mm	0. 00	0. 00		Bit Size	Drilled Length	Core Length	
165mm	44. 27	9. 03	100. 00	212mm	44. 27	N/C	
HW	54. 00	11. 01	100. 00	mm	16. 73	N/C	
NW	72. 89	14. 87	100. 00	114mm	0. 00	N/C	
BX	0. 00	0. 00		HQ	11. 89	9. 46	
				NQ	417. 37	385. 53	
				BQ	0. 00	0. 00	

Table 2-5-2 Record of the Drilling Operation on MJZC-8

Date	Drilling Length (m)			Daily Total (m)		Shift (shift)		Man Working (man)	
	shift 1	shift 2	Total Cumulated	Drilling Length	Core Length	Drilling	Total	Engineer	Worker
Nov 13	44.27	-	44.27	44.27	0.00	0.80	1.00	3.00	6.00
14	16.73	-	61.00	16.73	0.00	1.00	1.00	3.00	6.00
15	Out-cp	-	61.00	0.00	0.00	0.00	1.00	3.00	6.00
16	Day off	Day off	61.00	0.00	0.00	0.00	0.00	2.00	2.00
17	Dis	-	61.00	0.00	0.00	0.00	1.00	3.00	6.00
18	P-d-Tra	-	61.00	0.00	0.00	0.00	1.00	3.00	7.00
19	Tra	-	61.00	0.00	0.00	0.00	1.00	3.00	7.00
20	Reass	-	61.00	0.00	0.00	1.00	1.00	4.00	9.00
21	In-cp	1.62	62.62	1.62	0.60	2.00	2.00	3.00	8.00
22	3.27	Out. In-cp	65.89	3.27	3.00	2.00	2.00	3.00	8.00
23	6.11	6.23	78.23	12.34	11.20	2.00	2.00	3.00	8.00
24	12.99	22.15	113.37	35.14	35.14	2.00	2.00	3.00	8.00
25	11.75	10.70	135.82	22.45	21.96	2.00	2.00	3.00	8.00
26	12.35	23.66	171.83	36.01	34.40	2.00	2.00	3.00	8.00
27	7.19	11.40	190.42	18.59	18.36	2.00	2.00	3.00	8.00
28	13.30	18.64	222.36	31.94	31.78	2.00	2.00	3.00	8.00
29	18.86	10.74	251.96	29.60	29.60	2.00	2.00	3.00	8.00
30	1.26	18.00	271.22	19.26	19.01	2.00	2.00	3.00	8.00
Dec 1	17.41	Maint	288.63	17.41	15.92	2.00	2.00	3.00	8.00
2	10.64	1.95	301.22	12.59	10.49	2.00	2.00	3.00	8.00
3	10.00	8.00	319.22	18.00	13.17	2.00	2.00	3.00	8.00
4	18.00	11.31	348.53	29.31	17.45	2.00	2.00	3.00	8.00
5	9.67	20.53	378.73	30.20	24.43	2.00	2.00	3.00	8.00
6	13.49	-	392.22	13.49	10.58	1.00	1.00	3.00	5.00
7	Maint	-	392.22	0.00	0.00	0.00	0.50	4.00	5.00
8	Maint	17.86	410.08	17.86	17.86	1.00	1.50	4.00	8.00
9	18.14	Wash	428.22	18.14	18.00	2.00	2.00	3.00	8.00
10	6.00	11.90	446.12	17.90	17.90	2.00	2.00	3.00	8.00
11	11.10	13.00	470.22	24.10	24.10	2.00	2.00	3.00	8.00
12	10.24	8.66	489.12	18.90	18.90	2.00	2.00	3.00	8.00
13	1.14	-	490.26	1.14	1.14	1.00	1.00	4.00	5.00
14	Out-cp	-	490.26	0.00	0.00	0.00	1.00	4.00	9.00
15	Dis-Tra	-	490.26	0.00	0.00	0.00	1.00	4.00	9.00
16	Tra	-	490.26	0.00	0.00	0.00	1.00	3.00	8.00
Total	273.91	216.35	490.26	490.26	394.99	43.80	52.00	107.00	250.00

Abbreviations:

Band: Banding bit, Cem: Cementing, Dis: Dismantlement, Dr-cem: Dredging cemente,
 Exc-rd: Exchanging rod, In-cp: Inserting casing pipe, In-rd: Inserting rod,
 Maint: Maintenance of machines, Out-cp: Taking out casing pipe, Out-rd: Taking out rod
 P-d: Preparation for drilling, Rd-con: Roda construction, Rd-ex: Rod examination,
 Ream: Reaming, Reass: Reassemblage, Recov: Recovering, Search: Searching pump,
 Surv: Surveying of hole deviation, Tra: Transportation, Wash: Washing, Wedge: Wedging,
 Wt-e/m: Waiting for equipment/material, Wt-hd: Waiting for hardening

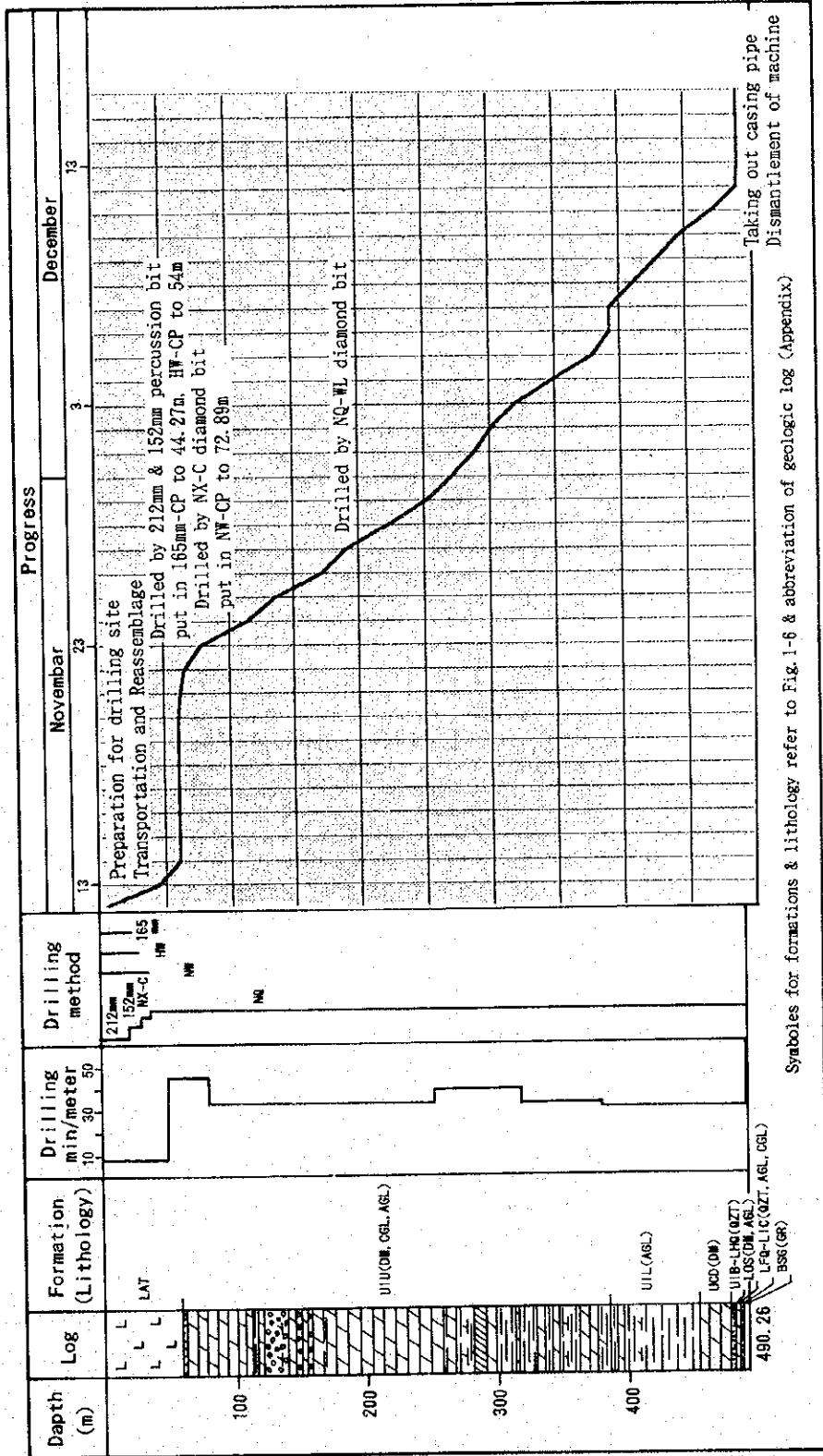


Fig. 2-5-1 Drilling Progress of MJZC-8

5-2 Geology and Mineralization

The geologic log is appended. The geology of this borehole compared to that of the survey area described in 3-2 of PART I, lacks the "Footwall Conglomerate", "Feldspathic Quartzite and Grit" and "Basal Conglomerate" below the ore horizon, but otherwise it agrees well. But the units between the "Cherty Dolomite" and the basement are very thin and the differentiation of the geologic units are not very clear. Description of the borehole is as follows.

"Basement": 486.40 to 490.26m. The rock is greyish white silicified granite. The rock is rich in quartz and biotite with weak pyrite-chalcopyrite dissemination.

Lower Roan Group

"Intermediate Conglomerate": 486.10 to 486.40m. Conglomerate with pebbles of grey silicified rocks with veinlets of dolomite-(anhydrite).

"Footwall Quartzite": 482.50 to 486.10m. It is composed mainly of greyish white quartzite with thin dolomite intercalation. Argillite with biotite bands occur in the basal part.

"Ore Shale Horizon": 480.90 to 482.50m. The unit consists mainly of alternation of argillite and dolomite. Biotite bands occur locally in the dolomite. Very weak dissemination of bornite-chalcopyrite is observed.

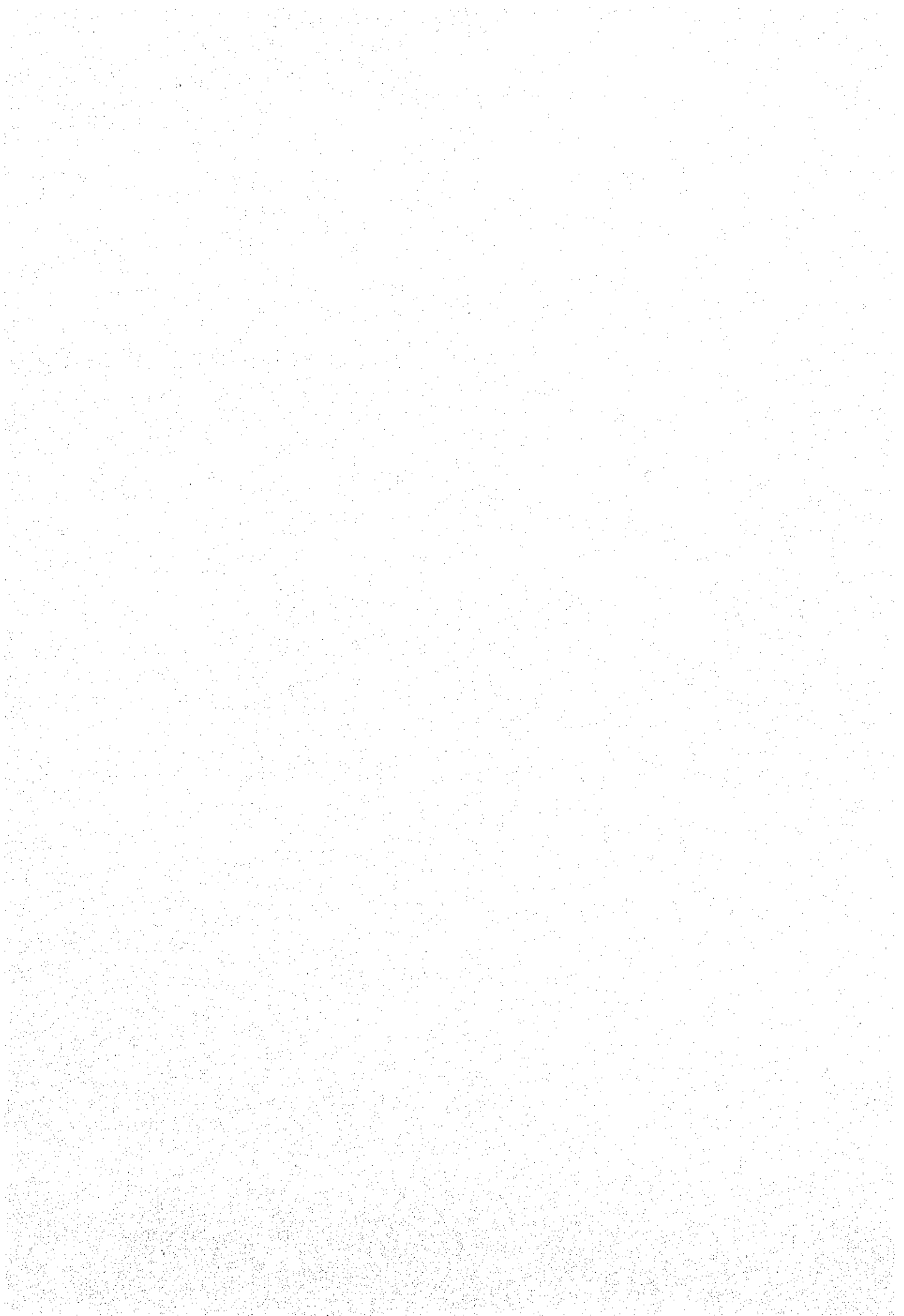
"Hangingwall Quartzite and Argillite": 479.10 to 480.90m. This is composed of dark grey pelitic quartzite with pelitic bands. Biotite and pyrite dissemination is observed.

"Interbedded Argillite and Quartzite": 478.80 to 479.10m. It is thin alternation of dolomite and argillite with lenses of anhydrite.

"Upper Quartzite": 477.40 to 478.80m. This unit consists of grey quartzite with pelitic bands and anhydrite lenses.

Upper Roan Group

"Interbedded Argillite, Dolomite and Quartzite": 476.90 to 477.40m. It consists of grey dolomitic quartzite and dolomite with pelitic bands. Weak pyrite dissemination is observed.



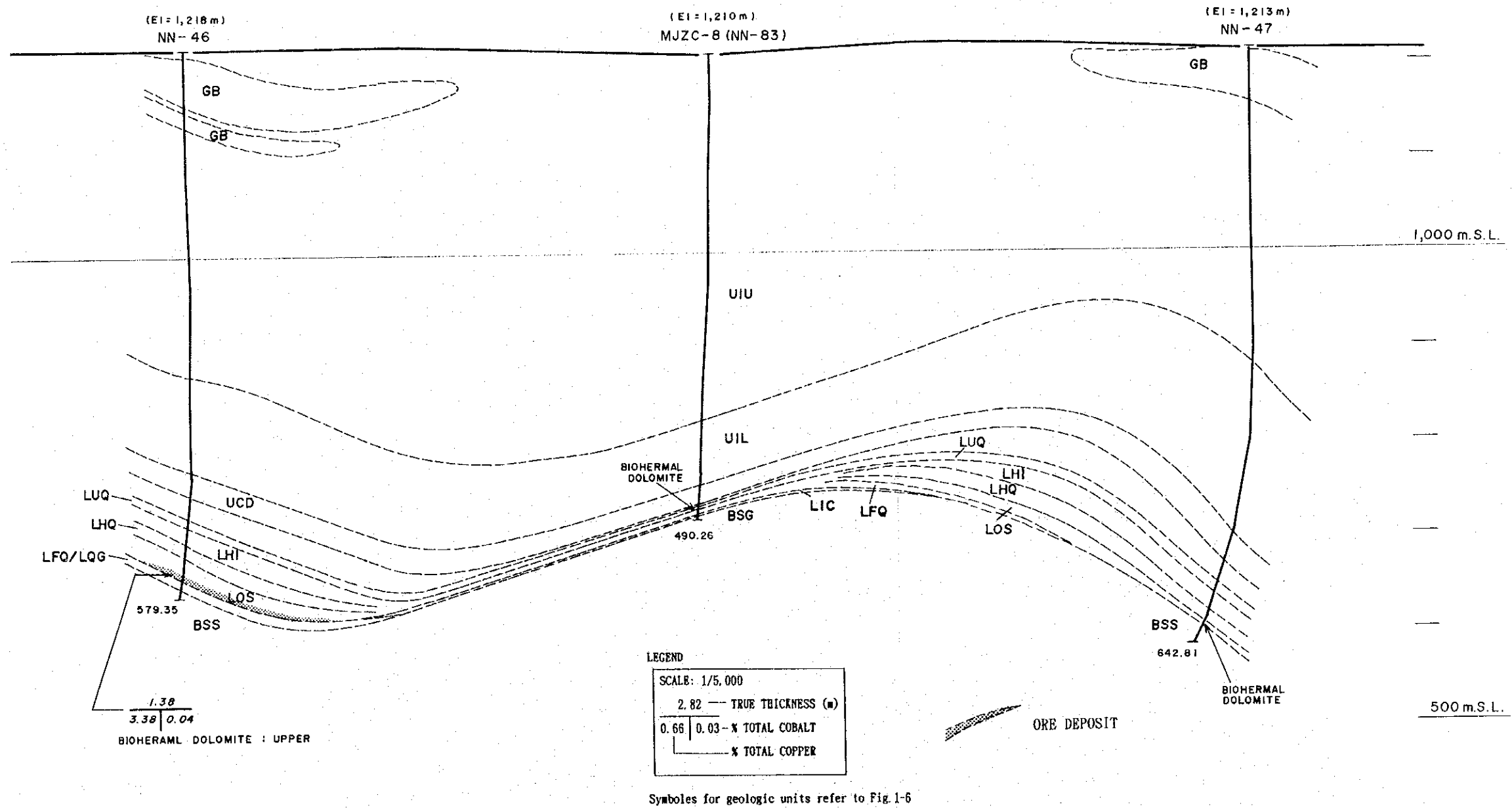


Fig. 2-5-2 Geological Profile of Drill Hole (MJZC-8)

