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METAL MINING AGENCY OF JAPAN

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF ZIMBABWE

REPORT ON THE COOPERATIVE MINERAL EXPLORATION OF SHAMVA AREA

PHASE Ⅲ

FEBRUARY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

PREFACE

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At the request of the Government of the Republic of Zimbabwe, the Japanese Government planned a mineral exploration programme consisting of several survey methods to examine the possibility of the existence of mineral deposits in the Shamva District located in the northeastern part of the country. The Japanese Government entrusted the execution of the general plan to the Japan International Cooperation Agency (JICA), and in turn JICA entrusted the execution of this survey to the Metal Mining Agency of Japan (MMAJ), since this survey was a professional survey programme of mineral exploration.

This year's programme is the third year's one. MMAJ organized a survey team of one member, and dispatched the team to Zimbabwe during the period from June 21 to November 8, 1985. The on-site survey was completed as scheduled with the cooperation of the Zimbabwe Government, particulary the Geological Survey Department of the Ministry of Mines.

This report describes the survey results of the third year programme of the Shamva Project, and will form a part of a final report.

Lastly, we would like to express our heatful gratitude to the members of concerned of the Zimbabwe Government, the Ministry of foreign Affairs of Japan, the Ministry of International Trade and Industry of Japan, Japanese Embassy in Zimbabwe, and all of whom extended their kind cooperation to us in executing the above mentioned survey.

February, 1986

Keisuke ARITA
President,
Japan International Cooperation Agency

Masayuki NISHIIE
President,
Metal Mining Agency of Japan

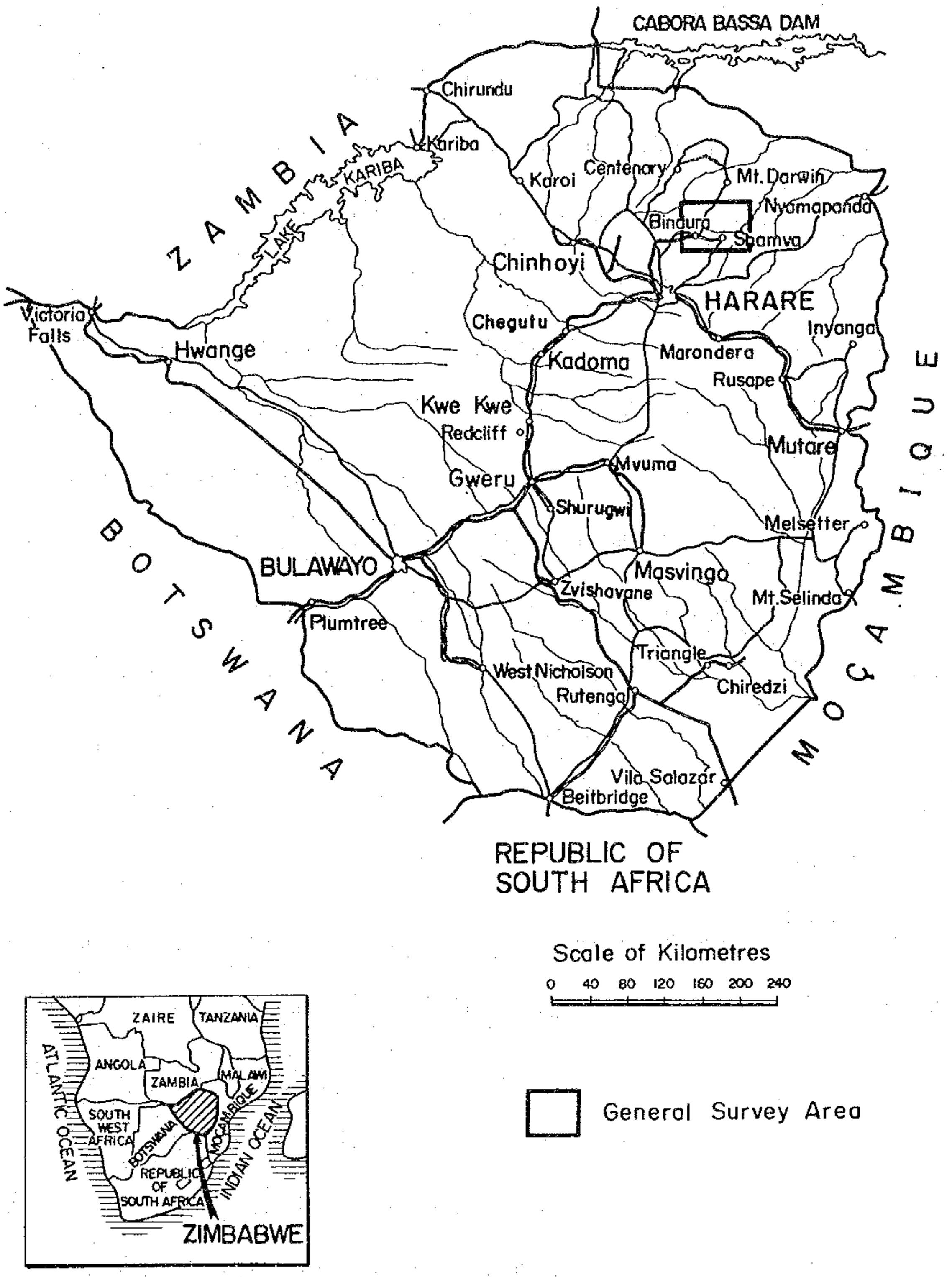

Fig. 1 Location Map of Shamva Area

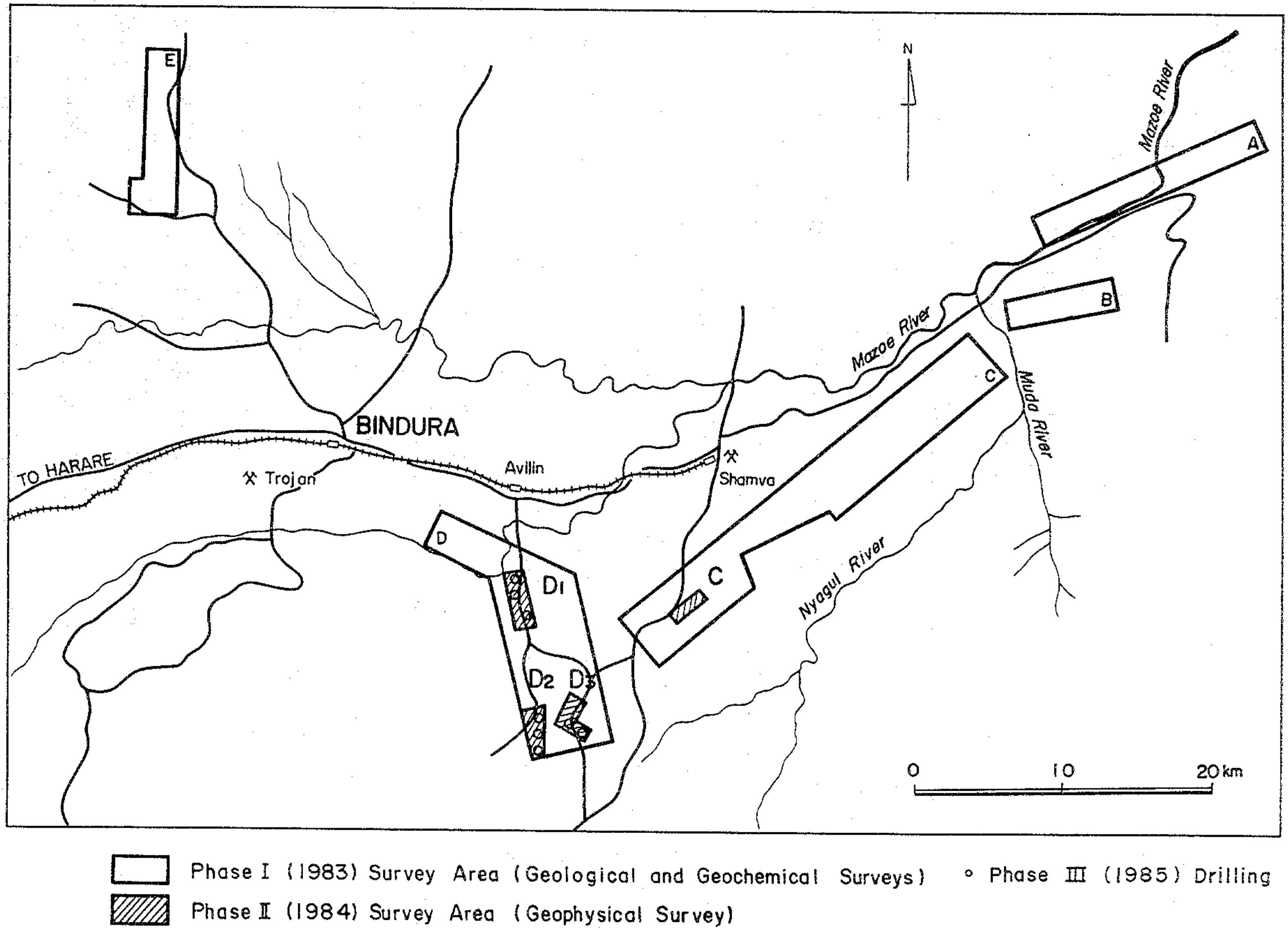

Fig. 2 Location Map of Survey Area

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ABSTRACT

The principal purpose of the third year's programme of the Shamva project was to examine the possibility of the existence of mineralized zones in the selected eight drilling targets, based on the results of the previous two annual programmes.

The survey programme was conducted from 21 June to 8 November 1985, a period of 139 days. The drilling was conducted by a drilling company based in Harare, and core loggings, assay sample preparation together with correlation of geology between the surface and the drill holes were done by the survey team with the cooperation of the counterpart, the Geological Survey Department of Zimbabwe.

Non-wireline drilling was adopted for the programme because of shortage of necessary parts for complete wireline sets. The drilling was done by three drilling crews, and consisted of eight holes with a total depth of 1,650 meters.

In this programme, some pyrrhotite occurrences were found in four of the eight holes drilled. Numbers of assay samples for mineralized parts were 80 for Cu, Ni and Co, 20 for Nb, Ta and Sn, and 50 for Au. In addition, 101 rock samples were analysed for Ni, Co, Mn, Mg, Fe and S.

Of the assay results, only one section of 17 centimeters in MJZ-3 showed some values; 0.38% Cu, 0.56% Ni, 0.08% Co, all other sections showing very low values. Even though its size is very small, this mineral occurrence is of massive pyrrhotite containing some chalcopyrite in serpentine, favourable host rocks for Trojan-type nickel mineralization. Therefore, it is considered that the area surrounding the hole has a very high potential for economic ore deposits.

On the other hand, the pyrrhotite intersection of 15 meters in MJZ-7 is of very low grade; 0.06% Cu, 0.06% Ni. Despite this, the sulphide occurrence in serpentine is in a very favourable geological setting for Trojan-type nickel ore deposits. Therefore, it is concluded that the area around this hole also has a high potential for economic ore deposits.

Based on the above mentioned results, it is hoped that further exploration programmes, consisting of surface and borehole geophysics as well as drilling, will be conducted in the areas of MJZ-3 and MJZ-7 sometime in the future.

PART I.

GENERAL DESCRIPTION

CHAPTER 1 INTRODUCTION

1-1 Purpose of the Survey

The purpose of the project was to clarify the geological setting of the ore deposits in the Shamva area, and to evaluate mineral resource potential in the target areas.

The principal purpose of the third year's programme was to examine the possibility of the existence of mineralized zones in eight drilling targets selected on the basis of the results of the previous two years survey programmes.

1-2 Outline of the Survey

The survey programme was conducted from 21 June to 8 November 1985, a period of 139 days. Drilling work was conducted by R.A. Longstaff (Pvt) Ltd. based in Harare, and core logging, assay sample preparation as well as correlation of geology between the surface and the boreholes were done by the survey team.

The drilling programme consisted of eight drill holes with a total length of 1,650 meters. Numbers of assay samples were 80 for Cu, Ni and Co, 20 for Nb, Ta and Sn, 50 for Au, and 101 for rock geochemical assay for Ni, Co, Mn, Mg, Fe and S.

The survey programme was completed by the team with the cooperation of the staff of the counter part agency, the Geological Survey Department of Zimbabwe.

1-3 Organization of the Survey Team

The members who were involved in the planning, managing, and field survey were as follows.

(1) Planning and Managing

Japanese Members

Makoto ISHIDA	Metal Mining Agency of Japan
Toshio SAKASEGAWA	Do.
Takahisa YAMAMOTO	Do.
Yoshiyuki KITA	Do.
Yosuke SUZUKI	Do.

Zimbabwean Members

E.R. MORRISON	Geological Survey Department
D.E.H. MURANGARI	Do.
C.B. ANDERSON	Do.

(2) Field Survey Team

Japanese Member

Akiyoshi KOMURA	Dowa Koei Co., Ltd.

CHAPTER 2 GENERAL CIRCUMSTANCES OF THE SURVEY AREA

2-1 Location and Transportation

The survey area is located 14km to 25km southeast of Bindura which is 70km northeast of the capital city, Harare. It takes about one hour to travel 87km from Harare to Bindura by car on a good highway. A good road network is available from Bindura to the survey area, although some parts are dirt roads. From Bindura, it takes about 20 minutes to Area D-1, and 30 minutes to Area D-3. The another way to go to the survey area from Harare is through the Shamva road. It takes about 45 minutes to the southern most drill hole in Area D-3.

2-2 Topography and Climate

The survey area is located in the Southern African Plateau at an altitude of 1,000m to 1,200m above sea level. Topography well reflects the geology. Andesitic to basaltic lavas, serpentines, and banded iron-stones are found in the area which features significant elongated narrow mountain ranges rising 200m to 300m from the background areas. The surrounding, flat, areas are suitable for farming. In the mountain ranges, scarce shrubs grow. Granite-gneiss complexes are found associated with rounded hills in significant contrast to the former region where the survey area is mainly located.

The climate of the survey area is not tropical because of the high altitude, despite the latitude of 17° south. Seasons are clearly divided into two, dry from April to October and wet from November to March. Precipitation per year is usually 700mm to 900mm. This year's survey work was done in the dry season, when the temperature was 25°C to 30°C in the day time, and below 10°C at night. October is the hottest month of the year, and the temperature never fell below 30°C day and night for several days. In November, the climate changed very suddenly. it rained almost every afternoon, and the temperature fell to about 18°C in the day time.

2-3 General Social Circumstances

Four years have passed since independence in 1980. The society has been changing toward socialization, and the departure of white people is continuing (at present only 70,000 still remain in the country). The international trade balance is becoming serious as a rsult of the world wide recession and three year's drought. Inflation is accelerating, and the value of the Zimbabwean Dollar quickly declining (as of November 1985 Z$1= US$0.6). The government is endeavouring to improve the situation.

The result of the general election held in July 1985 showed a landslade victory of the majority party (ZANU). Therefore, the minority party (ZAPU) supported by Matabere tribes stands in a very unstable basis now.

CHAPTER 3 GENERAL AND ECONOMIC GEOLOGY

3-1 General Geology

The land of Zimbabwe is geologically divided into two parts, the Rhodesian Craton area occupying the central eastern part of the country and the rest of the younger geological terrane occupying the northwestern and southeastern parts of the country. The Rhodesian Craton is one of the oldest archean cratons in the world (3.6 b.y. to 2.4 b.y.), and consists of granitic and gneissic terrane containing several greenstone belts. The greenstone belts consist mainly of intermediate to mafic lavas and pyroclastics, and various sedimentary piles, and these rocks are metamorphosed to the greenrock phase. The stratigraphy of these belts is as follows.

Shamvaian Group	clayey to pebbly sedimentary rock piles, felsic pyroclastic rock piles.
Bulawayan Group	
Upper Bulawayan Formation	intermediate to mafic lavas and pyroclastic rock piles, ultramafic komatiitic lavas, thin layers of cherts, limestones, and banded-ironstones.
Lower Bulawayan Formation	mafic lavas, cherts, conglomerates, phyllites, and banded ironstones.
Sebakwian Group	Intermediate to mafic lavas and pyroclastic rock piles, thin layers of cherts, limestones, and banded ironstones.

The Rhodesian Craton is surrounded by the Zambezi Mobile Belt to the north, the Mozambique Mobile Belt to the east, and the Limpopo Mobile Belt to the south. These mobile belts are of proterozoic activity (550 m.y.).

In the central part of this country, a very peculiar geological feature, the Great Dyke, extends about 540km north to south. Its activity age is 2.5 b.y. The rocks of this dyke are mafic to ultramafic layered differentiated rocks.

The survey area is located in the Shamva Greenstone Belt, one of the country's greenstone belts, and consists mainly of intermediate to mafic lavas and pyroclastic rock piles, komatiitic lavas, banded ironstones, cherts, limestones, and sandstones of the Upper Bulawayan Formation.

To the west and south of the survey area, granitic-gneissic rock terrane, believed to be reactivated igneous intrusions into the greenstone belts in most of the regions, is located.

This year's survey areas were selected, on the basis of the results of the first and second year's geological, geochemical and geophysical survey programmes, where extensive serpentine intrusives are distributed. These serpentines are parts of ultramafic activities which belong to komatiitic rock series, and usually contain more than 35% MgO. Komatiitic lavas sometimes show remarkable spinifex texture, and are easily determined.

The geological structure in the southern part of the survey areas, D-2 and D-3, is controlled by the distribution pattern of the granitic complex body surrounding the greenstone belt, and some significant tectonic features, such as faults, are located there. Therefore, its geological structure is very complicated. The dips of the formations and other features such as intrusive bodies of the serpentines seem to be close to vertical.

3-2 Economic Geology

Ore deposits distributed in the survey area are as follows.

(1) Gold Deposits

Shamva Deposit, Gold Deposits around the Bindura Granite (Kimberley Reef, R.A.N., Kingsley Hoard, Prince of Wales, Slam, Promoter, Hay, etc.), Montdor Deposit, Red Dragon Deposit, Churchill Deposit, Ivan Zone, Inyagui Deposit, Kadangi Deposit

(2) Nickel Deposits

Trojan Deposit, Katio Occurrence, Tynan Occurrence

(3) Pegmatite Deposits

Uzumba Deposit, Zero Deposit, Wanroo Deposit, Look and Weep Deposit, Chenjera Deposit, Trafuna Hill Deposit, Robnik Deposit, Mejenzi Deposit, Dale 4 Deposit, Nyagul Deposit, Lochness Deposit, Nkanga Deposit

Among them, Shamva Gold Mine, R.A.N. Gold Mine, and Trojan Nickel Mine are operating at present. Their production scales are as follows. (data of 1983)

Shamva Gold Mine

Gold produced per year	540 kg
Ore mined per year	150,000 ton
Grade	4.5 g/t

R.A.N. Gold Mine

No published data available, but its scale is very small.

Trojan Nickel Mine

Nickel Produced per year	3,025 ton
Ore mined per year	746,000 ton
Grade	0.55% Ni

Trojan nickel ore deposits located to the west of the survey area are closely associated with komatiitic ultramafic rocks which are in the Upper Bulawayan Formation. It is a well known fact that nickel ore deposits associated with such komatiitic ultramafic rocks have very high nickel/copper ratio (7:1 to 16:1) compared with those associated with tholeitic ultramafic rocks which have relatively low nickel/copper ratio (1:1 to 2:1).

In the survey area, the lower parts of the Upper Bulawayan Formation which are the host horizon of the Trojan ore deposits extend from the Trojan area, and such komatiitic ultramafic rocks are well distributed. Judging from the good geological setting, the potential for similar types of nickel ore deposits is high.

Two mineral occurrences, Tynan nickel mineralized zone and Lochness tin-bearing pegmatite, are located in this year's survey areas.

Tynan Nickel Occurrence

The occurrence is located in Area D-3, and is of a nickel mineralized zone associated with serpentine bodies intruded into graphitic sediments, banded ironstones, komatiitic lavas, and andesitic lavas and pyroclastics. This zone is located on our geophysical survey lines D-10-39 to D-9-42.

This mineralized zone was previously owned by several companies such as Rio Tinto, Anglo Vaal, J.C.I., Blanket Mines, Prospecting Ventures (A.A.C.), Tynan Syndicate, etc. They all conducted extensive exploration activities, including geological, geochemical, trenching, and drilling surveys. Among them, Blanket Mines was the most active, and conducted a significant drilling programme including ten drill holes in 1975, but failed to find economic ore deposits. A plan map of this property, made by Blanket Mines, is shown in Fig. I-1 in the phase II report.

Our geophysical survey lines covered this zone, and the CSAMT survey revealed a low resistivity area coincident with it, but the SIP survey lines were set up about 600m to 800m to the south.

Lochness Tin-bearing Pegmatite

The pegmatite dyke is located in the north-central part of Area D-1, and our geophysical survey lines D-39-6 to D-38-6 extended along the top ridge of north-south low hilly range. It intrudes into a serpentine body and contains large crystals of quartz and feldspar, large amounts of mica, and some black, pale green, and pinkish tourmaline crystals.

An old working exists at the northern end of the pegmatite, but it is small (about 20m long, 2m wide, and several meters deep), judging from the amount of the waste dump. it is very hard to find cassiterite crystals in the waste.

About 300m to the north, similar type and scale pegmatite dyke is located on the survey lines D-40-6 to D-41-6, but old working was not seen there.

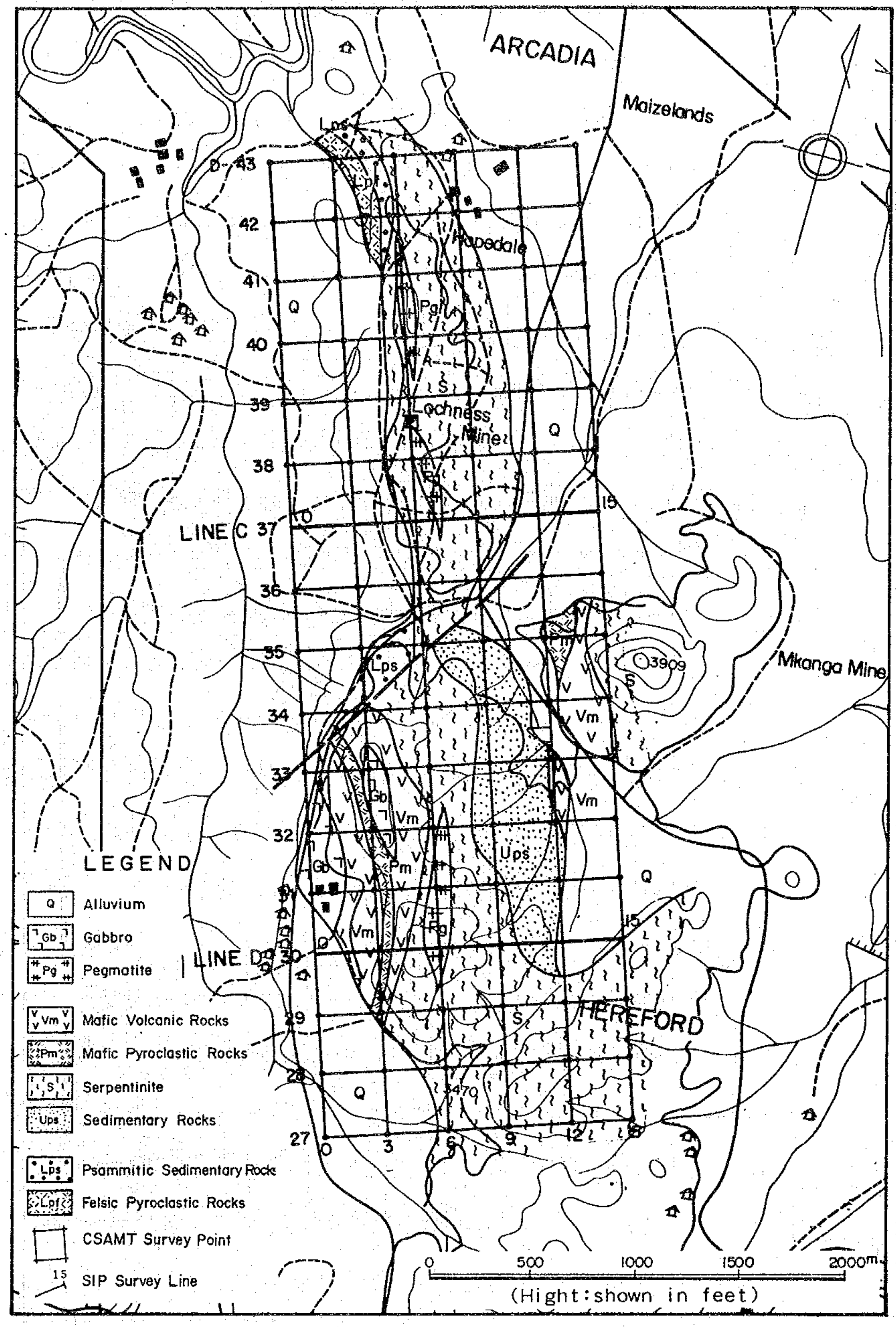


Fig. I-3-1-1 Geological Map of Area D-1

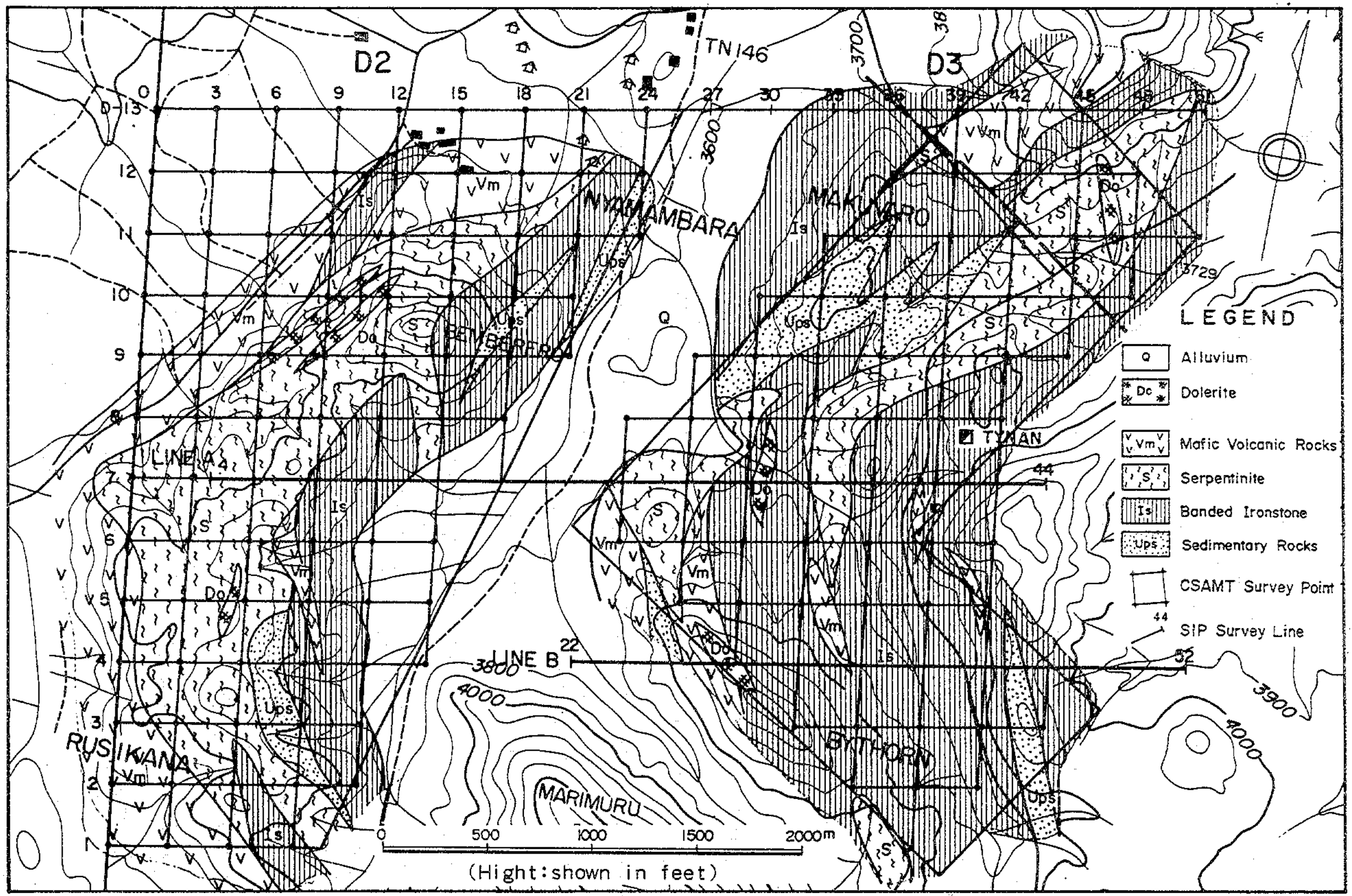


Fig. I-3-1-2 Geological Map of Area D-2, D-3

PART Ⅱ.

SURVEY RESULTS

CHAPTER 1 OUTLINE OF THE DRILLING SURVEY

1-1 Survey Plan

The drilling programme was planned to achieve the purpose of evaluating the potential for economic ore deposits, following study of all results of the geological, geochemical and geophysical surveys done by the mission in the previous two years.

Eight drill holes, totaling 1,651 meters, were sited: three holes in Area D-1, three holes in Area D-2, and two holes in Area D-3.

1-2 Survey Method

The drilling work was conducted by R.A. Longstaff (Pvt) Ltd. The Japanese survey team conducted core logging, assay sample preparation, etc. with the cooperation of the counterpart agency, the Geologycal Survey Department of the Ministry of Mines.

Because of shortage of necessary parts for complete wireline sets, non-wireline drilling method with a final bit size of TBW was adopted for the programme. TBW size drilling has the advantage of good core recovery, fast drilling and large diameter cores. Much careful attention was paid to good core recovery, especially in mineralized parts. As a result of this, almost 100% core recovery was achieved in all except the weakest ground.

The drilling was done by three machines using a 10-hour day, 6-day week system. Some mechanical troubles were experienced during the programme, and shortage of spare parts for repairs caused further delay. It is suggested that drilling skill and efficiency should be improved in future.

1-3 Progress of the Programme

Azimuth, dip, depth, and period of drilling for each hole are shown in Table II-1-3-1, and the results of the acid tube angle tests are shown in Table II-1-3-2.

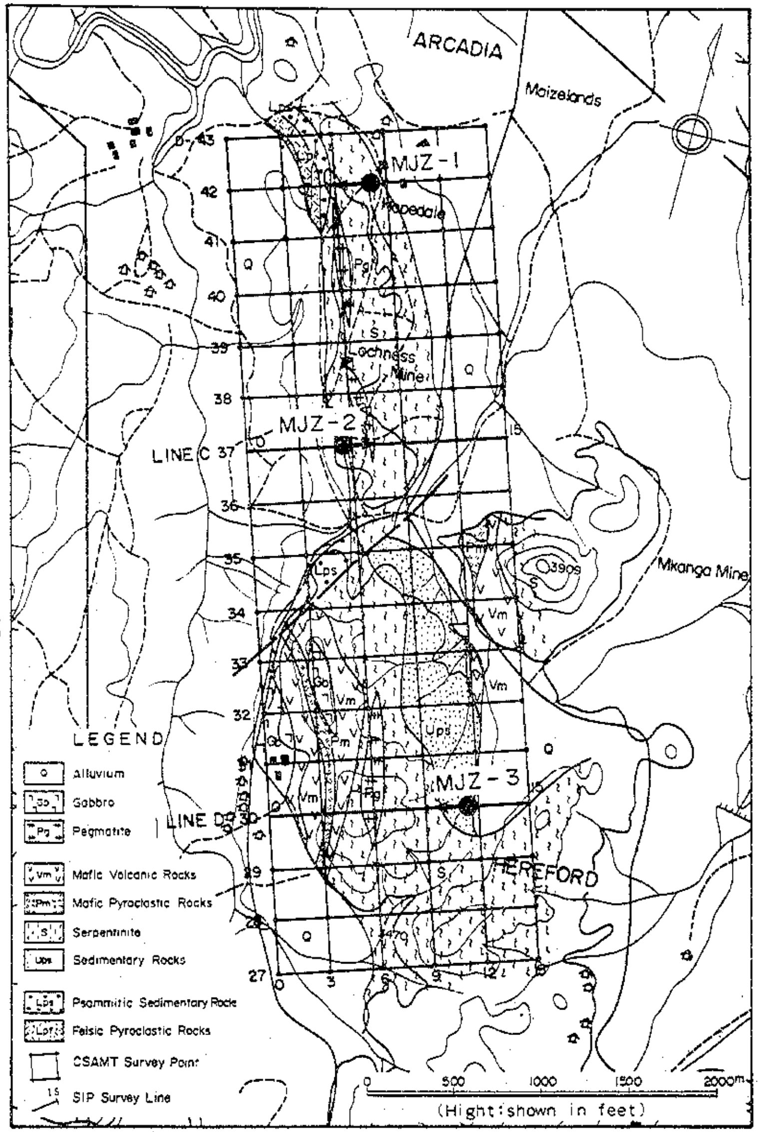


Fig. II-1-1-1 Location Map of Drill Holes in Area D-1

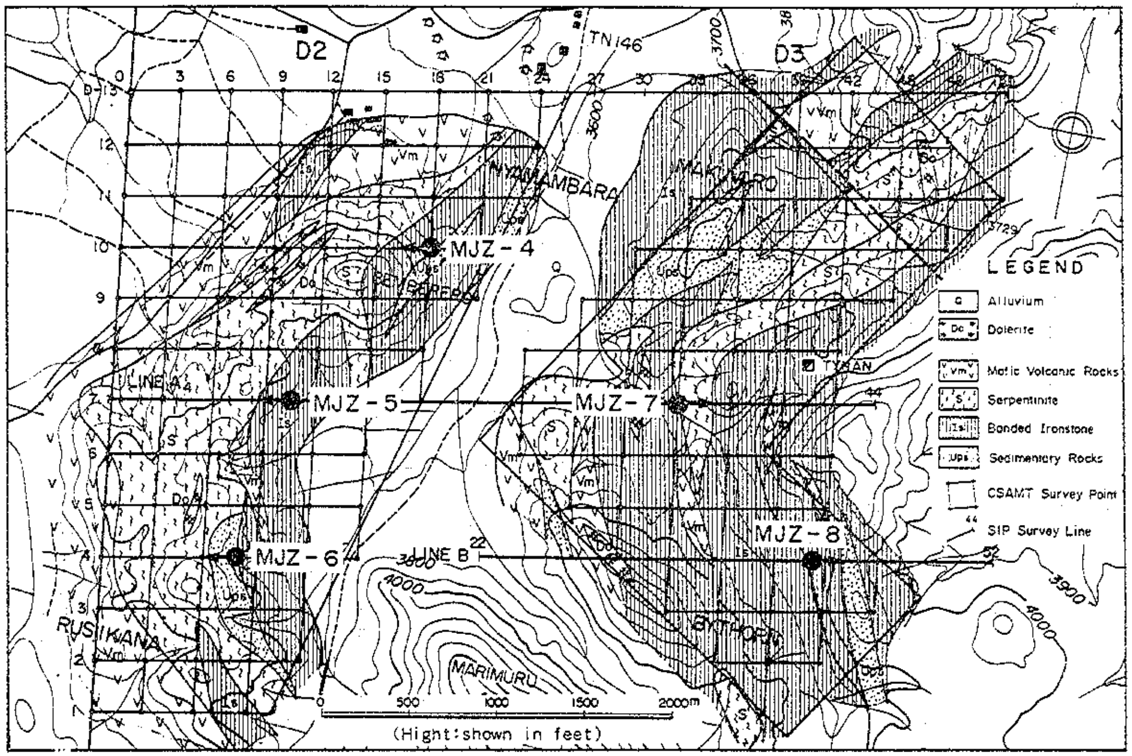


Fig. II-1-1-2 Location Map of Drill Holes in Area D-2, D-3

Table Ⅱ-1-3-1 Summary of Drilling Programme

	Azimuth	Dip	Depth m	Period
MJZ-1	255°	-60°	200.05	7.10.1985 - 29.10.1985
MJZ-2	75°	-60°	201.00	19. 9.1985 - 17.10.1985
MJZ-3	255°	-60°	200.03	4. 9.1985 - 28. 9.1985
MJZ-4	255°	-60°	200.00	2. 9.1985 - 8.10.1985
MJZ-5	255°	-60°	200.09	14. 8.1985 - 20. 9.1985
MJZ-6	255°	-60°	200.03	9. 8.1985 - 31. 8.1985
MJZ-7	75°	-60°	250.00	4. 7.1985 - 3. 9.1985
MJZ-8	75°	-60°	200.00	5. 7.1985 - 9. 8.1985
			1,651.20	

Table Ⅱ-1-3-2 Results of Acid Angle Test

	50 m	100 m	150 m	200 m	250 m
MJZ-1	65°	65°	68°	68°	
MJZ-2	68°	70°	73°	78°	
MJZ-3	65°	65°	65°	71°	
MJZ-4	61°	62°	63°	64°	
MJZ-5	64°	64°	65°	65°	
MJZ-6	65°	65°	66°	65°	
MJZ-7	62°	62°	64°	64°	65°
MJZ-8	64°	66°	67°	68°	

CHAPTER 2 DRILLING METHOD AND EQUIPMENT

2-1 Drilling Method

It is very difficult to secure modern equipment or supplies for drilling in Zimbabwe because of the serious trading balance situation. This affects driller's efficiency, and was the reason why wireline drilling was not adopted in this programme.

Rocks drilled were mafic volcanics, serpentine, banded ironstone, schist, gneiss, etc. of Archaean Greenstone Belt terrain. Some shear zones in the serpentine were encountered in some holes, and caused many problems: Drilling speed was greatly reduced, and machines, parts and tools suffered some damage.

2-2 Equipment used

The principal equipment such as drilling machines, pumps, rods, and other supplies and consumables expended in this programme are shown in Table II-2-2-1 and Table II-2-2-2.

Table II-2-2-1 List of Equipment Used

Item	Model	Quantity	Capacity, Type and Specification
Drilling machine	BBS-17A	1	300 m
" "	BBS-10	1	360 m
" "	BBS-2	1	300 m
" "	Borman	1	480 m
" "	Seco	1	400 m
Drill pump	Bean Royal	3	with Lister STI engine
Tractor	165	2	Massey Ferguson
Bowser	Tinto	2	1000 gallon
Supply pump	G 65	2	Honda centrifugal
Sheer legs		2	4 inch
" "		1	6 inch
Rods		84	'B' 3 m
"		167	BWY 3 m
Casing		50	BX 3 m
"		50	NX 3 m
Stand pipe		8	3 m

Table II-2-2-2 List of Supplies and Consumables Spent

Item	Specifications	Quantity	Others
Dromus B	Soluble cutting oil	1260 Lt	
Diesel		9870 Lt	
Engine oil	Delo 300	280 Lt	
Gear oil	Hypoid 140	60 Lt	
Hydraulic oil	Rando 46	100 Lt	
Lubricating grease	Marfak No.2	75 Kg	
Petrol		100 Lt	
Cement	Pockets	51	
Hard hats		16	
Jar rope	1" hemp	5	
Generator	12 volt	3	
Regulator	12 volt	2	
Acid bottles		20	
Hacksaw blades	Packets	6	
Clutch plate	12"	5	
Pressure plate	12"	5	
Hydraulic pump		1	
Hyd relief valve		1	
Battery	12 volt	4	
Hoist cable	11 mm x 30 m	5	
Exchange Bean pump	with Lister engine	3	
Exchange Mono pump		2	
Diamond crowns	NXC	17	
" "	NX	21	
" "	TNW	6	
" "	TBW	40	
Shells	NXC	7	
"	NX	4	
"	TNW	1	
"	TBW	7	
Core springs	NXC	3	
" "	NX	5	
" "	TNW	5	
" "	TBW	60	

Item	Specifications	Quantity	Others
Casing shoe	NX	2	
" "	BX	2	
Extension tube	TNW	3	
" "	TBW	46	
Baskets	TNW	3	
"	TBW	12	
Core barrel	NX	3	Single tube
" "	TBW	8	Double tube
" "	TNW	6	Double tube

CHAPTER 3 DRILLING

3-1 Mobilization and Setting

After inspections of the planned drilling sites to secure water supply, infrastructure, and permission of landowners, drilling equipment was moved to the sites. All equipment was transported from Harare by trucks, camp sites were set up near drill sites. It took about a day to move in and set up a camp.

To set up drilling machines, two thick timber sectons were used, and backet-type pans filled with stones as weights were hung down at each end of the timber sections to make them stable. Fifteen centimeter diameter iron pipes were used for tripod towers for drilling. it took about a day to set up a drilling machine.

In some drill sites, water boreholes were available for drilling, and water pumps and other necessary equipment such as water pipes were prepared for water supply. It took about two days to set up these facilities.

At the time of demobilization, tripod towers were dismounted into pieces, and, with the machines, were conveyed by trucks to the next site. Except for extraction of casing pipes and acid tube angle tests, it took about a day for mobilization between holes.

After mobilization, water sumps, machine positions, camping sites, etc. were rehabilitated for environment protection.

3-2 Water Supply

Almost all parts of the country have some water supply problems, and the Shamva area is no exception. But fortunately, water shortage problems did not happen during the period of the survey, because enough rain had fallen in the last rainy season.

In the three out of eight holes drilled, water bore-holes were available for drilling, but for the remaining holes farm water dams and rivers were utilized as sources using water haulage tractors.

The situation of water supply and haulage are as follows.

Hole No.	Method of water supply	Distance
MJZ-1	Water haulage tractor	1,600 m
MJZ-2	do.	4,000 m
MJZ-3	Piping from water well	800 m
MJZ-4	Water haulage tractor	500 m
MJZ-5	do.	2,000 m
MJZ-6	do.	3,000 m
MJZ-7	Piping from water well	300 m
MJZ-8	do.	1,000 m

The average volume of water supplied for each drill hole was 18 kl/day.

3-3 Bit Size and Casings

HX size metal crowns were used for surface overburden and weathered soft ground drilling, after stand pipes had been inserted. Then NX diamond bits were used down to adequate depths, and BX size casing pipe were inserted (up to 21 meter to 73 meter). Finally TBW size diamond bits were used, because of high speed drilling and the large size cores required. A disadvantage of this is the much faster wasting of bits in broken ground.

As the result of the usage of TBW size bits, very good core recovery was achieved in the programme.

3-4 Drilling Record

The state of the whole drilling programme is shown in Fig. II-3-4-1, and those of each hole are shown in Table II-3-4-1 (a)-(h) and Fig. II-3-4-2 (a)-(h).

Summary of the situaton for each hole is as follows.

MJZ-1; No special trouble happened. Smooth drilling.

MJZ-2; No special trouble happened. Smooth drilling.

MJZ-3; No speical trouble happened. Smooth drilling.

MJZ-4; Very badly broken ground encountered from 55 meter to 66 meter required the use of cement. At the last stage of the drilling, a machine breakdown occurred, and it took one and half days to repair it. It caused a delay in the schedule.

MJZ-5; Strong broken ground encountered from 31 meter to 33 meter necessitated reaming of the hole and extension of BX casing. A machine breakdown happened, and it had to be replaced by another machine. This took about two days. A further fault developed in the record machine at the last stage of the drilling, and it took half a day to repair it. These troubles caused delay of the programme, and resulted in a loss of drilling efficiency.

MJZ-6; No special trouble happened. Smooth drilling.

MJZ-7; Very broken ground encountered from the surface to 127 meter caused frequent cementing almost every day. After 83 meter drilled, reaming was done from the end of BX casing pipe. This caused a deviation of the hole at 62 meter, and a new hole started from there. Because of these troubles, it took more than two months to complete the hole, and the drilling efficiency was the lowest.

MJZ-8; At the start of the drilling, a machine fault developed, and a replacement machine was used. This took two days. Trouble with the water supply system caused one day off work. These problems caused delay of the schedule, and drilling efficiency was poor.

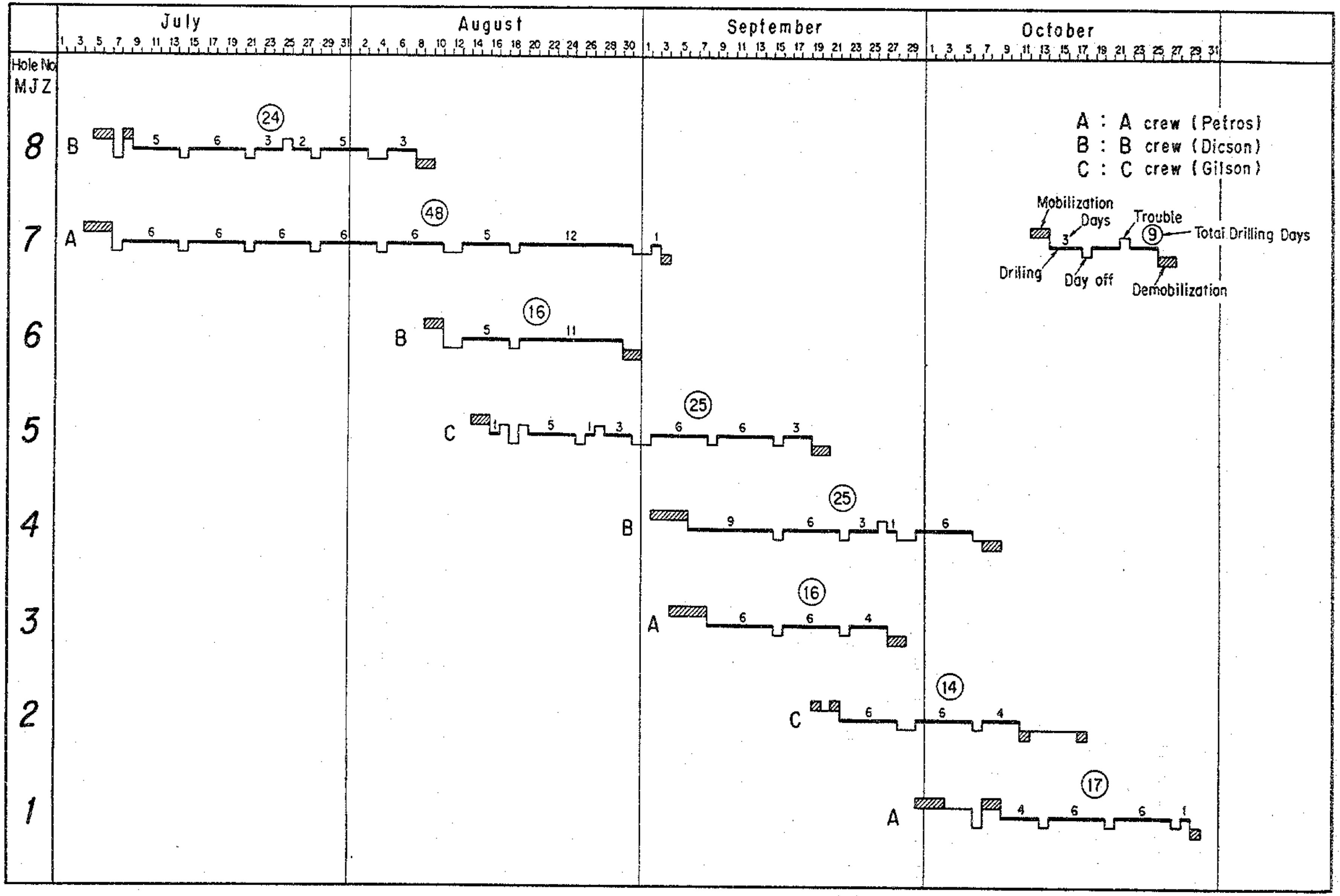


Fig. II-3-4-1 Progress of Drilling Programme

Table II-3-4-1 (a) Summary of Drilling Programme, MJZ-1

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Oct. 7 - Oct. 8	2	2	0	8
Drilling	Oct. 9 - Oct. 28	20	17	3	68
Demobilization	Oct. 29	1	1	0	4
Total	Oct. 7 - Oct. 29	23	20	3	80

Depth Planned		200m	Drilled		200.05m
Overburden		0m			
Core Length		192.95m	Recovery Rate		96.5%
Casing	NX	14.91m	Recovery	NX	14.91m
	BX	30.63m		BX	30.63m
Drilling Speed		11.76m/Drilling Day			
		10.00m/Working Day			

Table II-3-4-1 (b) Summary of Drilling Programme, MJZ-2

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Sept. 9 - Sept. 21	3	2	1	8
Drilling	Sept. 22 - Oct. 10	19	16	3	64
Demobilization	Oct. 11	7	2	5	8
Total	Sept. 19 - Oct. 17	29	20	9	80

Depth Planned		200m	Drilled		201.00m
Overburden		13.40m			
Core Length		172.00m	Recovery Rate		92.1%
Casing	NX	6.00m	Recovery	NX	6.00m
	BX	21.05m		BX	21.05m
Drilling Speed		12.56m/Drilling Day			
		10.00m/Working Day			

Table II-3-4-1 (c) Summary of Drilling Programme, MJZ-3

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Sept. 4 - Sept. 7	4	4	0	16
Drilling	Sept. 8 - Sept. 26	19	17	2	68
Demobilization	Sept. 27 - Sept. 28	2	2	0	8
Total	Sept. 4 - Sept. 28	25	23	2	92

Depth Planned		200m	Drilled		200.03m
Overburden		20.50m			
Core Length		180.75m	Recovery Rate		100.0%
Casing	NX	24.00m	Recovery	NX	24.00m
	BX	53.65m		BX	53.65m
Drilling Speed		11.76m/Drilling Day			
		8.69m/Working Day			

Table II-3-4-1 (d) Summary of Drilling Programme, MJZ-4

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Sept. 2 - Sept. 5	4	4	0	16
Drilling	Sept. 6 - Oct. 5	30	25	5	100
Demobilization	Oct. 6 - Oct. 8	3	2	1	8
Total	Sept. 2 - Oct. 8	37	31	6	124

Depth Planned		200m	Drilled		200.00m
Overburden		30.05m			
Core Length		156.65m	Recovery Rate		92.1%
Casing	NX	29.91m	Recovery	NX	29.91m
	BX	50.15m		BX	50.15m
Drilling Speed		8.00m/Drilling Day			
		6.45m/Working Day			

Table II-3-4-1 (e) Summary of Drilling Programme, MJZ-5

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Aug. 14 - Aug. 15	2	2	0	8
Drilling	Aug. 16 - Sept. 18	34	25	9	100
Demobilization	Sept. 19 - Sept. 20	2	2	0	8
Total	Aug. 14 - Sept. 20	38	29	9	116

Depth Planned		200m	Drilled	200.09m
Overburden		31.30m		
Core Length		164.00m	Recovery Rate	97.2%
Casing	NX	29.91m	Recovery NX	15.00m
	BX	33.00m	BX	33.00m
Drilling Speed		8.00m/Drilling Day		
		6.90m/Working Day		

Table II-3-4-1 (f) Summary of Drilling Programme, MJZ-6

	Period	Days	Working Day	Day off	No. of Workers
Mobilization	Aug. 9 - Aug. 12	4	2	2	8
Drilling	Aug. 13 - Aug. 29	17	16	1	64
Demobilization	Aug. 30 - Aug. 31	2	2	0	8
Total	Aug. 9 - Aug. 31	23	20	3	80

Depth Planned		200m	Drilled	200.03m
Overburden		17.90m		
Core Length		184.40m	Recovery Rate	100.0%
Casing	NX	17.90m	Recovery NX	17.90m
	BX	24.40m	BX	24.40m
Drilling Speed		12.50m/Drilling Day		
		10.00m/Working Day		

Table II-3-4-1 (g) Summary of Drilling Programme, MJZ-7

	Period		Days	Working Day	Day off	No. of Workers
Mobilization	July 4	- July 7	4	3	1	12
Drilling	July 8	- Sept. 2	57	48	9	192
Demobilization	Sept. 3		1	1	0	4
Total	July 4	- Sept. 3	62	52	10	208

Depth Planned		250m	Drilled		250.00m
Overburden		4.60m			
Core Length		240.60m	Recovery Rate		98.0%
Casing	NX	39.21m	Recovery	NX	39.21m
	BX	73.30m		BX	73.30m
Drilling Speed		5.21m/Drilling Day			
		4.81m/Working Day			

Table II-3-4-1 (h) Summary of Drilling Programme, MJZ-8

	Period		Days	Working Day	Day off	No. of Workers
Mobilization	July 5	- July 8	4	3	1	12
Drilling	July 9	- Aug. 7	30	24	6	96
Demobilization	Aug. 8	- Aug. 9	2	2	0	8
Total	July 5	- Aug. 9	36	29	7	116

Depth Planned		200m	Drilled		200.00m
Overburden		22.55m			
Core Length		172.10m	Recovery Rate		97.0%
Casing	NX	29.91m	Recovery	NX	6.00m
	BX	33.75m		BX	33.75m
Drilling Speed		8.33m/Drilling Day			
		6.90m/Working Day			

MJZ－1

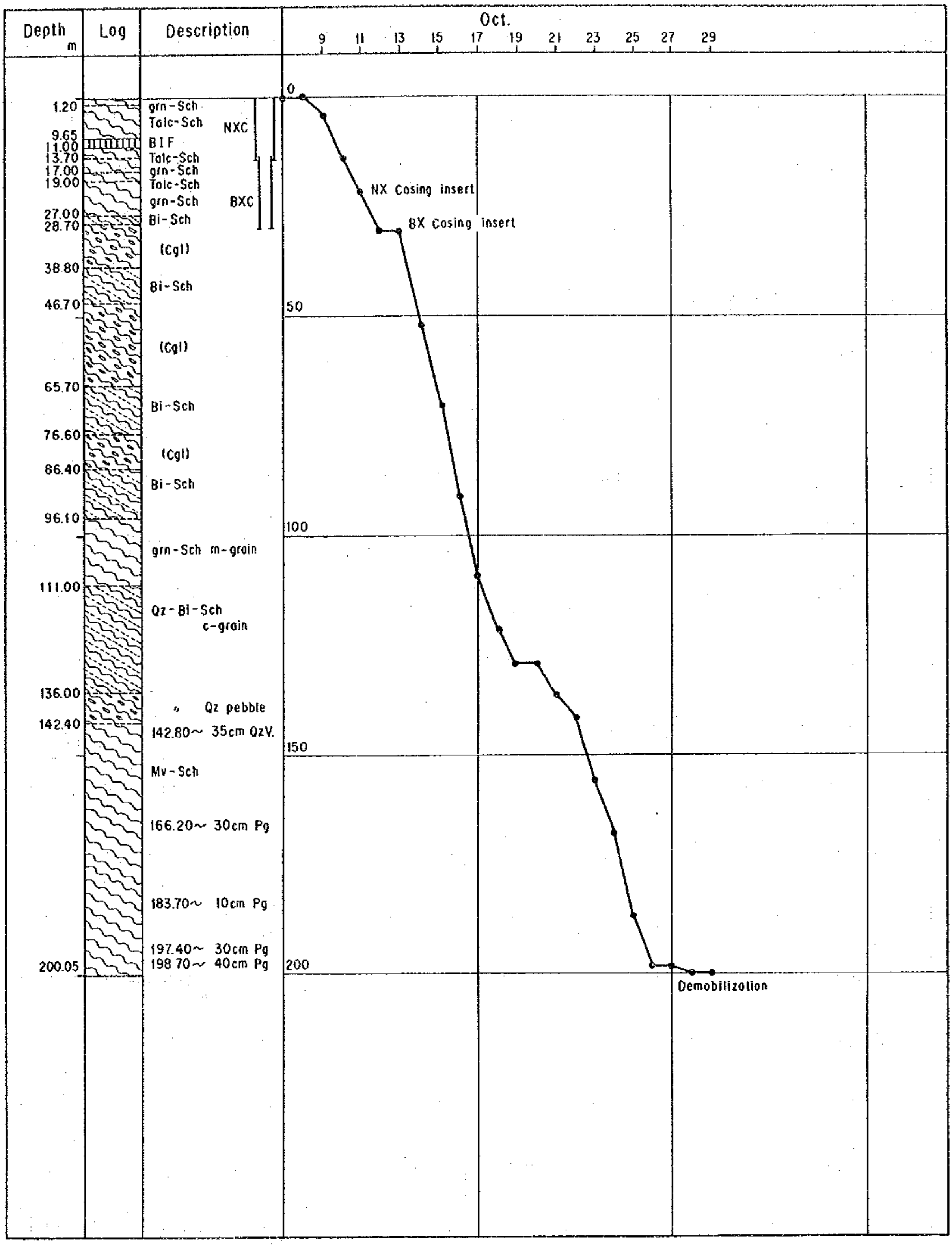


Fig. Ⅱ-3-4-2(a) Progress of Drill Hole MJZ-1

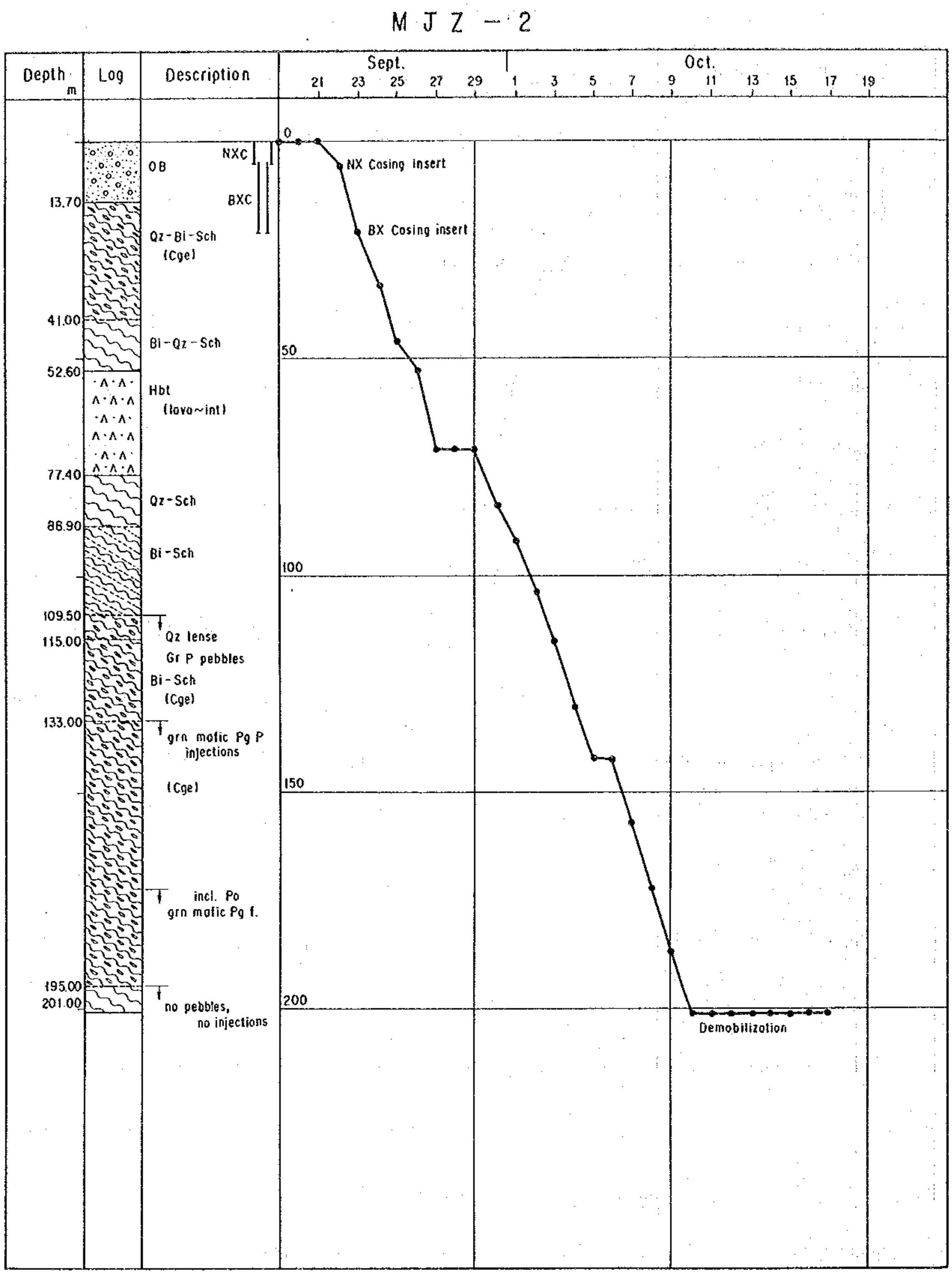


Fig. II-3-4-2(b) Progress of Drill Hole MJZ-2

M J Z - 3

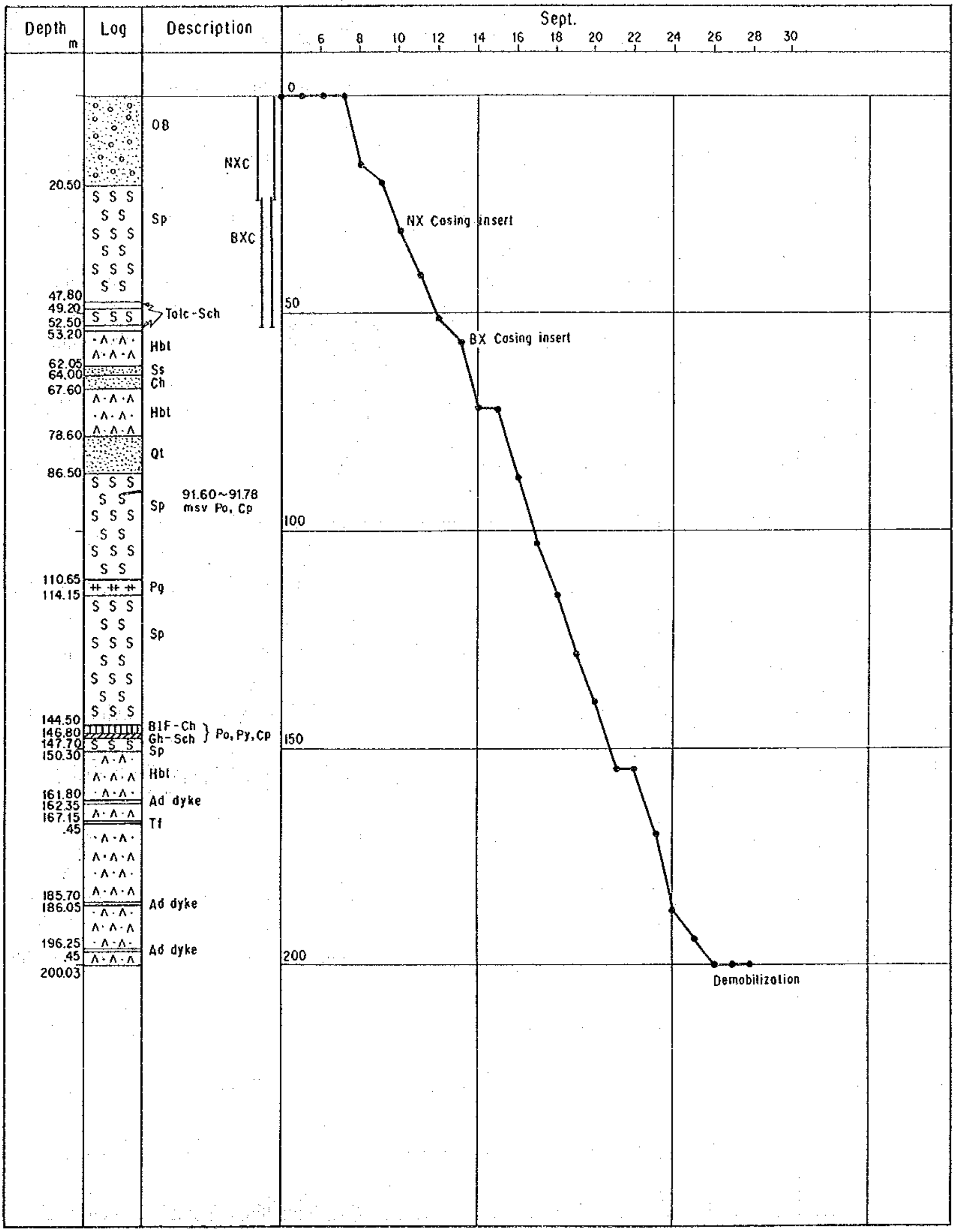


Fig. Ⅱ-3-4-2(c) Progress of Drill Hole MJZ-3

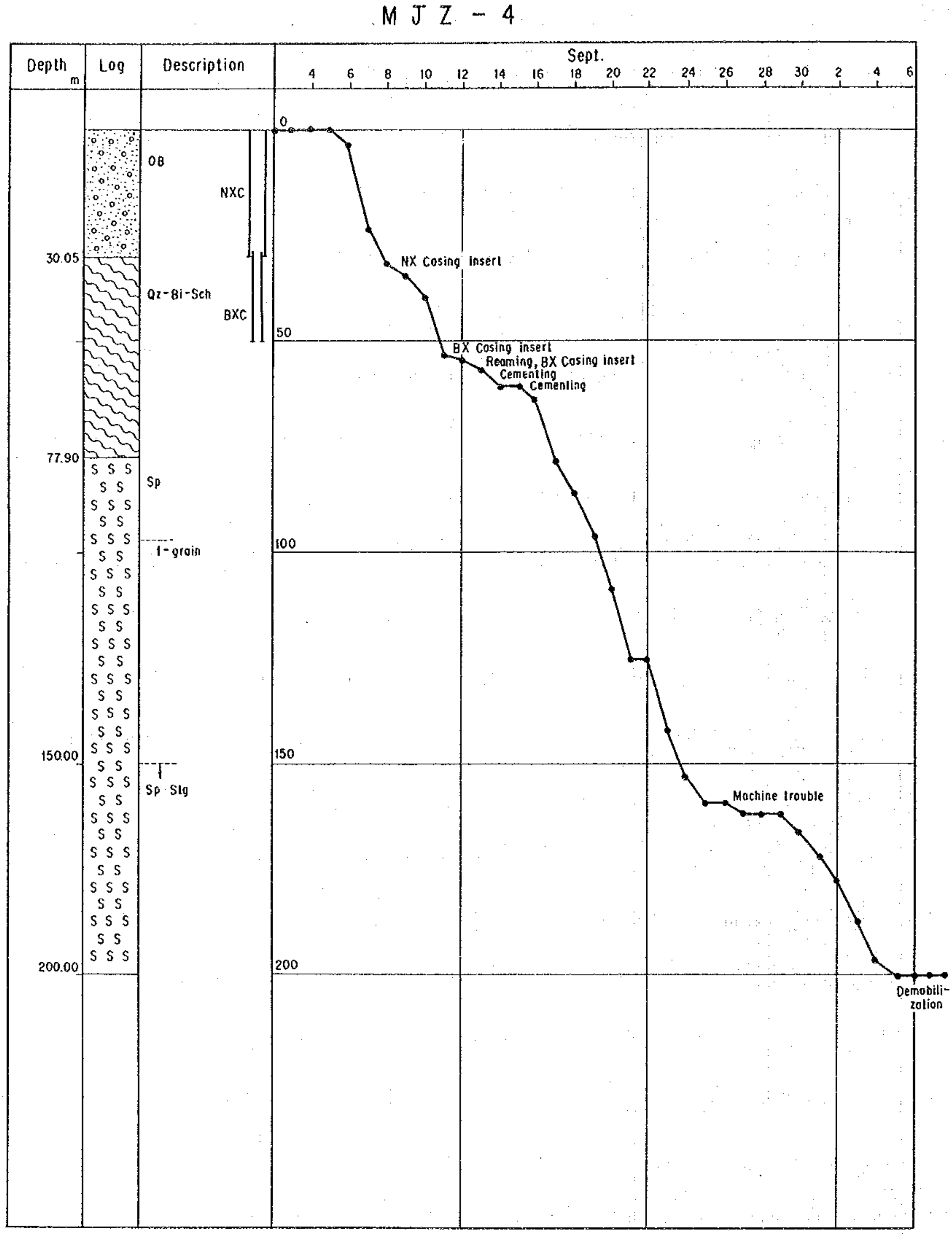


Fig. Ⅱ-3-4-2(d) Progress of Drill Hole MJZ-4

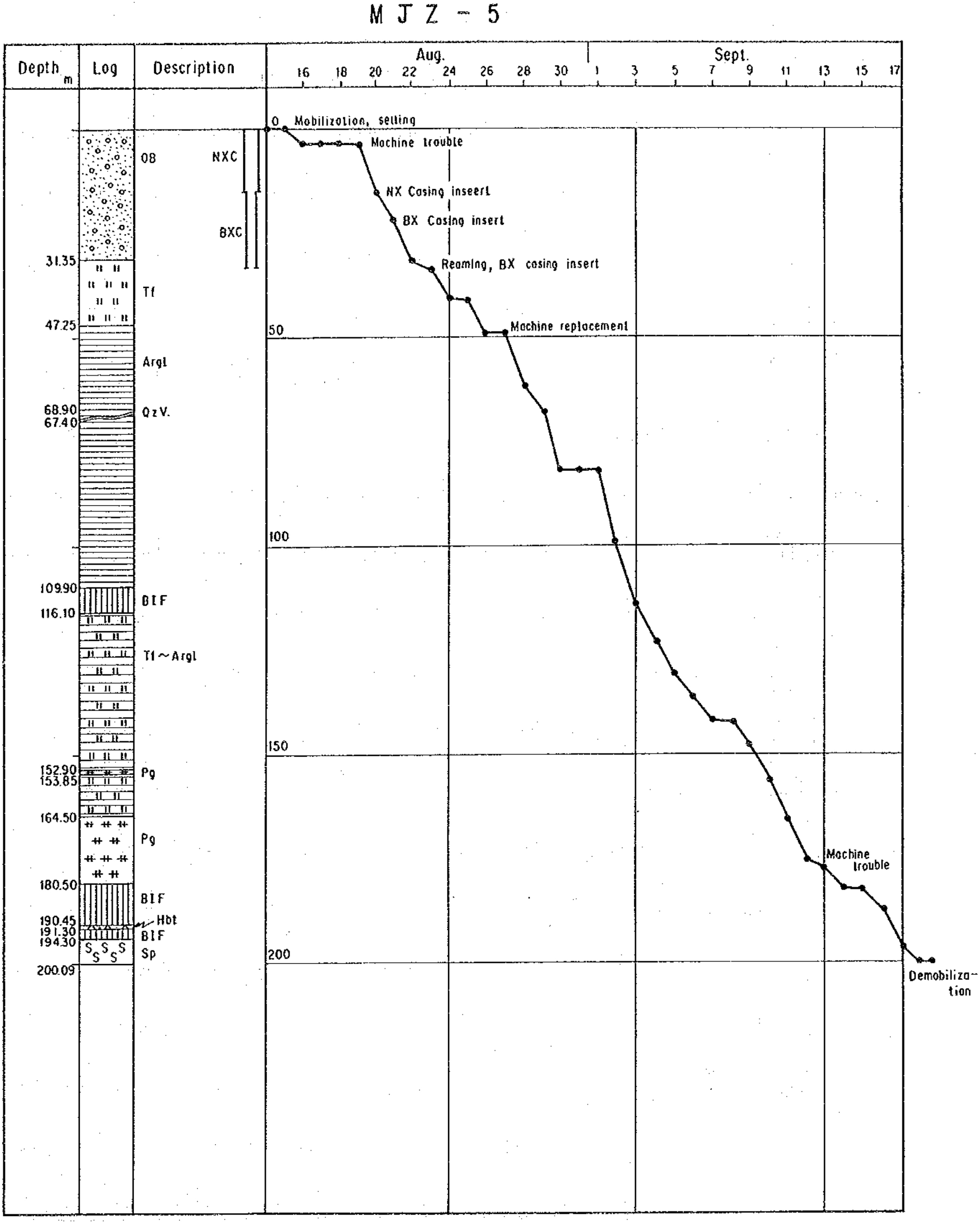


Fig. Ⅱ-3-4-2(e) Progress of Drill Hole MJZ-5

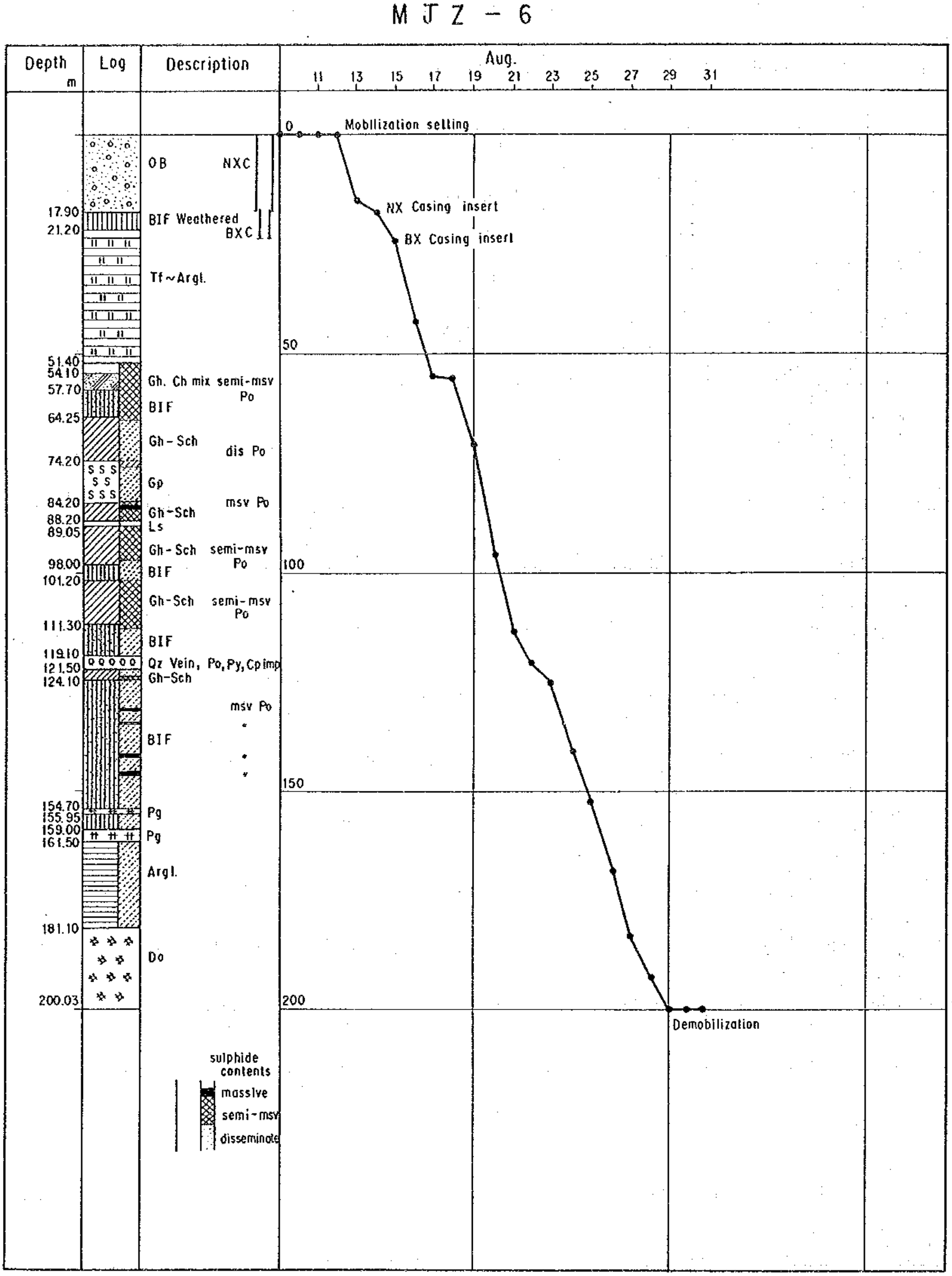


Fig. Ⅱ-3-4-2(f) Progress of Drill Hole MJZ-6

MJZ - 7

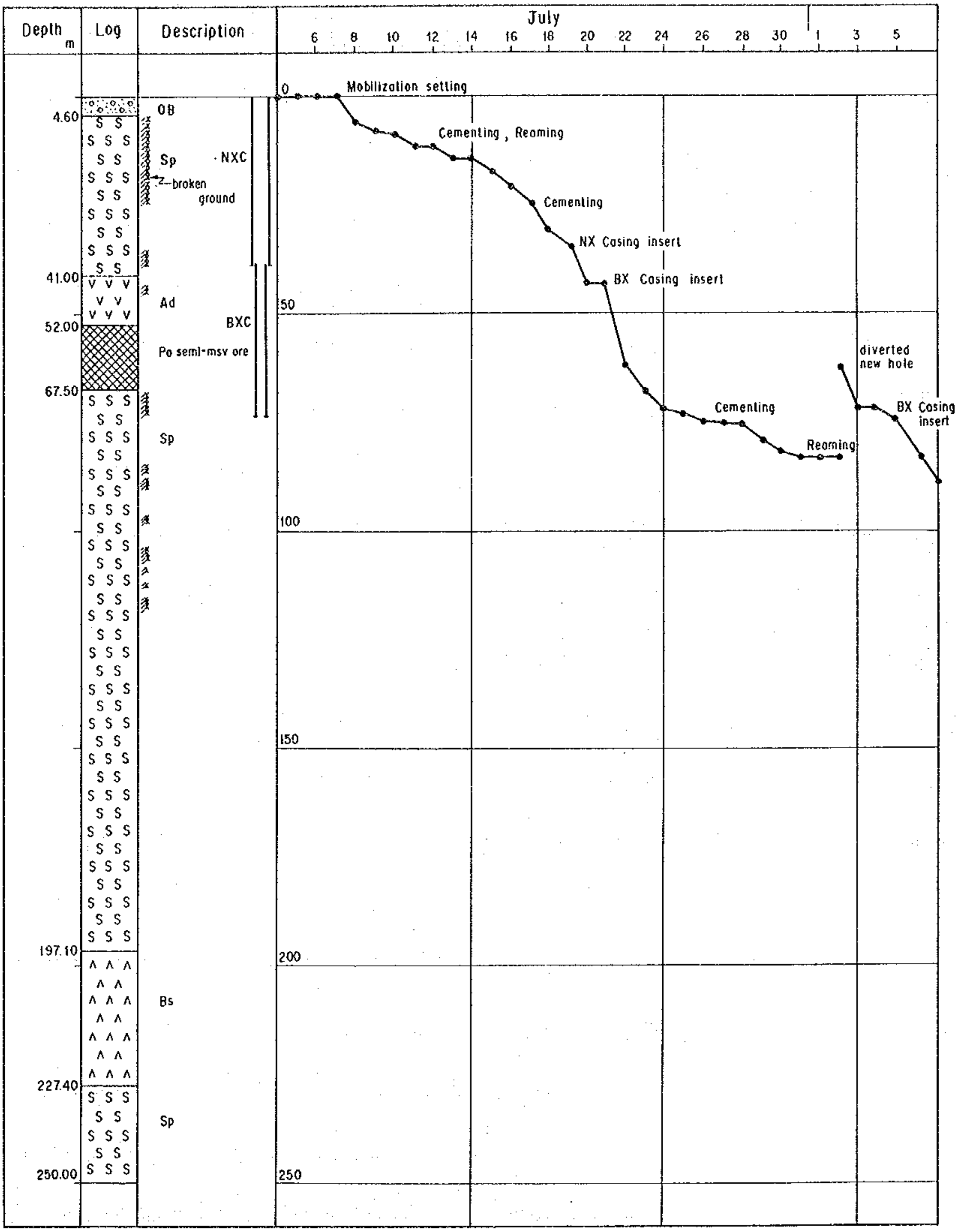
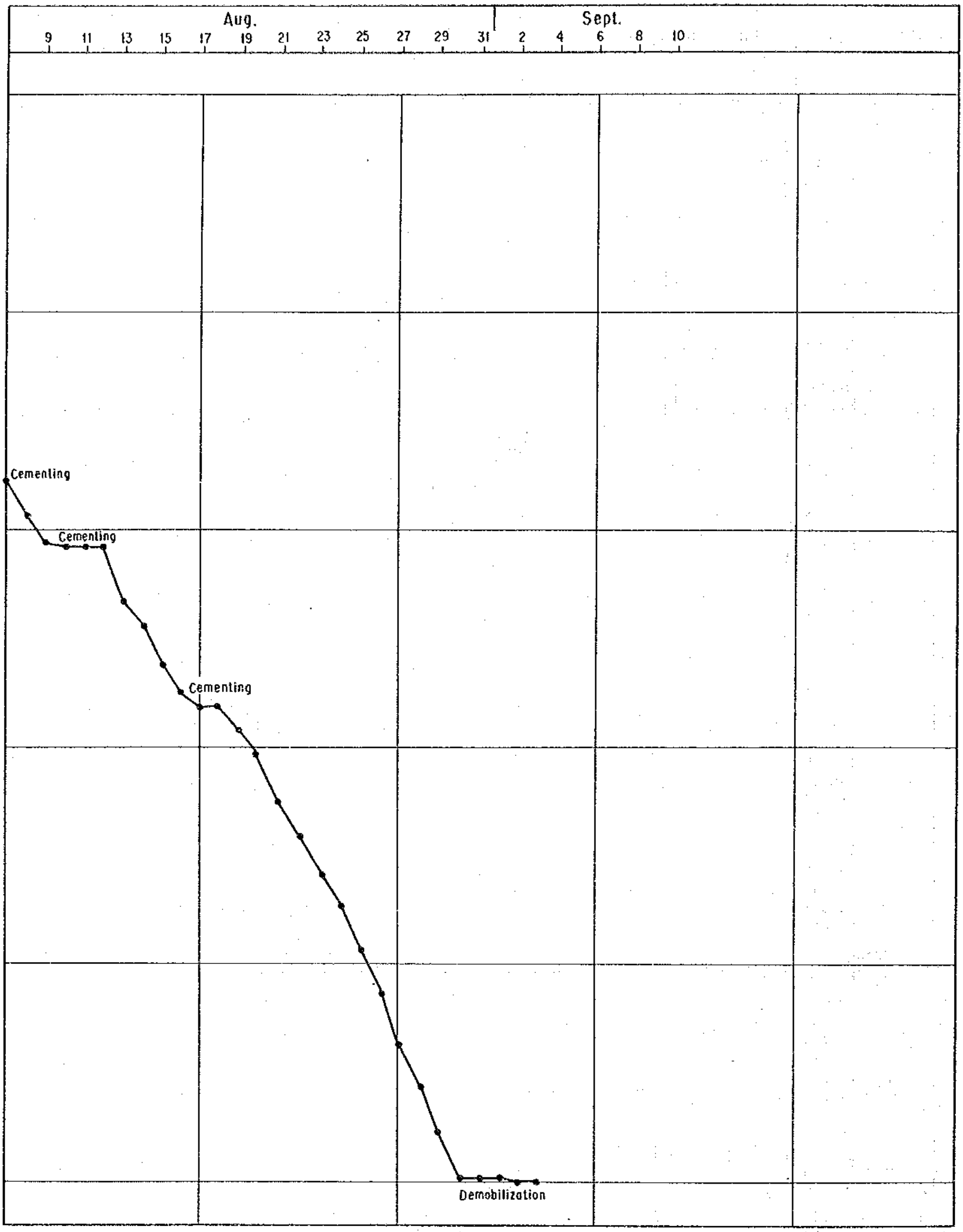


Fig. II-3-4-2(g) Progress of Drill Hole MJZ-7



Aug.
Sept.
9
11
13
15
17
19
21
23
25
27
29
31
2
4
6
8
10
Cementing
Cementing
Cementing
Demobilization

M J Z - 8

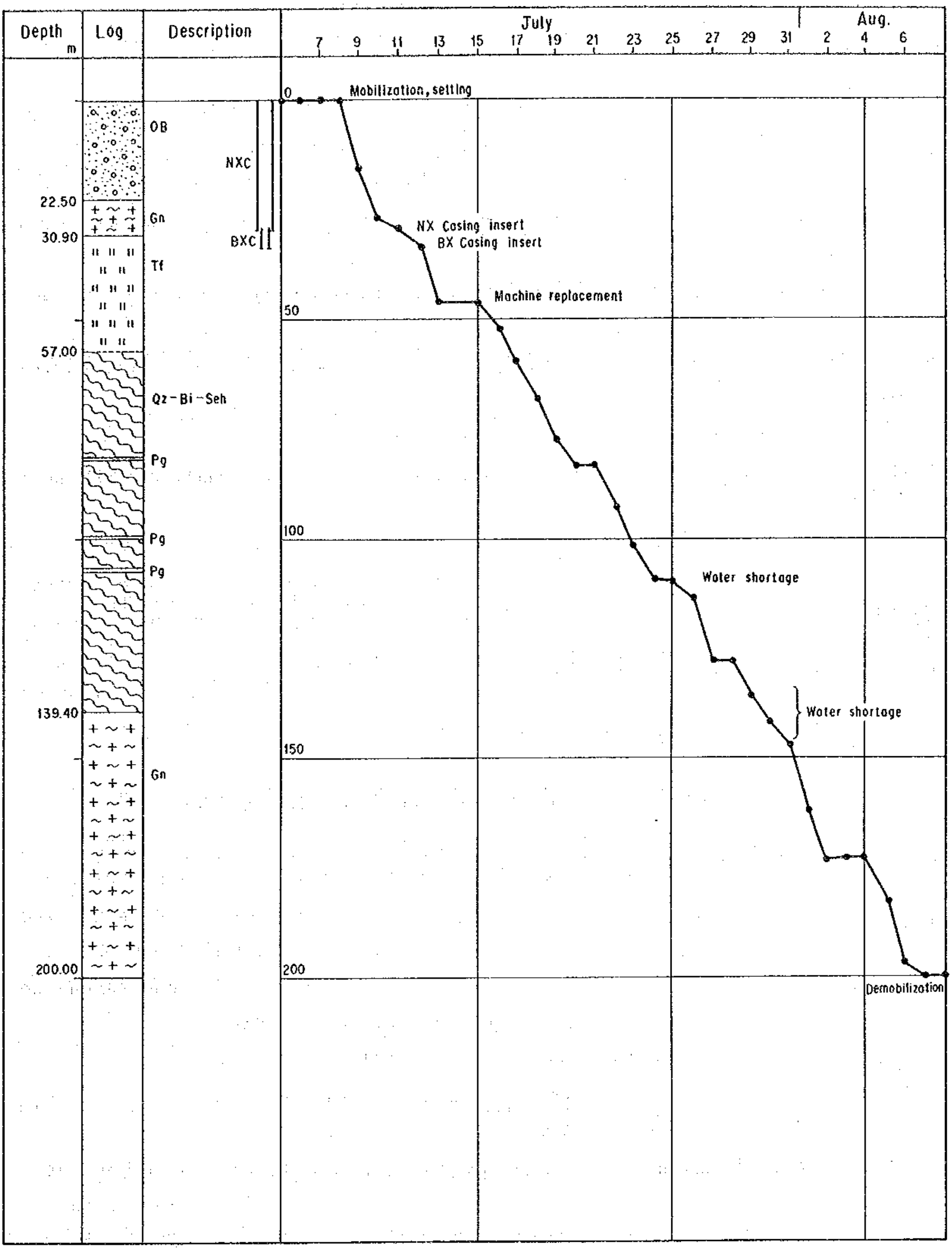


Fig. II-3-4-2(h) Progress of Drill Hole MJZ-8

CHAPTER 4 GEOLOGY OF THE HOLES

4-1 Selection of the Drilling Targets

This year's programme is the third and final for the Shamva Project. Based on the whole results of the geological, geochemical and geophysical surveys conducted in the previous two years, a drilling programme was planned to examine potential mineral occurrences in the most promising anomalous targets.

The following points were considered as important elements for the selection of drilling targets.

(1) Favourable geological setting similar to that of the Trojan nickel ore deposits.

(2) Good geochemical anomaly in Ni, Cr, Cu, and Zn.

(3) Low resistivity anomaly in CSAMT survey, and IP anomaly in SIP survey.

Although the above mentioned elements were basic ones, some targets were selected because of their favourable geological setting, despite lack of geochemical or geophysical anomalies.

Summary of the anomalies in the selected drilling targets is shown in Table II-4-1-1.

Table II-4-1-1 Summary of Anomalies in Drilling Targets

Hole No.	Geology	Geochem.	CSAMT	SIP	Others
MJZ-1	Edge of serpentine	None	Low resistivity	-	North of Lochness pegmatite
MJZ-2	Edge of serpentine	Yes	Low resistivity	Medium	South of Lochness pegmatite
MJZ-3	Edge of serpentine	Yes	Low resistivity	Medium	
MJZ-4	Edge of serpentine	None	High resistivity	-	
MJZ-5	Edge of serpentine	None	Low resistivity	Medium	
MJZ-6	Edge of serpentine	None	Low resistivity	-	
MJZ-7	Edge of serpentine	Yes	Low resistivity	Strong	Southwest of Tynan nickel occurrence
MJZ-8	Banded ironstone	Nearby	Low resistivity	Medium	

4-2 Outline of Geology for Each Hole and Correlation with Geophysics

MJZ-1

The rocks of the hole are green schist, talc schist, biotite schist, and muscovite schist, except a section of banded ironstone from 9.65 meter to 11.00 meter. Within them, especially in the shallow parts of the hole, lenticular pebbles of granitic rocks are enclosed in the biotite schists. These are probably products of compaction by reactivation of the granites and gneiss.

In the deeper parts of the hole, the rocks are injected by pegmatitic material consisting of chlorite, epidote, quartz, feldspar, etc.

As the hole is located near the granite-gneiss terrain, the rocks of the hole were affected by compaction and pneumatolytic reaction.

The hole is situated in an area of shallow low resistivity (30Ω-m) in the CSAMT survey, and no SIP survey was conducted. The rocks in the shallow part of the hole such as banded ironstone and water holding zones such as shears in the surrounding area presumably caused such low resistivity.

MJZ-2

The rocks of the hole are biotite-quartz schist enclosing granitic pebbles down to 41.00 meter, then pebble-free types of the same rocks down to 52.60 meter, then ultramafic volcanics (hornblendite) down to 77.40 meter, then quartz schist down to 109.50 meter, then pebbly biotite schist down to 195.00 meter, and finally pebble-free biotite schist down to the bottom at 201.00 meter. Pegmatite injections are recognized between 133.00 meter and 195.00 meter, and some pyrrhotite occurs within this zone.

The hole is situated in an area of low resistivity (Approx. 30Ω-m) in the CSAMT and SIP surveys, and of a clearly defined IP anomaly in the SIP survey. No good indication explaining those anomalies was recognized in this hole. It is presumed that the anomaly is seated in a deeper part around there.

MJZ-3

The rocks of the hole are serpentine down to 53.20 meter, this rock containing 0.70 meter and 1.40 meter thick talc schist inclusions and a

0.10 meter thin asbestos layer, then alternation of ultramafic volcanics and thin sandstone-chert layers down to 86.50 meter, then serpentine down to 150.30 meter with intercalations of 3.50 meter of pegmatite, 2.30 meter of banded ironstone, 0.90 meter of graphitic schist assaying Cu 0.14%, and 0.17 meter of massive pyrrhotite with minor chalcopyrite assaying Cu 0.38%, Ni 0.56%, and Co 0.08%. After 150.30 meter, ultramafic volcanics occurs to the bottom at 200.03 meter, and contain three 0.20 meter to 0.55 meter-thick andesite dykes and a 0.30 meter-thick tuffaceois layer.

The hole is situated in an area of low resistivity (several Ω-m) in the CSAMT survey combined with similar resistivity and a significant IP anomaly in the SIP survey. However no obvious interpretation of these anomalies was recognized in the hole. The reason for it seems that the size of the expected mineralized zone judged from the anomalies is too small to locate by a drill hole.

The geology of the hole is very favourable for nickel sulphide ore deposits associated with ultramafic rocks. In addition some small but distinct copper-nickel occurrences are recognized in the hole. Consequently it is considered that the area around this hole is one of the highest potential areas for economic ore deposits.

MJZ-4

The rocks of the hole are quartz-biotite schist down to 77.90 meter, then ultramafic volcanics - intrusives down to 150.00 meter, then serpentine down to the bottom at 200.00 meter. No mineralized zone is found in the hole.

The hole is situated in an area of high resistivity (several hundred to 1,000 Ω-m) in the CSAMT survey where no SIP survey was conducted. The geology of the core satisfactory explains the high resistivity.

MJZ-5

The rocks of the hole are andesitic pyroclastics down to 47.20 meter, then argillaceous rocks down to 109.90 meter, then banded ironstone down to 116.10 meter, then serpentine down to the bottom at 200.09 meter.

The hole is situated in an area of low resistivity (approx. 10

Ω-m) in the CSAMT survey combined with similar resistivity and a low level (10% REF) small scale IP anomaly in the SIP survey. These anomalies are interpreted as probably due to a 30 meter-thick banded ironstone containing disseminated to semi-massive pyrrhotite, a pegmatite dyke containing some probably remobilized pyrrhotite, and widespread minor amounts of disseminated pyrrhotite in the argillaceous rocks and pyroclastics.

MJZ-6

Except dolerite intersected from 181.10 meter to the end of the hole at 200.03 meter, almost entire hole was drilled through predominantly argillaceous rocks, graphitic schist and banded ironstone.

Pyrrhotite layers up to several millimeters thick are interbeded in the graphitic schist forming a banded texture, but may also form disseminated, pod like, stockwork, and semi-massive textures. Several tens centimeters thick pyrrhotite layers and lenses are alternatively interbeded in the banded ironstones where in some sections they form disseminated, veinlet, and network textures. As the pyrrhotite quite often cuts across original sedimentary textures of the rocks, it is suggested that these minerals were removed from their original chemically precipitated positions during the period of metamorphism.

Such mineralized zones are seen from 51.40 meter to 181.10 meter, a length of 130.00 meters. Within this section, a 2.50 meter quartz vein containing some pyrrhotite and a 3.50 meter pegmatite are included.

The significant assay values of these mineralized sections are as follows.

From	To	
84.50 m	84.90 m	Cu 0.19%, Ni 0.18%, Co 0.04%
70.25 m	71.75 m	Au 0.3 g/t
104.30 m	105.80 m	Au 0.2 g/t
108.85 m	109.90 m	Au 0.2 g/t
133.80 m	135.70 m	Au 0.3 g/t
159.00 m	161.33 m	Au 0.2 g/t

This type of sulphide mineralization in Archaen greenstone belts in

Zimbabwe contains gold in some places and, though low grade, may be large in scale. Some deposits are in operation as gold mines. The low assay values reported from this hole are, however, of no economic interest.

The hole is situated in an area of low resistivity (approx. 10 Ω-m) in the CSAMT survey where no SIP survey was conducted. The large amounts of sulphide minerals in the hole certainly account for the resistivity anomaly.

MJZ-7

The rocks of the hole are andesitic pyroclastics down to 35.00 meter, then predominantly serpentine down to the bottom at 250.00 meter. Mafic volcanics are intercalated between 197.10 meter and 227.40 meter.

Very strong shear zones were intersected in the hole from surface to a depth of 120 meter, those parallel to the foliation of the serpentine causing many drilling problems.

Drilling intersected disseminated to semi-massive pyrrhotite zones in the serpentine. Sulphide ratios to the waste are 20% to 30%, and in most parts inclusions of graphitic argillaceous rocks are contained.

Assay results of this mineralized zone show Cu 80-640 ppm, Ni 160-630 ppm, Co 50-100 ppm.

The hole is situated in an area of low resistivity (20 Ω-m) in the CSAMT survey and very low resistivity (several Ω-m) combined with a deep seated large scale significant IP anomaly showing a double pattern in the SIP survey. However no mineral occurrence was seen at the depth expected from the anomaly. The reason may be that the hole was not deep enough to reach the expected mineralized zone: our experiences is that IP anomalies quite often appear above actual mineral occurrences. Judging from the scale and quality of the anomaly, it is still expected that deeper seated mineralized zones occur in the vicinity of the hole. Above mentioned 15 meters mineralized zone is too shallow to be detected by geophysical surveys using a wide spacing of electrodes.

Judging from such favourable geological setting similar to that of the Tynan occurrence and those sulphides occurrences in the hole, areas between the hole and the Tynan occurrence can be evaluated as one of the highest potential areas for economic ore deposits.

MJZ-8

The rocks of the hole are gneiss down to 30.90 meter, then andesitic pyroclastics down to 57.00 meter, then quartz-biotite schist down to 139.40 meter, then finally gneiss down to the bottom at 200.00 meter. Thin pegmatite dykes (0.40 to 0.80 meter) intruded around the depth of 100 meter. The gneiss underlies in the shallow part of the hole than expected from the surface geology, therefore the slope angle of its surface would be very gentle.

No mineral occurrence was fouind in the hole.

The hole is situated in an area of high resistivity in the shallow part and low resistivity (several Ω-m) in the deeper part in the CSAMT survey, and same range resistivity and weak small scale IP anomaly in the SIP survey. But no evidence to explain these anomalies is recognized. The reason for it is probably that near surface weak mineral occurrences around the electrodes of the SIP survey affected to the results relating to the electrode arrangement.

4-3 Outline of Mineralized zones

As described in the previous section, some sulphide mineral occurrences were found in four holes among eight holes drilled in this programme. Summary of the mineral occurrences in the each drill hole is as follows.

Table II-4-3-1 Mineral Occurrences in Drill Holes

Hole No.	Sulphides associated with Ultramafic rocks	Sulphides associated with Banded ironstone	Sulphides associated with Graphitic rocks
MJZ-3	0.17m msv Po with some Cp, 0.20 m semi-msv Po	2.30m semi-msv Po	0.90m semi-msv Po
MJZ-5		19.15m semi-msv Po	
MJZ-6		62.05m diss - semi-msv Po	41.90m diss - semi-msv Po
MJZ-7	15.00m diss - semi-msv Po		

Hole No.	Minerals associated with Pegmatite	Quartz vein
MJZ-3	3.50m	
MJZ-5	16.95m minor Po	0.50m minor Po
MJZ-6	3.75m	2.40m minor Po

Note
Po: Pyrrhotite
Cp: Chalcopyrite

Samples for analysis were basically prepared for every 1.50 meter section of the mineralized sections, and were assayed elements of Cu, Ni, and Co for sulphides, Nb, Ta, and Sn for mineral occurrences associated with pegmatite, and Au for every two samples. Results of the assay are shown in the supplemental table, and some significant values selected from the table are as follows.

Hole No.	Section m	Cu %	Ni %	CO %	Au g/t
MJZ-3	91.60 - 91.77	0.379	0.560	0.081	
	146.80 - 147.70	0.139	0.065	0.021	
MJZ-6	70.25 - 71.75				0.3
	84.50 - 84.90	0.187	0.178	0.037	
	104.30 - 105.80				0.2
	108.85 - 109.90				0.2
	133.80 - 135.70				0.3
	159.00 - 161.33				0.2

Of these the first shows some economical values, but the section is only 0.17 meters. Nevertheless this is a mineral occurrence in serpentine, a favourable host rock for Trojan type nickel mineralization, and it is suggested that a very high potential for economic ore deposits exists in the area around the hole.

AREA SHAMVA Drill No. MJZ — 1 ( ) 0 m ~ 200.05 m

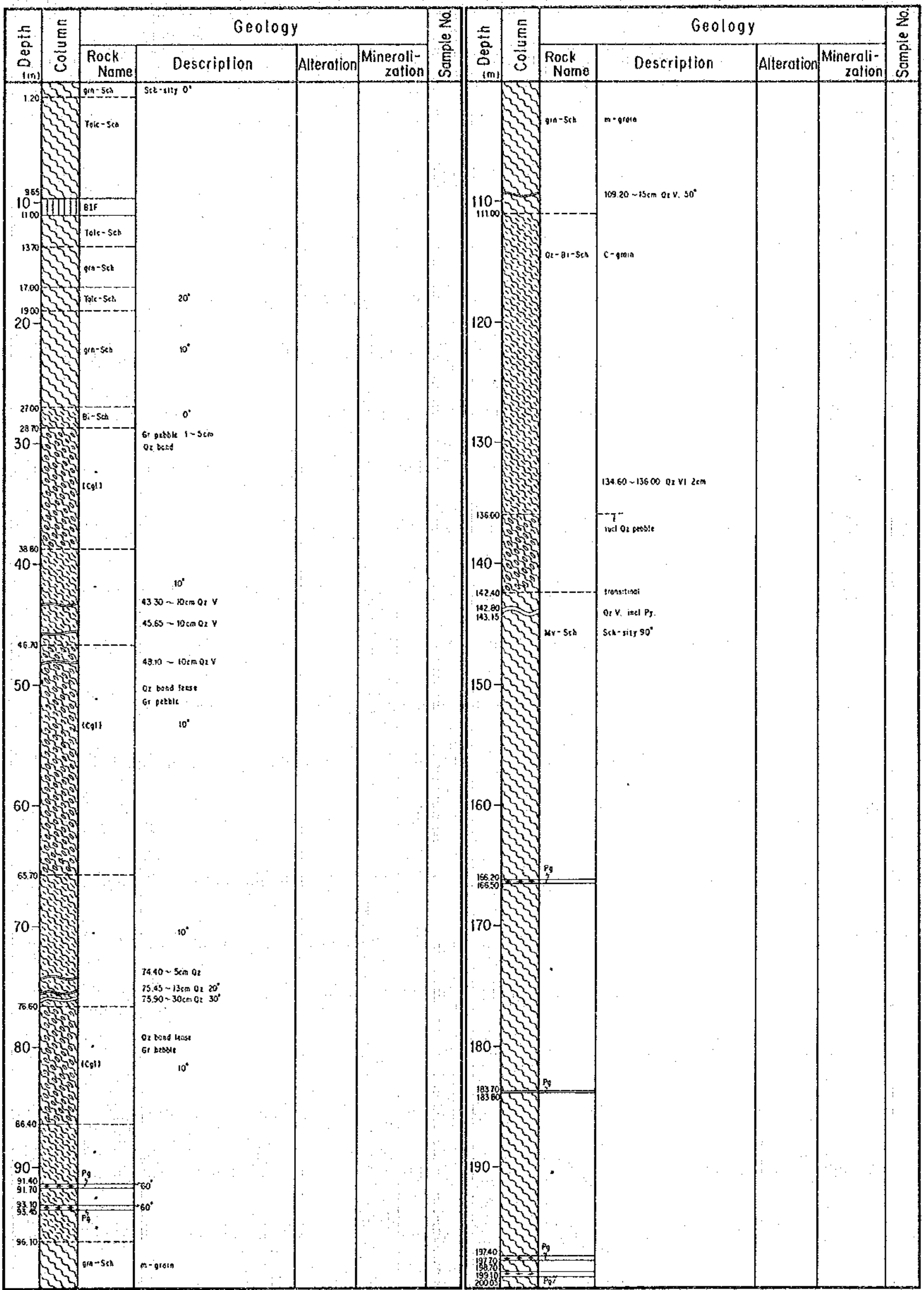


Fig. II-4-2-1 (a) Drill Log of MJZ-1

AREA SHAMVA Drill No. MJZ—2 ( ) 0 m ~ 201.00 m

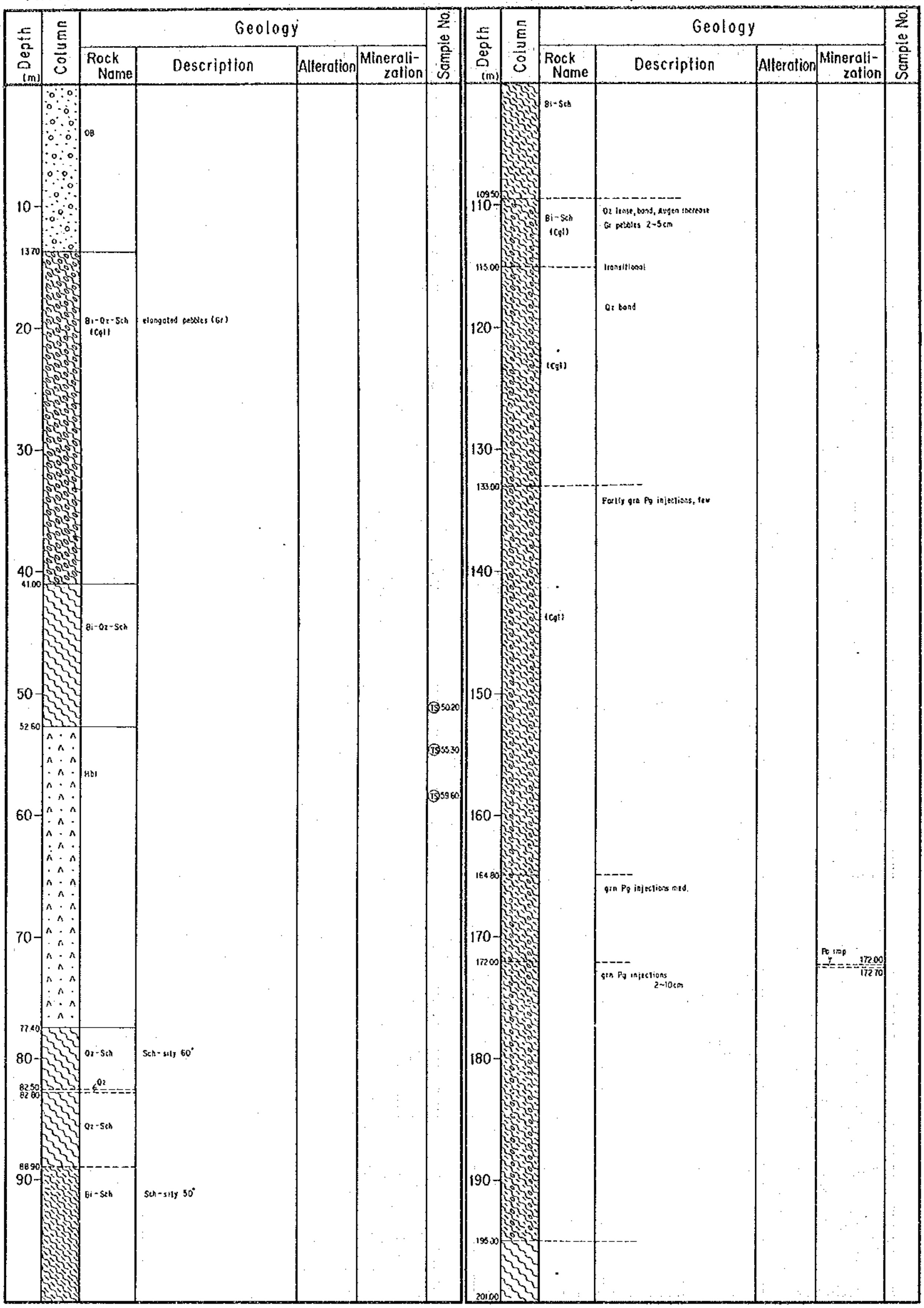


Fig. II-4-2-1 (b) Drill Log of MJZ-2

AREA SHAMVA Drill No. MJZ—3 ( ) 0 m ~ 200.03 m

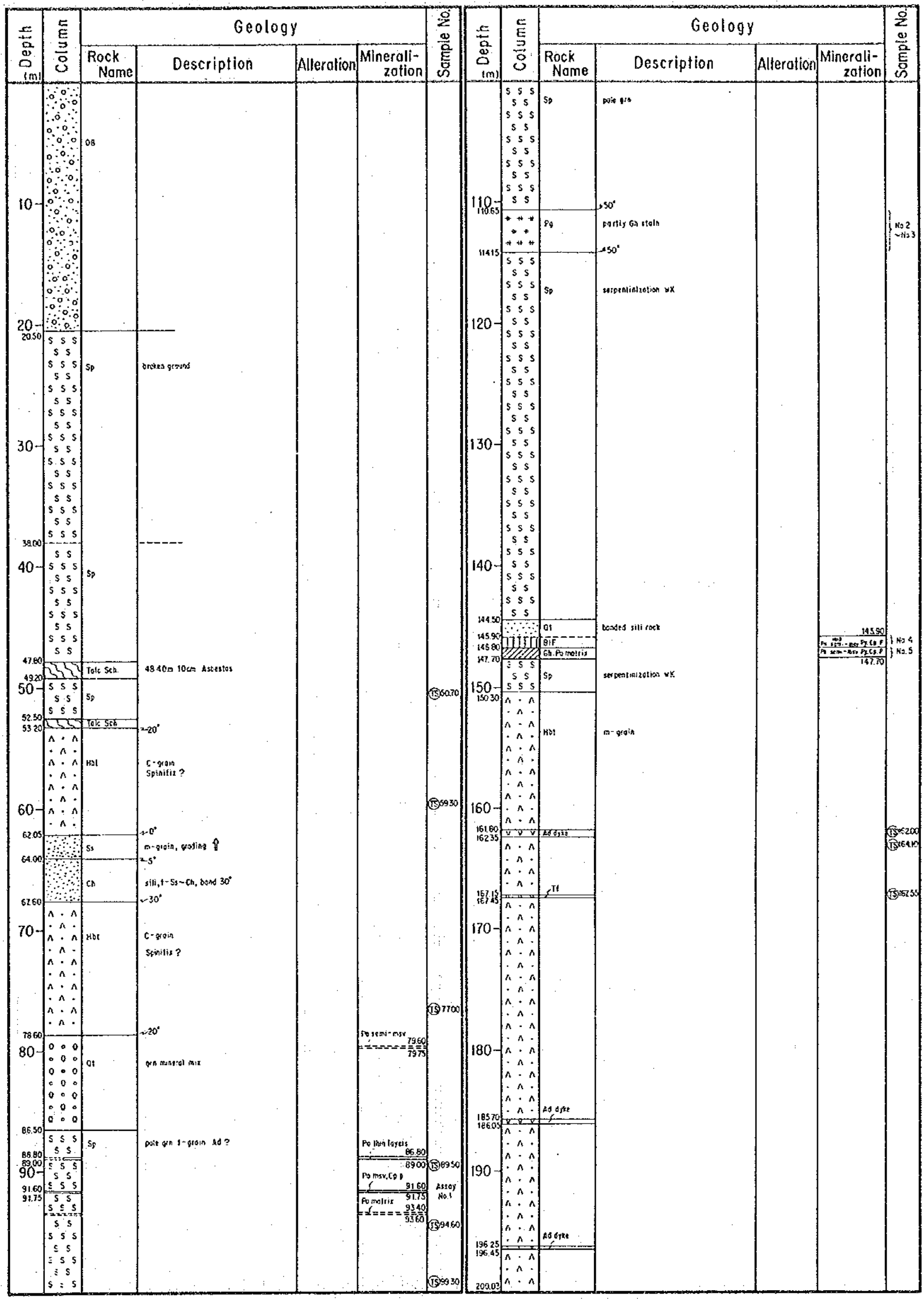


Fig. II-4-2-1 (c) Drill Log of MJZ-3

AREA SHAMVA Drill No. MJZ—4 ( ) 0 m ~ 200.00 m

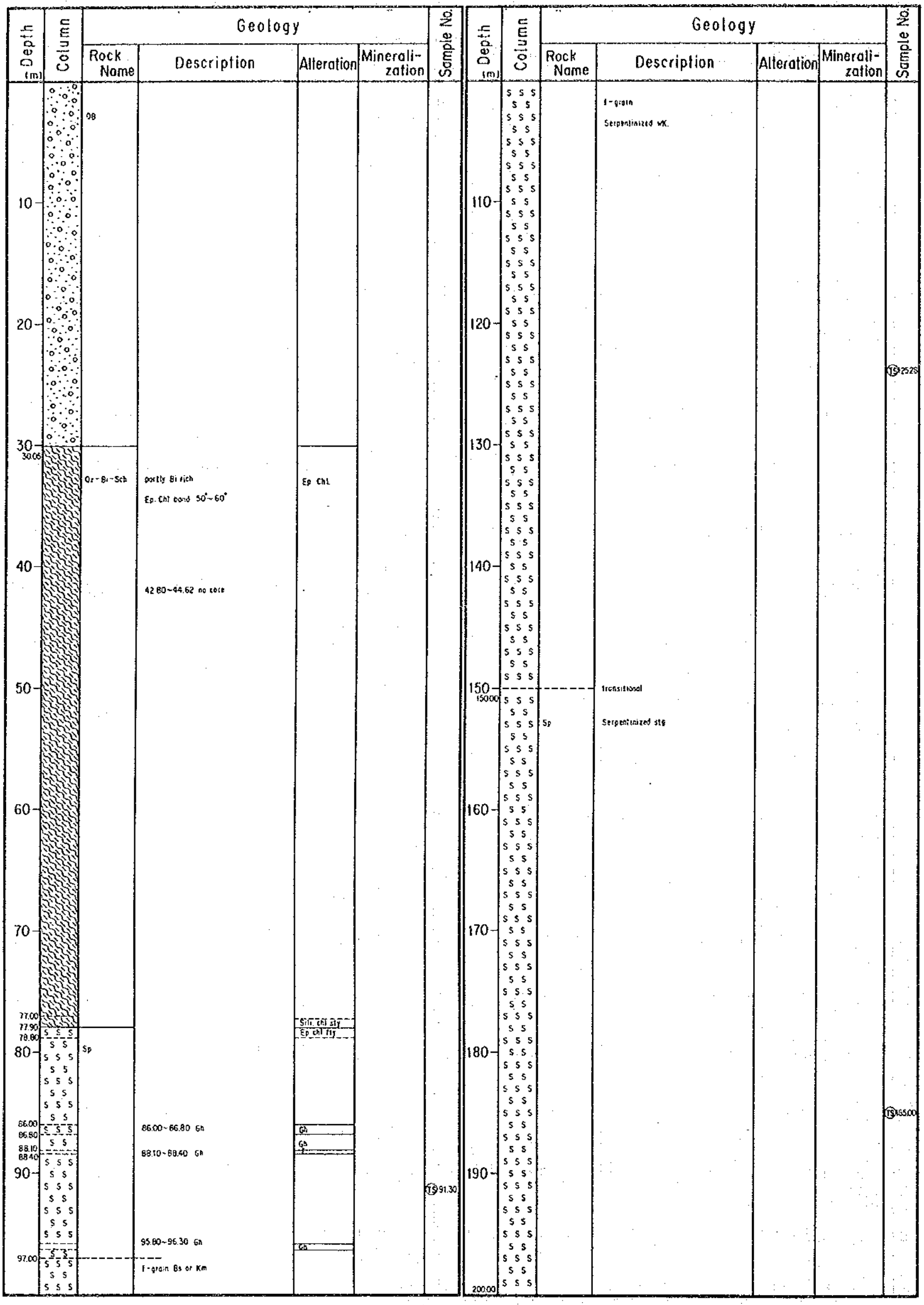


Fig. Ⅱ-4-2-1 (d) Drill Log of MJZ-4

AREA SHAMVA Drill No.MJZ— 5 ( ) 0 m ~ 200.09 m

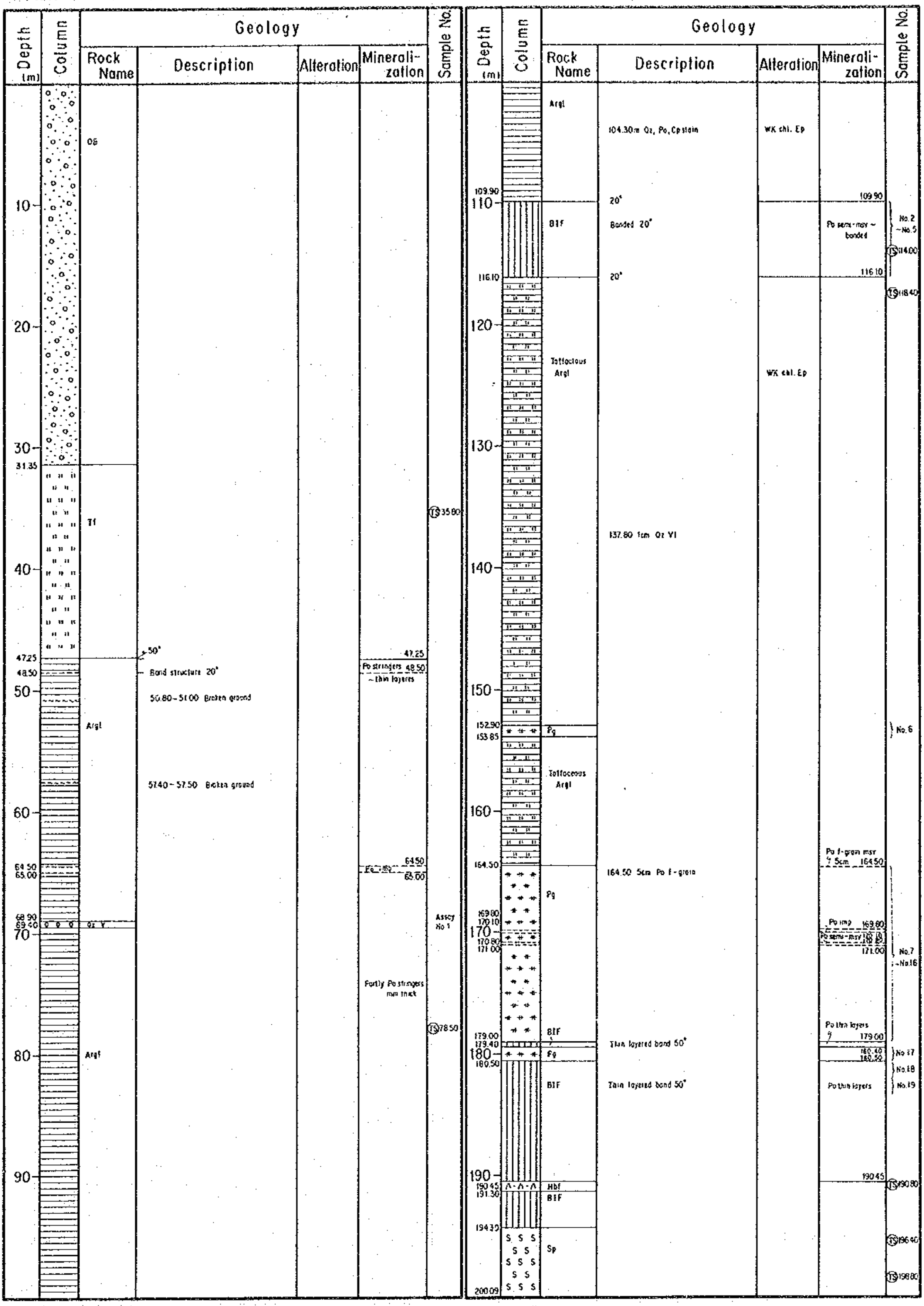


Fig. II-4-2-1 (e) Drill Log of MJZ-5

AREA SHAMVA Drill No.MJZ— 6 ( ) 0 m ~ 200.03 m

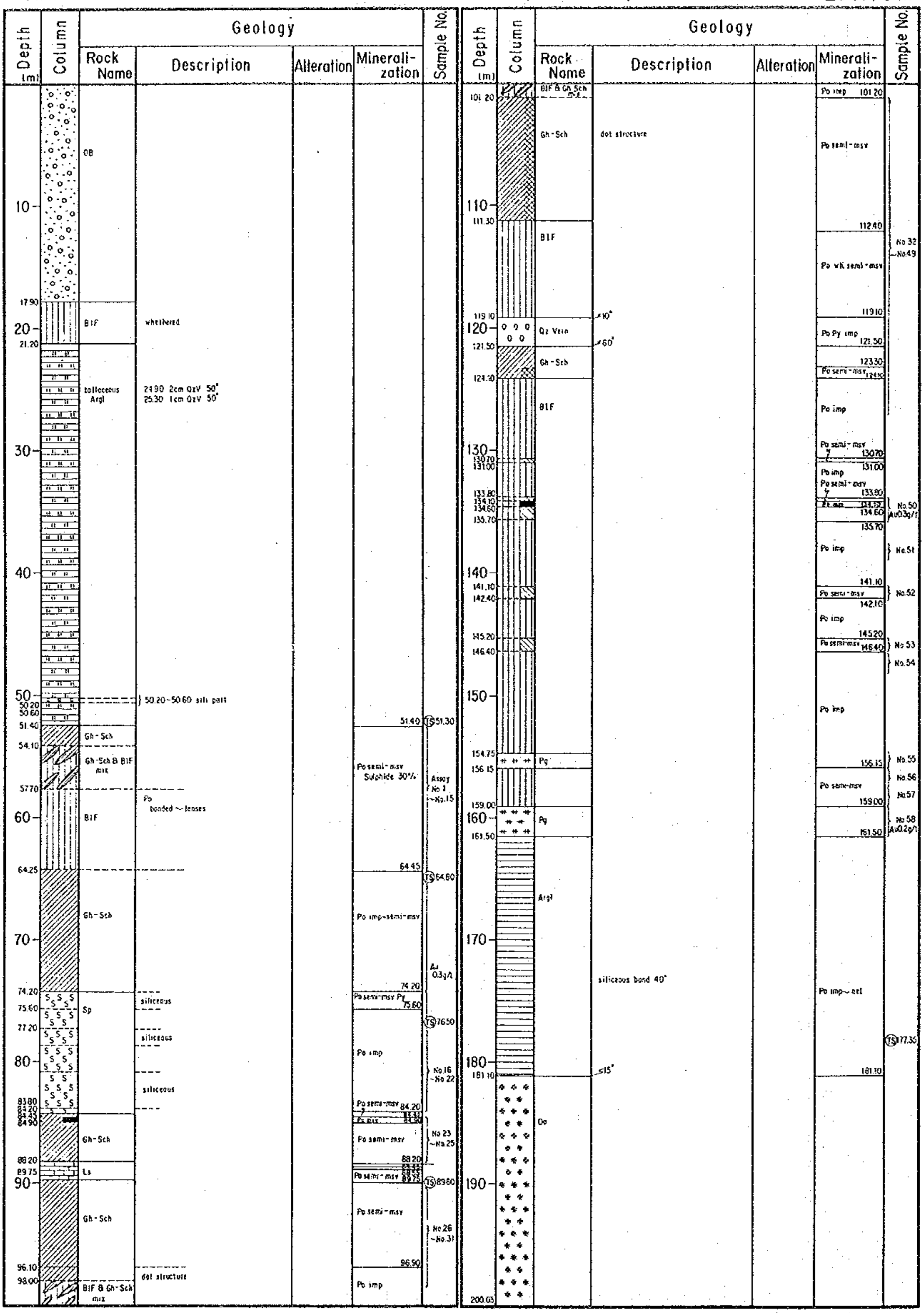


Fig. Ⅱ-4-2-1 (f) Drill Log of MJZ-6

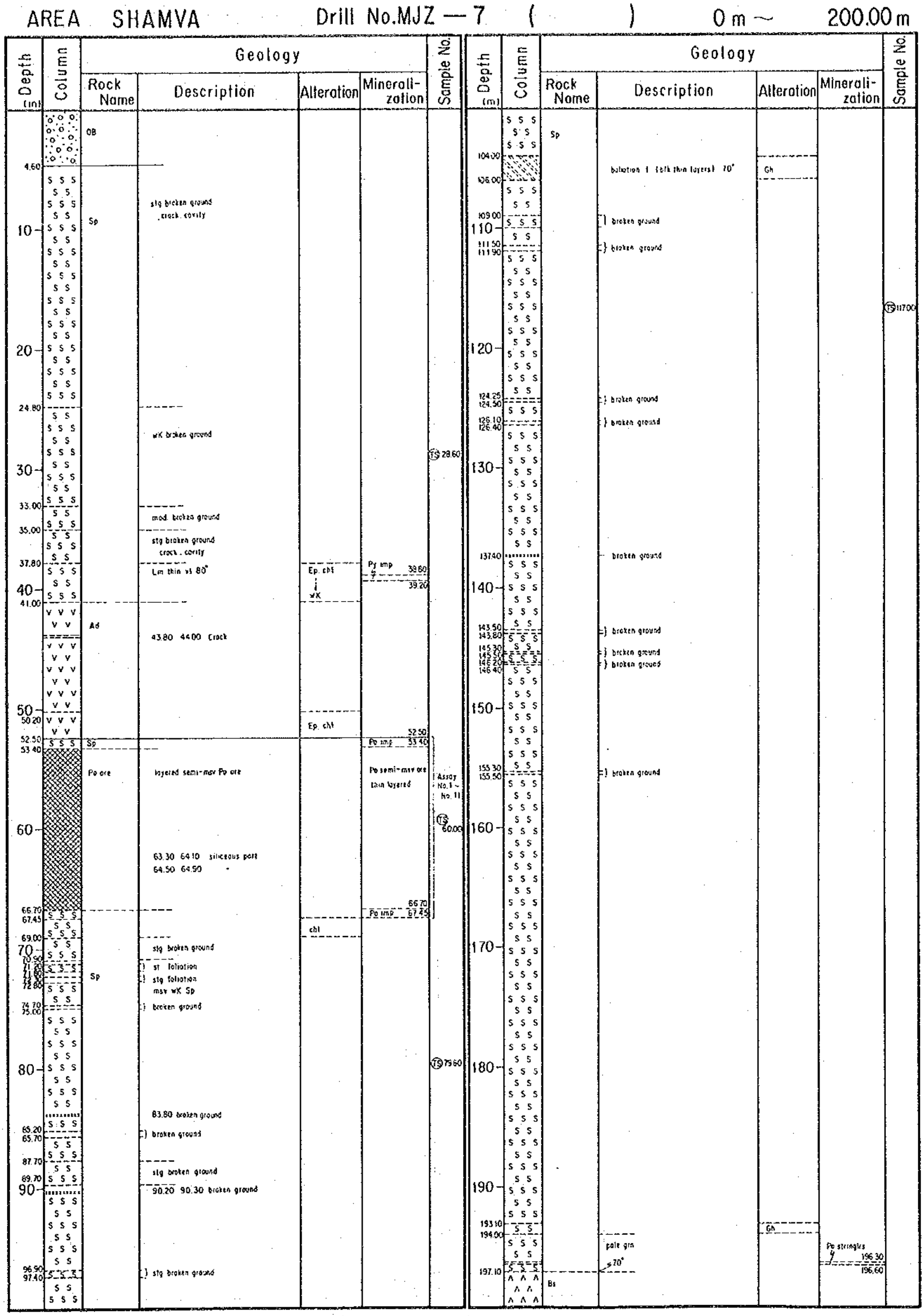


Fig. II-4-2-1 (g) Drill Log of MJZ-7

AREA SHAMVA Drill No. MJZ—7 (Cont.) 200.00m ～ 250.00m

Depth (m)	Column	Rock Name	Description	Alteration	Mineralization	Sample No.
202.55		Bs			Po imp 202.55	
202.65					202.65	
205.00			Po thin layers band 60°		Po stringer 205.00	
205.20					205.20 thin layers band	
210			212.10～212.40 Di Xenolith ?			
219.30						
220			C－grain			
227.40						
230		Sp				
240						
250 (250.00)						
60						
70						
80						
90						

Depth (m)	Column	Rock Name	Description	Alteration	Mineralization	Sample No.
10						
20						
30						
40						
50						
60						
70						
80						
90						

AREA SHAMVA Drill No. MJZ— 8 ( ) 0 m ~ 200.00 m

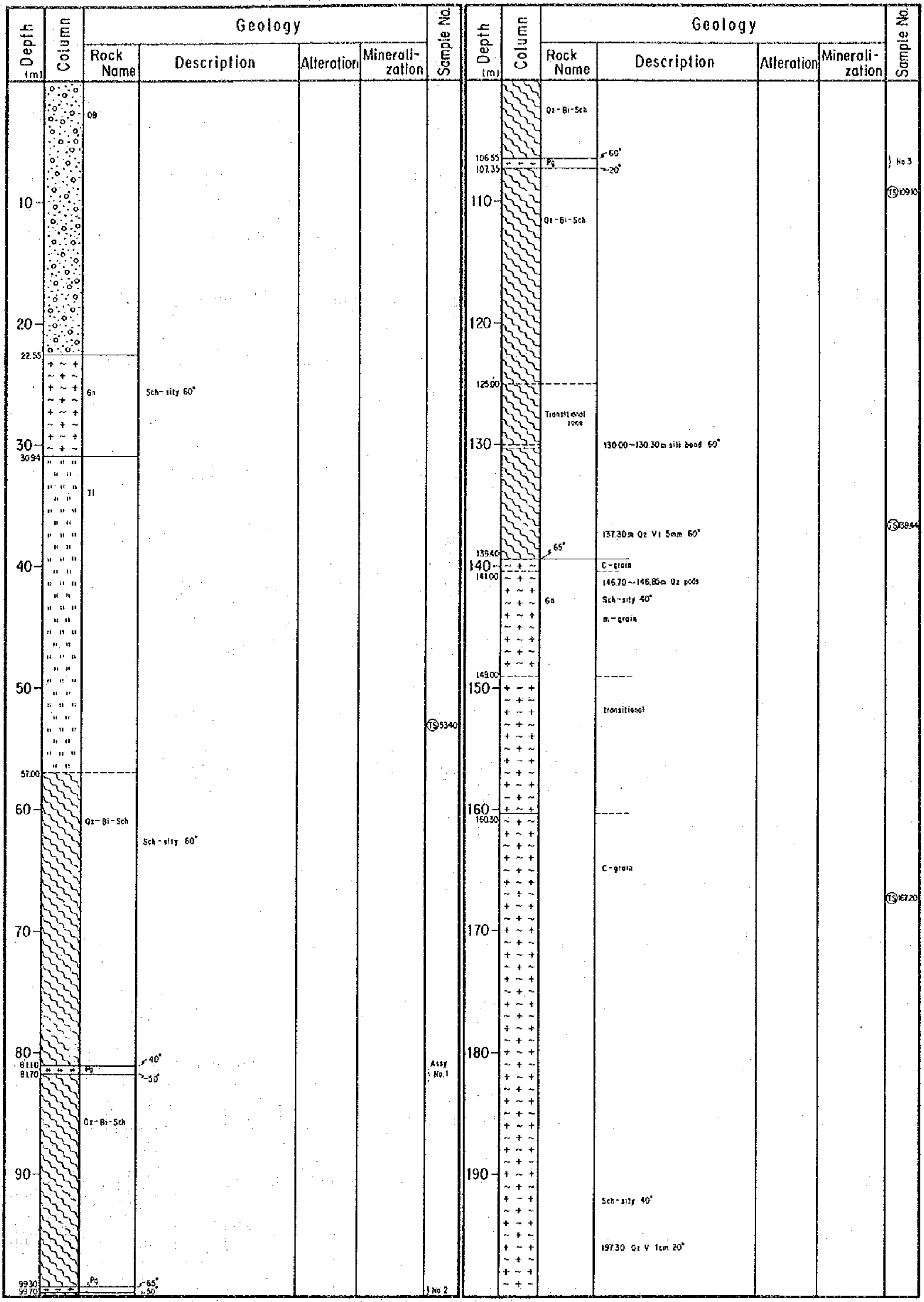
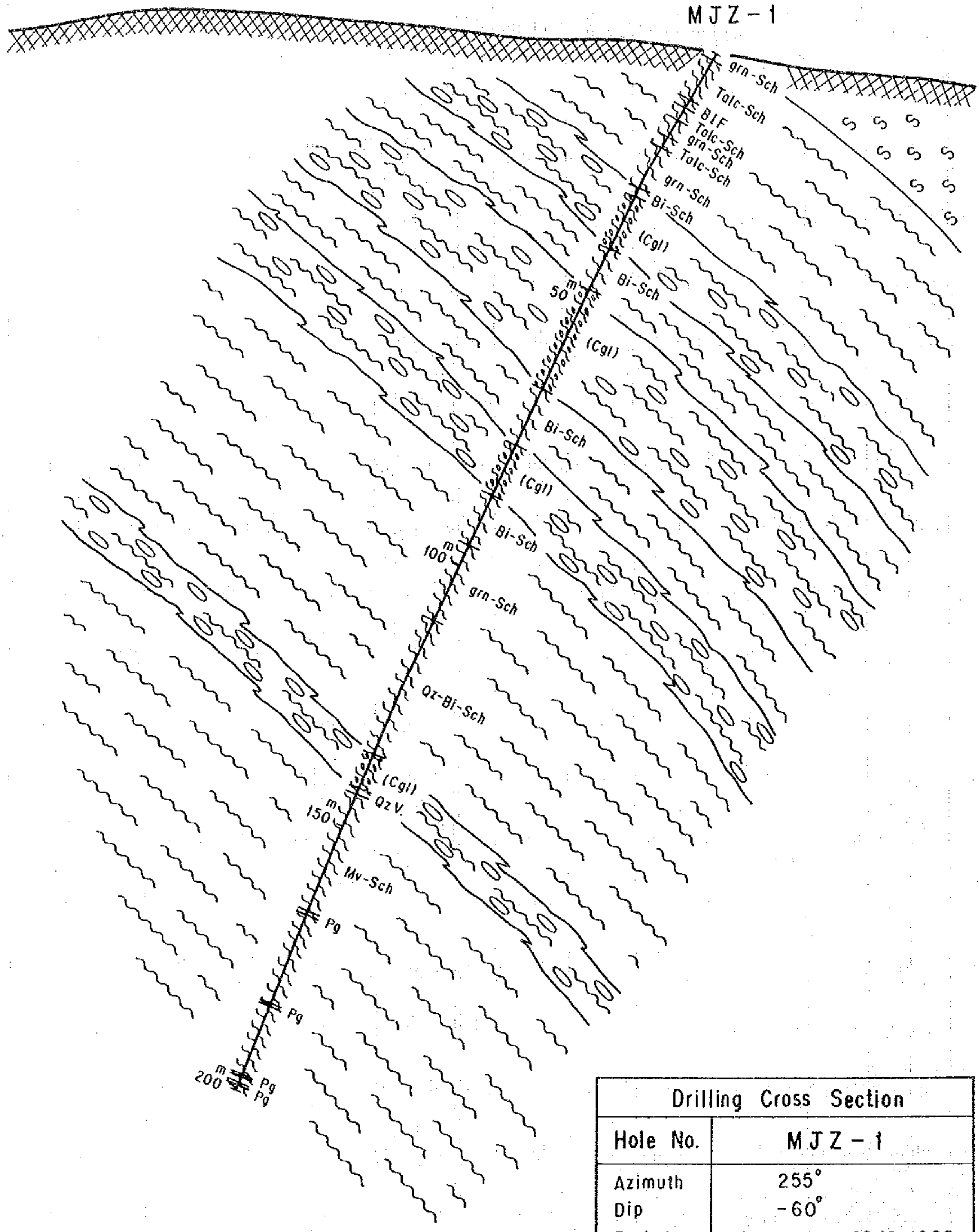
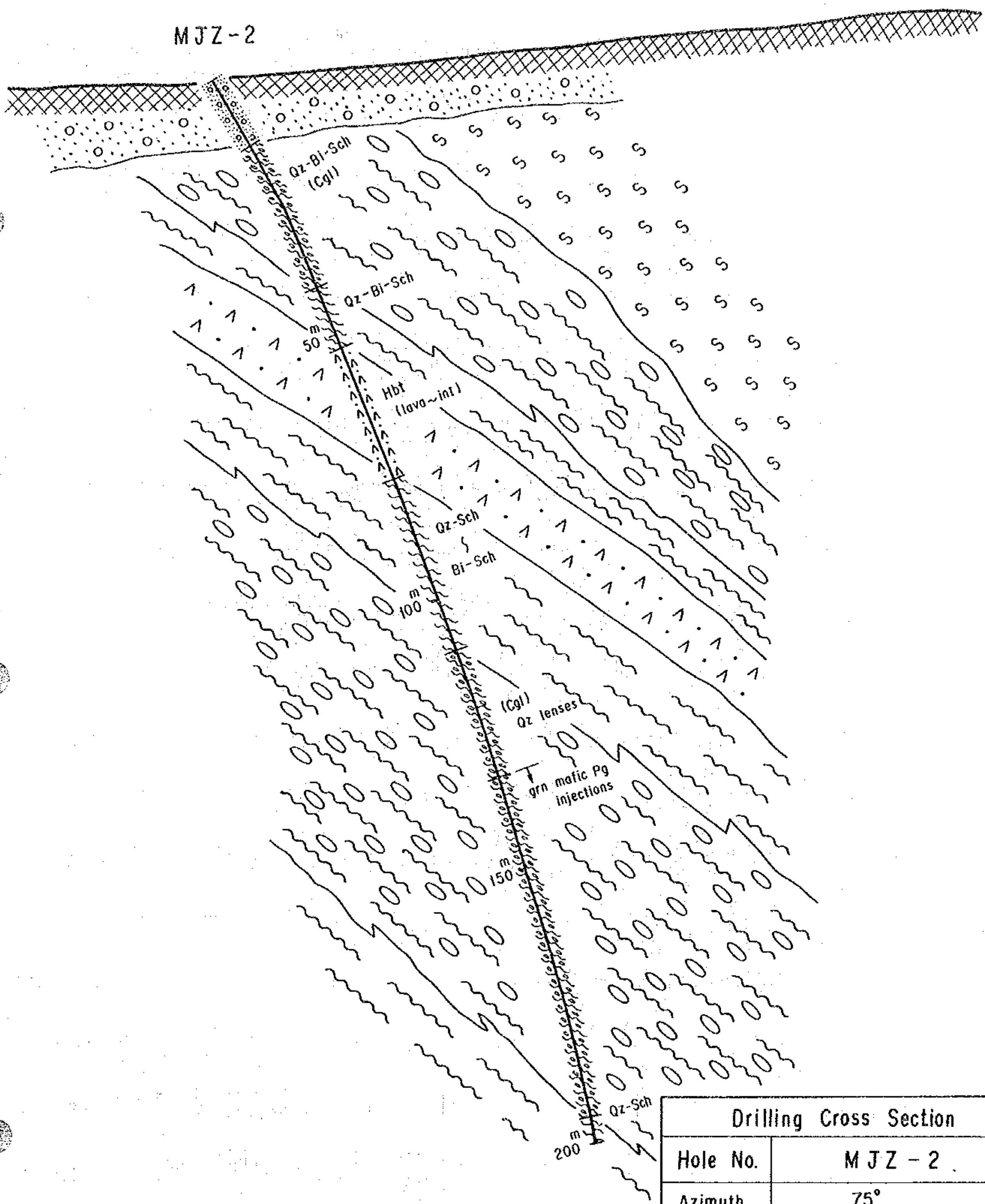


Fig. II-4-2-1 (h) Drill Log of MJZ-8



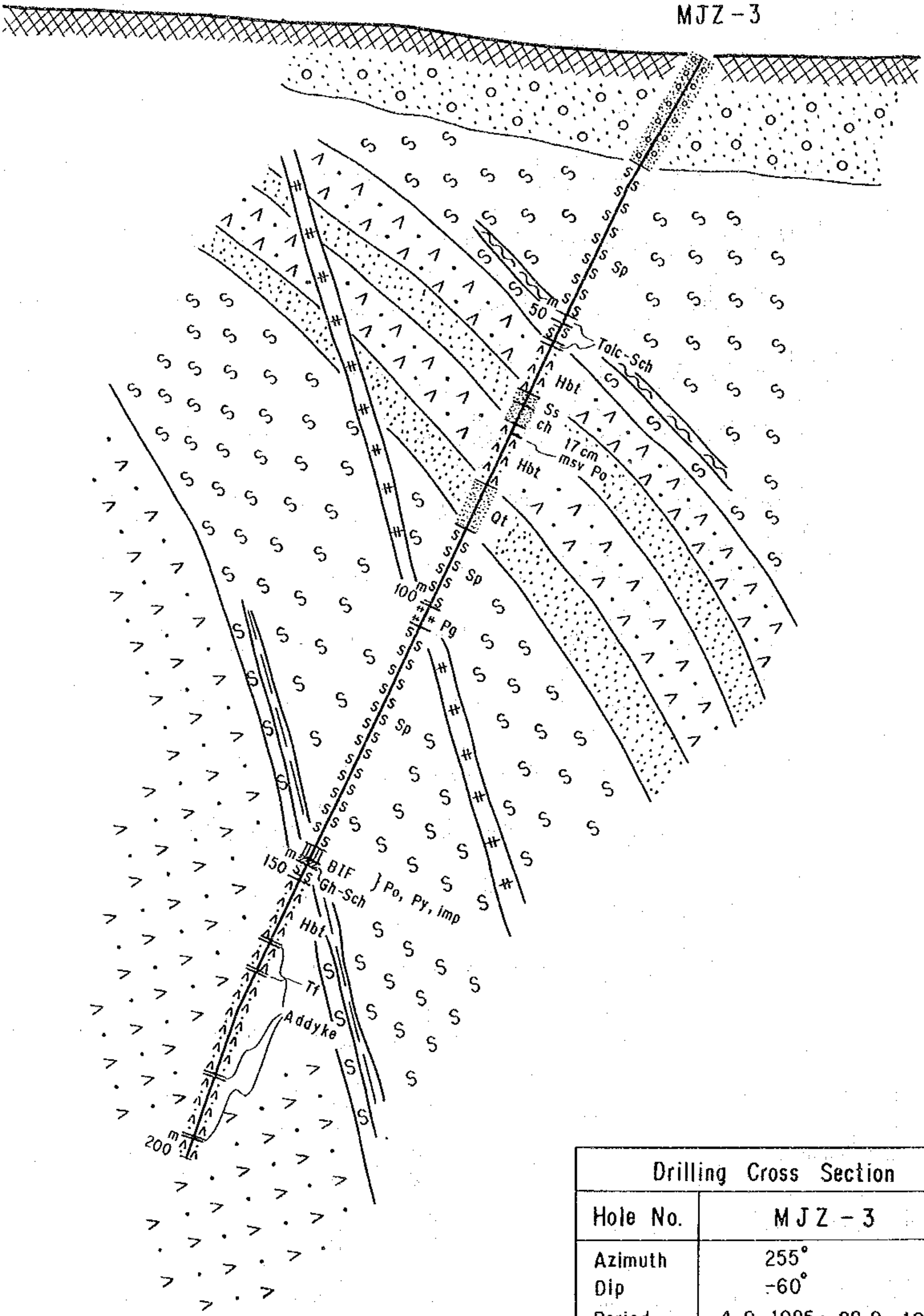
Drilling Cross Section	
Hole No.	MJZ-1
Azimuth	255°
Dip	-60°
Period	7.10, 1985～29.10, 1985
Angle Test	50m 65°, 100m 65° 150m 68°, 200m 68°

Fig. II-4-2-2(a) Drilling SECTION OF MJZ-1



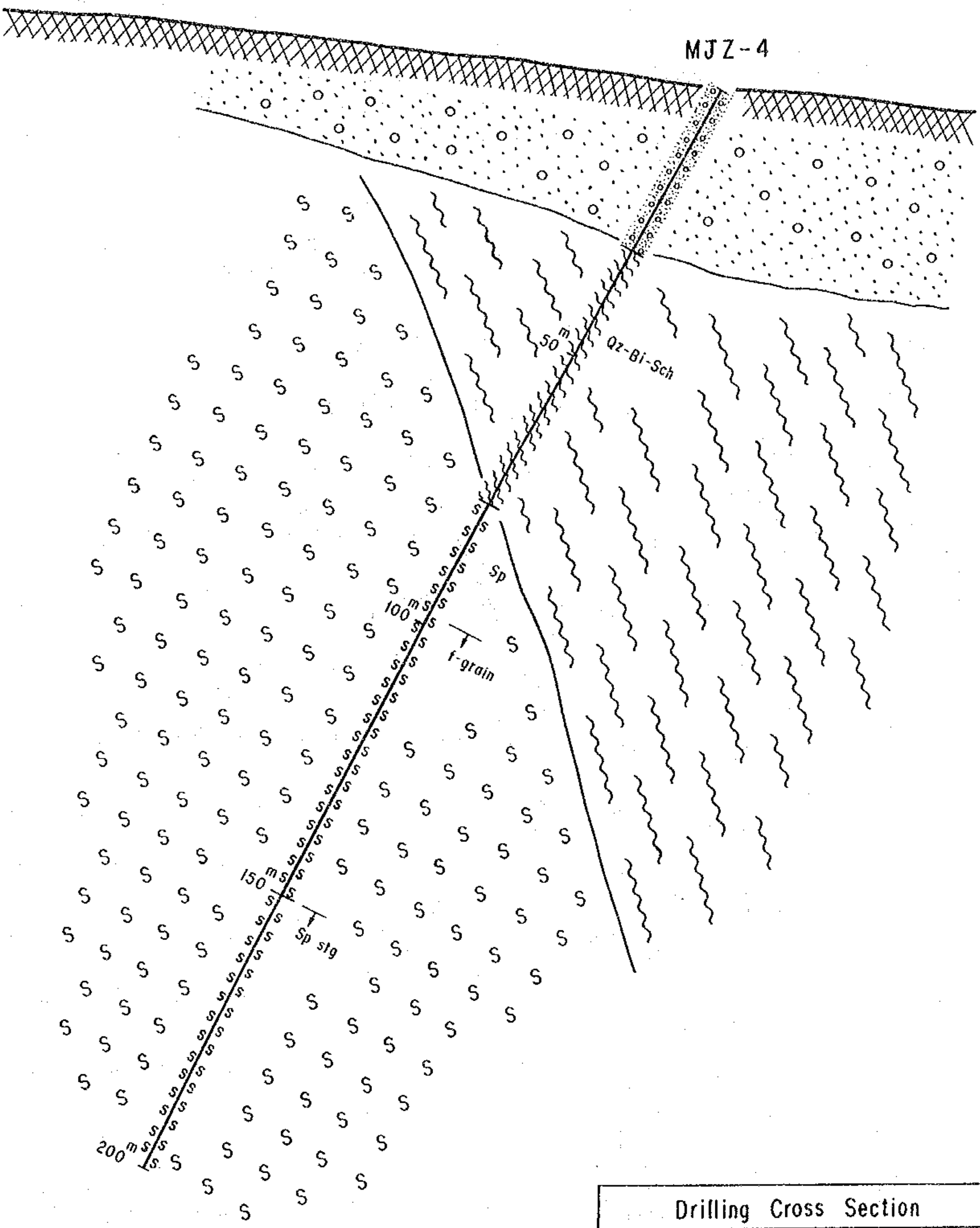
Drilling Cross Section	
Hole No.	MJZ-2
Azimuth	75°
Dip	-60°
Period	19. 9, 1985~17. 10, 1985
Angle Test	50m 68°, 100m 70° 150m 73°, 200m 78°

Fig. II-4-2-2(b) Drilling SECTION OF MJZ-2



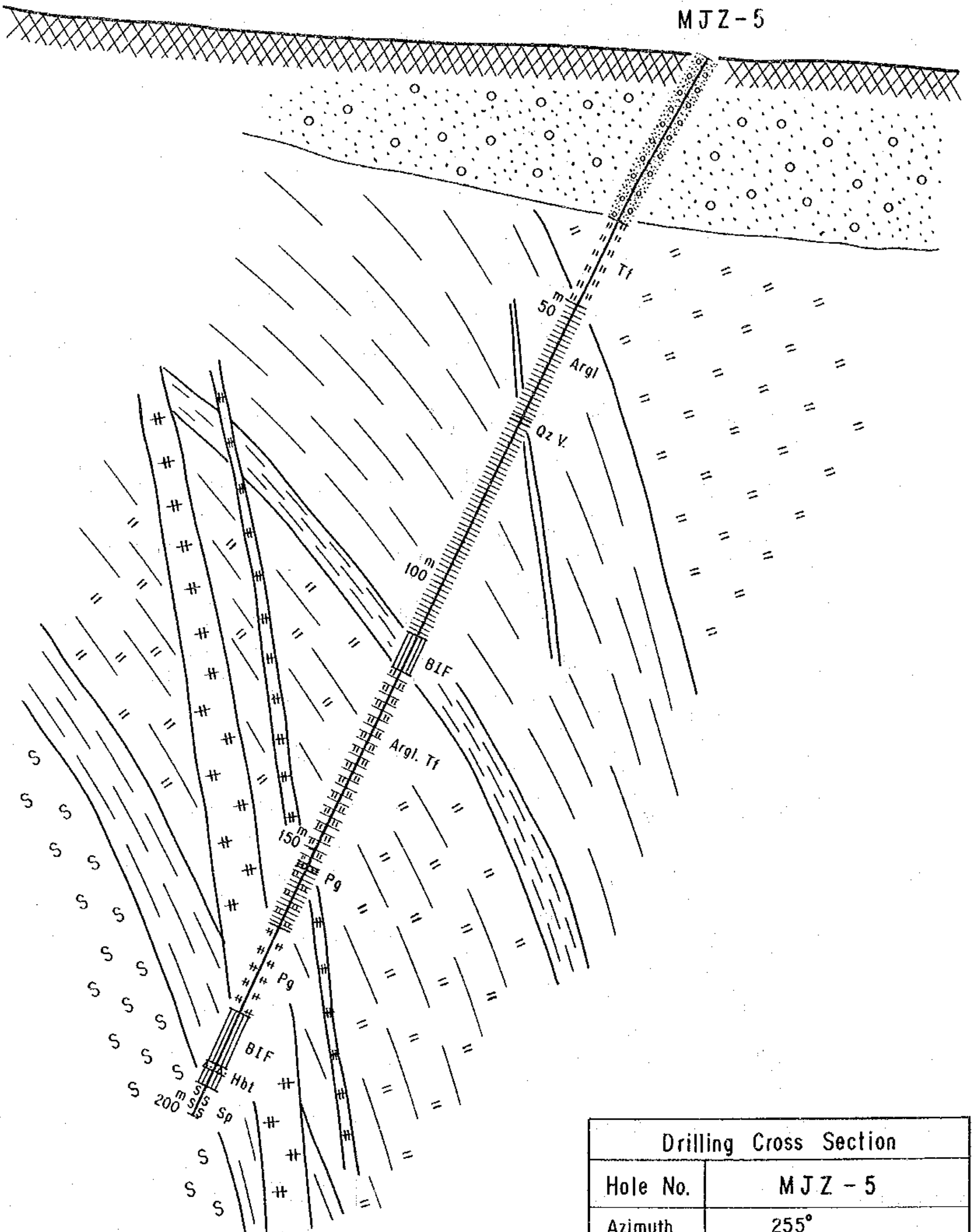
Drilling Cross Section	
Hole No.	MJZ-3
Azimuth Dip Period Angle Test	255° -60° 4.9,1985~28.9,1985 50m 65°, 100m 65° 150m 65°, 200m 71°

Fig. II-4-2-2(c) Drilling SECTION OF MJZ-3



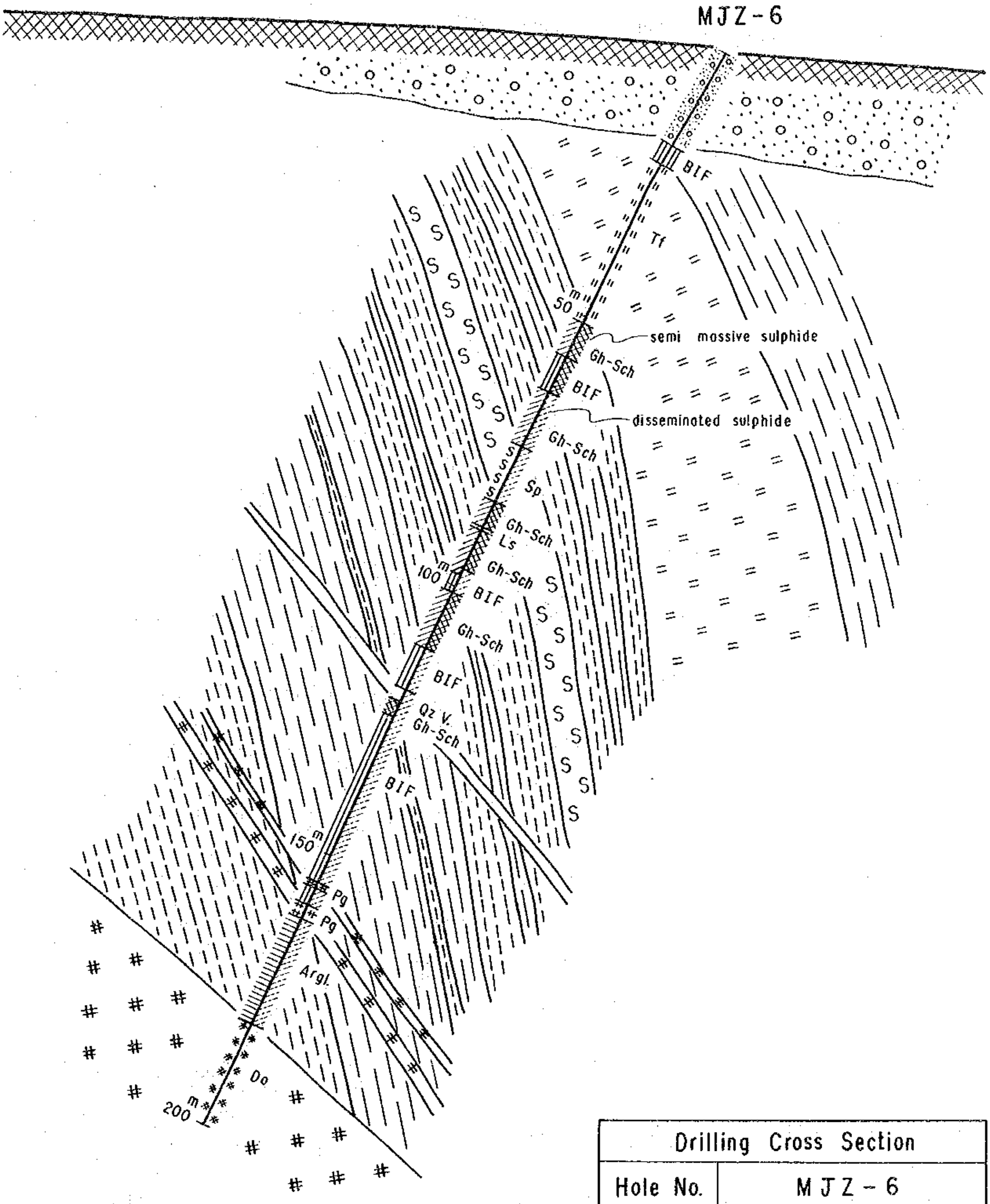
Drilling Cross Section	
Hole No.	M J Z - 4
Azimuth	255°
Dip	-60°
Period	2. 9, 1985～8. 10, 1985
Angle Test	50m 61°, 100m 62° 150m 63°, 200m 64°

Fig. II-4-2-2(d) Drilling SECTION OF MJZ-4



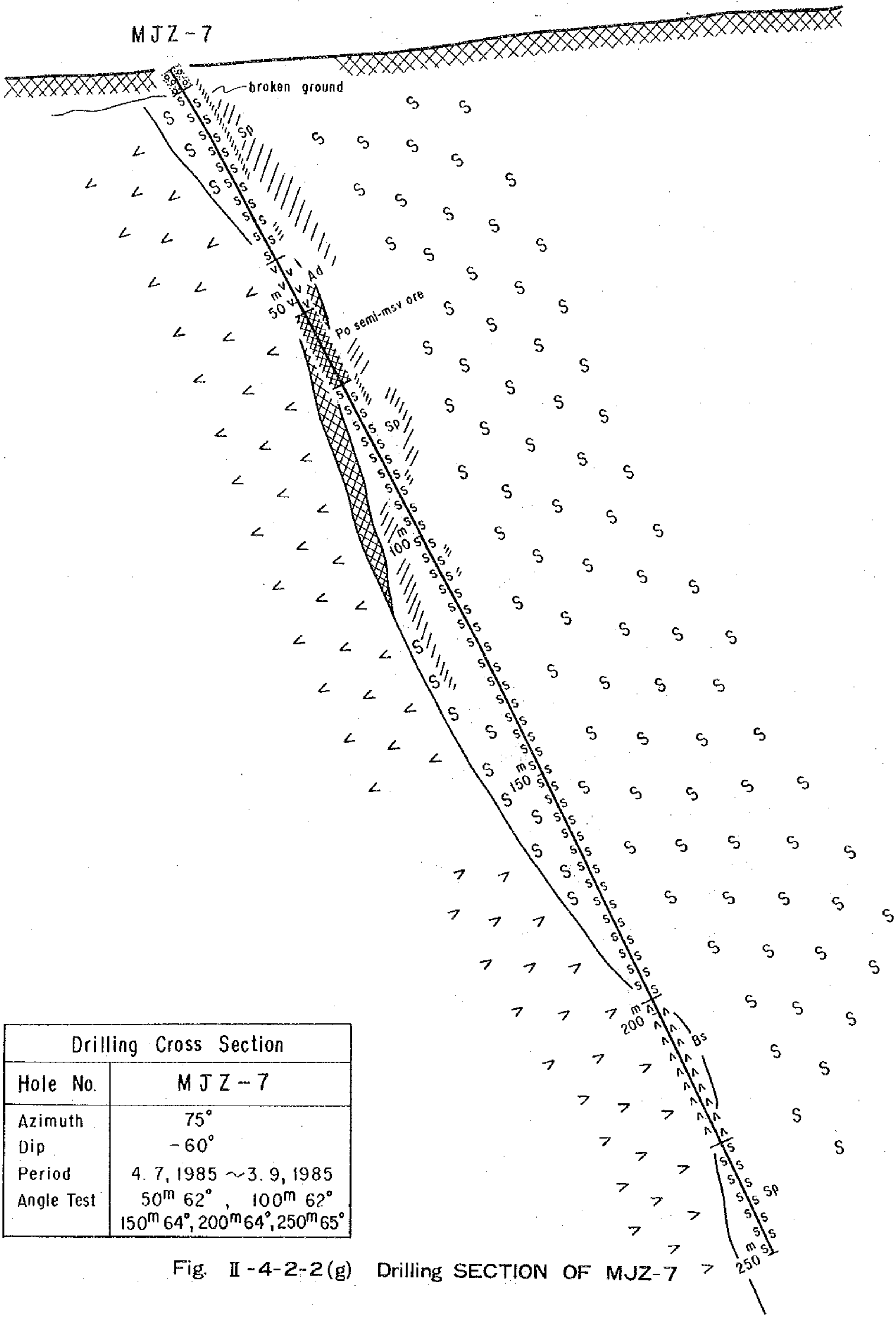
Drilling Cross Section	
Hole No.	MJZ - 5
Azimuth	255°
Dip	-60°
Period	14. 8, 1985 ~ 20. 9, 1985
Angle Test	50m 64° , 100m 64° 150m 65° , 200m 65°

Fig. II-4-2-2(e) Drilling SECTION OF MJZ-5



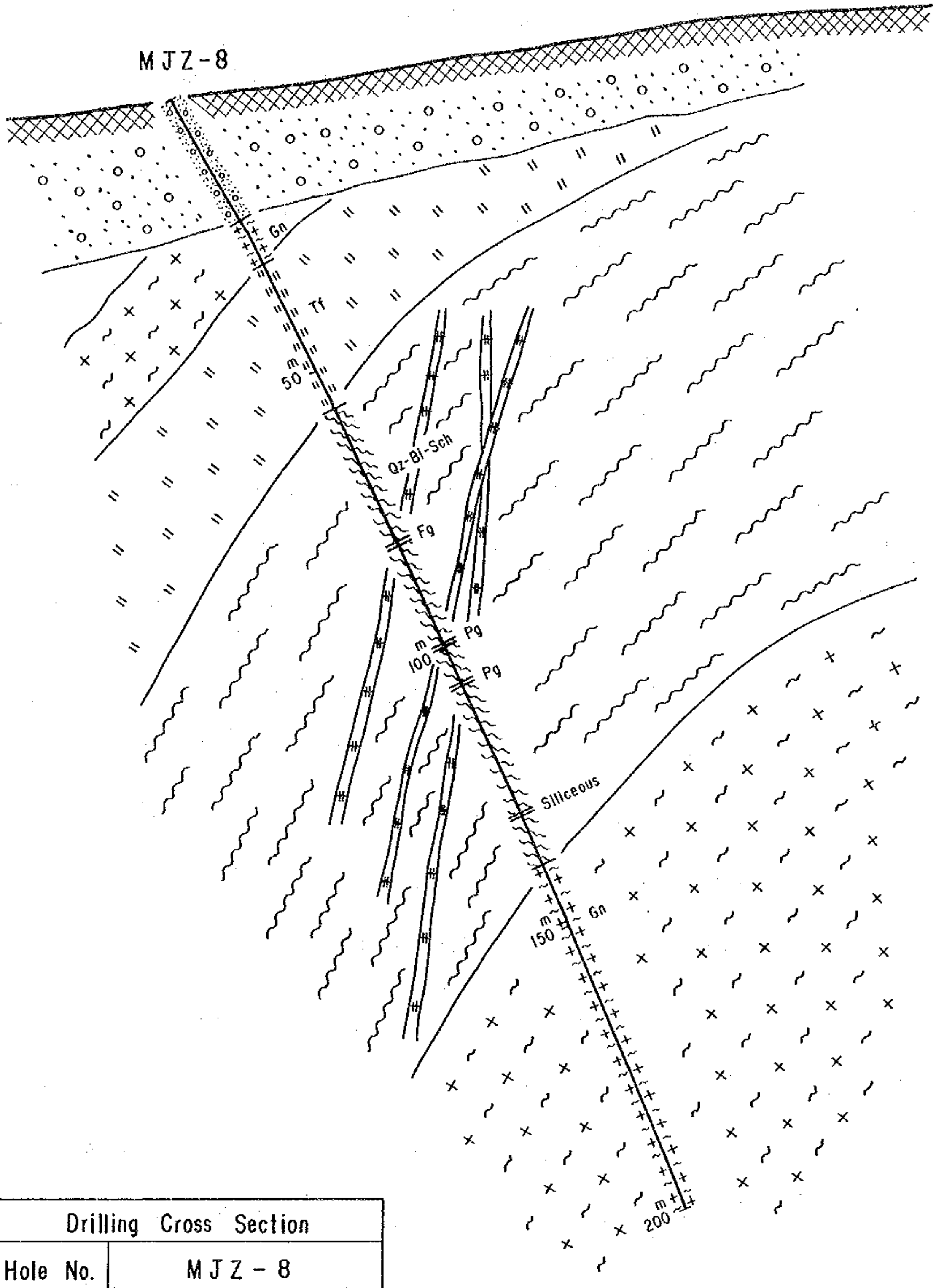
Drilling Cross Section	
Hole No.	MJZ-6
Azimuth	255°
Dip	−60°
Period	9. 8, 1985 ~ 31. 8, 1985
Angle Test	50m 65°, 100m 65° 150m 66°, 200m 65°

Fig. II-4-2-2(f) Drilling SECTION OF MJZ-6



Drilling Cross Section	
Hole No.	MJZ-7
Azimuth	75°
Dip	-60°
Period	4. 7, 1985 ~3. 9, 1985
Angle Test	50m 62°, 100m 62° 150m 64°, 200m 64°, 250m 65°

Fig. II-4-2-2(g) Drilling SECTION OF MJZ-7



Drilling Cross Section	
Hole No.	MJZ－8
Azimuth	75°
Dip	－60°
Period	5. 7, 1985 ～ 9. 8 1985
Angle Test	50m 64°, 100m 66° 150m 67°, 200m 68°

Fig. II-4-2-2(h) Drilling SECTION OF MJZ-8

PART Ⅲ.

CONCLUSIONS

CONCLUSIONS

In the third year's programme, a drilling programme consisting of eight holes with a total depth of 1,650 meters was conducted to examine promising target anomalies based on geological, geochemical, and geophysical surveys.

As a result of this programme, phrrhotite occurrences were found in four out of eight holes drilled, but did not show economic grade and size. Nevertheless, the results of the programme add considerable information to those of various previous surveys, and should lead to future exploration activities in the area.

It is considered that the areas surrounding MJZ-3 and MJZ-7 have very high potential for economic ore deposits, in particular Trojan-type nickel sulphides because of their geological settings and the nature of the mineral occurrences.

At some stage in the future, it is hoped that further exploration activities consisting of detail surface geophysical surveys with additional survey lines, borehole geophysical logging together with drilling based on the results of such surveys will be conducted in the areas around MJZ-3 and MJZ-7.

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APPENDICES

Appendix 1.
Assay Result

Hole No.	Section m	Rock	Sulphide			Pegmatite			Au g/t
			Cu ppm	Ni ppm	Co ppm	Nb ppm	Ta ppm	Sn ppm	
MJZ-3	91.60~91.75	Po	3790	5600	811				N.D.
	110.65~112.40	Pg				112	198	<20	
	112.40~114.15	"				132	211	<20	
	145.90~146.80	BIF	304	116	61				N.D.
	146.80~147.70	Gh	1380	655	211				N.D.
MJZ-5	68.90~69.40	Qz				<10	<20	<20	N.D.
	109.90~111.40	Gh	384	311	178				N.D.
	111.40~112.90	"	405	367	153				
	112.90~114.40	"	286	239	100				N.D.
	114.40~116.10	"	276	219	95				
	152.90~153.85	Pg				36	<20	<20	
	164.50~166.00	"				66	<20	<20	
	166.00~167.50	"				75	<20	<20	
	167.50~169.00	"				64	<20	<20	
	169.00~170.50	"	26	91	37	53	<20	<20	N.D.
	170.50~172.00	"	52	125	29	50	<20	<20	N.D.
	172.00~173.50	"				108	<20	<20	
	173.50~175.00	"				79	<20	<20	
	175.00~176.50	"				61	<20	<20	
	176.50~178.00	"				60	<20	<20	
	178.00~179.00	Pg				78	<20	<20	
	179.40~180.50	"				70	<20	<20	
	180.50~182.00	BIF	95	226	41				N.D.
	182.00~183.50	"	89	215	41				
MJZ-6	51.40~52.75	"	237	298	95				N.D.
	52.75~54.10	"	333	382	115				
	54.10~55.90	Gh	167	203	52				N.D.
	55.90~57.70	"	210	295	89				
	57.70~59.20	BIF	178	281	80				N.D.
	59.20~60.70	"	308	389	117				
	60.70~62.20	"	234	324	93				N.D.
	62.20~64.25	"	320	436	135				
	64.25~65.75	Gh	156	268	88				N.D.
	65.75~67.25	"	152	340	94				
	67.25~68.75	"	151	373	96				N.D.

Assay Result

Hole No.	Section m	Rock	Sulphide			Pegmatite			Au g/t
			Cu ppm	Ni ppm	Co ppm	Nb ppm	Ta ppm	Sn ppm	
MJZ-6 cont.	68.75～70.25	Gh	155	361	89				
	70.25～71.75	"	152	327	76				0.3
	71.75～73.25	"	156	271	90				
	73.25～74.20	"	159	257	67				N.D.
	74.20～75.60	Gb	582	447	257				N.D.
	75.60～77.10	"	248	254	81				
	77.10～78.60	"	162	172	62				N.D.
	78.60～80.10	"	230	263	84				
	80.10～81.60	"	284	293	89				N.D.
	81.60～83.10	"	255	249	73				
	83.10～84.20	"	396	347	93				N.D.
	84.50～84.90	Po	1870	1780	369				N.D.
	84.90～86.55	Gh	350	402	94				
	86.55～88.20	"	207	269	65				N.D.
	89.75～91.25	"	252	362	78				N.D.
	91.25～92.75	"	219	381	71				
	92.75～94.25	"	378	482	106				N.D.
	94.25～95.75	"	405	482	138				
	95.75～97.25	"	279	309	79				N.D.
	97.25～98.65	"	266	251	82				
	101.30～102.80	Gh	249	357	97				N.D.
	102.80～104.30	"	205	345	167				
	104.30～105.80	"	265	416	121				0.2
	105.80～107.10	"	118	244	71				
	107.10～108.85	"	591	963	288				N.D.
	108.85～109.90	"	401	606	178				0.2
	109.90～111.30	"	376	457	129				
	111.30～112.80	BIF	432	690	228				N.D.
	112.80～114.30	"	235	377	131				
	114.30～115.80	"	176	249	85				N.D.
	115.80～117.30	"	82	205	87				N.D.
	117.30～119.10	"	187	194	92				N.D.
	119.10～120.30	Qz	315	54	64				N.D.
	120.30～121.50	Qz	65	41	33				N.D.
	121.50～123.30	Gh	65	238	51				

Hole No.	Section m		Rock	Sulphide			Pegmatite			Au g/t
				Cu ppm	Ni ppm	Co ppm	Nb ppm	Ta ppm	Sn ppm	
MJZ-6 cont.	123.30	124.10	Gh	58	262	63				N.D.
	124.10	125.60	BIF	61	113	57				N.D.
	125.60	127.10	"	79	159	84				N.D.
	133.80	135.70	"	141	263	183				0.3
	137.40	138.90	"	87	159	165				
	141.10	142.10	"	222	322	250				N.D.
	145.20	146.40	"	291	392	233				N.D.
	146.40	148.10	"	106	155	151				
	154.75	156.15	Pg	165	225	130	27	<20	<20	N.D.
	156.15	157.65	BIF	127	163	165				N.D.
	157.65	159.00	"	174	212	75				
	159.00	161.33	Pg	179	232	126	10	<20	40	0.2
MJZ-7	52.50	53.40	Mafic	150	150	630	60			
	53.40	54.90	"	420	310	90				N.D.
	54.90	56.40	"	640	380	100				
	56.40	57.90	"	360	260	70				N.D.
	57.90	59.40	"	400	290	80				
	59.40	60.90	"	430	250	70				N.D.
	60.90	62.40	"	310	160	50				
	62.40	63.90	"	480	350	90				N.D.
	63.90	65.40	"	570	340	80				
	65.40	66.70	"	410	280	80				N.D.
	66.70	67.50	"	80	480	50				
MJZ-8	81.10	81.70	Pg				46	<20	<20	
	99.30	99.70	"				30	25	<20	
	106.55	107.35	"				55	26	<20	

SAMPLE MARKS:	NICKEL, Ni	COBALT, Co	MANGANESE, Mn	MAGNESIUM as MgO	TOTAL IRON, Fe	SULPHUR, S
	ppm	ppm	%	%	%	%
MJZ-1 10m	180	204	0,050	6,8	8,6	0,15
MJZ-1 25m	740	238	0,15	25	10,9	0,02
MJZ-1 40m	120	278	0,10	6,5	6,4	0,09
MJZ-1 55m	140	202	0,14	5,6	7,6	0,09
MJZ-1 70m	160	232	0,10	7,5	6,4	0,32
MJZ-1 85m	80	180	0,13	4,9	6,9	0,12
MJZ-1 100m	260	157	0,13	15,0	6,6	0,01
MJZ-1 115m	40	148	0,064	4,2	4,5	0,01
MJZ-1 130m	60	160	0,091	4,5	5,0	0,20
MJZ-1 145m	30	84	0,018	2,4	1,42	<0,01
MJZ-1 160m	<10	74	0,020	1,7	1,26	<0,01
MJZ-1 175m	20	136	0,058	1,4	1,77	0,01
MJZ-1 190m	<10	62	0,021	2,4	1,56	0,01
MJZ-2 20m	120	74	0,11	6,8	5,9	0,01
MJZ-2 35m	100	80	0,15	6,4	5,8	<0,01
MJZ-2 50m	70	59	0,054	4,7	3,8	0,01
MJZ-2 65m	400	152	0,17	18	7,7	0,01
MJZ-2 80m	40	82	0,051	3,4	4,0	0,01
MJZ-2 95m	60	100	0,072	4,1	4,4	0,04
MJZ-2 110m	80	77	0,076	5,2	5,2	0,03
MJZ-2 125m	100	83	0,12	6,5	6,5	0,13
MJZ-2 140m	70	71	0,14	6,3	7,5	0,07
MJZ-2 155m	40	86	0,15	7,0	6,8	0,18
MJZ-2 170m	100	105	0,14	4,4	6,0	0,15
MJZ-2 185m	40	65	0,094	3,6	5,3	0,09
MJZ-2 200m	20	56	0,065	3,7	2,9	0,01
MJZ-3 30m	1160	131	0,090	41	7,4	0,01
MJZ-3 45m	1720	171	0,14	42	8,0	0,02
MJZ-3 60m	170	131	0,13	13	8,6	0,34
MJZ-3 75m	110	177	0,11	11	7,3	0,14
MJZ-3 90m	910	172	0,15	26	9,2	0,12
MJZ-3 105m	1300	164	0,10	34	8,0	0,34
MJZ-3 120m	230	111	0,12	17	7,9	0,46
MJZ-3 135m	740	145	0,16	23	8,0	0,01
MJZ-3 150m	1060	137	0,072	33	6,1	0,15
MJZ-3 165m	160	122	0,10	19	6,4	0,01
MJZ-3 190m	80	112	0,12	9,1	7,7	0,07
MJZ-4 30m	100	91	0,14	8,7	6,4	0,01
MJZ-4 45m	140	144	0,20	10	9,9	0,20
MJZ-4 60m	120	94	0,14	12	7,9	0,01
MJZ-4 75m	100	67	0,11	5,9	4,1	0,01
MJZ-4 90m	1660	133	0,086	34	7,8	0,20
MJZ-4 105m	1690	176	0,16	35	8,6	0,13
MJZ-4 120m	1340	146	0,16	33	8,5	0,07
MJZ-4 135m	1280	152	0,14	32	8,1	0,01
MJZ-4 150m	850	107	0,13	28	7,8	0,02
MJZ-4 165m	930	150	0,14	27	8,9	0,01
MJZ-4 180m	510	295	0,20	19	10,3	0,01
MJZ-4 200m	810	124	0,15	22	9,7	0,01

SAMPLE MARKS:	NICKEL, Ni	COBALT, Co	MANGANESE, Mn	MAGNESIUM as MgO	TOTAL IRON, Fe	SULPHUR, S
	ppm	ppm	%	%	%	%
MJZ-5 40m	230	203	0,16	14	11,0	0,15
MJZ-5 55m	1100	231	0,12	12	9,9	0,61
MJZ-5 70m	140	118	0,13	6,5	8,4	0,36
MJZ-5 85m	200	98	0,10	7,3	10,0	0,48
MJZ-5 100m	120	103	0,13	4,7	9,1	0,57
MJZ-5 115m	160	84	0,32	8,7	10,3	3,20
MJZ-5 130m	100	113	0,14	7,1	9,6	1,30
MJZ-5 145m	160	75	0,17	15	8,5	0,26
MJZ-5 160m	140	84	0,13	8,6	7,2	0,03
MJZ-5 175m	<10	36	0,028	0,8	1,56	0,01
MJZ-5 190m	340	101	0,75	8,3	17,5	3,40
MJZ-6 20m	60	57	0,049	2,2	18,8	0,33
MJZ-6 35m	100	104	0,15	7,4	11,2	0,21
MJZ-6 50m	140	90	0,13	8,2	9,0	0,15
MJZ-6 65m	260	101	0,34	4,1	14,3	7,18
MJZ-6 80m	120	67	0,11	7,8	5,4	2,83
MJZ-6 95m	200	91	0,20	9,9	7,9	3,18
MJZ-6 110m	380	128	0,052	4,5	11,7	5,05
MJZ-6 125m	70	147	0,64	2,7	4,8	1,63
MJZ-6 140m	150	125	0,17	8,3	13,7	5,44
MJZ-6 155m	100	72	0,20	6,4	6,2	1,47
MJZ-6 170m	320	120	0,36	10	11,9	4,53
MJZ-6 185m	70	164	0,19	5,1	11,8	0,18
MJZ-6 200m	60	114	0,26	4,1	15,9	0,08
MJZ-7 10m	480	140	0,24	18	12,6	0,03
MJZ-7 25m	260	91	0,14	12	7,1	0,02
MJZ-7 40m	1000	104	0,13	28	8,4	0,60
MJZ-7 70m	890	118	0,079	32	6,4	0,02
MJZ-7 85m	1050	110	0,15	28	6,8	0,31
MJZ-7 100m	960	137	0,12	28	8,1	0,23
MJZ-7 115m	1590	163	0,14	29	7,8	0,33
MJZ-7 130m	1100	131	0,14	28	7,4	0,01
MJZ-7 145m	1260	134	0,15	30	8,4	0,03
MJZ-7 160m	750	126	0,15	26	9,2	0,22
MJZ-7 175m	860	130	0,13	29	8,2	0,31
MJZ-7 190m	810	140	0,13	28	8,0	0,37
MJZ-7 205m	1460	160	0,13	27	9,1	1,68
MJZ-7 220m	750	200	0,26	22	11,2	0,19
MJZ-7 235m	1010	190	0,24	20	12,0	1,30
MJZ-7 250m	500	250	0,17	21	9,8	0,04
MJZ-8 30m	230	40	0,076	9,3	4,5	0,02
MJZ-8 45m	170	50	0,086	9,2	5,0	0,16
MJZ-8 60m	170	60	0,079	10	5,0	0,08
MJZ-8 75m	180	60	0,076	10	4,4	0,02
MJZ-8 90m	170	60	0,084	9,3	4,9	0,03
MJZ-8 105m	170	90	0,077	10	4,7	0,03
MJZ-8 120m	170	60	0,087	9,1	4,7	0,12
MJZ-8 135m	190	90	0,093	9,9	5,2	0,16
MJZ-8 150m	180	60	0,090	8,8	5,1	0,10
MJZ-8 165m	160	60	0,084	7,7	4,8	0,29
MJZ-8 180m	140	40	0,074	7,4	4,2	0,01
MJZ-8 195m	130	50	0,072	7,5	4,2	0,06

Appendix 2.

ABBREVIATIONS

Mineral

Biotite	Bi
Calcite	Cal
Chalcopyrite	Cp
Chlorite	Chl
Feldspar	Fd
Hematite	Hm
Hornblend	Hb
Gypsum	Gyp
Limonite	Lm
Magnetite	Mg
Muscovite	Mv
Olivine	Ov
Pentlandite	Pent
Pyrite	Py
Pyroxine	Pxn
Pyrrhotite	Po
Plagioclase	Plg
Quartz	Qz
Sericite	Sc
Sphalerite	Sph
Tourmaline	Tml

Rocks

Granite	Gr
Pegmatite	Pg
Diorite	Di
Gabbro	Gb
Norite	Nr
Peridotite	Pd
Pyroxinite	Px
Hornblendite	Hbt
Dolerite	Do
Diabase	Db
Porphyrite	P
Dacite	Dc
Andesite	Ad
Basalt	Bs
Komatiite	Km
Aplite	Ap
Gneiss	Gn

Rocks cont.

Schist	Sch
Serpentine	Sp
Amphibolite	Am
Greenstone	Gs
Quartzite	Qt
Graphite Schist	Gh
Conglomerate	Cgl
Sandstone	Ss
Argillite	Argl
Tuff	Tf
Hornfles	Hf
Limestone	Lm
Banded Iron Stone	BIF
Overburden	OB

Descripive

Altered	alt
Alternate	altn
Concentrate	conc
Disseminate	diss
Impregnate	imp
Fault	flt
Schistsity	sch-sity
Fine	f
Medium	m
Course	c
Formation	Fm
Group	Gp
Member	Mb
Massive	msv
Siliceous	sili
Brecciate	brc
Strong	stg
Moderate	mod
Weak	wk
White	wht
Black	blk
Blue	blu
Brown	brn
Gray	gry
Green	grn
Yellow	ylw
Purple	ppl

Appendix 3.

Legend

Overburden	Seprpentine
Granite	Argillite
Gneiss	Graphite Schist
Schist	Conglomerate
Pegmatite	Sandstone
Dacite	Quartzite, Chert
Andesite	Banded Iron Stone
Basalt	Limestone
Hornblendite	Tuff