REPORT
ON
THE MINERAL EXPLORATION
IN
THE SNAKE HEAD AREA
THE REPUBLIC OF ZIMBABWE
PHASE II

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PHASE III

MARCH, 1998

JAPAN INTERNATIONAL COOPERATION AGENCY
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Preface

In response to the request of the Government of Zimbabwe, the Japanese Government decided to conduct a Mineral Exploration in the Snake Head Area Project and entrusted the survey to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

The JICA and MMAJ sent to Zimbabwe a survey team headed by Mr. Yoshioki Nishitani from 14 June to 26 August, 1997.

The team exchanged views with the officials concerned of the Government of Zimbabwe and conducted a field survey in the Snake Head area. After the returned to Japan, further studies were made and the present report has been prepared.

We hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

We wish to express our deep appreciation to the officials concerned of the Government of Zimbabwe for their close cooperation extended to the team.

December 1997

Kimio FUJITA
President
Japan International Cooperation Agency

Hiroaki HIYAMA
President
Metal Mining Agency of Japan

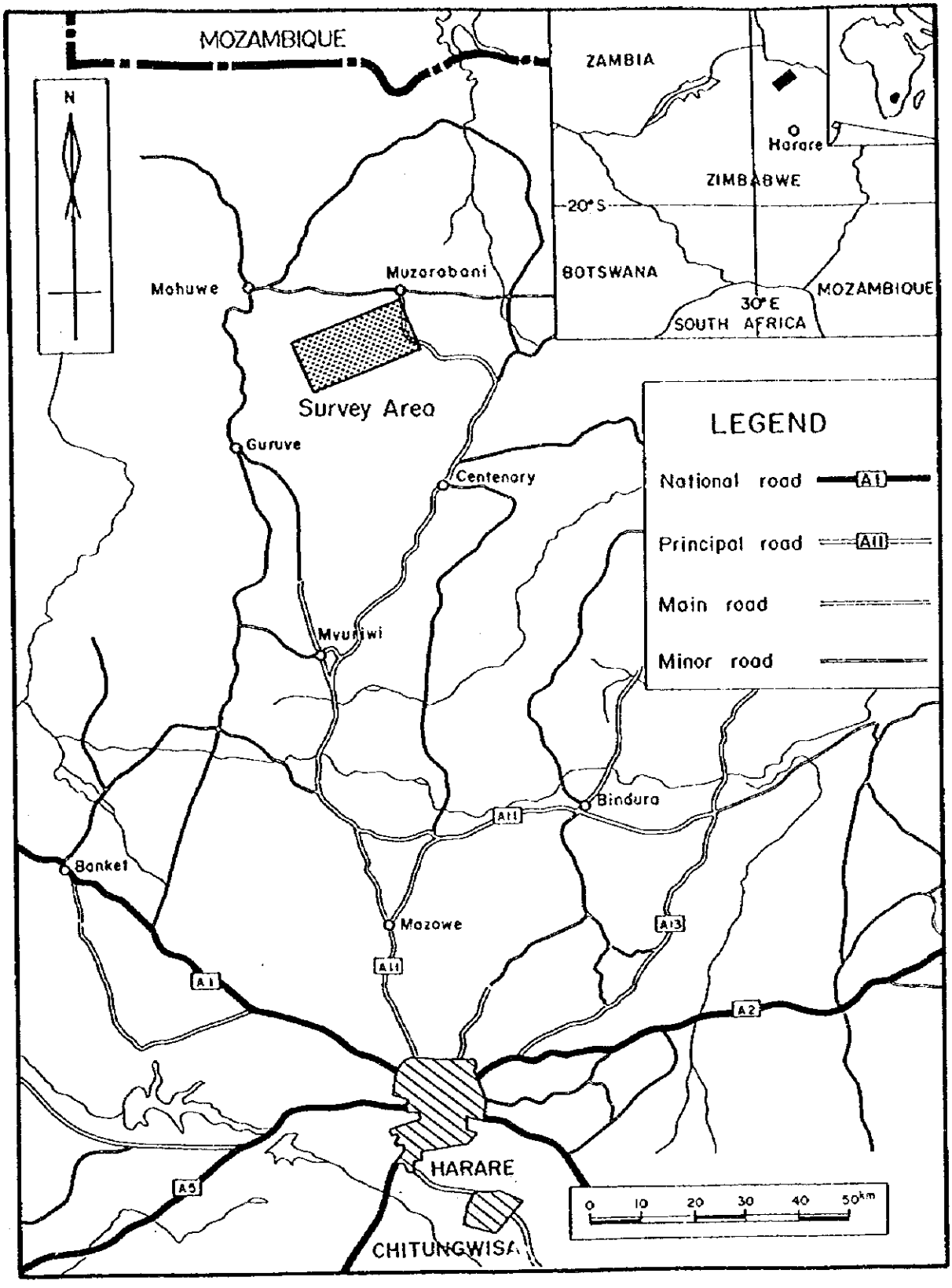

Fig.I-1-1 Locality of the survey area

Abstract

This survey was carried out in order to study the geology and explore new ore deposits of platinum group metals in the Snake Head area of the Republic of Zimbabwe.

Drilling of five holes was carried out in this fiscal year as the Phase III of this project. The results are summarized below.

As a result of the drilling survey, sulphide mineralization zone was encountered by all drillings, it is consider that this area has continuous sulphide and PGM mineralization zone.

Summary of sulphide mineralization of each holes are as follows.

Hole No.	Depth(m)	Mineralization	Main Sulphides
MJZS-6	327.00～348.00	disseminate	Po, Pn, Cp, Py,
MJZS-7	443.00～485.00	disseminate	Po, Pn, Cp, Py,
MJZS-8	556.00～564.00	disseminate	Po, Pn, Cp, Py,
MJZS-8	610.00～626.00	disseminate	Po, Pn, Cp, Py,
MJZS-9	331.00～343.00	disseminate	Po, Pn, Cp, Py,
MJZS-9	396.00～399.00	disseminate	Po, Pn, Cp, Py,
MJZS-10	370.00～400.50	disseminate	Po, Pn, Cp, Py,

Maximum metal content of the platinum group elements in the sulphide mineralization zone is as follows.

Hole No.	Depth(m)	Pt(ppb)	Pd(ppb)	Rh(ppb)	PGM(ppb)
MJZS-6	339.00～340.00	541	145	15	701
MJZS-6	341.00～342.00	511	154	27	692
MJZS-7	469.00～470.00	514	442	27	983
MJZS-7	470.00～471.00	486	412	20	918
MJZS-8	616.00～617.00	423	301	10	734
MJZS-8	617.00～618.00	392	264	26	682
MJZS-10	377.00～378.00	384	271	19	675

Through Phase II and III drilling survey, maximum PGM content is approximately 1 g/t, on the other hand , the Hartley Mine which is developed recently published their ore reserves and grade as follows.

Reserves : 50.9 million tonnes (proven and probable)

Grading : 2.64g/t Pt, 1.8g/t Pd. 0.21g/t Rh, 0.47g/t Au,

Snake Head area is generally low grade of PGM compared with the Hartley Mine, it is considered that the grade of concentration of PGM may be low in this survey area, it could not be attained to discover the new ore deposit that can expect to develop at present.

According to conclusions obtained through the survey results in Phase I to III, the following program will be proposed.

(1) Drilling survey must be carried out in the north-eastern portion of the WN area and the northern portion of the CB area in order to study the probability of the existence of the platinum ore deposit.

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Part I General remarks

Part I General remarks

Chapter 1 Introduction

1-1 Background and purpose of the survey

This survey commenced in 1995. This year, 1997, is the phase III of the project. The Great Dyke is generally known as the main host area for nickel, cobalt, and platinum group metals in the world. In the Snake Head area, the target area of this survey, is the last expected area where a high potential for existence of Platinum group metals deposit such as those at Hartley, Serious, Zinka, and Mimoza mines can be found. Therefore, the Government of the Republic of Zimbabwe requested the Government of Japan for a Technical Cooperation to carry out mineral exploration in the Snake Head area. The Government of Japan responded to the request and conducted a drilling surveys. A survey team was dispatched to carry out the survey in order to explore for new deposits.

1-2 Conclusion and recommendation of the phase II survey

1-2-1 Conclusion of the phase II survey

As a result of the drilling survey, a MSZ was encountered by 5 drill holes, LSZ was encountered by 2 drill holes.
Comparison of all results from drillings in this area including previous work shows a possibility that the mineralization of sulphide and PGM in this area will continue to the northern direction and in the southern potion of this area the mineralization will continue to eastern direction.

Therefore additional drilling survey may be necessary in order to find more areas of mineralization.

1-2-2 Recommendation for the phase III survey

According to conclusions obtained through the survey results in Phase I to II, the method of survey in Phase III is proposed as follows.

(1) Drilling survey must be carried out in WS area in order to find a new ore deposit which can be expect to develop.

(2) Drilling survey must be carried out in the north-eastern portion of the WN area and the northern portion of the CB area in order to study the probability of the existence of the platinum ore deposit.

1-3 Outline of the phase III survey

1-3-1 Survey area

The target area of this survey is the WS area recommended by

phase II survey.

1-3-2 Purpose of the survey

The survey was carried out in order to explore for a new ore deposit in this area.

1-3-3 Method of the survey

Drilling survey was done on the extension area where the mineralization of PGM were recognized by phase II survey, and where the potential of new ore deposit was identified.

Specifications of survey are shown in Table I-1-1.

Table I-1-1. Outline of the survey

Specification of the survey	Numbers of survey	
Drilling survey	MJZS-6(W,-60degree)	450.00m
	MJZS-7(W,-60degree)	500.00m
	MJZS-8(-90degree)	650.00m
	MJZS-9(W,-70degree)	400.00m
	MJZS-10(W,-60degree)	400.00m
	Total(5 holes)	2,400.00m

Table I-1-1. Outline of the survey(Continue)

Specifications of laboratory test	Amounts of samples
1. Microscopic observation of rock thin section	7
2. Microscopic observation of ore polished section	13
3. EPMA quantitative analysis	7
4. Chemical analyses of ore : Au,Ag,Cu,Co,Ni,Pt,Pd,Rh,S,Cr	135

1-3-4 Members of the survey team

The following members were organized as the survey team, who conducted and actual survey.

Field survey

(Japanese)

Yoshioki NISHITANI :DOWA Engineering Co.,Ltd.

(Zimbabwean)

Forbes MUGUMBATE :GSD

1-3-5 Terms of the survey

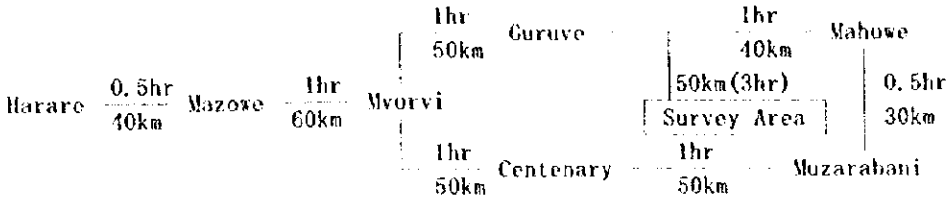
Field survey was carried out as follows:

Field survey (Drilling) from 14 June to 26 August, 1997

Chapter 2 Physical features

2-1 Location and access

The Snake Head area is located in the northern part of Zimbabwe as shown in Fig.I-1-1. The distance and travel time by car from Harare are as follows:



There are paved national roads and local roads from the Capital to the north of Guruve, From north of Guruve to survey area is by gravel road through mountains. Only the 4WD cars can drive in the dry season, however during the rainy season of November to March, it is impossible to access the survey area.

During the field survey, Japanese engineers and counterpart stayed in Guruve. Labours were employed in the survey area.

2-2 Topography and river system

The topography of the survey area is generally affected by fault systems, and shows mountain blocks. Gabbroic rocks and pyroxenite rocks were distributed characteristically along to the mountain range. Elevation is between 500 meters to 1,600 meters. The topography is steep with valleys that were eroded strongly by river system.

Streams and rivers flow parallel to the mountain range with the direction of the south-west or the north-east, and flow into Musengezi river which runs to the north to flow into Zambezi river.

All the rivers flow only in the rainy season. There is no water in the river except some pools in the dry season.

2-3 Climate and vegetation

The climate of the survey area is divided into the dry season (from April to October) and the rainy season (from November to March). there is no rainfall in the dry season and maximum rainfall in the rainy season is about 200 to 250mm/month.

As regards vegetation, except short broad-leaved trees as oaks which is distributed in the mountainous district, the vegetation is generally thin in the survey area. Many bamboo trees characteristically grow along the river. The serpentinite zone shows poor vegetation especially with grass only growing on its surface. Big wild animals like a elephant, antelope and buffalo live in the survey area, and also small amount of carnivorous fierce animals like lions and leopards exist.

Chapter 3 General geology

3-1 General geology in the survey area

This survey area is located in northern end of the Great Dyke which pass through the center of the Republic of Zimbabwe as shown in Fig.I-3-1. Geological map, geological section and schematic geological column are shown in Fig.I-3-2 to Fig.I-3-4.

Geology of this area consists of gneisses and granites of Archaean era which forms the basement, and ultramafic to mafic rocks of the Great Dyke which intruded in to the basement rocks.

The basement rocks mainly consists of augen gneiss with remarkable feldspar, and are distributed in the northwestern and southern side of the survey area.

The Great Dyke is a layered basic intrusion whose geology consists of a topmost layer of gabbroic rocks distributed widely in the center part of the survey area. Gabbro is black to deep green in color, massive, holocrystalline texture. Below gabbro are multi-layers of pyroxenite with deep green to green color, coarse grained, holocrystalline texture. Followed by peridotite(dunite, harzburgite) from top to bottom.

PGM is mainly in the upper most layer(P1) of the multi- layered pyroxenite, and chromite occurs below the lower pyroxenite layers.

3-2 Geological structure in the survey area

The Great Dyke in the survey area is curved like an "S" form due to the structural movements of the Pan-Africa Zambezi Mobile Belt. In addition, the area is cut by fault systems striking in the N-S and E-W direction which resulted in the formation of the western mountain block forming the Botera range, the central mountain block forming the Guyu range, and the eastern mountain block of the east bank of the Musengezi river.

The western block strikes N-S to NE-SW and dips to the E to SE direction whereas the central block strikes N-S and dips towards the E in the northern portion and W in the southern portion. The eastern block shows a N-S to NE-SW strike and W to NW direction of dip.

3-3 Known ore deposit

Union Carbide and Cluff resources zimbabwe Ltd. carried out a geological survey and exploration through E.P.O. license areas.

Union Carbide carried out the geochemical soil sampling with sampling distance of 30m at the main sulphide zone(hereinafter called MSZ). For the obtained PGM occurring layer, 4 drill holes of crossing the layer were carried out. As a result, a MSZ(1.4g/t Of Pt+Pd, thickness 14m) and a lower sulphide zone(hereinafter called LSZ) 50m under from MSZ(1.2g/t of Pt+Pd, thickness over 7.6m) were recognized.

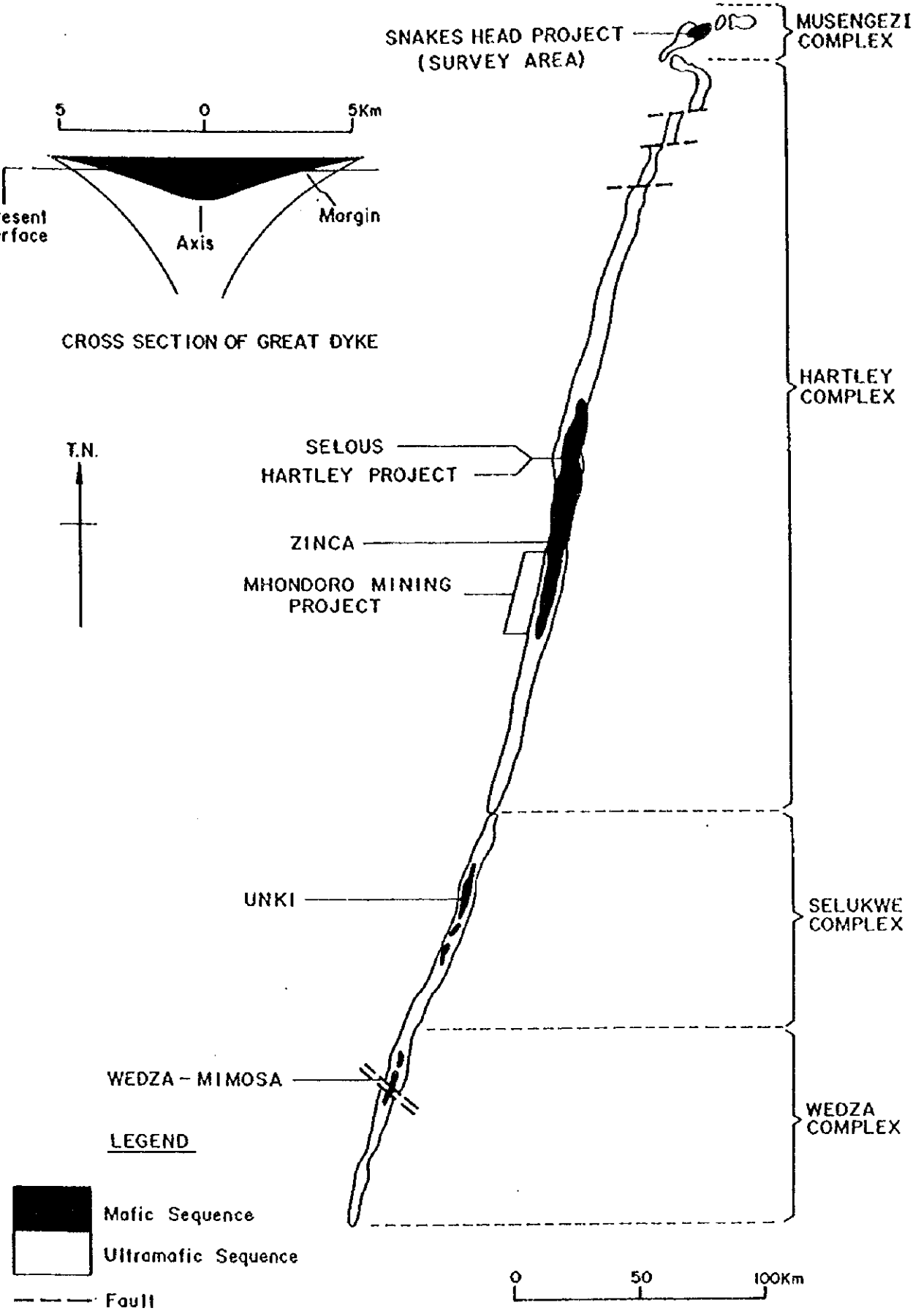


Fig.I-3-1 Outline of the Great Dyke

Cluff produced a topographic map on the scale of 1:25,000, constructing an access road to the survey area, and a geological map confirming the distribution of the P1 layer and fault systems to decide the priority of drilling. 5 holes of drilling were completed out, and Cu, Ni, Pt, Pd, Rh, Au, As were analyzed. As a result, 2 layers of PGM mineralized zone(0.88 to 1.16g/t of Pt+Pd, thickness 4.2 and 5.2m) were recognized. Distribution of mineralized zones was estimated to cover an area 7km x 4km.

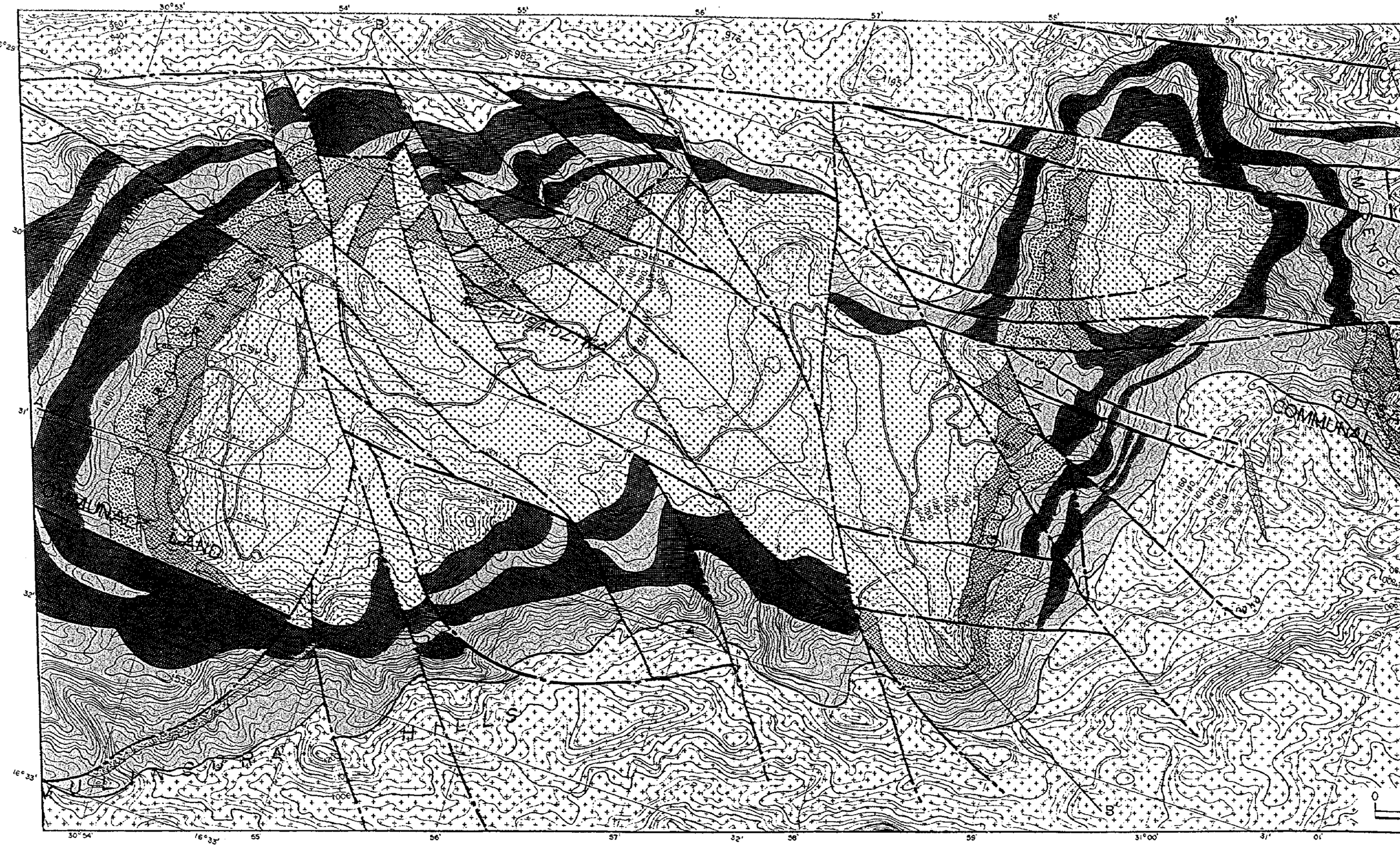


Fig.I-3-2 Geological map

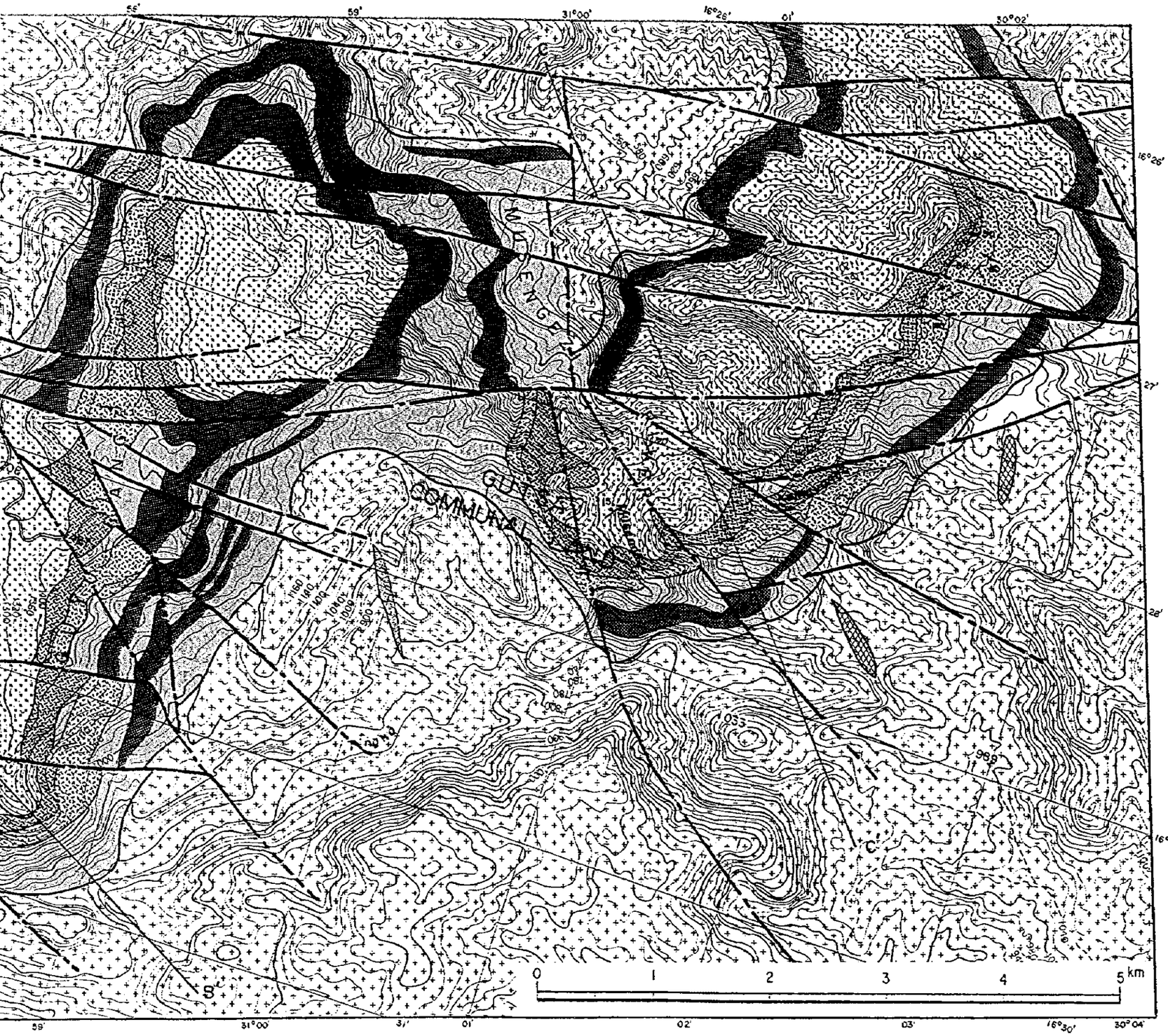
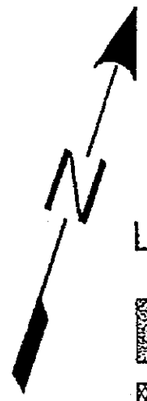


Fig.I-3-2 Geological map

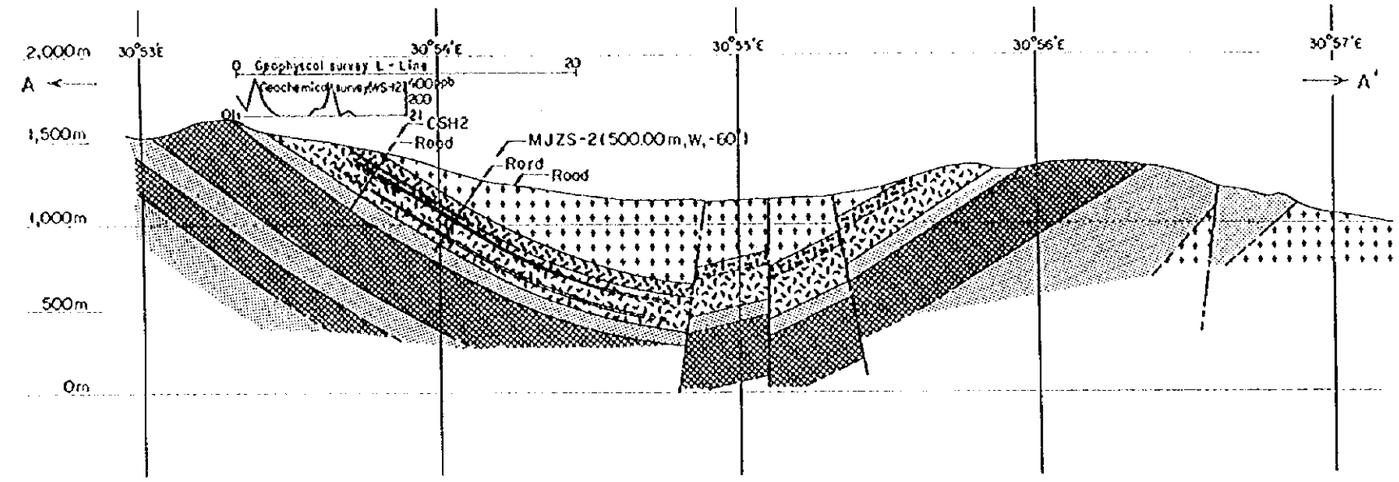


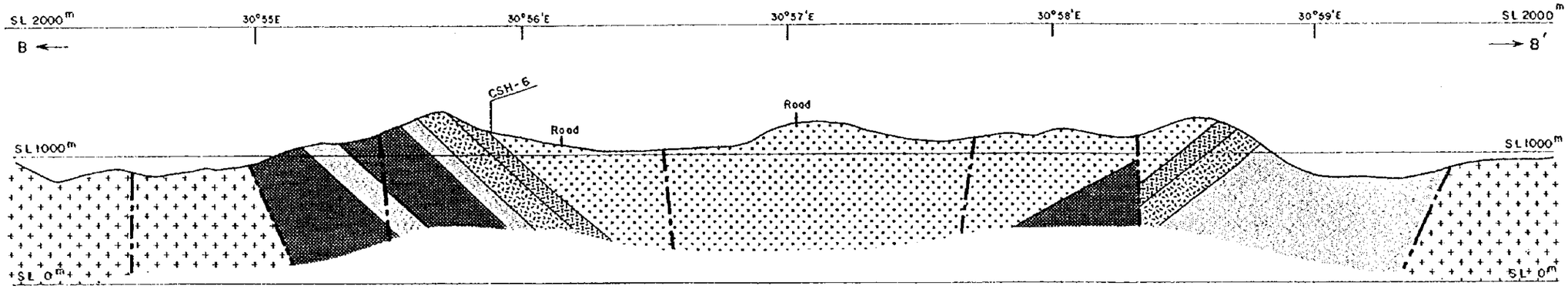
LEGEND

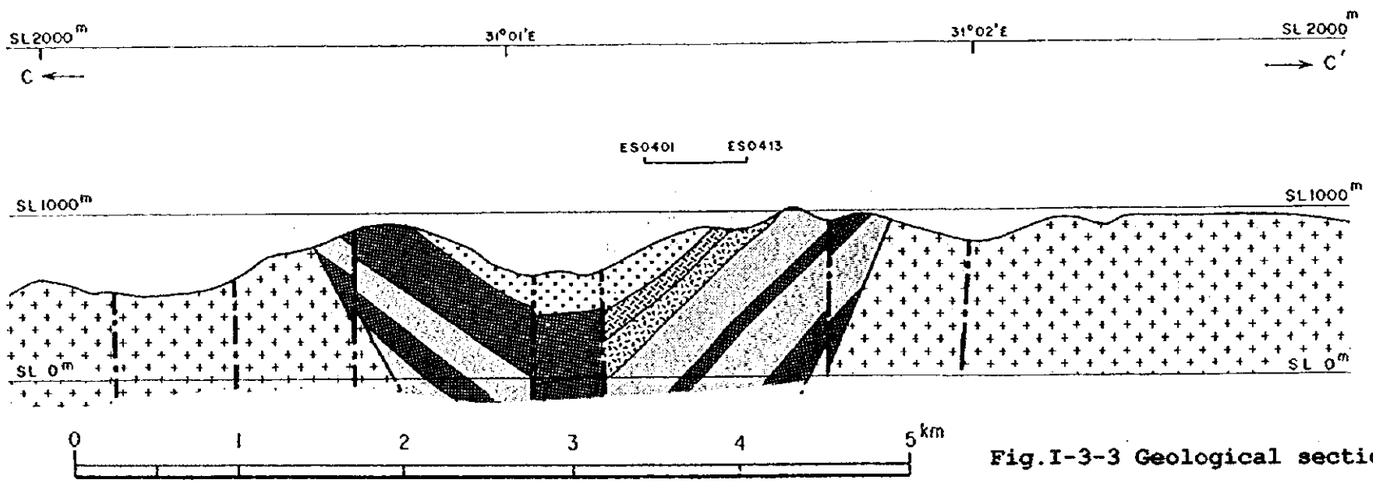
- DOLERITE DYKE
- QUARTZ VEIN
- GABBRO
- WEBSTERITE
- BRONZITITE
- SERPENTINITE
- PYROXINITE

P1 — GREAT DYKE

- GNEISS
- GEOROGICAL BOUNDARY
- INTRUSIVE BOUNDARY
- FAULT, TECTONIC LINE
- γ_{30} DIP AND STRIKE OF IGNEOUS LAYER
- $\blacktriangleleft_{55}$ SHEARING PLANE
- DRILLING
- A—A' GEOLOGIC SECTION LINE







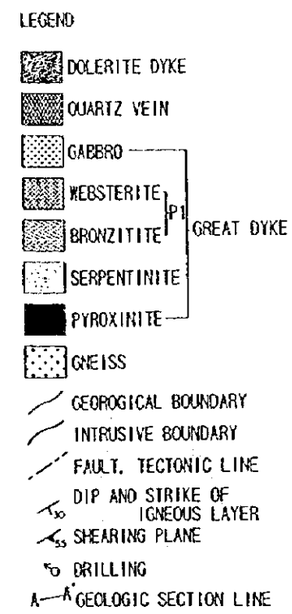


Fig.I-3-3 Geological sections

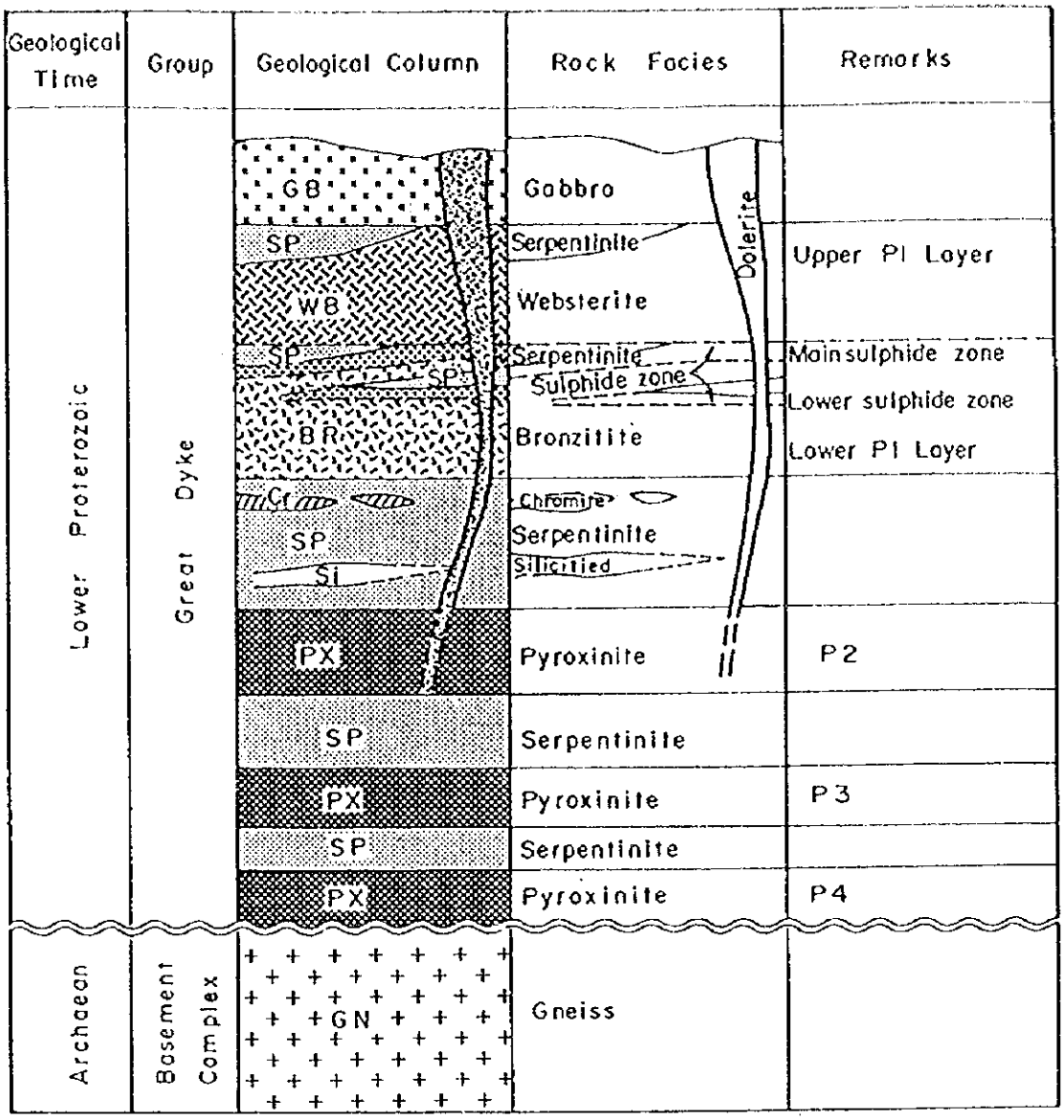


Fig.I-3-4 Schematic geological column

Chapter 4 Considerations of the survey results

4-1 Controls on mineralization related to the geological structure and characteristics of the mineralization

In this area, upper gabbroic rocks are widely distributed in the center portion of the survey area. Rock facies move to lower peridotite (dunite, harzburgite) passing through multi layered pyroxenite.

The sulphide mineralization which can be observed by the naked eye mainly occur in the P1 layer of the upper most pyroxenite layer. Chromite occurs mainly in the lower pyroxenite layer.

Sulphide minerals in the mineralized zone consist of pyrrhotite, pentlandite, chalcopyrite as essential minerals and pyrite. Moncheite and Sperrylite are observed as a PGM minerals, they are closely assemblaged with sulphide minerals and occur especially boundary portion between pentlandite and chalcopyrite or sulphide minerals and cumulus minerals.

4-2 Results of drilling and mineralization.

Trough Phase II and III survey, Mineralization of PGM was encountered by all drill holes. It is considered that PGM occur in upper most of bronzitite zone and this area may have a continuous mineralization zone similar to other platinum mining areas along the Great Dyke.

A summary of the sulphide mineralization zone of each hole which can be observed by the naked eye are as follows.

Hole No.	Depth(m)	Mineralization	Main Sulphides
MJZS-6	327.00~348.00	disseminate	Po, Pn, Cp, Py,
MJZS-7	443.00~485.00	disseminate	Po, Pn, Cp, Py,
MJZS-8	556.00~564.00	disseminate	Po, Pn, Cp, Py,
MJZS-8	610.00~626.00	disseminate	Po, Pn, Cp, Py,
MJZS-9	331.00~343.00	disseminate	Po, Pn, Cp, Py,
MJZS-9	396.00~399.00	disseminate	Po, Pn, Cp, Py,
MJZS-10	370.00~400.50	disseminate	Po, Pn, Cp, Py,

Metal content of the platinum group elements in the sulphide mineralization zone is as follows.

Hole No.	Depth(m)	Pt(ppb)	Pd(ppb)	Rh(ppb)	PGM(ppb)
MJZS-6	338.00~339.00	534	79	--	613
MJZS-6	339.00~340.00	541	145	15	701
MJZS-6	341.00~342.00	511	154	27	692
MJZS-6	342.00~343.00	409	262	18	689
MJZS-7	468.00~469.00	339	266	--	605
MJZS-7	469.00~470.00	514	442	27	983
MJZS-7	470.00~471.00	486	412	20	918
MJZS-7	471.00~472.00	256	394	24	673

Hole No.	Depth(m)	Pt(ppb)	Pd(ppb)	Rh(ppb)	PGM(ppb)
MJZS-8	616.00~617.00	423	301	10	734
MJZS-8	617.00~618.00	392	264	26	682
MJZS-8	618.00~619.00	274	332	37	643
MJZS-10	376.00~377.00	329	214	--	543
MJZS-10	377.00~378.00	384	271	19	675
MJZS-10	378.00~379.00	304	238	12	553

4-3 Potentialities of expected ore deposits

Snake Head area is generally low grade of PGM compared with the Hartley Mine, it is considered that the grade of concentration of PGM may be low in this survey area, and in addition, this area is under poor infrastructure, some difficulty may exist to develop a new mine at present.

Chapter 5 Conclusion and recommendation

5-1 Conclusion

Based on the study of results of Phase II survey, A probability of the existence of platinum ore deposit was indicated in the WS area. Drilling exploration of 5 holes was carried out in this area in order to encounter the mineralization zone and find a new ore deposit.

A summary of the drilling are as follows.

MJZS-6 (W, -60degree)	450.00m
MJZS-7 (W, -60degree)	500.00m
MJZS-8 (W, -60degree)	650.00m
MJZS-9 (W, -70degree)	400.00m
MJZS-10(W, -60degree)	400.00m
Total(5 holes)	2,400.00m

A summary of the sulphide mineralization zone of each hole which can be observed by the naked eye are as follows.

Hole No.	Depth(m)	Mineralization	Main Sulphides
MJZS-6	327.00~348.00	disseminate	Po, Pn, Cp, Py,
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MJZS-9	331.00~343.00	disseminate	Po, Pn, Cp, Py,
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Maximum metal content of the platinum group elements in the sulphide mineralization zone is as follows.

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MJZS-6	341.00~342.00	511	154	27	692
MJZS-7	469.00~470.00	514	442	27	983
MJZS-7	470.00~471.00	486	412	20	918
MJZS-8	616.00~617.00	423	301	10	734
MJZS-8	617.00~618.00	392	264	26	682
MJZS-10	377.00~378.00	384	271	19	675

Through Phase II and III survey, maximum thickness of sulphide mineralization zone is 42m(MJZS-7) but maximum metal content of PGM is about 1 g/t. On the other hand, the Hartley Mine which developed recently published their ore reserves and grading as follows.

Reserves : 50.9 million tonnes (proven and probable)

Grading : 2.64g/t Pt, 1.8g/t Pd. 0.21g/t Rh, 0.47g/t Au,

Snake Head area is generally low grade of PGM compared with the Hartley Mine, it is considered that the grade of concentration of PGM may be low in this survey area, it could not be attained to discover the new ore deposit that can expect to develop at present.

5-2 Recommendations for the future

According to conclusions obtained through the survey results in Phase I to III, the following program will be proposed.

(1) Drilling survey must be carried out in the north-eastern portion of the WN area and the northern portion of the CB area in order to study the probability of the existence of the platinum ore deposit.

Part II Details of the surveys

Part II Details of the survey

Chapter 1 Drilling survey

1-1 Method of the survey

1-1-1 Purpose and outline of the survey

Based on results of Phase II surveys, drilling was carried out in order to find mineralized zone. The drilling survey consisted of five drill holes, total length of 2,400.00 meters.

The target sites are in the WS area where the geochemical and geophysical anomalies were obtained by Phase I survey, and are in the extension area from where the sulphide mineralization was recognized by Phase II drilling survey.

Each drilling site is shown in Fig.II-1-1, and details of drilling and laboratory tests were shown in Table I-1-1.

The drilling work was contracted to R. A. Longstaff (Pvt) Ltd., based in Harare.

All drilling was smoothly performed.

1-1-2 Drilling method and equipment

Three drilling machines were used. All holes were drilled down by wireline method using NX diamond bit. Equipment used and materials consumed for drilling operations were all obtained in Zimbabwe and are listed in Table II-1-1 and Table II-1-2.

1-1-3 Drilling

1) Road and site Preparation

Access road was strongly destroyed by heavy rain in this year, therefore it was reconstructed using bulldozer. All drilling sites were on slope, construction of work roads and site preparation for 5 drilling sites were performed using bulldozer.

2) Mobilization and Demobilization

A 10ton truck was used for mobilization work between Harare and extra storage yard. All equipment and tools were transported pulling by 4x4 tractor between the extra storage yard and each drilling site. After completion of the final hole, all equipment and tools were checked and repaired and then stored by Longstaff people.

Drilling cores were transported to a storage of the Ministry of Mines in Harare.

3) Core recovery and drilling water control

The depth of weathered zone is in between 15 to 37 meters in each hole. Core recovery was 36.7% to 52.0% in this zone. After the drilling reached fresh rock, core recovery increased to 100%. Total core recovery of each hole was 95.7% to 100%, and 97.9% in average.

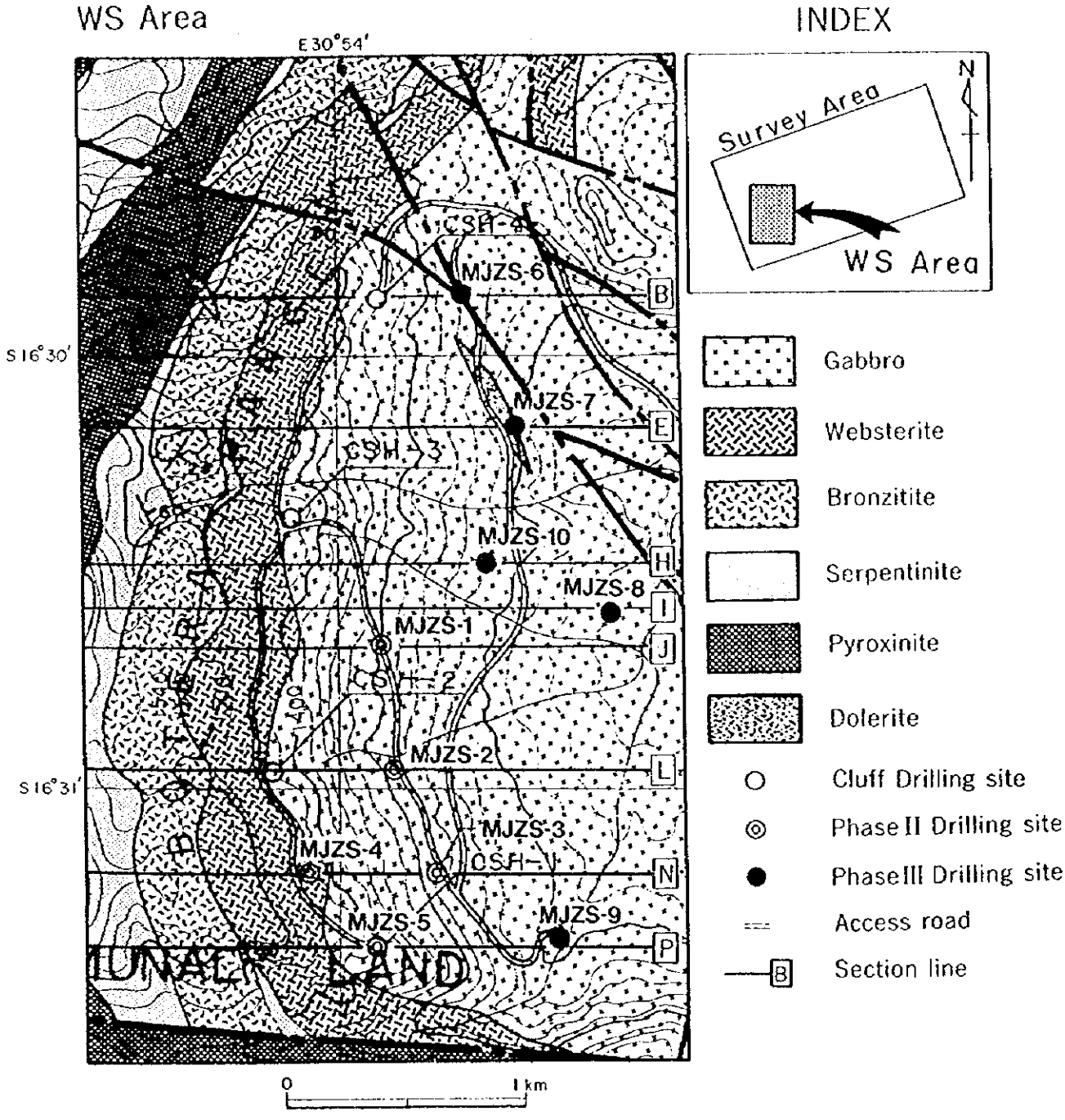


Fig.II-1-1 Locality of drilling sites

Table II-1-1 List of drilling equipments

Item	Quantity	Specification	Comment
Longyear 44 drills	2		
Longyear 44 mobil drill	1		
Set of sheer legs	2		
Bean pumps	3		
Winches	3		
BNM water swivels	3		
Foot clamps and jaws	3		
NX casing 3M	60		
NQ rods 3M	400		
AW rods	30		
Overshot assemblies	3		
NQ inner tube assemblies	3		
Rod adapters	15		
Casing heads	2		
Hoistplugs	5		
Landini 4x4 tractor	1		
Trailer	1		
Bulldozer	1		

Table II-1-2 List of supplies and consumables spent

Item	Quantity	Specification	Comment
Rod grease	200kg		
Multi purpose grease	135 Kg		
Cement	1,000kg		
EEZE core	500kg		
EEZE mix	100kg		
Dromus	325Lts		
Diesel	7,030Lts		
NQ crowns	21		
Reaming shells	7		
NXC crowns	10		
49/16 crowns	3		
NQ core springs	56		
49/16 core springs	3		
NXC core springs	6		
Gear oil	500Lts		
Hydraulic oil	310Lts		
Engine oil	210Lts		

Pure water was used for drilling and polymer was added to water according to ground condition.

4) Water Supply

Drilling water was taken from the river that passes through the southern end of the area. A bowser capacity of 6 cubic meters was used for the water supply.

1-1-4 Drilling conditions

Summary of drilling condition is shown in Table II-1-3. Progress of each drill hole is shown in Table II-1-4. Drilling conditions of each hole are shown in Table II-1-5 to Table II-1-9.

Each drilling machine was operated by one driller and four assistants. A shift 10 hours per day was applied.

3 m of stand pipe was used at the surface portion, and around 30 m of casing pipe was used according to ground condition in each hole.

All drilling holes were smoothly performed only with small machine trouble.

Table II-1-3 Condition of drillings

No.	Period					Drilling		Casing			Efficiency (m)			
	Start	Complete	Total days	Working days	Day-off	Depth (m)	Recovery (%)	Size (mm)	Depth (m)	Recovery (%)	Depth/ Total -days	Depth/ Working -days	Depth/ Total Drill-days	Depth/ True Drill-days
MJZS- 6	97/07/10	97/08/10	19	19	0	450.00	97.67	86	20.5	82.9	14.60	14.60	20.45	26.47
MJZS- 7	97/06/18	97/07/20	33	32	1	500.00	98.40	86	18.5	81.1	15.15	15.63	20.00	20.83
MJZS- 8	97/06/18	97/07/27	40	39	1	650.00	99.78	86	17.7	84.7	16.25	16.67	19.70	24.07
MJZS- 9	97/06/18	97/07/09	22	21	1	400.00	98.05	86	20.5	82.9	18.80	19.05	22.22	26.67
MJZS- 10	97/07/27	97/08/20	25	25	0	400.00	97.73	86	29.0	89.7	16.00	16.00	36.36	36.36

Table II-1-4 Time table of drillings

Month	June	July	August	Remarks
Road construction	23			
Movement	19			
MJZS-6		11	1	Depth : 450m
MJZS-7	21	15		Depth : 500m
MJZS-8	20	22		Depth : 650m
MJZS-9	20	7		Depth : 400m
MJZS-10			2 12	Depth : 400m
Withdraw			13 20	

1-2 Result of the survey

1-2-1 Lithology of holes

Drilling logs are shown in Fig.II-1-2 to Fig.II-1-6. Geologic section are shown in Fig.II-1-7 to Fig.II-1-11. The results of microscopic observations of thin sections of rocks are shown in Table II-1-10.

Summary of each hole is as follows :

(1) MJZS-6 (450.00m)

The bed rock appears after the red and white soil with gabbro boulder portion of 16.69 meters.

16.69m--156.10m Gabbro

It is pale green color, medium grain, and soft. Texture is holocrystalline and equigranular. Mineral assemblage is mainly composed of plenty of plagioclase, orthopyroxene and small quantity of clinopyroxene. White and pale green part is recognized in some part, a white spot of plagioclase becomes remarkable. The brecciated zone with strongly silicified is observed between 51.00m and 61.00m, the shear zone with green clay is observed between 64.96m and 68.90m, 75.00m and 76.60m.

156.10m--285.00m Websterite

It shows green color and purple spot of clinopyroxene, and medium to fine grain, Texture is holocrystalline and equigranular. Mineral assemblage is composed of approximately same quantity of orthopyroxene and clinopyroxene. Small vein of calcite, chlorite and serpentine is admitted in websterite layer. Fault zone with strong brecciation and silicification is observed between 200.70m and 210.94m, shear zone with green clay and silicification is observed between 263.50m and 268.00m, 275.00m and 281.50m.

285.00m--307.50 Bronzitite

Boundary changes gradually from websterite to bronzitite. It shows a green to dark green color. Texture is rather coarse grain, holocrystalline and equigranular. Mineral assemblage is composed of almost all orthopyroxene and includes a small to an extremely small quantity of clinopyroxene. Fault zone with strong brecciation is observed between 296.00m and 300.00m.

307.50m--322.80m Serpentinite

It shows gray to dark gray color. Rock facies shows fine grain and soapy, and characteristically show banding and stripe form with dark and clear color. Center part shows black color, fine grain and include a olivine. Thin layer of chromite is accompanied in center part.

322.80m--371.34m Bronzitite

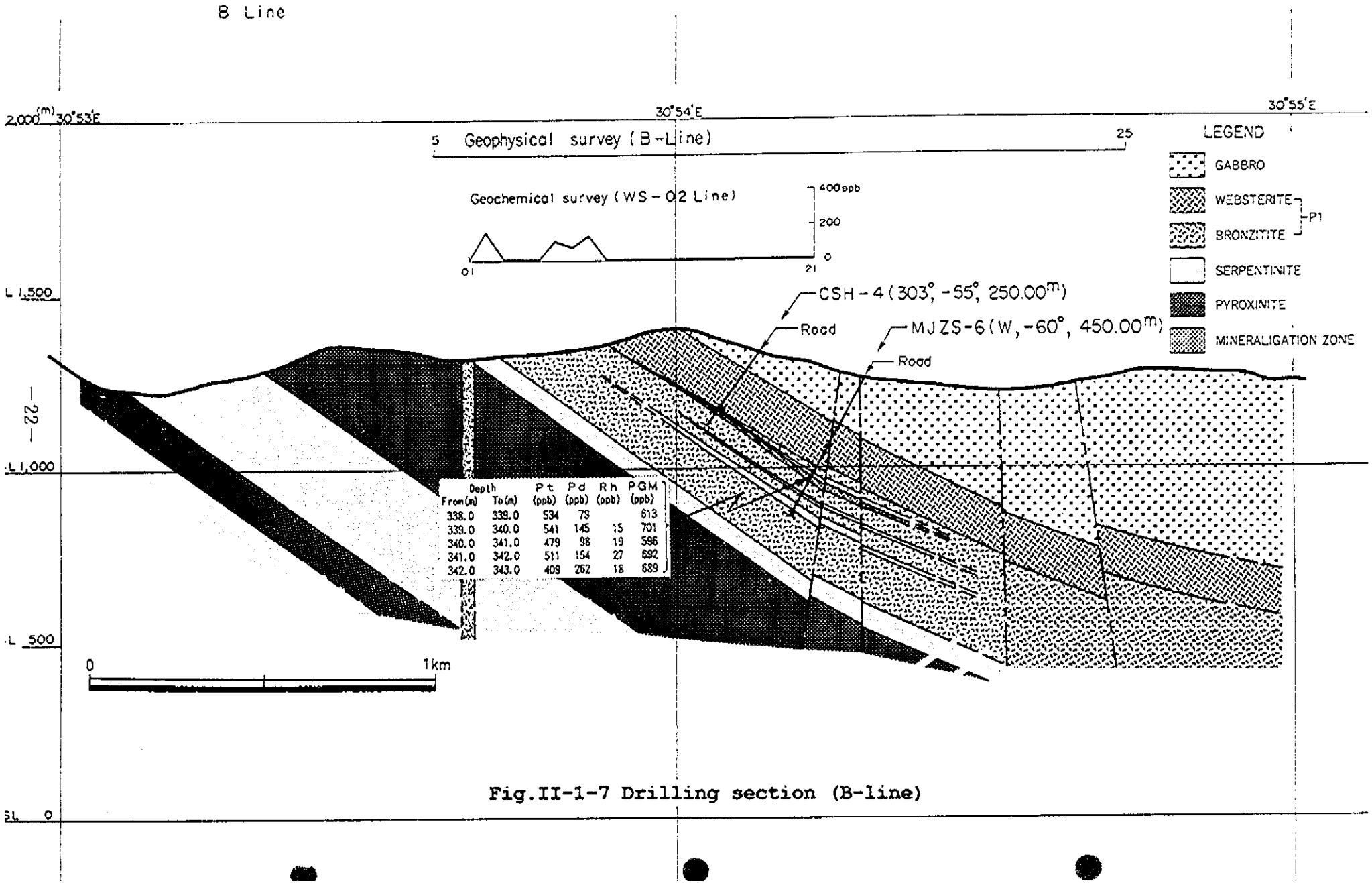


Fig.II-1-7 Drilling section (B-line)

Table II-1-10 Results of the microscopic observations of thin section of rocks and polished section of ores

Number	Sample name	Rock name	Rock name defined by microscopic observation	Location		Mineral assemblages									Ore minerals															Texture
						Cumulus minerals				Intercumulus minerals					Sulphides					PGM			Oxides			Others				
				Drill number	Depth(m)	Olivine	Orthopyroxene	Clinopyroxene		Olivine	Plagioclase	Phlogopite	Opaque mineral	Orthopyroxene	Pyrrhotite	Pentlandite	Chalcopyrite	Pyrite		Moncheite	Sperrylite		Magnetite	Chromitite		Quartz	Carbonates	Other minerals		
1	TS-1	Bronzitite	Olivin-Websterite	MJZS-7	448.50	△	◎	○			・		・																Adcumulate
2	TS-2	Bronzitite	Olivin-Websterite	MJZS-7	462.50	○	◎	◎		・	△	△	・																Ortho-Adcumulate
3	TS-3	Bronzitite	Websterite	MJZS-7	464.50	・	◎	◎		△	△	・	・																Ortho-Adcumulate
4	TS-4	Bronzitite	Olivin-Websterite	MJZS-6	334.50	○	◎	◎			・		△																Adcumulate
5	TS-5	Bronzitite	Olivin-Websterite	MJZS-8	614.50	◎	○	○			△	・	・																Ortho-Adcumulate
6	TS-6	Bronzitite	Websterite	MJZS-10	371.50		◎	◎			△	△	△	○															Ortho-Adcumulate
7	TS-7	Bronzitite	Olivin-Websterite	MJZS-10	394.50	○	○	○			・	△	・																Adcumulate
8	PS-1	Bronzitite	Olivin-Websterite	MJZS-7	468.50	○	◎	○			・	・	△		◎	○	△	・		・									Adcumulate
9	PS-2	Bronzitite	Olivin-Websterite	MJZS-7	469.50	○	◎	○			・	△	△		◎	◎	○	・											Adcumulate
10	PS-3	Bronzitite	Olivin-Websterite	MJZS-7	470.50	△	◎	○		△	△	・	・		◎	◎	△												Ortho-Adcumulate
11	PS-4	Bronzitite	Olivin-Websterite	MJZS-7	471.50	△	◎	○		・	△		・		○	○	○	・											Adcumulate
12	PS-5	Bronzitite	Olivin-Websterite	MJZS-7	472.50	△	◎	○		△	・		△		◎	◎	△												Ortho-Adcumulate
13	PS-6	Bronzitite	Olivin-Websterite	MJZS-6	338.50	○	◎	○			・		・		◎	△	△												Adcumulate
14	PS-7	Bronzitite	Olivin-Websterite	MJZS-6	339.50	○	○	○		・	・		・		◎	○	△												Adcumulate
15	PS-8	Bronzitite	Olivin-Websterite	MJZS-6	341.50	○	○	○					・		◎	○	△	・		・	・								Adcumulate
16	PS-9	Bronzitite	Olivin-Websterite	MJZS-6	342.50	○	○	○					・		○	○	○												Ortho-Adcumulate
17	PS-10	Bronzitite	Websterite	MJZS-8	616.50		◎	◎		△	△		△		◎	○	△	・											Ortho-Adcumulate
18	PS-11	Bronzitite	Olivin-Websterite	MJZS-8	617.50	○	○	○		・	△		△		◎	○	△	△											Orthocumulate
19	PS-12	Bronzitite	Olivin-Websterite	MJZS-8	618.50	○	○	○		・	△		△		○	○	○	△											Ortho-Adcumulate
20	PS-13	Bronzitite	Orthopyroxenite	MJZS-10	377.50		◎	・		・	△	・	△		◎	◎	○	△											Orthocumulate

※ ◎ : abundance ○ : common △ : minor ・ : rare

Mineral assemblage and rock facies is similar to the upper bronzitite. The uppermost of this layer includes sulphide dissemination between around 322m and 340m. Sulphide is mainly composed of pyrite, pyrrhotite and chalcopyrite.

371.34m--374.00m Dunite

Rock facies shows black color, fine grain, and stripe form. Mineral assemblage is almost all composed of olivine.

374.00m--404.00m Bronzitite

Mineral assemblage and rock facies is similar to the upper bronzitite. Brecciated zone including pale green to white chlorite and serpentine is observed between 392.00m to 395.50m.

404.00m--436.00m Serpentinite

Contact part shows gray to dark gray color. Rock facies shows fine grain, soapy, and stripe form. Center part(423.00m to 426.30m) shows black color, fine grain minute and hard. Mineral assemblage is almost all composed of olivine.

436.00m--450.00 Bronzitite

Mineral assemblage and rock facies is similar to the upper bronzitite.

The results of microscopic observation of thin section of rocks are as follows :

TS-4 (334.50m) : Olivin websterite

Texture : Holocrystalline equigranular adocumulate.

Cumulus minerals : Mainly large quantities of subhedral orthopyroxene and clinopyroxene which grain size generally shows around 5 to 1 mm, and include small quantities of euhedral to subhedral olivin which grain size shows average 5 to 1 mm.

Intercumulus minerals : Extremely small quantities of anhedral plagioclase and opaque minerals which grain size shows average 1 to 0.1 mm.

(2) MJZS-7 (500.00m)

The bed rock appears after the red and green soil with gabbro boulder portion of 18.00 meters.

18.00m--223.70m Gabbro

It shows green to dark green color, and fine grain, minute , hard. Texture is holocrystalline and equigranular. Mineral assemblage is mainly composed of plenty plagioclase, and orthopyroxene, a small quantity of clinopyroxene. Plagioclase is recognized clearly in white and pale green part. Mineral assemblages has a tendency to increase the amount of clinopyroxene in the direction towards the lower portion. Small vein of calcite and chlorite is observed in lower portion.

223.70m--233.00m Serpentinite

It shows dark green and olive green color. Rock facies

shows fine grain, soapy, soft and stripe form. Center portion becomes black color and mineral assemblage is almost all composed of olivine.

233.00m--340.38m Websterite

It shows purple spot in dark green color, and medium grain. Texture is holocrystalline and equigranular. Mineral assemblage is mainly composed of about equal quantity of orthopyroxene and clinopyroxene. Small vein of calcite and chlorite is observed.

340.36m--375.00 Bronzitite

It shows dark green to dark gray color. Texture is a coarse grain, holocrystalline and equigranular. Mineral assemblage is almost all composed of orthopyroxene and includes an extremely small quantity of clinopyroxene. Small calcite vein is observed between 358m and 370m and sulphide dissemination which is mainly composed of pyrite, pyrrhotite and chalcopyrite recognized along to this vein.

375.00m--450.00m Serpentinite

Boundary changes gradually from bronzitite to serpentinite. It shows pale green and olive green color. Rock facies shows mottled pattern. Mineral assemblage is almost all composed of serpentine and olivine, a small quantity of orthopyroxene is included. Many small calcite vein is observed, and sulphide dissemination which is mainly composed of pyrite, pyrrhotite and chalcopyrite recognized from around 395m.

450.00m--500.00m Bronzitite

Mineral assemblage and rock facies is similar to the upper bronzitite. Rather strong sulphide dissemination is observed continue from upper serpentinite to around 475m.

The results of microscopic observation of thin section of rocks are as follows :

TS-1 (448.50m) : Olivin websterite

Texture : Holocrystalline equigranular adocumulate.

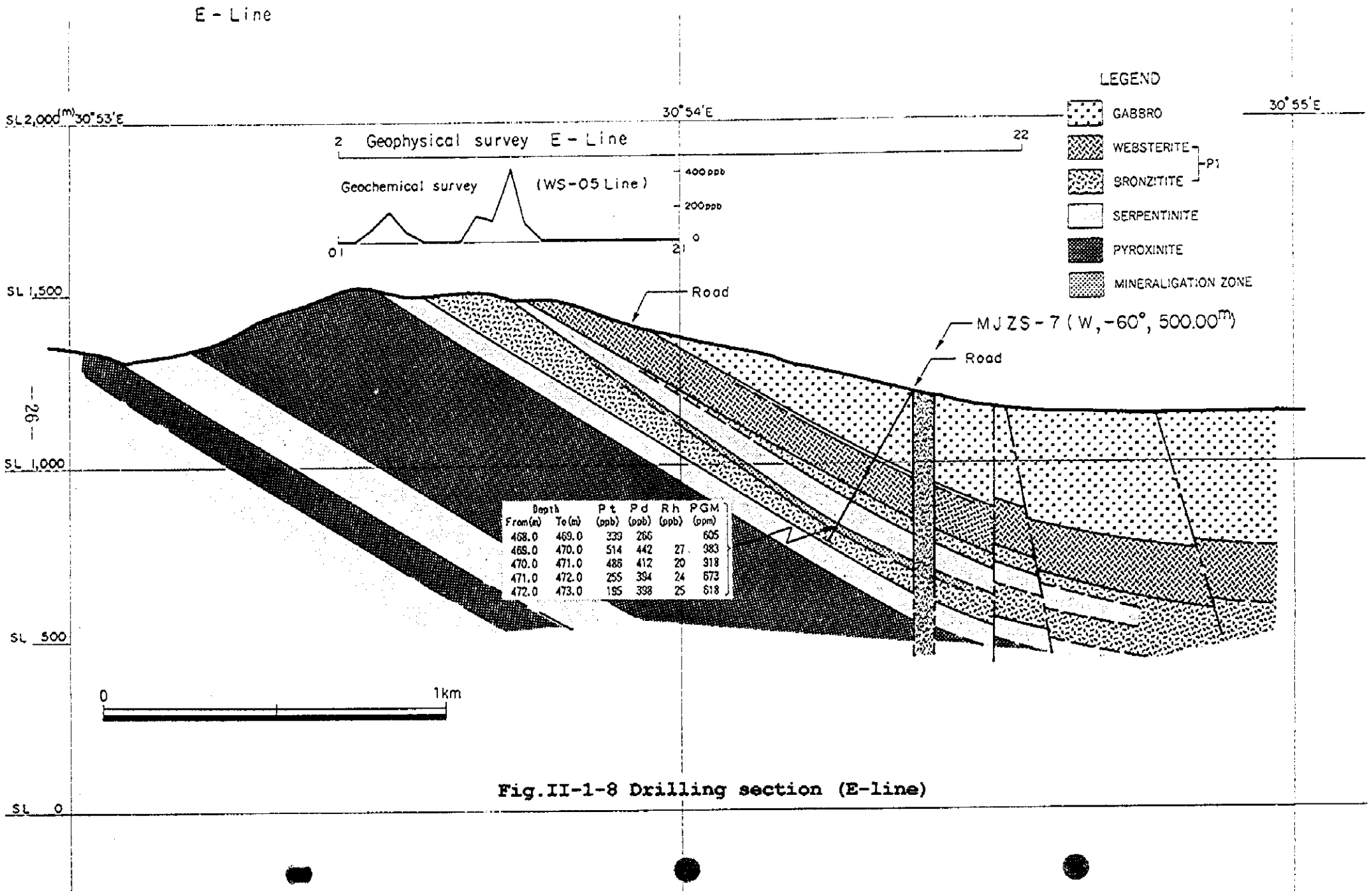
Cumulus minerals : Mainly large quantities of euhedral to subhedral orthopyroxene and clinopyroxene which grain size generally shows around 5 to 1 mm, and include small quantities of subhedral olivin which grain size shows average 5 to 1 mm.

Intercumulus minerals : Extremely small quantities of anhedral plagioclase and opaque minerals which grain size shows average 1 to 0.1 mm.

TS-2 (462.50m) : Olivin websterite

Texture : Holocrystalline equigranular orthocumulate to adocumulate.

Cumulus minerals : Mainly large quantities of euhedral to subhedral orthopyroxene and clinopyroxene which grain size generally shows around 5 to 1 mm, and include medium quantities



Depth From(m)	Depth To(m)	Pt (ppb)	Pd (ppb)	Rh (ppb)	PGM (ppm)
468.0	469.0	339	266		605
469.0	470.0	514	442	27	983
470.0	471.0	486	412	20	918
471.0	472.0	255	394	24	673
472.0	473.0	195	398	25	618

Fig.II-1-8 Drilling section (E-line)

of subhedral olivin which grain size shows average 5 to 1 mm.

Intercumulus minerals : Small quantities of anhedral plagioclase and phlogopite which grain size shows average 1 to 0.1 mm, and extremely small quantities of anhedral olivin and opaque minerals which grain size shows average 1 mm.

TS-3 (464.50m) : Websterite

Texture : Holocrystalline equigranular orthocumulate to adocumulate.

Cumulus minerals : Mainly large quantities of euhedral to subhedral orthopyroxene and clinopyroxene which grain size generally shows around 5 to 1 mm, and include small quantities of subhedral olivin which grain size shows average 5 to 1 mm.

Intercumulus minerals : Small quantities of anhedral plagioclase and olivin which grain size shows average 1 mm, and extremely small quantities of anhedral phlogopite and opaque minerals which grain size shows average 1 to 0.1 mm.

(3) MJZS-8 (650.00m)

The bed rock appears after the red soil with gabbro boulder portion of 12.50 meters.

12.50m--350.00m Gabbro

It shows pale green, green to dark green color, and medium grain, minute, hard. Texture is holocrystalline and equigranular. Mineral assemblage is mainly composed of plenty plagioclase, and orthopyroxene with green to pale green color, clinopyroxene with light purple color. Weak brecciated zone and small vein of chlorite are recognized in some parts.

350.00m--527.60m Websterite

It shows green to dark green color, and medium to coarse grain, Texture is holocrystalline and equigranular. Mineral assemblage is mainly composed of orthopyroxene and clinopyroxene, these two pyroxenes are about equal quantity, or quantity of orthopyroxene is little more than clinopyroxene. Clinopyroxene with light purple color is observed clearly as s spot.

527.60m--574.19 Bronzitite

It shows green to dark green color. Texture is a coarse grain, holocrystalline and equigranular. Mineral assemblage is almost all composed of orthopyroxene (green to dark green color) and include an extremely small quantity of clinopyroxene (light purple color). Very weak sulphide dissemination zone is observed between 554m and 562m.

574.19m--581.30m Serpentinite

It shows a dark gray color. Rock facies shows fine grain and stripe form. Mineral assemblage is mainly composed of olivine and serpentine.

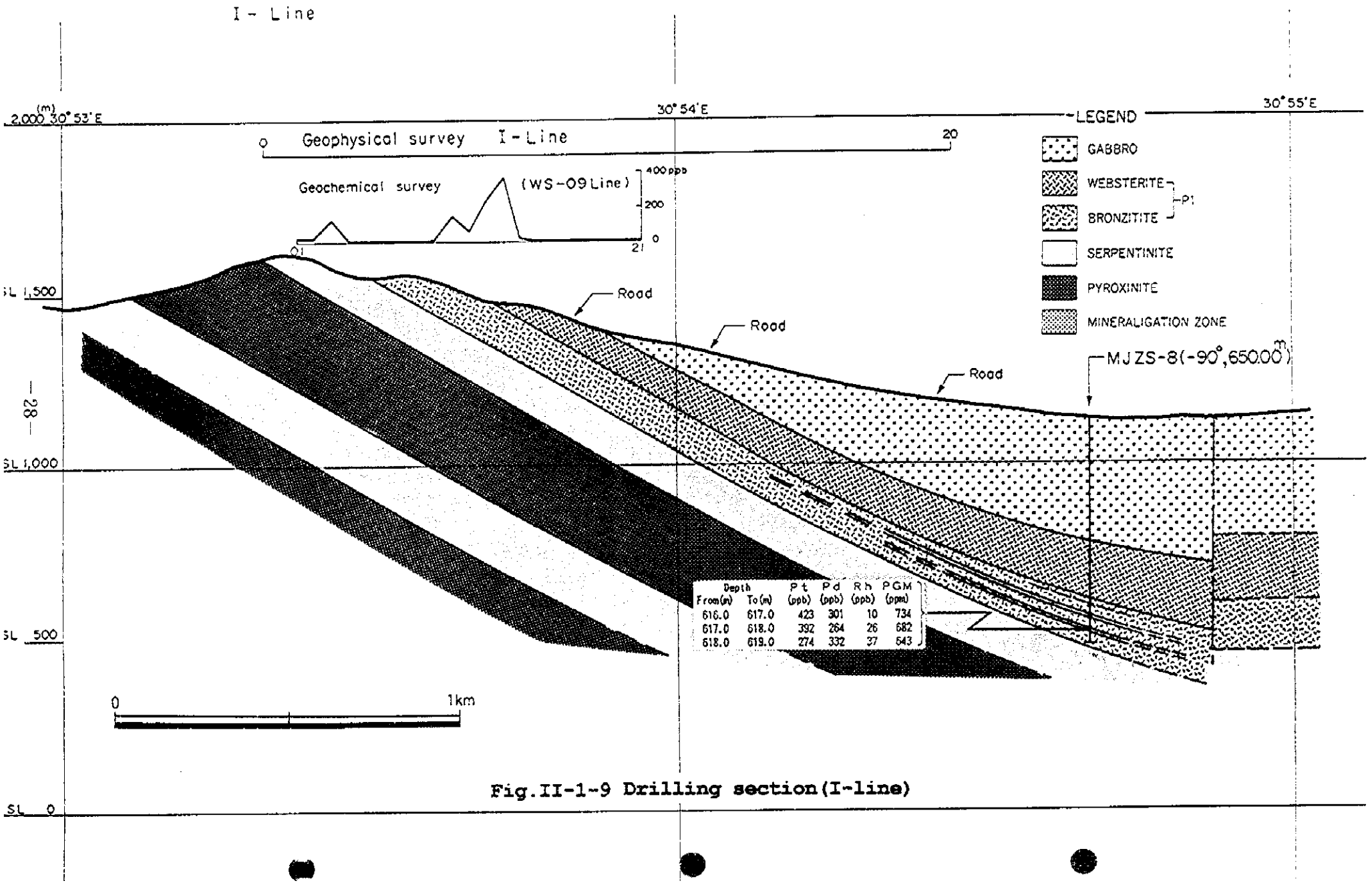


Fig.II-1-9 Drilling section(I-line)