REPORT
ON
THE COOPERATIVE MINERAL EXPLORATION
IN
THE CATANDUANES AREA,
THE REPUBLIC OF THE PHILIPPINES

PHASE III

MARCH, 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

In response to the request of the Government of the Republic of the Philippines, the Japanese Government decided to conduct a Mineral Exploration in the Catanduanes area 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 the Republic of the Philippines a survey team headed by Mr. Takehiro Sakimoto from July 4 to October 10, 1995.

The team exchanged views with the officials concerned with the Government of the Republic of the Philippines and conducted field surveys in the Catanduanes area. After the team 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 with the Government of the Republic of the Philippines for the close cooperation they extended to the team.

January, 1996

Kimio Fujita
President
Japan International Cooperation Agency

Shozaburo Kiyotaki
President
Metal Mining Agency of Japan

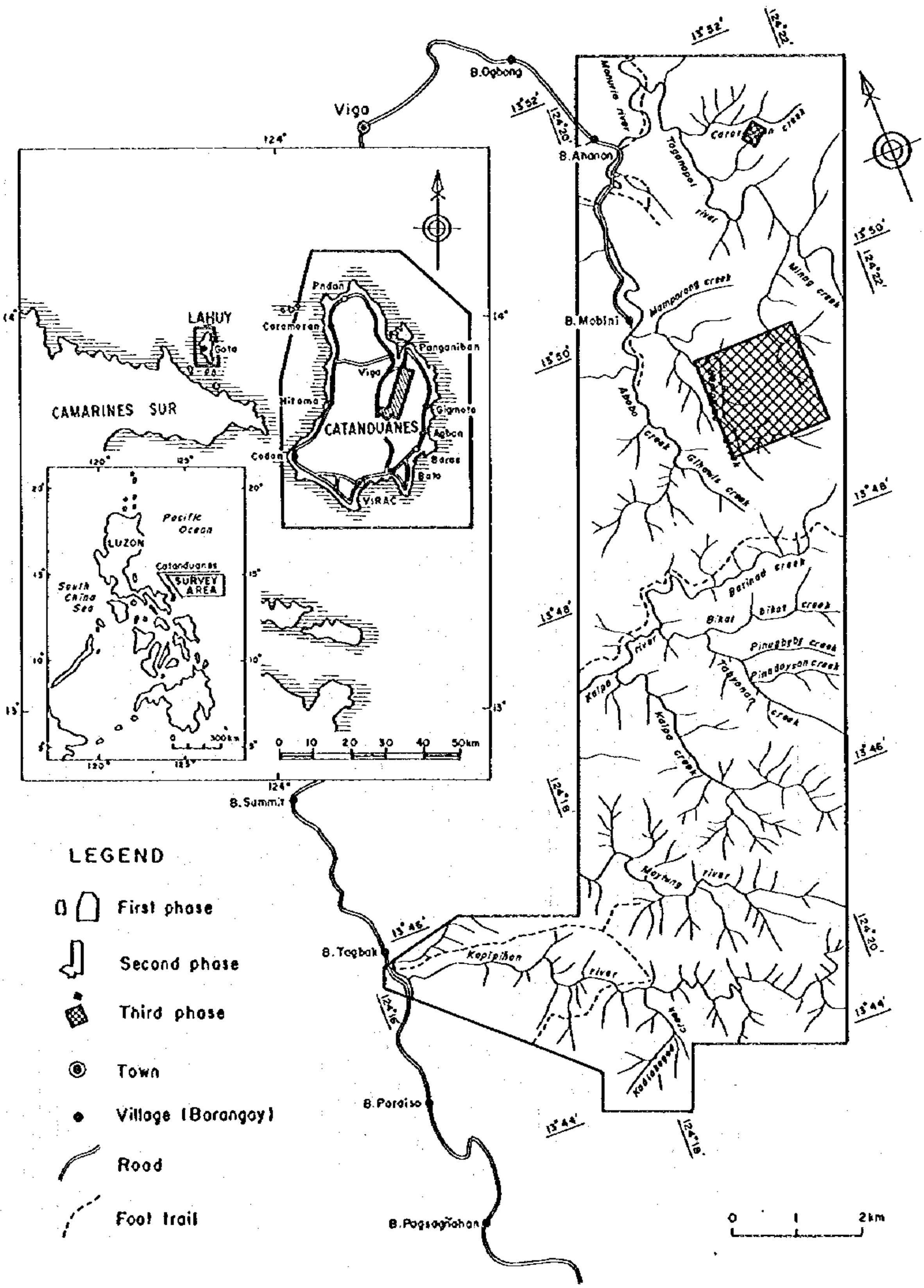

Fig. 1 Locations of the Survey Areas

SUMMARY

This survey corresponds to the Third Phase of the Cooperative Mineral Exploration in the Catanduanes Area, the Republic of the Philippines. The objective of the survey is to evaluate the potential of gold and copper in the area. In this year, drilling, trenching and geochemical surveys were carried out based on the results of the First and Second Phase Surveys.

The survey area is situated in Catanduanes Island and is divided into two areas; Carorongan Area and Kampayas Area. The results are as follows;

(1) Carorongan Area

The geology is composed of greenschist and metagabbro of the Catanduanes Formation. The greenschist and the metagabbro generally have schistosities trending NW-SE and are silicified and argillized around the mineralization zone. One of the characteristics of the ore deposits is the presence of gold-bearing quartz vein with attendant argillized and silicified zones. The mineralization zones are believed to be formed by hydrothermal fluids ascending along the NW-SE and E-W oriented faults.

From the results of trenching survey, the gold mineralization is said to be related to hydrothermal alteration and the quartz veins within the whole series of trenches. The notable gold occurrences are the silicified zone yielding 4.2 g/t Au of about 4 m in width with the quartz vein containing 58.8 g/t Au of 15 cm in width within Trench-3, the argillized zone having value of 1.5 g/t Au with about 2 m width within Trench-4 and the quartz veinlets zone yielding values of 30.3 g/t Au of about 1 m in width within Trench-6.

From the results of drilling survey, the strongly silicified zones were proved to continue 30 m below the surface in 4 holes (MJPC-3, 4, 5, 6) which were carried out on platform 2. Some other silicified zones exist at deeper levels (44-86 m below the surface) than the above-mentioned silicified zone and were recognized in the holes MJPC-8 and 9 that were carried out on platform 3. Major portion of the mineralization usually occurs within the metagabbro intrusives and the contacts between the metagabbro and the greenschist. As to the Au grade, values of 1.5 g/t (MJPC-5, 26.80-30.85 m) were determined in the silicified zone at shallower levels and values of 1.2 g/t (MJPC-8, 83.20-84.20 m) were determined in the silicified zone at deeper levels.

It seems that the ore deposits recognized in Carorongan Area is sub-economical to develop at present because the deposits are slightly low gold grade as a whole and of limited size particularly concerning the high gold portions. It is notable, however, that the gold contents of the metagabbro tend to be more than 0.1 g/t where the metagabbro was altered. Therefore, Carorongan Area and its vicinity must have a huge gold potential.

(2) Kampayas Area

The geology of Kampayas Area is mainly composed of sedimentary rocks of the Catanduanes Formation. These rocks are cut by the andesite porphyry and diorite of Batalay Intrusives. As to the mineralization, there are silicified zones and quartz veins in some places.

The variation of each element on the geochemical survey is controlled by the NNE-SSW oriented fault, by the diorite body at the ridge around peak 379 m and by the strongly silicified zone at the eastern part of Kampayas creek. The NNE-SSW oriented fault passing by the ridge of peak 379 m could have served as channelways for the andesite porphyry and hydrothermal solutions.

The highest gold potential areas are believed to be near the ridge of peak 379 m and at the intersection of the NNE-SSW and E-W oriented faults. In particular, the site for forming a gold deposit is preferable at the above-mentioned intersection of the faults because the big quartz veins of about 20 cm (0.3 g/t Au) to 1 m in width and geochemical high gold anomalies are observed near the intersection. Therefore, we recommend to continue the additional surveys such as geophysical survey or drilling survey.

Moreover, it is proposed that the geological and geochemical detailed surveys be conducted in the eastern extension of Carorongan Area and Kampayas Area because the geochemical high gold anomalies extend to the area.

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PART I GENERAL REMARKS

PART I GENERAL REMARKS

Chapter 1 Introduction

1-1 Background and Objective

The Republic of the Philippines is one of the major mineral producing countries in Southeast Asia, and its production in 1990 is eighth for gold and eleventh for copper in the world. Ore reserves for both metals, however, are sixth and ninth respectively in the world. This means that the country has vast reserve of undeveloped resources.

The areas geologically mapped at the scale of 1 is to 50,000 in this country are 130,000km², hardly 43 % of the total land area (Metal Mining Agency of Japan, 1992). It simply indicates that there is a high possibility for finding new potential areas for mineral resources as geological mapping and exploration activity progress.

The economic environment for mining in the Philippines in recent years, however, has been very severe; hampered mainly by low metal prices, low mining grades, diminishing ore reserves and natural disasters, thus the amounts of gold and copper production tend to go down. Due to these circumstances, the Government of the Philippines requested the Government of Japan to execute cooperative mineral resources exploration projects for delineation of new mineral resources.

In response to the request, the Japanese government dispatched a preliminary survey mission to the Philippines, and discussed this matter with the concerned agency in the Philippines. In due time a consensus was reached, and the Japanese representatives, the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ), and the Philippines representatives, the Mines and Geo-Science Bureau (MGB) of the Department of Environment and Natural Resources, Philippines, entered into an agreement on July 21, 1993. Based on this agreement, a three-year project entitled the Cooperative Mineral Resources Exploration in Catanduanes Area, northeast offshore islands of the Bicol Peninsula, was programmed to be conducted from 1993. This year is the Third phase of the survey.

The objective of this project is to discover new ore deposits of gold, copper, and other useful minerals through the study of the geology, geological structure, mineralization, and geochemical characteristics of the area and integrate interpretation of these data.

1-2 Conclusions and Recommendations of the Second Phase Survey

1-2-1 Conclusions of the Second Phase Survey

(1) The geology of the survey area is composed of Cretaceous Catanduanes Formation (graywacke, greenschist and basic lava), Eocene Payo Formation (sandstone, limestone and volcanic rocks), Cretaceous Intrusives (gabbro and dolerite), Oligocene Batalay Intrusives (diorite, andesite porphyry and aplite) and Alluvium. Batalay Intrusives occur as small intrusive bodies in the survey area.

(2) The geological structure is characterized by northwest-southeast trending faults and folds and a distinct east-west trending set of faults. In the northeastern part of the survey area, the Catanduanes Formation underwent dynamo-metamorphism due to faulting and the graywacke was metamorphosed into greenschist during Eocene time.

(3) Important mineralization and attendant alteration (pyritization) are associated with Batalay Intrusives. The Catanduanes Formation underwent metamorphism in parts, alteration and mineralization, but the overlying Payo Formation is unaffected by such events.

(4) The mineralization is divided into the following groups; **(i)** quartz vein (Au), **(ii)** silicified zone, **(iii)** placer gold, **(iv)** native copper and (v) others. Among them, the most important types are gold bearing quartz vein and placer gold. There are two kinds of quartz vein: one is the segregated veins and the other is hydrothermal veins which are associated with gold mineralization. Many floats of quartz veins are distributed in the Taganopol river basin but both types are not distinguishable in floats. Silicified zone is noted at about 20 localities. All of them underwent medium to weak silicification and weak pyritization. Some of them are probably showing the surface indications of the deep-seated intrusion and/or related mineralization. Placer gold is noted in the eastern part of Ananon and in Kadlakogod creek. Gold grains were observed in Quaternary sediments through panning. Native copper is found in small cracks within gabbro of Cretaceous Intrusives and nearby graywacke in Barinad creek. The scale, however, is small and the copper grade is very low. Others denote network quartz veinlets in weathered graywacke and so on.

Based on the results of geological and geochemical surveys, the following areas were chosen as potentials for mineralizations;

(1) Carorongan Mineral Occurrence: It is located in the northernmost survey area and east of Ananon. The geology is underlain mainly by the greenschist of the Catanduanes Formation. Mineralization is in the form of gold-bearing quartz veins in association with clay minerals. The widths of the veins are 0.7 to 2 meters. Maximum gold grades are 65.19g/t in the quartz vein (W=5cm) and 10.70g/t in the clay-rich portion (W=30cm). The silicified zone probably stretches 100 m by 200 m in size.

Based on the result of geological and geochemical surveys, the mineralization zone extends over the limit of the survey area of last year. The positive indication in the geochemical survey results made the area a promising prospect for a primary gold deposit.

(2) Taganopol Mineral Occurrence: It is situated in the southeastern part of Carorongan Mineral Occurrence. Quartz vein of 50cm wide is noted in the greenschist of the Catanduanes Formation. This quartz vein is associated with pyrite occurrences and the maximum gold grade is 10.33g/t (W=50cm). Soil and vegetation cover concealed the continuation of the vein. Geochemical anomaly in the area is rather small and continuity is rather obscure, but the presence of mineralization underneath can not be discounted.

(3) Ananon North Area: It is located in the east of Ananon. The geology is composed of greenschist and Quaternary sediments. Many quartz vein floats were observed along the Taganopol river and there are about 20 pits for placer gold along the river. A maximum diameter of 4mm of gold grain was recognized in one of the pits through panning. Gold content is high in stream sediments along this river and the potential for placer gold is expected to be large.

(4) Kadlakogod Area: It is located in the south of the survey area. Silicified and argillized zones in the Kadlakogod creek were recognized and attributed its formation through the intrusion of andesite porphyry of Batalay Intrusives. There are many pits for placer gold in the lower reaches of the intrusive rocks. Through panning of Quaternary sediments, a maximum size of 7mm gold nugget was discovered. The surrounding areas have the possibility to contain placer gold.

(5) Kampayas Area: It is located in the southeast of Mabini. A small diorite body of Batalay Intrusives was found in the upper stream of Kampayas river. The sedimentary rocks surrounding the diorite were subjected to silicification and argillization.

In this area, gold content is high in stream sediments and primary gold deposit related with diorite is expected to exist.

The survey result for this year is indicative that the high potential area for gold may extend to the eastern extremity of the survey area. The results of the reconnaissance survey of last year have picked out the significant geochemical anomaly areas in the eastern extension of the project area. Thus, in addition to the promising areas mentioned above, we can expect high potential areas in the eastern extension to Sicmil of the survey area for this year.

1-2-2 Recommendations based on the Second Phase Survey

(1) Carorongan Mineral Occurrence: Mineralization zone was found to extend outside the second phase target area. Accordingly, it is recommended that a detailed geological survey and soil geochemical survey be conducted in the northern and southern extension of last year's target area.

For the mineralized quartz and clay veins, it is recommended that drilling be conducted to clarify the character and degree of mineralization.

(2) Taganopol Mineral Occurrence: It is recommended that test pitting and trenching be conducted to confirm the vein extension.

(3) Ananon North Area: It is recommended that test pitting be conducted to know the grade and scale of placer gold.

(4) Kadlakogod Area: It is recommended that test pitting be conducted to know the grade and scale of placer gold.

(5) Kampayas Area: It is recommended that detailed geological survey and soil geochemical surveys be carried out to define the geological settings of mineralization and to find primary gold deposit. If the results of the survey are promising, drilling surveys will be recommended to verify the mineralization.

In addition, it is proposed that detailed geological survey and stream sediments geochemical survey be extended in the eastern extension of high gold concentration areas of the second phase survey.

1-3 Outline of the Third Phase Survey

1-3-1 Objective of the Survey

This year is the Third Phase Survey of the cooperative mineral exploration, therefore the objective of the survey is to find new deposits through verification of geology and mineralization based on the results of the first and second phase surveys. Drilling, trenching and geochemical surveys were carried out this year. It is also intended to transfer the

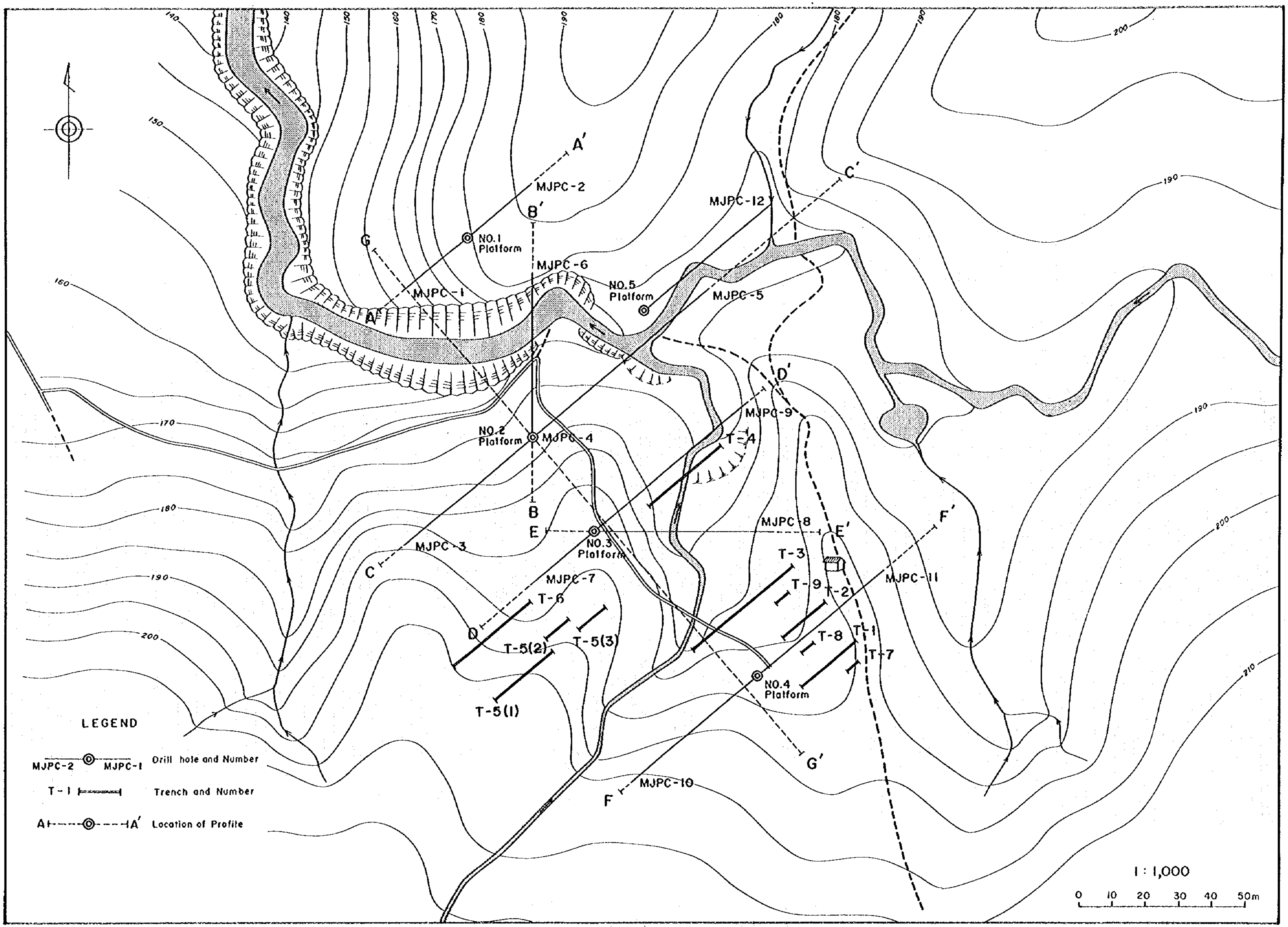


Fig. 2 Locations of Trenching and Drilling Surveys in Carorongan Area

technology to the Government of the Republic of the Philippines through this survey.

1-3-2 Area of the Survey

The survey area is situated in Catanduanes Island, Catanduanes Province in Bicol Region. The Third Phase Survey was focused at Carorongan Area and Kampayas Area based on the results of the past two years of surveys. Fig. 1 shows the survey areas.

1-3-3 Contents of the Survey

(1) Trenching Survey: The survey was carried out in Carorongan Mineral Occurrence to verify the extension and grade of the mineralized outcrop. Fig. 2 shows the locations of the survey.

(2) Drilling Survey: The survey was carried out in Carorongan Mineral Occurrence to explore and assess the Mineralization zone of the area shown in Fig. 2.

(3) Geochemical Survey: The survey was executed in Kampayas Area to determine the geochemical anomalies through analyses of soil samples in order to asses the potential of the area and to select the prospective sections.

(4) Laboratory Works: Microscopic observation, X-ray diffraction, measurement of homogenization temperature of fluid inclusions, K-Ar dating, EPMA and chemical analysis of rocks and ores were carried out to verify the geological setting and mineralization as shown in Table 1.

1-3-4 Members of the Survey Team

Japan

Planning and Coordination

Kenji Nakamura	MMAJ
Nobuyasu Nishikawa	MMAJ
Yuichi Sasaki	MMAJ
Tetsuo Suzuki	MMAJ, Manila

Field Survey

Takehiro Sakimoto	Nittetsu Mining Consultants Co., Ltd.
Yasunori Ito	do.
Hirohisa Horiuchi	do.
Makoto Miyoshi	do.
Dr. Masanori Furuno	do.

Philippines

Planning and Coordination

Joel D. Muyco	MGB
Salvador G. Martin	do.
Edwin G. Domingo	do.
Romeo L. Almeda	do.

Field Survey

Dr. Sevillo D. David Jr.	MGB
Joselito Velasquez	do.
Emmanuel John M. Carranza	do.
Jose Marcel S. Laud	do.

1-3-5 Period of the Survey

From June 29, 1995 to January 31, 1996

(Field Survey: from July 4 to October 10, 1995)

Table 1 Content of Works

(1) Content of Field Surveys

Content of Surveys and Areas	Amount of Surveys				
Drilling Survey (Carorongan Mineral Occurrence)	Hole No.	Direction	Inclination	Length	
	MJPC- 1	S50° W	-60°	50.20m	No.1 Platform
	MJPC- 2	N50° E	-60°	50.40m	
	MJPC- 3	S50° W	-60°	100.25m	
	MJPC- 4		-90°	100.25m	No.2
	MJPC- 5	N50° E	-60°	132.70m	
	MJPC- 6	N	-60°	100.25m	
	MJPC- 7	S50° W	-60°	57.80m	
	MJPC- 8	E	-60°	110.50m	No.3
	MJPC- 9	N50° E	-60°	100.15m	
	MJPC-10	S50° W	-60°	100.90m	No.4
	MJPC-11	N50° E	-60°	100.30m	
	MJPC-12	N50° E	-60°	100.30m	No.5
	Total 12 holes			1,104.00m	
Trenching Survey (Carorongan Mineral Occurrence)	Total Length : 204m				
	Number of Trenches : 9 points				
	Length of Trench : T-1(22m) T-4(32m) T-7(5m) T-2(17m) T-5(46m) T-8(5m) T-3(40m) T-6(32m) T-9(5m)				
Geochemical Survey (Kampayas Area)	Number of Soil Samples 673 pcs				

(2) Laboratory Tests

Content of Surveys and Areas	Item of Tests	Amount
Drilling Survey Trenching Survey (Carorongan Mineral Occurrence) and Geochemical Survey (Kampayas Area)	①Polished thin section	52 pcs
	②X-ray diffractation analysis	79 pcs
	③Homogenization temperature measurement of fluid inclusion	40 pcs
	④K-Ar dating	3 pcs
	⑤EPMA analysis	13 pcs
	⑥Chemical analysis (Ore)	633 pcs
	Au,Ag,Cu,Fe,Mo,Pb,S,Zn (8 elements)	5,064 components
	⑦Chemical analysis (Soil)	673 pcs
	Au,Ag,As,Cu,Fe,Hg,Mo,Pb,S Sb,Zn (11 elements)	7,413 components
	⑧Thin section	10 pcs
	⑨Chemical analysis (Rock)	17 pcs
	SiO_2,Al_2O_3,CaO,FeO,Fe_2O_3,K_2O MgO,MnO,Na_2O,P_2O_5,TiO_2,+H_2O -H_2O,LOI,Au,Ag,As,Cu,Fe,Hg Mo,Pb,S,Sb,Zn (25 elements)	425 components
	⑩Chemical analysis (REE)	12 pcs
	Ce,Eu,La,Lu,Nd,Sm,Tb,Th,U, Yb (10 elements)	120 components

Chapter 2 Geography

2-1 Location and Accessibility

The survey area is situated in the eastern part of Catanduanes Island (Fig. 1).

To reach Catanduanes Island, it takes about one hour from Manila to Legazpi by plane, another one hour from Legazpi to Tabaco by car, and about four hours from Tabaco to Virac, the capital town of Catanduanes, by ferry boat. Flight service from Manila to Virac is available once a day, and from Legazpi to Virac three flights a week.

The Provincial Government is active in the development of road systems in the island, and the system is in good condition at present. There exist peripheral-coastal roads and across-island roads throughout the province. The survey area is accessible through a principal road running in north-south direction interconnecting Virac and Viga. Within the survey area, only a road from Viga runs to Mabini through Ananon at the northwestern part of the area.

2-2 Topography

The topography of the survey area is characterized by a ridge oriented in the north-south direction. Rivers run north between and parallel with these mountain ridges and changes their directions sharply. Some parts of the main river up to Kampayas Area are wide and develop alluvium. Most of the area, however, is formed of narrow rivers and creeks, and relatively gentle mountainsides. The topography of tributaries is steep and many small waterfalls are distributed.

Chapter 3 Outline of Survey Results

3-1 Carorongan Area

This area is about 2 km east-southeast of Ananon and is located along Carorongan creek.

The geology is composed of greenschist and metagabbro of the Catanduanes Formation. The greenschist and metagabbro generally have schistosities trending NW-SE (northwest-southeast) and are silicified and argillized around the mineralization zone. One of the characteristics of the ore deposits is the presence of gold-bearing quartz veins with attendant argillized and silicified zones. The mineralization zones are believed to be formed by hydrothermal fluids ascending along the NW-SE and E-W (east-west) oriented faults.

Trenching and drilling surveys were carried out because primary ore deposits were expected to exist in the area.

3-1-1 Trenching Survey

The geological structure is characterized by NW-SE trending faults and folds which are cut by E-W and NE-SW (northeast-southeast) trending faults (JICA and MMAJ,1995). This trend is also recognizable within the trenches. The extended directions of sheared zone and silicified zone mainly follow the NW-SE trend, but some quartz veins containing high gold grade have the E-W direction.

As to mineralization, there are gold anomalies related to hydrothermal alteration and quartz veins throughout the whole series of trenches from Trench-1 (T-1) to Trench-9 (T-9). The dominant trend of quartz veins is NW-SE and in decreasing frequency of N-S, E-W and NE-SW direction. The quartz veins with high Au grade generally trend NW-SE and in E-W directions. Of particular interest is Trench-3 wherein the silicified zone contains 4.2 g/t Au and about 4 m in width. It seems that the silicified zone continues to N50° W direction. Therefore, the silicified zone with values of 1.3 to 4.7 g/t Au and about 3.5 m in width also exists within Trench-1. The quartz vein which contains 58.8 g/t Au and about 15 cm in width at the above-mentioned silicified zone in Trench-3, however, shows N75° E/85° NW in the dip-strike, and gold anomalies also continue to E-W direction considering the conditions of Trench-5 and Trench-6. Other notable gold occurrences are the argillized zone having Au values of 1.5 g/t with about 2 m width within Trench-4 and the quartz veinlets zone yielding values of 30.3 g/t Au and about 1 m in width within Trench-6.

The homogenization temperatures of quartz fluid inclusions have the peak at around 200° C. In some places the clay parts close to the quartz veins show higher Au grade than the quartz vein itself.

Based on the results of ore analysis, only Au has the high potential, though there are some samples yielding slightly high concentrations of Cu and Zn.

3-1-2 Drilling Survey

The results of the drilling survey revealed that the silicified zones continue up the deeper levels from the surface. Of particular interest is the strongly silicified zone which continues to about 30 m below the surface as observed in the 4 holes (MJPC-3, 4, 5, 6) that were carried out on platform 2. Some other silicified zones exist at deeper levels (44 - 86 m below the surface) than the above-mentioned silicified zone and were recognized in the holes of MJPC-8 and 9 that were carried out on platform 3. Major portion of the mineralization usually occurs within the metagabbro intrusives and the contacts between the metagabbro and the greenschist.

Based on the results of ore analysis, only Au has the high potential though there are some samples containing slightly high concentrations of Cu and Zn. As to the Au grade, values of 1.5 g/t (MJPC-5, 26.80-30.85 m) were determined in the silicified zone at shallower levels and values of 1.2 g/t Au (MJPC-8, 83.20-84.20 m) were determined in the silicified zone at deeper levels.

The homogenization temperatures of quartz fluid inclusions have the peak at around 250 - 300° C and tend to be higher by around 50° C than the trench samples.

3-2 Kampayas Area

Kampayas Area is located at the southern part of Carorongan Area. Both areas are divided by Ogbon Fault which trends NW-SE.

The geology is mainly composed of the sedimentary units of the Catanduanes Formation. These rocks are cut by dolerite and gabbro of Cretaceous ages and by andesite porphyry and diorite of Batalay Intrusives.

At the ridge around peak 379 m, numerous floats of andesite porphyry and microdiorite were recognized indicating that the ridge might be underlain by Batalay Intrusives which could be responsible for the mineralization of the area.

Geological mapping revealed that the whole survey area is silicified in which very strong silicification with high amount of pyrite crystals was identified. Generally, the area was affected by numerous NW-SE and NE-SW trending quartz veins/veinlets which are probably conjugate. A 1 m thick quartz vein was identified at the southeastern part of the area and trends N30° E dipping around 65 degrees NW.

3-2-1 Geochemical Survey

The survey was executed in Kampayas Area in which the geochemical anomalies from soil samples were determined to know the potential of the area and select the prospective sections.

The variation of each element on the geochemical survey in Kampayas Area was controlled by the NNE-SSW oriented fault delineated through geological survey, by the diorite body at the ridge around peak 379 m and by the strongly silicified zone at the eastern part of Kampayas creek.

Comparing the concentrations of each ore element in Kampayas Area with the Clarke number, Au is about dozens times, Cu is around 3 times, Pb is one tenth and Zn is about unity. Therefore, only Au is selected as the mineralization in the area.

As to the Au content, unaltered to weakly altered rocks yield values several times in comparison with the Clarke number, and the strongly altered rocks are several dozen times higher. Of particular interest are the silicified rocks with high frequency of quartz veins and the quartz veins frequently yield values of 0.1 to 0.3 g/t Au. In Kampayas Area, the maximum Au value was determined in quartz vein of about 20 cm in width along the NNE-SSW oriented fault passing by the ridge around peak 379 m. The value is 0.3 g/t Au.

Chapter 4 Comprehensive Discussion

4-1 Characteristics of Geological Structure and Mineralization

The metagabbro is relatively strongly altered with associated gold mineralization than the greenschist, the main 2 lithofacies of Carorongan Area. The brittle lithologic character (usually brecciated) of the metagabbro during an earlier deformational phase due to faulting and folding might have serve as good sites for mineralization. It seems that some parts of the faults have accomplished the role as the mineralization fluids' paths. These suggest that tectonism (faulting and folding) in Carorongan Area has contributed to the mineralization that occurred.

As it has been mentioned in the above survey results, the quartz veins with high Au grade strike in NW-SE and E-W directions. Of particular interest is Trench-3 wherein the silicified zone contains 4.2 g/t Au and about 4 m in width. It seems that the silicified zone continues to N50° W direction. Therefore, the silicified zone with values of 1.3 to 4.7 g/t Au and about 3.5 m in width also exists within Trench-1. The quartz vein which contains 58.8 g/t Au and about 15 cm in width at the above-mentioned silicified zone in Trench-3, however, shows N75° E/85° NW in the dip-strike, and gold anomalies also continue to E-W direction considering the conditions of Trench-5 and Trench-6. These facts may be suggestive that there is a complicated event where the NW-SE and E-W oriented faults intersected near Trench-3.

We have to consider the influence of the supergene enrichment in the value of the samples collected in the trenches because the gossan in which limonite and hematite occur are recognized in all the trenches.

The gold mineralization in Carorongan Area is characterized by silicification with strong cabonatization, sericitization and pyritization. Epidotization is generally recognized around the silicified zone, especially at deeper levels. The following characteristics are very notable about the occurrences of iron-bearing minerals and carbonates; the iron-bearing minerals are generally composed of pyrite while the carbonates are mainly composed of dolomite - ankerite series minerals in the high Au zone; the iron-bearing minerals in the low Au zone are generally composed of magnetite or hematite while the carbonates are mainly composed of calcite. Based on the results of bulk analysis, the weight percentage of SiO_2 in the strongly silicified zone increase by only about 10 %. It seems that the other elements also increase or be transported at minute quantities. Therefore, it is believed that the carbon dioxide and the sulfur originating from H_2S were mainly added to the mineralization zone by hydrothermal fluids.

As to the origin of the gold, although the data were not enough to discuss it at the present, if we consider the available information, the gold might have originated from the Catanduanes Formation which was mainly composed of mafic materials or from the metagabbro which represented igneous activity during Cretaceous ages. The later volcanic activity related to Batalay Intrusives, however, may have contributed to the final stage of gold mineralization because the metagabbro had been affected by a strong hydrothermal alteration.

4-2 Geochemical Anomaly and Mineralization

The variation of each element on the geochemical survey in Kampayas Area was controlled by the NNE-SSW oriented fault, by the diorite body at the ridge around peak 379 m and by the strongly silicified zone at the eastern part of Kampayas creek. Of particular interest is the NNE-SSW oriented fault passing by the ridge of peak 379 m in which the andesite porphyry is believed to have intruded.

From the results of the geochemical survey, strong gold anomalies were recognized near the ridge of peak 379 m and at the intersection of the NNE-SSW and E-W oriented faults in the southern part of the detailed survey area. Therefore, it is possible that the andesite porphyry and diorite of Batalay Intrusives contributed to the gold mineralization.

The results of K-Ar dating revealed the ages ranging from 33.6±2.1 Ma to 26.7±0.6 Ma. These ages estimate for Batalay Intrusives correspond to middle to later period of Eocene. Based on these results, at least, the main mineralization in Kampayas Area is said to have occurred during a hydrothermal activity related to Batalay Intrusives.

4-3 Estimation of Potential Resources

It seems that the ore deposits recognized in Carorongan Area is sub-economical to develop at present because the deposits are slightly low gold grade as a whole and of limited size particularly concerning the high gold portions. It is notable, however, that the gold contents of the metagabbro tend to be more than 0.1 g/t where the metagabbro was altered. Therefore, Carorongan Area and its vicinity must have a huge gold potential. At present, it is difficult to conclude whether the area was the centers of hydrothermal activity which brought about the gold mineralization or not.

In Kampayas Area, the highest gold potential areas are believed to be near the ridge of peak 379 m and at the intersection of the NNE-SSW and E-W oriented faults in the southern part of the survey area. In particular, the site for forming a gold deposit is preferable at the above-mentioned intersection of the faults because the big quartz veins of about 20 cm (0.3 g/t Au) to 1 m in width and geochemical high gold anomalies are observed near the intersection.

Chapter 5 Conclusions and Recommendations

5-1 Conclusions

5-1-1 Carorongan Area

(1) The geology of Carorongan Area is composed of greenschist and metagabbro of the Catanduanes Formation. The greenschist originated from shale, siltstone, sandstone and lapilli tuff which have basic composition. The schistosities generally show the NW-SE

direction subparalleling the faults in sheared zone. The metagabbro has schistosities subparalleling the faults in sheared zone as those of the greenschist. The metagabbro usually occurs in the form of sheets in the Catanduanes Formation such as strata.

(2) The geological structure is characterized by NW-SE trending faults which are cut by E-W and NE-SW trending faults. The extended directions of sheared zone and silicified zone mainly define the NW-SE trend, but some quartz veins containing high gold grade have the E-W trend.

(3) From the results of trenching survey, the gold mineralization is said to be related to hydrothermal alteration and the quartz veins within the whole series of trenches. The direction of quartz veins is generally NW-SE and decreases in frequency to N-S, E-W and NE-SW, however, the quartz veins with high Au grade are mainly in NW-SE and E-W directions. Within the trench T-3, the silicified zone containing 4.2 g/t Au and about 4 m in width is recognized and the quartz vein striking N75° E and dips 85° NW contains 58.8 g/t Au and about 15 cm in width.

(4) From the results of drilling survey, the silicified zones were found to continue to deeper levels from surface. The strongly silicified zones were proved to continue 30 m below the surface in 4 holes (MJPC-3, 4, 5, 6) which were carried out on platform 2. Some other silicified zones exist at deeper levels (44 - 86 m below the surface) than the above-mentioned silicified zone and were recognized in the holes MJPC-8 and 9 that were carried out on platform 3. Major portion of the mineralization usually occurs within the metagabbro intrusives and the contacts between the metagabbro and the greenschist.

(5) Based on the results of ore analysis, only Au has the high potential, though there are some samples containing slightly high concentrations of Cu and Zn. As to the Au grade, values of 1.5 g/t (MJPC-5, 26.80 - 30.85 m) were determined in the silicified zone at shallower levels and values of 1.2 g/t (MJPC-8, 83.20 - 84.20 m) were determined in the silicified zone at deeper levels.

5-1-2 Kampayas Area

(1) The geology of Kampayas Area is mainly composed of sedimentary rocks of the Catanduanes Formation. These rocks are cut by the andesite porphyry and diorite of Batalay Intrusives. As to the mineralization, there are silicified zones and quartz veins in some places.

(2) The variation of each element in Kampayas Area is controlled by the NNE-SSW oriented fault, by the diorite body at the ridge around peak 379 m and by the strongly silicified zone at the eastern part of Kampayas creek. The NNE-SSW oriented fault passing by the ridge of peak 379 m could have served as channelways for the andesite porphyry and some hydrothermal solutions.

(3) As to the Au content, unaltered to weakly altered rocks yield values several times as compared with the Clarke number, and the strongly altered rocks are at dozens times. Of particular interest are the silicified rocks with high frequency of quartz veins wherein the quartz veins frequently yield values of 0.1 to 0.3 g/t Au. In Kampayas Area, the maximum Au value was determined in the quartz vein of about 20 cm in width along the NNE-SSW oriented fault passing by the ridge of peak 379 m. The value is 0.3 g/t Au.

(4) The results of K-Ar dating revealed the ages ranging from 33.6±2.1 Ma to 26.7±0.6 Ma. These ages estimate for Batalay Intrusives correspond to middle to later period of Eocene. Based on these results, at least, the main mineralization in Kampayas Area occurred due to the hydrothermal activity related to Batalay Intrusives.

5-2 Recommendations for Future Activity

5-2-1 Carorongan Area

It seems that the ore deposits recognized in Carorongan Area is sub-economical to develop at present because the deposits are slightly low gold grade as a whole and of limited size particularly concerning the high gold portions.

It is notable, however, that the gold contents of the metagabbro tend to be more than 0.1 g/t where the metagabbro was altered. Therefore, Carorongan Area and its vicinity must have a huge gold potential. At present, it is difficult to conclude whether the survey area was the centers of hydrothermal activity which brought about the gold mineralization or not.

After the detailed survey, we must delineate the potential areas for gold mineralization near Carorongan Area. In this case, it is imperative that the junctions of the NW-SE oriented faults consistent with the extension of the silicified zones and the E-W or NE-SW oriented faults of later tectonism could be of highest potential.

5-2-2 Kampayas Area

In Kampayas Area, the highest gold potential areas are believed to be near the ridge of peak 379 m and at the intersection of the NNE-SSW and E-W oriented faults in the southern part of the detailed survey area. In particular, the site for forming a gold deposit is preferable at the above-mentioned intersection of the faults because the big quartz veins of about 20 cm (0.3 g/t Au) to 1 m in width and geochemical high gold anomalies are observed near the intersection. Therefore, we recommend to continue the additional surveys such as geophysical survey or drilling survey.

It is highly possible that a promising gold mineralization exists at the relatively higher part (above the 200 m in altitude) in the following reasons; There are many soil samples yielding high values of 0.1 to 2.6 g/t Au at the ridge around peak 379 m and in the southern part. High gold anomalies (more than 10 g/t Au) were recognized by the stream sediments geochemical survey of the Second Phase Survey at the eastern creek of the ridge.
The quartz vein (KCR-08) of about 1 m in width at 200 m in altitude includes fluid inclusions showing the temperature ranging from 203 to 285° C (Ave. 248° C) and has low value of 0.02 g/t Au. On the other hand, the quartz vein (KCR-09) of about 20 cm in width at 270 m in altitude shows fluid inclusions homogenizing at ranging from 189 to 262° C (Ave. 217° C) and has relatively high value of 0.3 g/t Au. Therefore, it is recommended that the additional surveys be conducted above the 200 m in altitude.

Moreover, it is proposed that the geological and geochemical detailed surveys be conducted in the eastern extension of Carorongan Area and Kampayas Area because the geochemical high gold anomalies extend to the area.

PART II DETAILED DESCRIPTION

PART II DETAILED DESCRIPTION

Chapter 1 Carorongan Area

1-1 Trenching Survey

1-1-1 Purpose of the Survey

The survey was carried out to clarify the extension and grade of the mineralization for the geochemical anomalies and the original places of quartz floats with 0.5 to 1.0 m in size on surface which were recognized in Carorongan Mineral Occurrence on the Second Phase Survey. Fig. 2 shows the locations of the survey.

1-1-2 Contents of the Survey

(1) Total length of the trenches is 204m and the trenches were carried out at 9 places.

(2) The width of each trench is 1.5 m, and the trenches were dug up to expose the rocks.

(3) We observed the geology and mineralization in detail, and made the survey map (Fig.3) on the scale of one to one hundred (1:100).

(4) The laboratory test samples for ore analysis, X-ray diffraction analysis, polished thin section, homogenization temperature measurement of fluid inclusion, etc. were collected to clarify the geology and mineralization. The locality maps of rock and ore samples were shown in Fig. 3 and Appendix-3.

(5) After the trenching survey, the trenches were recovered with soil just like the original condition.

1-1-3 Results of the Survey

Trench-1 (T-1): A horizon soil, B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The A horizon soil is composed of black to dark gray colored organic soil from surface to 20 cm deep.

The B horizon soil is composed of reddish brown to brown colored argillic soil having 5 to 150 cm in deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite and the fragments of greenschist and metagabbro are partly recognized within this horizon.

The greenschist is mostly black to yellowish green color and strongly weathered but partly pale green to grayish white with green tinge color and highly silicified and argillized.

The metagabbro is mostly pale green color and silicified and argillized. The boundary between metagabbro and greenschist is highly silicified and argillized.

Most of the quartz veins occur as fine veinlets having 5 to 20 mm in width within the metagabbro. Also, the veins occur as pockets near the boundary between greenschist and metagabbro. These quartz veins are composed of quartz, kaolinite, sericite, chlorite and limonite with some pyrite. The strikes and dips of the quartz veins generally trend N40° W/40-50° SW.

Based on the results of ore analysis, the high gold (Au) grade parts mainly exist within the silicified and argillized zone corresponding to the contact between metagabbro and greenschist. A maximum Au grade of 4.7 g/t was determined in channel sampling (JT1-23) of 40 cm in width and in some trenches yield values of 2 to 4 g/t Au. The quartz vein of about 10 cm in width within the metagabbro also yields value of 1.6 g/t Au.

Trench-2 (T-2): B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The B horizon soil is composed of reddish brown to brown colored argillic soil about 10 to 140 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite and the fragments of greenschist and metagabbro are in part recognizable within the trench.

The greenschist is mostly reddish brown to yellowish green color and characterized by the strongly weathered lithofacies with oxidized minerals such as limonite and hematite. The schistosities mainly trend north-south (N-S) to northwest-southeast (NW-SE) directions and dips steeply and partly northeast-southwest (NE-SW) direction. Therefore, the schistosity represents geological structure of complex origin.

The metagabbro is mostly reddish brown to pale green color and silicified and argillized. The boundary between metagabbro and greenschist is highly silicified and argillized and microfaults trending N80° E/80° NW were observed in the trench.

Most of the quartz veins exist as veins/veinlets having 2 to 10 cm in width within the metagabbro while some quartz veins of 1 to 6 cm in width are recognized within the greenschist. These quartz veins are composed of quartz, kaolinite, sericite, chlorite limonite and hematite. The strikes of the quartz veins generally trend N-S to NW-SE directions but also occur in various directions following the schistosities which complicate in the quartz veining system. Clay veins fill up the conjugate fractures of N-S and NW-SE trends which are recognized within the greenschist.

Based on the results of ore analysis, a channel sampling (JT2-30) of 2 m in width yields a maximum Au value of 1.6 g/t within the silicified metagabbro.

Trench-3 (T-3): B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The B horizon soil is composed of reddish brown to brown colored argillic soil about 20 to 120 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite and the fragments of greenschist and metagabbro are partly observable within the trench.

The greenschist is mostly reddish brown to yellowish green color and characterized by the strongly weathered lithofacies with oxidized minerals such as limonite and hematite. The greenschist is distributed only in the northeasternmost part. The schistosities generally show the N30-40° W/40-60° SW attitude.

The metagabbro is mostly reddish brown to pale green color and silicified and argillized. The metagabbro in the trench is strongly sheared and has the largest amount of gossan affected by limonite and hematite in the whole trench. The quartz vein of about 15 cm in width along a well-defined fault trends N75° E/70-85° NW and occurs in the central part of the trench.

Most of the quartz veins exist as veins/veinlets having 2 to 15 cm in width within the metagabbro and, in some parts, quartz pockets (floats?) were also recognized. These quartz veins are composed of quartz, kaolinite, sericite, chlorite and limonite with some pyrite. The strikes of the quartz veins generally trend N-S to NW-SE directions. Some quartz veins are cut by E-W oriented faults and at times follows the E-W oriented faults therefore complicating the quartz veining system.

Based on the results of ore analysis, a quartz vein (FT3-09) of about 15 cm in width along the fault having N75° E/70-85° NW trend yields a maximum Au value of 58.8 g/t within the metagabbro. Two quartz pockets of 18 cm and 28 cm in diameter yield extremely high Au values of 56.6 g/t (FT3-06), and 44.6 g/t (FT3-10), respectively. The strongly silicified zone is formed in and around the E-W oriented faults at the central part of the channel of 4 m in width and yields the high Au values of 2.3 to 4.3 g/t. Some quartz veins have values of 2 to 6 g/t Au.

Trench-4 (T-4): A horizon soil, B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The A horizon soil is composed of black to dark gray colored organic soil about 0 to 50 cm deep from surface.

The B horizon soil is composed of brown colored soil about 20 to 110 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite and the fragments of greenschist and metagabbro are partly recognized within the trench.

The greenschist is mostly yellowish green color and characterized by strongly weathered lithofacies but partly pale green to grayish white with green tinge color and highly silicified and argillized. The schistosities generally trend N40-50° W/40-60° SW.

The metagabbro is mostly brown to pale greenish gray color, and the silicification and argillization tend to be stronger within the highly sheared portion.

Most of the quartz veins occur as the irregular veins/veinlets having 3 to 20 cm in width within the metagabbro and within the above-mentioned sheared zone. Some quartz veins having 1 to 2 cm in width occur within the greenschist. These quartz veins are composed mainly of quartz, kaolinite, sericite, chlorite, limonite and hematite. The strike of the quartz veins generally trend N40-60° W/60° SW-90°. Some quartz veins fill up the NE-SW and E-W oriented fractures.

Based on the results of ore analysis, a spot sample of clay is composed of chlorite, sericite, albite and small amount of kaolinite yields 2.8 g/t Au within the metagabbro. Channel sampling of 2 m in width yields value of 1.5 g/t Au. The characteristic values of ore analysis are what most of the quartz veins show; the low Au grades of 0.1 to 0.3 g/t while the clay parts close to the quartz veins have the high Au grade of more than 1 g/t.

Trench-5 (T-5): A horizon soil, B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The A horizon soil is composed of black to dark gray colored organic soil from surface to 20 cm deep.

The B horizon soil is composed of reddish brown colored argillic soil about 10 to 160 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite because C horizon is also strongly argillized.

The greenschist is mostly reddish brown to pale green color and characterized by strongly weathered and argillized lithofacies. The schistosities generally trend N20-60° W/40-50° SW.

The metagabbro is also mostly reddish brown to pale green color making it difficult to be distinguished from greenschist, but relatively possesses stronger silicification and argillization than greenschist.

Most of the quartz veins occur as fine veins/veinlets having 1 to 10 cm in width. These quartz veins are composed mainly of quartz, kaolinite, sericite, chlorite, limonite, hematite and potassium feldspar. The attitudes of the quartz veins generally show N20-60° W/40-70° SW paralleling the schistosities. Some quartz veins within the metagabbro in the northeasternmost area fill up the E-W oriented fractures.

Based on the results of ore analysis, the quartz veinlets (GT5-44) yield value of 3.3 g/t Au within the metagabbro. Most of the channel samplings within the metagabbro in the northeasternmost area yield values of 0.1 to 0.5 g/t Au.

Trench-6 (T-6): A horizon soil, B horizon soil, greenschist, metagabbro and its silicified and argillized fraction were observed in the trench.

The A horizon soil is composed of black to dark gray colored organic soil from surface to 20 cm deep.

The B horizon soil is composed of reddish brown colored argillic soil about 20 to 140 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite because C horizon is also strongly argillized.

The greenschist is mostly reddish brown to pale green color and is characterized by the deeply weathered and argillized lithofacies. The schistosities generally are indefinite but mostly follow the NW-SW direction.

The metagabbro is also mostly reddish brown to pale green color making it difficult to be distinguished from greenschist, but relatively possesses stronger silicification and argillization than greenschist. A sheared zone of about 10 m in width at the central part of the trench was observed to contain large volumes of argillized rocks and quartz veinlets.

Most of the quartz veins occur as fine veins/veinlets having 0.5 to 4 cm in width. These quartz veins are composed mainly of quartz, kaolinite, sericite, chlorite, limonite, hematite and potassium feldspar. The attitudes of the quartz veins generally show two directions, N30-60° W/30-50° SW and N70-90° W/40-50° SW.

Based on the results of ore analysis, the quartz veinlets (FT6-14) yield values of 30.3 g/t Au within the metagabbro. The channel sampling within the sheared zone in the central part of the trench and in the metagabbro in the northeasternmost area yield values of 0.1 to 0.6 g/t Au, respectively.

Trench-7 (T-7): B horizon soil and argillized greenschist occur in the trench.

The B horizon soil is composed of reddish brown to yellowish brown colored argillic soil about 70 to 140 cm deep from surface. The boundary between B horizon and the underlying greenschist (C horizon) is indefinite and the fragments of greenschist are in part observed within the trench.

The greenschist is mostly reddish brown to yellowish green color and is characterized by deeply weathered lithofacies.

Quartz veins only occur as floats having 4 to 15 cm in diameter.

Based on the results of ore analysis, one of the quartz floats (JT7-30) yields value of 2.3 g/t Au.

Trench-8 (T-8): B horizon soil and silicified metagabbro occur in the trench.

The B horizon soil is composed of reddish brown to brown colored argillic soil from surface to 80 cm deep. The boundary between B horizon and the underlying rocks (C horizon) is indefinite.

The metagabbro is mostly pale green with red tinge to greenish white color, silicified and argillized and partly exposed on the surface. The schistosities observed in the trench revealed a N-S direction which is different from the general trend in the area because of the influence of the microfaults trending E-W/60° S.

Quartz veins occur as the irregular veins/veinlets having 1 to 2 cm in width.

Based on the results of ore analysis, a channel sampling (JT8-26) of 1 m in width yields Au value of 1.0 g/t within the silicified metagabbro.

Trench-9 (T-9): B horizon soil and silicified metagabbro are distributed in the trench.

The B horizon soil is composed of brown colored argillic soil about 10 to 50 cm deep from surface. The boundary between B horizon and the underlying rocks (C horizon) is indefinite and the fragments of metagabbro are partly recognizable within the trench.

The metagabbro is mostly reddish brown to greenish white color and silicified. The large amount of gossan originating from oxidation of pyrite led into the formation of limonite and hematite occurring in the trench.

Quartz veins exist irregular veins/veinlets having 2 to 30 cm in width.

Based on the results of ore analysis, a channel sampling (JT9-35) of 2.5 m in width yields Au value of 0.55 g/t within the silicified metagabbro. Each of the samples contains 0.4 g/t Au on the black colored Mn-rich part and values of 0.1 to 0.2 g/t Au on some quartz veinlets.

1-1-4 Consolidation of survey results

Nine (Trench-1 to Trench-9) NE-SW oriented trenches with a total length of around 204 meters were dug to complement the surface geology and drilling data. Six trenches have length ranging from 17-45 meters while three supplementary trenches have lengths of around 5 meters. The geology observed through the trenches is characterized by highly oxidized and schistosed volcano-sedimentary rocks cut by metagabbroic intrusives. These rocks generally have the schistosities showing NW-SE direction and are silicified and argillized around the mineralization zone. Some highly silicified zones are also present in all the trenches where numerous quartz veins with thickness ranging from 2 to 30 cm. Some veins are characterized by black staining due to oxidation which is probably of manganese. Some portions within the greenschist in all the trenches are affected by numerous oxidized quartz veinlets. The metagabbro is relatively strongly altered with high frequency of quartz veinlets than the greenschist, although the host rocks are difficult to distinguish due to the influence of tropical weathering.

The geological structure is characterized by NW-SE trending faults and folds which are cut by E-W and NE-SW trending faults (JICA and MMAJ, 1995). This trend is also recognizable within the trenches (Fig. 4). The extended directions of sheared zone and silicified zone generally follow the NW-SE trend, but some quartz veins yielding high gold grade have the E-W direction. The strongly argillized parts are recognizable within Trench-3, Trench-4 and Trench-6. A complicated development in the geological structure is reflected in the area because the fractures and quartz veins exhibit various directions.

As to mineralization, there are gold anomalies related to hydrothermal alteration and quartz veins throughout the whole series of trenches from Trench-1 to Trench-9. The direction of quartz veins is generally NW-SE and decreases in frequency in direction of N-S, E-W and NE-SW. The quartz veins with high Au grade, however, follow the NW-SE and E-W directions. Of particular interest is Trench-3 wherein the silicified zone contains 4.2 g/t Au and about 4 m in width. It seems that the silicified zone continues to N50° W direction. Therefore, the silicified zone with values of 1.3 to 4.7 g/t Au and about 3.5 m in width also exists within Trench-1. The quartz vein which contains 58.8 g/t Au and about 15 cm in width at the above-mentioned silicified zone in Trench-3, however, shows N75° E/85° NW in the dip-strike, and gold anomalies also continue to E-W direction considering the conditions of Trench-5 and Trench-6. Other notable gold occurrences are within the argillized zone having values of 1.5 g/t Au with about 2 m in width within Trench-4 and the quartz veinlets zone yielding values of 30.3 g/t Au and about 1 m in width within Trench-6.

The quartz veins are mainly divided into transparent and opaque varieties in the field. The latter are white to white with brown tinge. The white with brown tinge quartz veins which contains oxidized pyrite forming limonite and hematite mainly exhibit the high Au grade. Based on X-ray diffraction analysis, the quartz veins are generally composed of quartz, kaolinite, sericite, albite, chlorite, gibbsite, limonite, hematite and mix layered clays.

The homogenization temperatures of quartz fluid inclusions have the peak at around 200° C. In some places the clay parts close to the quartz veins yield higher Au grade than the quartz vein itself.

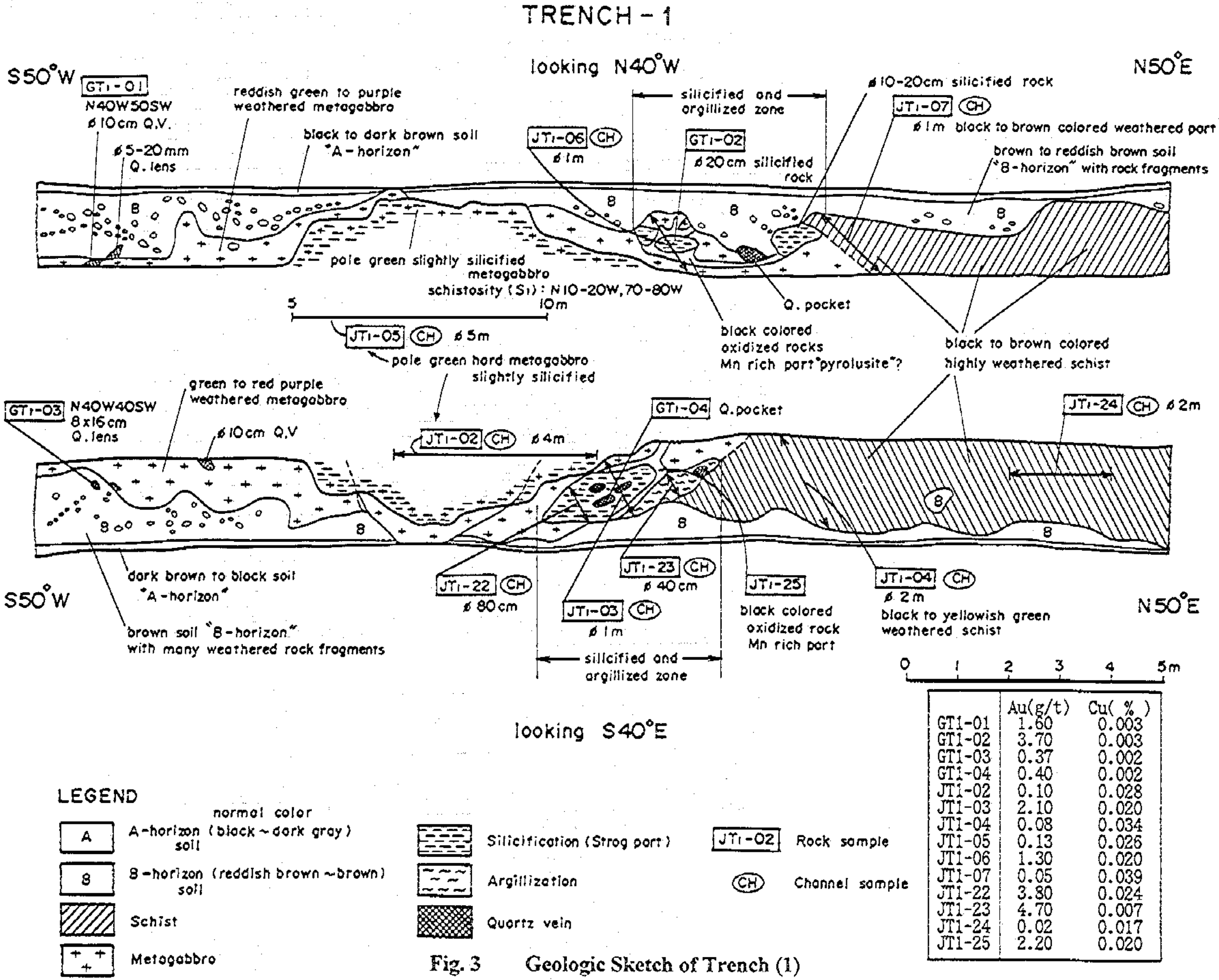
Based on the results of ore analysis, only Au has the high potential, though there are some samples yielding slightly high concentrations of Cu and Zn. The results of ore analysis were shown in Appendix-1.

1-1-5 Discussion

Silicified zones and quartz veins were recognized in all the trenches in Carorongan Area. Although it is hard to discern the host rocks because of the influence of alteration and tropical weathering, but taking into consideration the results of the drilling survey, it seems that the contact between the metagabbro and greenschist or the metagabbro itself were sheared by the fault activities, after which the silicified zone were formed by hydrothermal alteration. The Au grades of quartz veins generally correspond to the geochemical anomalies, though they have different Au values depending on the attitudes of the veins. The results show that the geochemical anomalies are related to the silicified zone with numerous quartz veins.

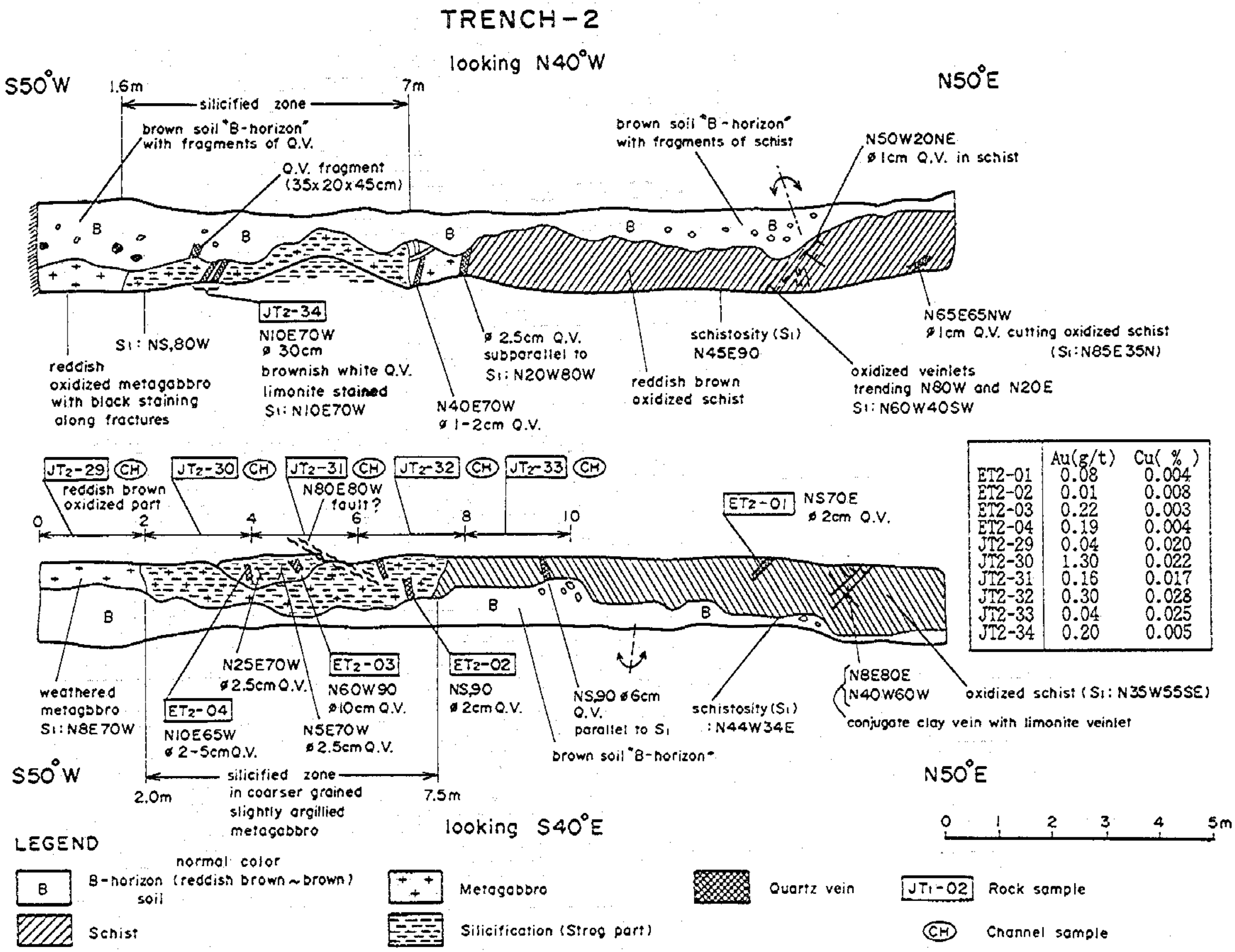
As it has been mentioned in the above survey results, the quartz veins with high Au grade trend NW-SE and in E-W directions. Of particular interest is Trench-3 wherein the silicified zone contains 4.2 g/t Au and about 4 m in width. It seems that the silicified zone continues to N50° W direction. Therefore, the silicified zone with values of 1.3 to 4.7 g/t Au and about 3.5 m in width also exists within Trench-1. The quartz vein which contains 58.8 g/t Au and about 15 cm in width at the above-mentioned silicified zone in Trench-3, however, shows N75° E/85° NW in the dip-strike, and gold anomalies also continue to E-W direction considering the conditions of Trench-5 and Trench-6. These facts may imply that a complicated process occurred where the NW-SE and E-W oriented faults intersected and are observable in and around Trench-3.

We have to consider the influence of supergene enrichment in the analytical results of the samples collected in the trenches because the gossan in which limonite and hematite occur are observed in all the trenches.



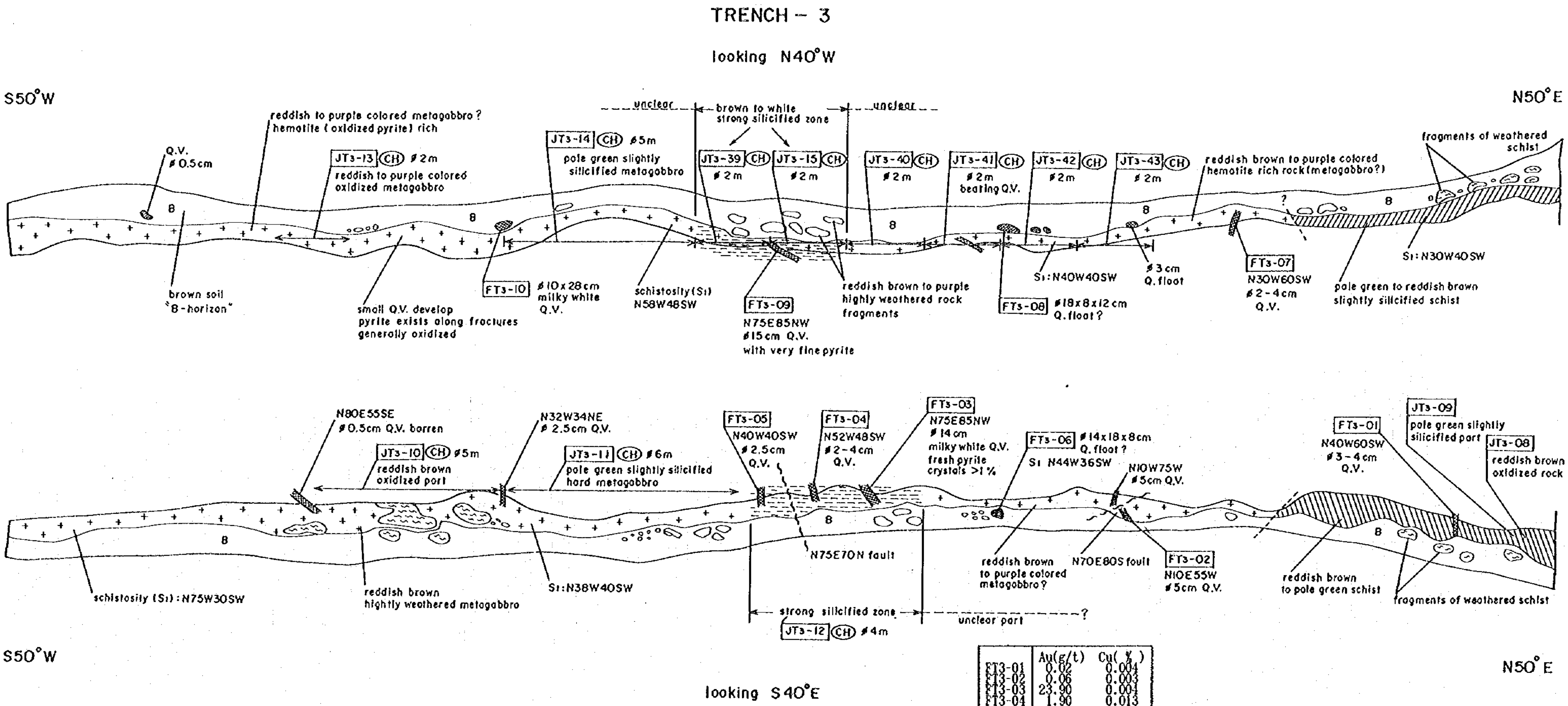
	Au(g/t)	Cu(%)
GT1-01	1.60	0.003
GT1-02	3.70	0.003
GT1-03	0.37	0.002
GT1-04	0.40	0.002
JT1-02	0.10	0.028
JT1-03	2.10	0.020
JT1-04	0.08	0.034
JT1-05	0.13	0.026
JT1-06	1.30	0.020
JT1-07	0.05	0.039
JT1-22	3.80	0.024
JT1-23	4.70	0.007
JT1-24	0.02	0.017
JT1-25	2.20	0.020

Fig. 3 Geologic Sketch of Trench (1)

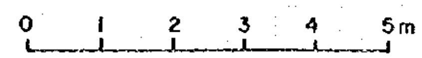


	Au(g/t)	Cu(%)
ET2-01	0.08	0.004
ET2-02	0.01	0.008
ET2-03	0.22	0.003
ET2-04	0.19	0.004
JT2-29	0.04	0.020
JT2-30	1.30	0.022
JT2-31	0.16	0.017
JT2-32	0.30	0.028
JT2-33	0.04	0.025
JT2-34	0.20	0.005

Fig. 3 Geologic Sketch of Trench (2)



	Au(g/t)	Cu(%)
FT3-01	0.02	0.004
FT3-02	0.06	0.003
FT3-03	23.90	0.004
FT3-04	1.90	0.013
FT3-05	0.45	0.004
FT3-06	56.60	0.008
FT3-07	6.50	0.022
FT3-08	1.80	0.005
FT3-09	58.80	0.009
FT3-10	44.60	0.006
JT3-08	0.02	0.049
JT3-09	<0.01	0.024
JT3-10	0.10	0.027
JT3-11	0.38	0.036
JT3-12	4.20	0.023
JT3-13	0.11	0.020
JT3-14	0.45	0.024
JT3-15	2.25	0.018
JT3-39	2.30	0.017
JT3-40	0.09	0.023
JT3-41	0.50	0.017
JT3-42	0.15	0.013
JT3-43	0.08	0.019



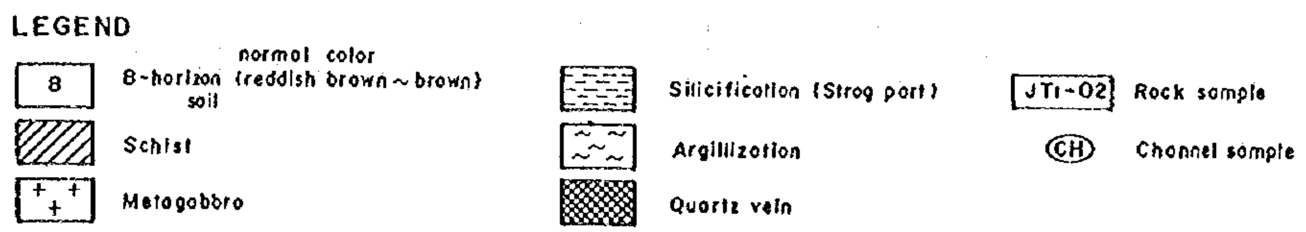
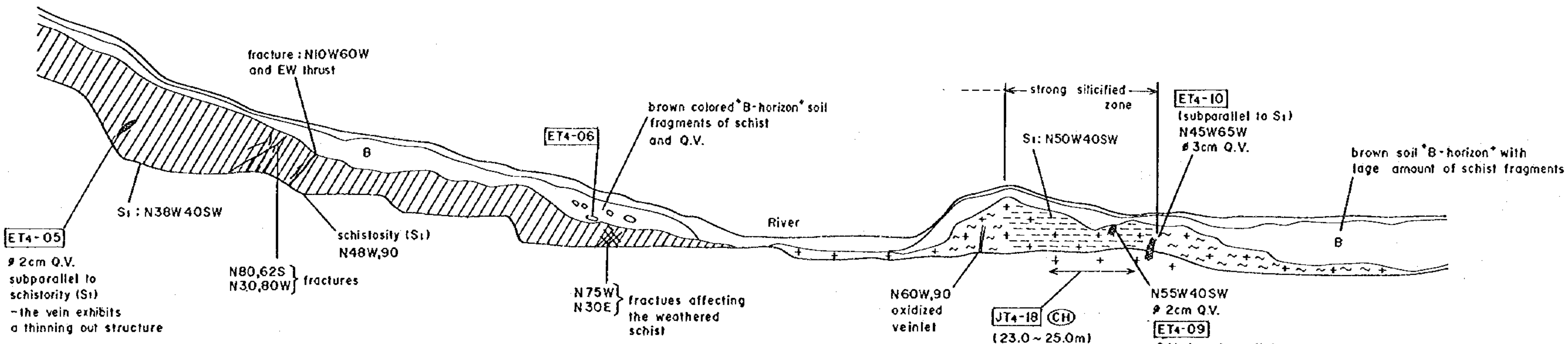


Fig. 3 Geologic Sketch of Trench (3)

TRENCH - 4



	Au(g/t)	Cu(%)		Au(g/t)	Cu(%)		Au(g/t)	Cu(%)		Au(g/t)	Cu(%)		Au(g/t)	Cu(%)
ET4-05	0.04	0.003	ET4-10	0.04	0.002	JT4-16	2.80	0.011	JT4-47	0.09	0.022	JT4-52	0.06	0.005
ET4-06	0.41	0.006	ET4-11	0.07	0.001	JT4-17	0.70	0.024	JT4-48	1.50	0.016	JT4-53	0.32	0.019
ET4-07	0.75	0.012	ET4-12	0.15	0.002	JT4-18	0.62	0.022	JT4-49	0.95	0.023	JT4-54	0.34	0.023
ET4-08	1.00	0.004	ET4-13	0.34	0.004	JT4-44	0.14	0.019	JT4-50	0.04	0.002	JT4-55	0.41	0.024
ET4-09	0.08	0.005	ET4-14	0.15	0.002	JT4-45	0.21	0.019	JT4-51	1.70	0.012	JT4-56	0.15	0.023

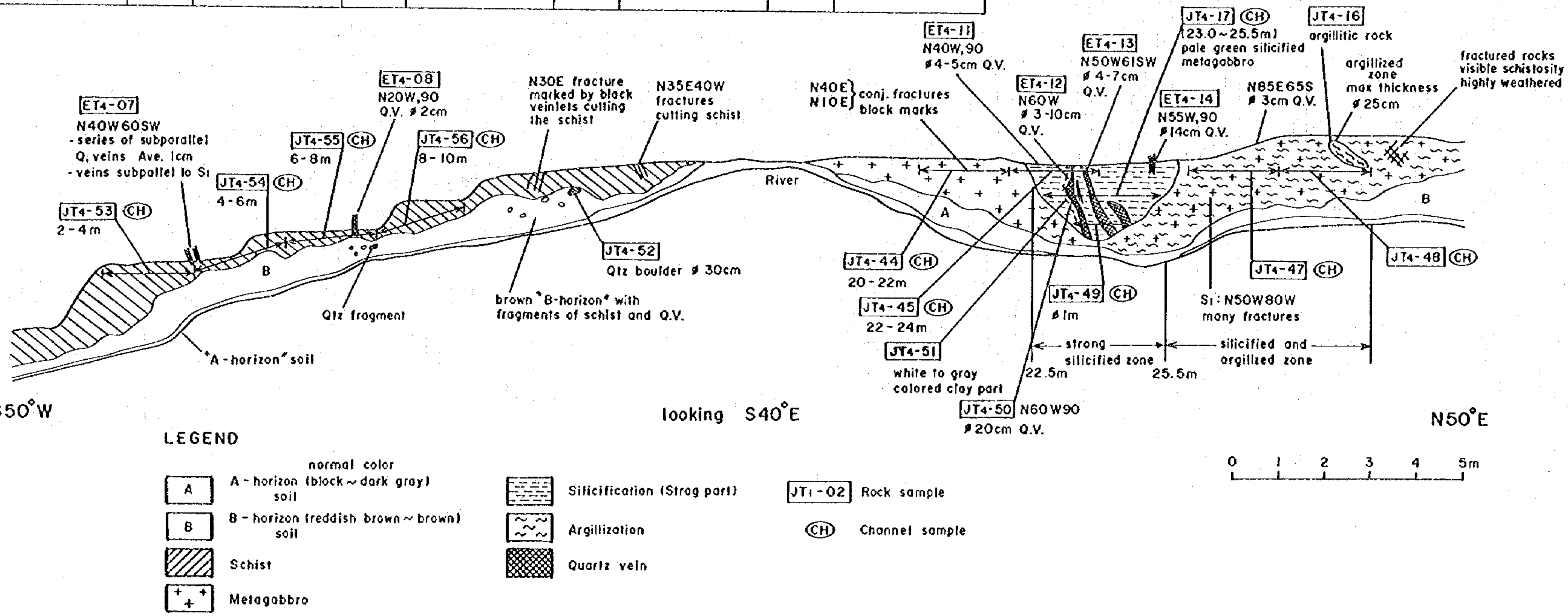
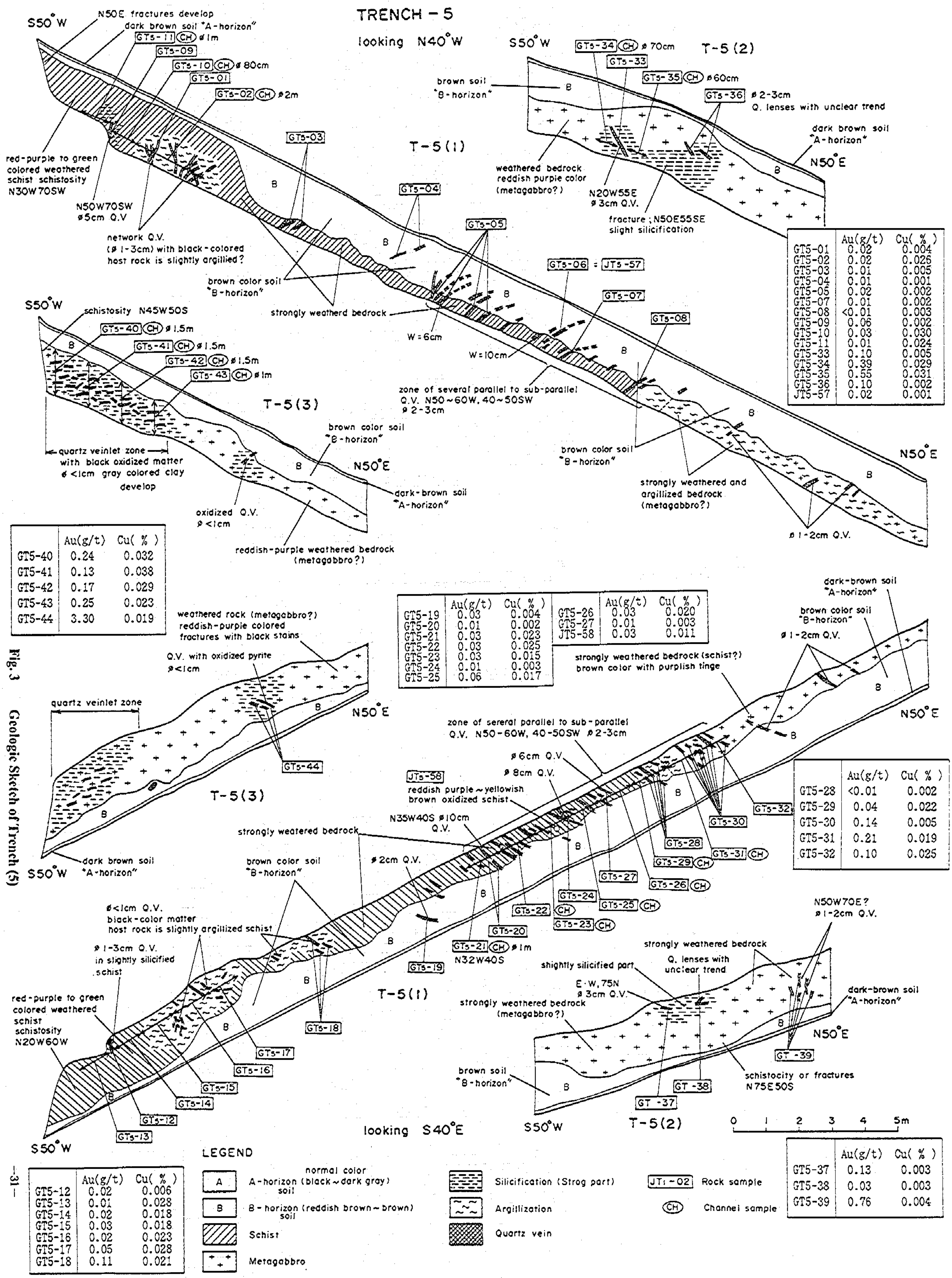


Fig. 3 Geologic Sketch of Trench (4)



	Au(g/t)	Cu(%)
GT5-01	0.02	0.004
GT5-02	0.02	0.026
GT5-03	0.01	0.005
GT5-04	0.01	0.001
GT5-05	0.02	0.002
GT5-07	0.01	0.002
GT5-08	<0.01	0.003
GT5-09	0.06	0.002
GT5-10	0.03	0.030
GT5-11	0.01	0.024
GT5-33	0.10	0.005
GT5-34	0.39	0.029
GT5-35	0.55	0.031
GT5-36	0.10	0.002
JT5-57	0.02	0.001

	Au(g/t)	Cu(%)
GT5-40	0.24	0.032
GT5-41	0.13	0.038
GT5-42	0.17	0.029
GT5-43	0.25	0.023
GT5-44	3.30	0.019

	Au(g/t)	Cu(%)
GT5-19	0.03	0.004
GT5-20	0.01	0.002
GT5-21	0.03	0.023
GT5-22	0.03	0.025
GT5-23	0.03	0.015
GT5-24	0.01	0.003
GT5-25	0.06	0.017

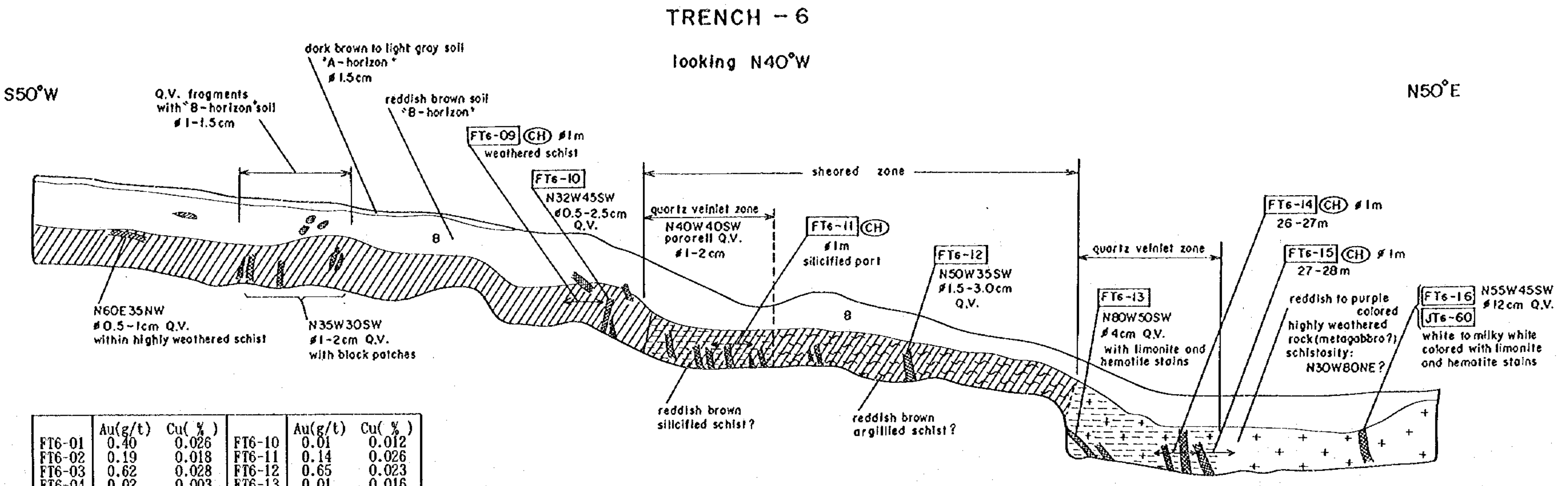
	Au(g/t)	Cu(%)
GT5-26	0.03	0.020
GT5-27	0.01	0.003
JT5-58	0.03	0.011

	Au(g/t)	Cu(%)
GT5-28	<0.01	0.002
GT5-29	0.04	0.022
GT5-30	0.14	0.005
GT5-31	0.21	0.019
GT5-32	0.10	0.025

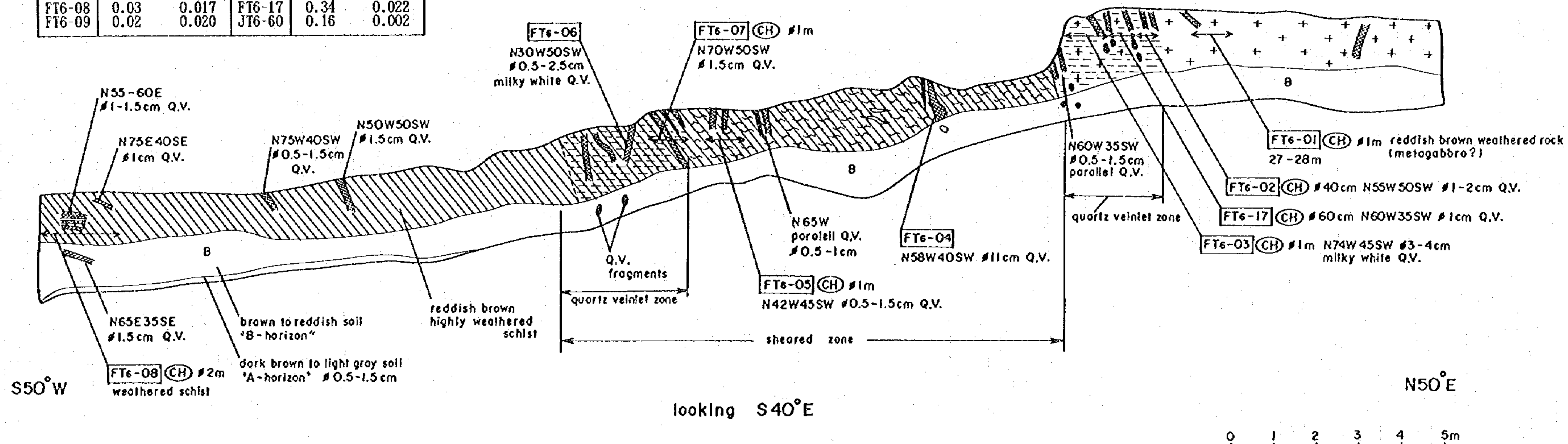
	Au(g/t)	Cu(%)
GT5-12	0.02	0.006
GT5-13	0.01	0.028
GT5-14	0.02	0.018
GT5-15	0.03	0.018
GT5-16	0.02	0.023
GT5-17	0.05	0.028
GT5-18	0.11	0.021

	Au(g/t)	Cu(%)
GT5-37	0.13	0.003
GT5-38	0.03	0.003
GT5-39	0.76	0.004

Fig. 3 Geologic Sketch of Trench (5)



	Au(g/t)	Cu(%)		Au(g/t)	Cu(%)
FT6-01	0.40	0.026	FT6-10	0.01	0.012
FT6-02	0.19	0.018	FT6-11	0.14	0.026
FT6-03	0.62	0.028	FT6-12	0.65	0.023
FT6-04	0.02	0.003	FT6-13	0.01	0.016
FT6-05	0.03	0.020	FT6-14	30.30	0.015
FT6-06	0.02	0.010	FT6-15	0.03	0.005
FT6-07	0.03	0.020	FT6-16	0.38	0.002
FT6-08	0.03	0.017	FT6-17	0.34	0.022
FT6-09	0.02	0.020	JT6-60	0.16	0.002



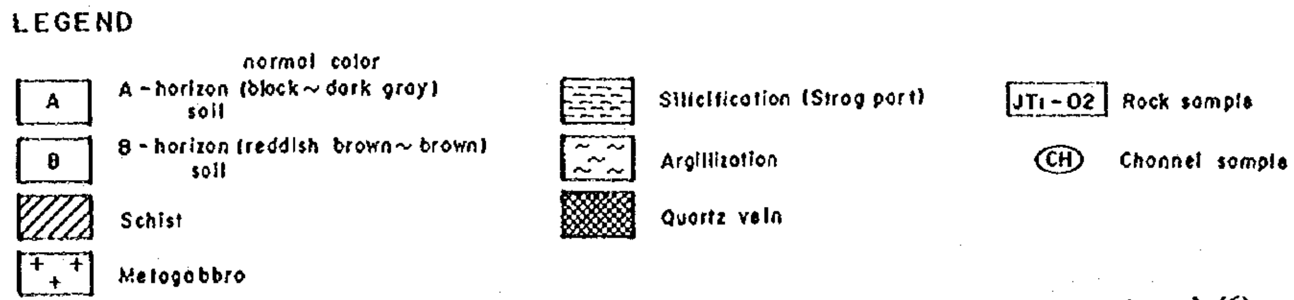
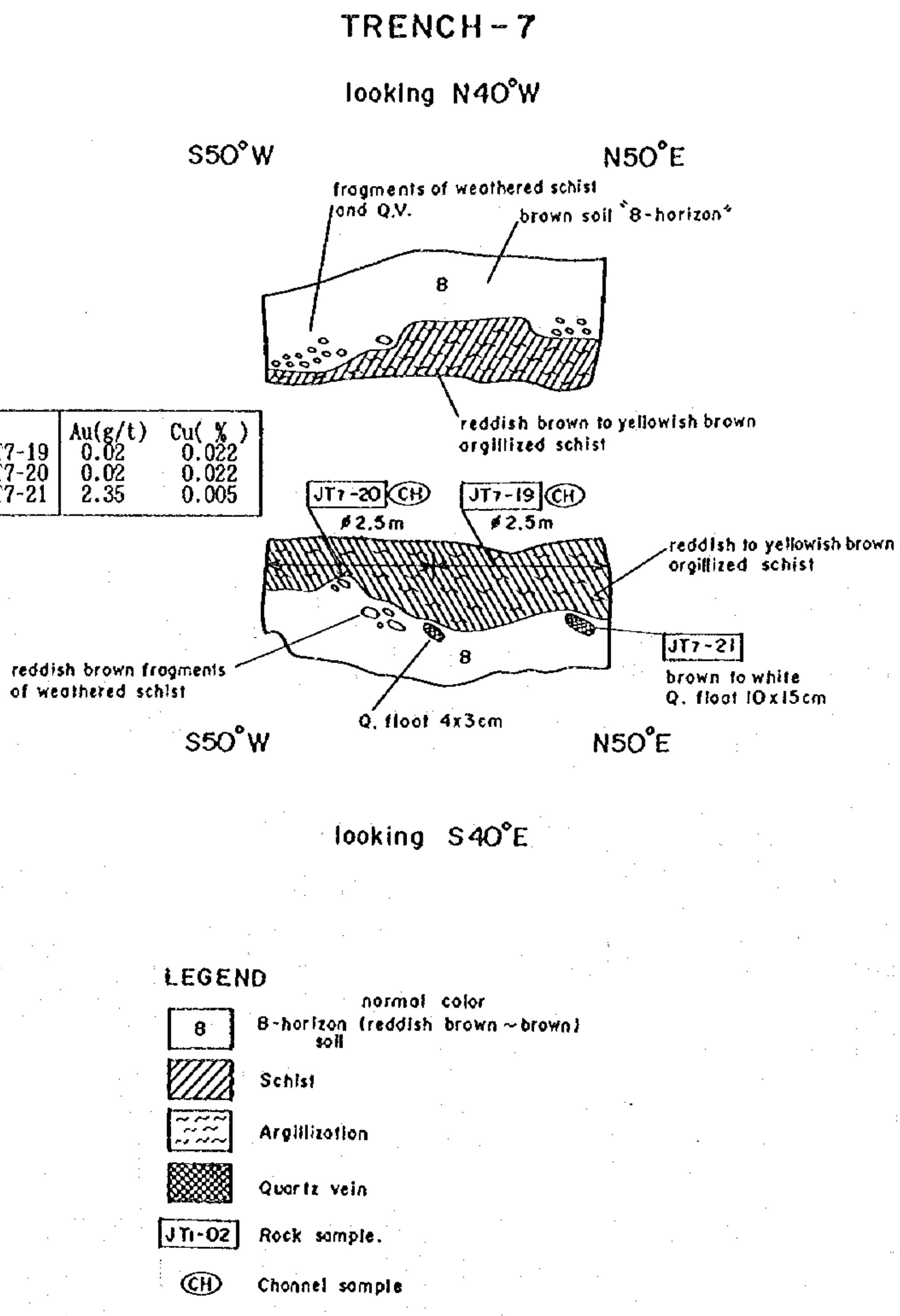


Fig. 3 Geologic Sketch of Trench (6)

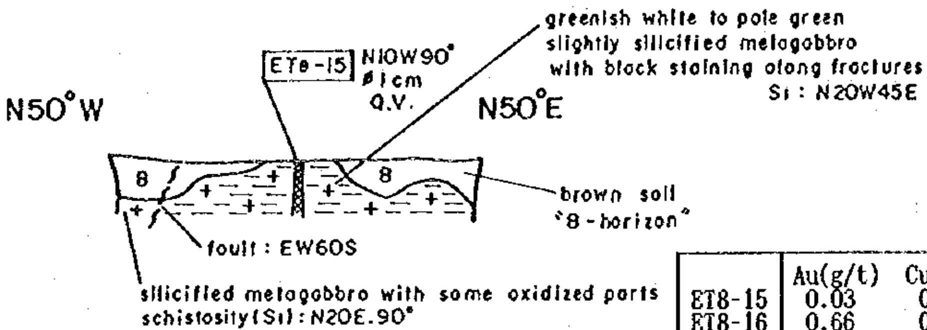


	Au(g/t)	Cu(%)
JT7-19	0.02	0.022
JT7-20	0.02	0.022
JT7-21	2.35	0.005

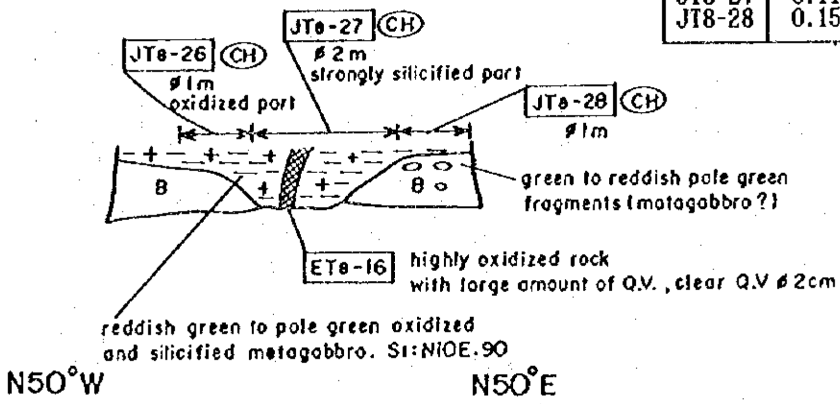
Fig. 3 Geologic Sketch of Trench (7)

TRENCH-8

looking N40°W



	Au(g/t)	Cu(%)
ET8-15	0.03	0.002
ET8-16	0.66	0.004
JT8-26	1.05	0.031
JT8-27	0.11	0.007
JT8-28	0.15	0.021



looking S40°E

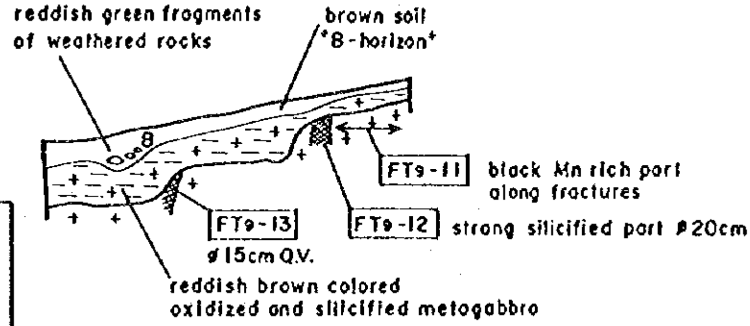
LEGEND

- 8 : B-horizon soil normal color (reddish brown~brown)
- + + : Metagabbro
- Silicification (Strog part)
- Quartz vein
- JTi-02 : Rock sample
- CH : Channel sample

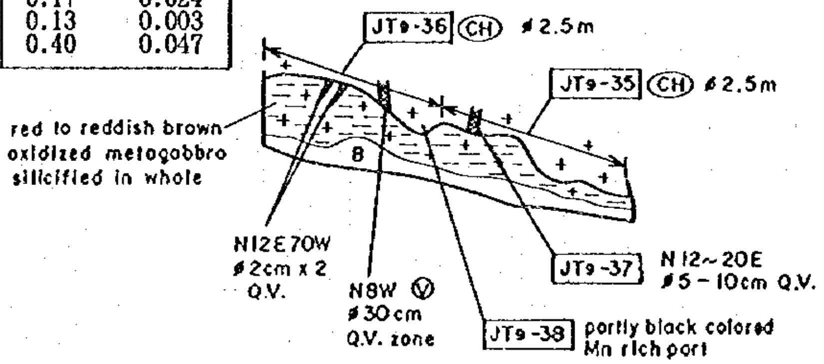
Fig. 3 Geologic Sketch of Trench (8)

TRENCH-9

looking N40°W



	Au(g/t)	Cu(%)
FT9-11	0.19	0.004
FT9-12	0.11	0.004
FT9-13	0.03	0.002
JT9-35	0.55	0.025
JT9-36	0.17	0.024
JT9-37	0.13	0.003
JT9-38	0.40	0.047



looking S40°E

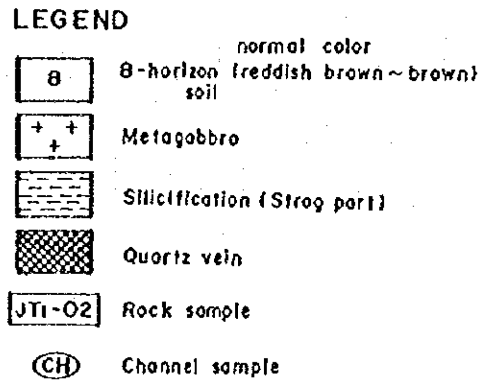


Fig. 3 Geologic Sketch of Trench (9)

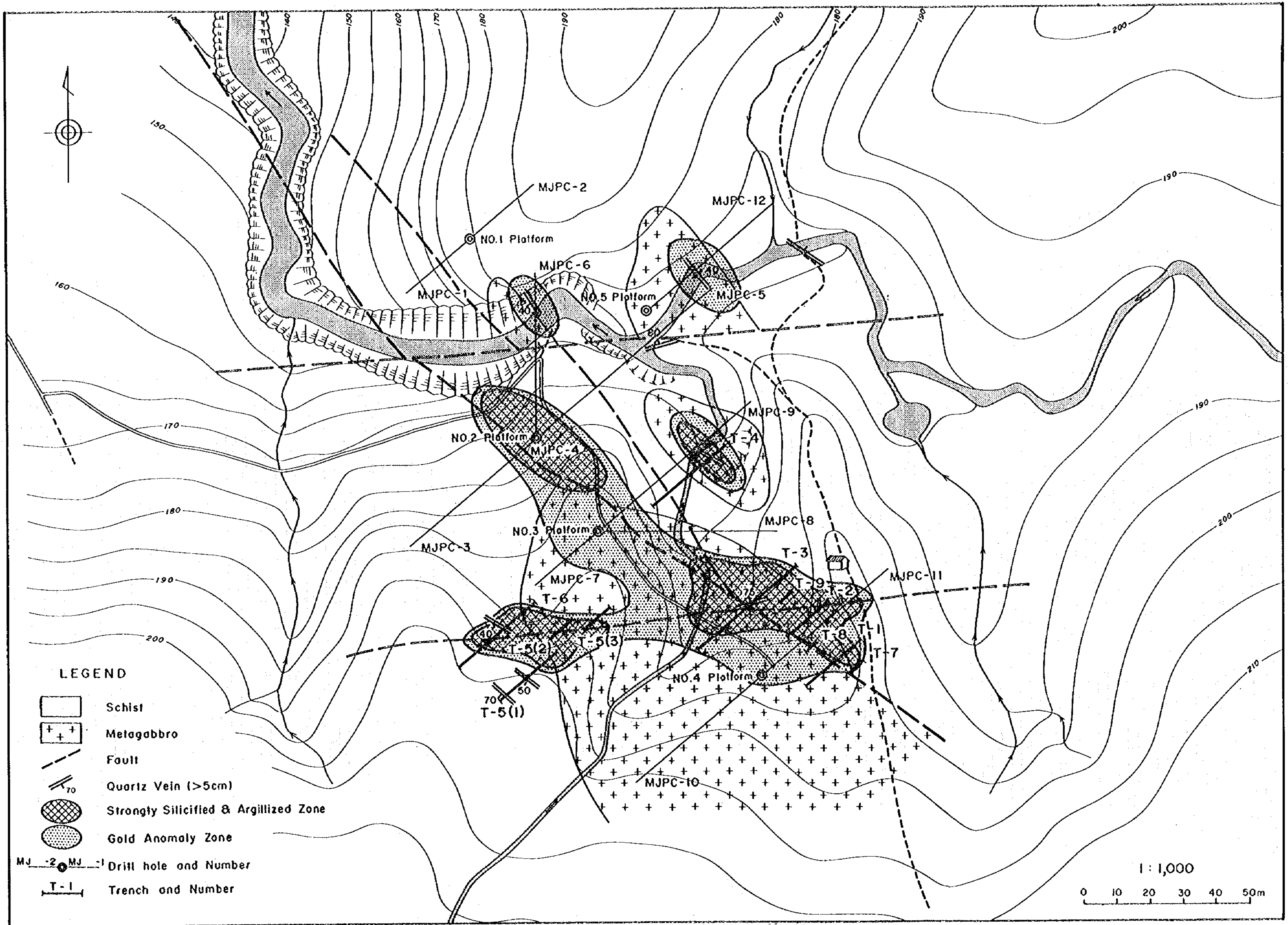


Fig. 4 Schematic Geologic Map and Mineral Occurrences in Carorongan Area

1-2 Drilling Survey

1-2-1 Purpose of the Survey

The survey was carried out in Carorongan Mineral Occurrence which was selected as potential area during the Second Phase Survey to explore and assess the mineralization zone of the area.

1-2-2 Contents of the Survey

The survey was undertaken by conducting some exploratory drilling in 12 holes on at least five sites totaling 1,104 m. The length of each drill core ranges from 50 to 132 m. The depths of the drill holes depend largely on the geology observed in each core during the drilling operation. Chip and channel samplings on the drill cores were undertaken for ore analysis, X-ray diffraction analysis and polished thin sections with a total of around 400 samples.

The investigation period for the drilling survey was from July 4 to October 10, 1995. The drilling activity was conducted over the period from July 10 to September 19, 1995. The drilling equipment, the conditions applied in the drilling work, drilling progress and drilling work for each hole were shown in Table 2, Table 3, Table 4 and Table 5, respectively.

Drilling was carried out with hole diameters of NQ and BQ; and the average core recovery rate is more than 90 % excepting the surface soil. Drilling efficiency varied greatly depending on the geological conditions; due in particular to the crumbling of holes in clay areas, and inundation in and around the fracture zone. Average drilling efficiency for individual holes ranged 3.88-12.53 m/working day, the overall average being 7.72 m/working day.

After the survey, the drilling cores were kept in the regional office No.5 of MGB at Legazpi City.

1-2-3 Results of the Survey

Geology, mineralization and ore grade of each drill hole are described as follows; The geologic columns were shown in Appendix-4. The geologic profiles of each drill hole were shown in Fig.5. Angles of bedding, schistosity and quartz vein in the geologic column are measured as follows; 0° : perpendicular to the long axis, 90° : parallel to long axis.

Table 2 Equipment of Drilling Survey

Item	Spec.	Total	1st	2nd	Remarks
Drilling machine			THC-1	THS-88	Set
Drilling pump	BEAN ROYAL 520	1	1		Set
〃	FMC 535	1		1	Set
Supply pump	BEAN ROYAL 520	1	0.5	0.5	Set
Mixing pump	CENTRI FUGAL	2	1	1	Set
Drilling rods	HQ	3		3	3.05m/rod
	NQ	70	27	43	3.05m/rod
	BQ	50	50		3.05m/rod
Inner tube assembly	NQ	4	2	2	Set
	BQ	2	2		Set
Core barrel assembly	NQ	4	2	2	Set
	BQ	2	2		Set
Casing	NW	18	6	12	3.05m/rod
	NW	3		3	1.50m/rod
	NW	4		4	0.50m/rod
	BW	30	30		3.05m/rod
Drilling depth	MJPC- 1	50.20	50.20		m
	MJPC- 2	50.40	50.40		m
	MJPC- 3	100.25	100.25		m
	MJPC- 4	100.25	100.25		m
	MJPC- 5	132.70	132.70		m
	MJPC- 6	100.25	100.25		m
	MJPC- 7	57.80		57.80	m
	MJPC- 8	110.50		110.50	m
	MJPC- 9	100.15		100.15	m
	MJPC-10	100.90		100.90	m
	MJPC-11	100.30		100.30	m
	MJPC-12	100.30	100.30		m
	Total	1104.00	634.35	469.65	m

Table 3 Articles of Consumption during Drilling Survey

Item	Spec.	Total	MJPC- 1	MJPC- 2	MJPC- 3	MJPC- 4	MJPC- 5	MJPC- 6	MJPC- 7	MJPC- 8	MJPC- 9	MJPC-10	MJPC-11	MJPC-12	Remarks
Diamond bit	NQ	28	2	2	2	5	2	2	1	3	3	2	3	1	
	BQ	7			1	1	2	1						2	
Reaming shell	NQ	13	1	1	2	1	1	1	1	1	1	1	1	1	
	BQ	5			1	1	1	1						1	
Casing shoe	NW	12	1	1	1	1	1	1	1	1	1	1	1	1	
Cement	bag	56	4	4	4	4	3	6	4	4	4	4	4	11	40Kg/bag
Bentonite	bag	46			7	2		2			23	1	3	8	22kg/bag
Quick Trol	kg	1,952	24	154	154	21	22	18.5	66	616	330	484	44	18.5	
Quick gel	kg	406					22			330		22	32		
Polymer	ℓ	54					13		9					32	
Diesel	ℓ	6,255	296	387	518.5	547	831	651.5	305	443	597	568	618.5	492.5	
Core box	box	175	8	8	15	18	19	16	9	17	17	16	17	15	

Table 4　Program of Drilling Survey

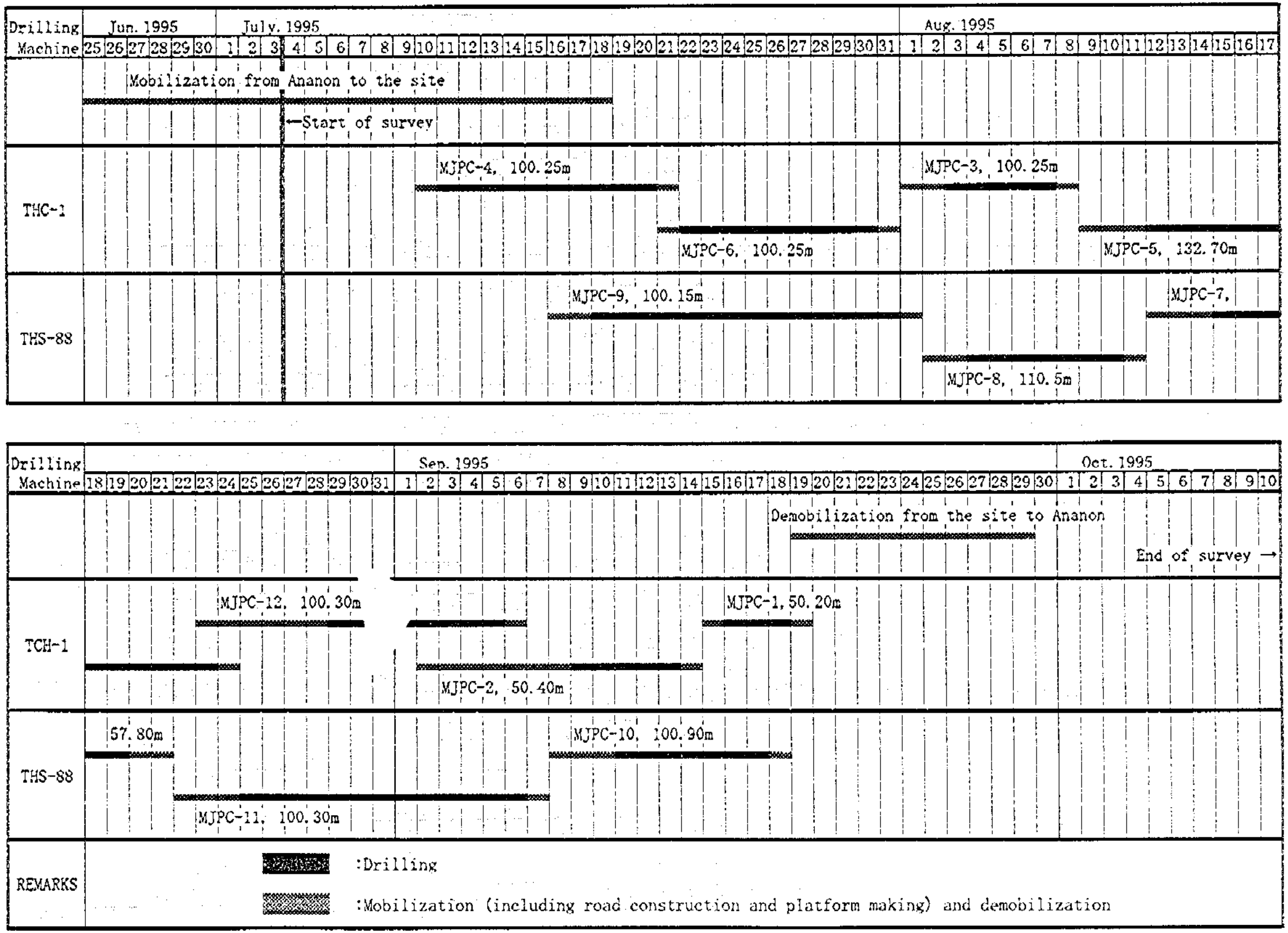


Table 5 Summary of Drilling Activity (1)

MJPC−1	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	9/15	3	1	2	10	1
DRILLING	9/16〜9/18	9	9	-	80	3
DEMOBILIZATION	9/19	3	1	2	10	1
TOTAL	9/15〜9/19	15	11	4	100	5
DEPTH PLANNED	50.00	(m)	DRILLING	16.73	(m/drilling day)	
DEPTH DRILLED	50.20	(m)	SPEED	10.04	(m/total working day)	
CORE LENGTH	45.90	(m)	CASING	18.00	NW CP (m)	
CORE RECOVERRY	91.43	(%)			NQ ROD (m)	

MJPC−2	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	9/ 2〜9/ 8	21	7	14	70	7
DRILLING	9/ 9〜9/13	15	15	-	140	5
DEMOBILIZATION	9/14	3	1	2	10	1
TOTAL	9/ 2〜9/14	39	23	16	220	13
DEPTH PLANNED	50.00	(m)	DRILLING	10.08	(m/drilling day)	
DEPTH DRILLED	50.40	(m)	SPEED	3.88	(m/total working day)	
CORE LENGTH	45.60	(m)	CASING	19.00	NW CP (m)	
CORE RECOVERRY	90.48	(%)			NQ ROD (m)	

MJPC−3	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/ 1〜8/ 2	6	2	4	20	2
DRILLING	8/ 3〜8/ 8	17	17	-	130	5.7
DEMOBILIZATION	8/ 8	1	1	-	10	0.3
TOTAL	8/ 1〜8/ 8	24	20	4	160	8
DEPTH PLANNED	100.00	(m)	DRILLING	17.59	(m/drilling day)	
DEPTH DRILLED	100.25	(m)	SPEED	12.53	(m/total working day)	
CORE LENGTH	92.76	(m)	CASING	10.00	NW CP (m)	
CORE RECOVERRY	92.53	(%)		57.00	NQ ROD (m)	

MJPC−4	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	7/10	3	1	2	10	1
DRILLING	7/11〜7/20	29	29	-	200	9.7
DEMOBILIZATION	7/20	1	1	-	10	0.3
TOTAL	7/10〜7/20	33	31	2	220	11
DEPTH PLANNED	100.00	(m)	DRILLING	10.34	(m/drilling day)	
DEPTH DRILLED	100.25	(m)	SPEED	9.11	(m/total working day)	
CORE LENGTH	98.98	(m)	CASING	12.00	NW CP (m)	
CORE RECOVERRY	98.73	(%)		70.00	NQ ROD (m)	

Table 5 Summary of Drilling Activity (2)

MJPC−5	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/ 9～8/11	9	3	6	30	3
DRILLING	8/12～8/23	36	28	8	274	12
DEMOBILIZATION	8/24	3	1	2	10	1
TOTAL	8/ 9～8/24	48	32	16	304	16
DEPTH PLANNED	100.00	(m)	DRILLING SPEED	11.06	(m/drilling day)	
DEPTH DRILLED	132.70	(m)		8.29	(m/total working day)	
CORE LENGTH	130.75	(m)	CASING	7.00	NW CP (m)	
CORE RECOVERRY	98.53	(%)		60.00	NQ ROD (m)	

MJPC−6	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	7/21	3	1	2	10	1
DRILLING	7/22～7/31	27	25	2	202	9
DEMOBILIZATION	7/31	3	1	2	10	1
TOTAL	7/21～7/31	33	27	6	222	11
DEPTH PLANNED	100.00	(m)	DRILLING SPEED	11.14	(m/drilling day)	
DEPTH DRILLED	100.25	(m)		9.11	(m/total working day)	
CORE LENGTH	98.98	(m)	CASING	7.00	NW CP (m)	
CORE RECOVERRY	98.73	(%)		58.00	NQ ROD (m)	

MJPC−7	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/12～8/14	9	3	6	30	3
DRILLING	8/15～8/19	15	14	1	150	5
DEMOBILIZATION	8/20～8/21	6	2	4	20	2
TOTAL	8/12～8/21	30	19	11	200	10
DEPTH PLANNED	50.00	(m)	DRILLING SPEED	11.56	(m/drilling day)	
DEPTH DRILLED	57.80	(m)		5.78	(m/total working day)	
CORE LENGTH	48.25	(m)	CASING	15.00	NW CP (m)	
CORE RECOVERRY	83.48	(%)			NQ ROD (m)	

MJPC−8	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/ 2～8/ 3	6	2	4	20	2
DRILLING	8/ 4～8/10	21	19	2	170	7
DEMOBILIZATION	8/11	3	1	2	10	1
TOTAL	8/ 2～8/11	30	22	8	200	10
DEPTH PLANNED	110.00	(m)	DRILLING SPEED	15.79	(m/drilling day)	
DEPTH DRILLED	110.50	(m)		11.05	(m/total working day)	
CORE LENGTH	91.31	(m)	CASING	24.00	NW CP (m)	
CORE RECOVERRY	82.63	(%)			NQ ROD (m)	

Table 5 Summary of Drilling Activity (3)

MJPC－9	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	7/16～7/17	6	2	4	20	2
DRILLING	7/18～7/31	42	38	4	310	14
DEMOBILIZATION	8/ 1	3	1	2	10	1
TOTAL	7/16～8/ 1	51	41	10	340	17
DEPTH PLANNED	100.00	(m)	DRILLING	7.15	(m/drilling day)	
DEPTH DRILLED	100.15	(m)	SPEED	5.89	(m/total working day)	
CORE LENGTH	73.40	(m)	CASING	32.00	NW CP (m)	
CORE RECOVERRY	73.29	(%)			NQ ROD (m)	

MJPC－10	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	9/ 8～9/10	9	3	6	30	3
DRILLING	9/11～9/17	21	19	2	180	7
DEMOBILIZATION	9/18	3	1	2	10	1
TOTAL	9/ 8～9/18	33	23	10	220	11
DEPTH PLANNED	100.00	(m)	DRILLING	14.41	(m/drilling day)	
DEPTH DRILLED	100.90	(m)	SPEED	9.17	(m/total working day)	
CORE LENGTH	88.55	(m)	CASING	24.00	NW CP (m)	
CORE RECOVERRY	87.76	(%)			NQ ROD (m)	

MJPC－11	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/22～8/24	9	3	6	30	3
DRILLING	8/25～9/ 6	39	27	12	256	13
DEMOBILIZATION	9/ 7	3	2	1	10	1
TOTAL	8/22～9/ 7	51	32	19	296	17
DEPTH PLANNED	100.00	(m)	DRILLING	7.72	(m/drilling day)	
DEPTH DRILLED	100.30	(m)	SPEED	5.90	(m/total working day)	
CORE LENGTH	89.65	(m)	CASING	19.00	NW CP (m)	
CORE RECOVERRY	89.38	(%)			NQ ROD (m)	

MJPC－12	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	8/23～8/28	18	4	14	50	6
DRILLING	8/29～9/ 5	24	19	5	236	8
DEMOBILIZATION	9/ 6	3	1	2	10	1
TOTAL	8/23～9/ 6	45	24	21	296	15
DEPTH PLANNED	100.00	(m)	DRILLING	12.54	(m/drilling day)	
DEPTH DRILLED	100.30	(m)	SPEED	6.69	(m/total working day)	
CORE LENGTH	98.10	(m)	CASING	7.00	NW CP (m)	
CORE RECOVERRY	97.81	(%)		60.00	NQ ROD (m)	

Table 5 Summary of Drilling Activity (4)

TRANSPORTATION	PERIOD	TOTAL TURNS	WORKIHG TURNS	DAY OFF TURNS	TURN WORKER	DAYS
MOBILIZATION	6/25～7/ 3	27	9	18	213	9 *1
MOBILIZATION	7/ 4～7/18	45	15	30	495	15 *2
DEMOBILIZATION	9/19～9/29	33	11	22	517	11
TOTAL	6/25～9/29	105	35	70	1225	35

*1 :including road constraction (9 days) and platform making (3 days)
*2 :including platform making (1 day)

Platform 1: This is the site of two drill holes: MJPC-1 and MJPC-2.

MJPC-1: The drill hole plunges 60 degrees towards S50° W with a total length of 50.20 m. This is generally characterized by medium to coarse-grained sandstone at its upper part up to a depth of 24.00 m. A highly silicified zone is present at the level of 16.45 to 18.10 m which is affected by pale orange to cream-colored dolomite-ankerite series minerals (hereafter, dolomite), white quartz and pyrite. The medium to coarse grained sandstone is then followed by a very coarse sandstone or lapilli tuff up to the end of the core with some minor intercalations of medium grained sandstone and siltstone. Highly silicified zones with pyrite crystals are present ranging from 29.00 to 35.75 m and from 41.55 to 43.40 m. Generally the whole core is affected by numerous quartz veinlets. Some faultings are also present in the cores as indicated by some fragments which contain some slickensides and the highly fragmented character of some layers. These faults are put at a depth of 20.00 to 24.00 m and 27.00 to 29.00 m. Generally the core is schistosed and is inclined at a range of 25-40 degrees.

Based on the results of ore analysis, values of 0.8 to 1.2 g/t Au were observed at depths of 16.45 to 21.55 m which correspond to the part from sheared zone to upper silicified zone. Each core yields values of 0.1 to 0.4 g/t at depths of 29.00 to 35.75 m, and values of about 0.3 g/t at depths of 41.55 to 43.40 m.

MJPC-2: The drill hole plunges 60 degrees towards N50° E with a total length of 50.40 m. This is characterized by siltstone and medium to coarse sandstone to at a depth of 21.35 m. This is followed by lapilli tuff with intercalations of fine sandstone and siltstone up to 36.00 m. The tuff is then turns into sandstone and siltstone with yellowish green and brownish black color up to 42.25 m. The lower part of the drill hole is represented by metagabbro which is also schistosed. Highly silicified portions are at around 42.25 to 46.50 m and contain some pyrite. Strong epidotization is present particularly on the coarser lapilli tuff layer. The lower part of the core from 25.00 m up to 49.00 m is affected by numerous white quartz veinlets where some contain minor pyrite. The core generally present a highly inclined schistosity (45-60 degrees some reaching around 90 degrees). Highly fragmented character and low core recovery at around 27.00 m suggest some faulting in this level and at around 33.00 to 35.00 m where fragments shows some slickensides.

Based on the results of ore analysis, values of 0.2 to 0.4 g/t Au were determined at a depth of 10.75 m from surface. It is, however, possible to be affected by supergene enrichment related to weathering and ground water activity.

Platform 2: This is the site of drill holes MJPC-3, MJPC-4, MJPC-5 and MJPC-6.

MJPC-3: The drill hole plunges 60 degrees towards S50° W with a total length of 100.25 m. The first 20.80 m of the core is represented by medium to coarse sandstone with minor lapilli tuff. A metagabbroic intrusive then cuts these schistosed sediments ranging from 20.80 to 28.55 m and partly intercalates with coarse sandstone. The metagabbro is then followed by intercalations of siltstone and fine to coarse sandstone up to 49.80 m. After this level the core is dominated by lapilli tuff with intercalations of coarse to very coarse sandstone which continues up to 73.60 m. The lower part of the drill hole is mainly characterized by siltstone and medium to coarse sandstone with minor lapilli tuff. The core is highly silicified on its upper portion up to around 36.50 m with high concentrations of sulfide minerals where pyrite sometimes occur as large as 0.5 cm. The zone is affected by numerous white quartz veins/veinlets with varying orientations. Some veins contain some cream colored dolomite along with minor chlorite which is usually younger than the white quartz vein with dolomite. Faulting are present within the core at around 23.00 to 26.00 m marked by the highly fragmented character of the core resulting in its poor recovery at this level. Shearing is also clear along some silicified portions at depths of 12.00 to 15.70 m and 33.30 to 36.65 m which suggests the presence of a fault along this portion.

Based on the results of ore analysis, a quartz vein of 20 cm width yields maximum values of 1.3 g/t Au at a depth of 20.60 to 20.80 m. Each of the above-mentioned silicified zones have values of 0.7 to 0.8 g/t Au at depths of 12.00 to 15.70 m, and values of 0.3 to 0.4 g/t Au at depths of 33.30 to 36.65 m.

MJPC-4: This is a vertical drill hole with a total length of 100.25 m. The first 19.60 m of the core is represented by medium to coarse sandstone and siltstone with minor lapilli tuff. A metagabbroic intrusive then cuts these schistosed sediments ranging from 19.60 to 28.40 m. The contact of the metagabbro is marked by a highly brecciated zone (probably hydrothermal breccia) with breccia clasts of sediments and minor metagabbro. The metagabbro is then followed by intercalations of siltstone and fine to coarse sandstone up to 43.80 m. After this level the core is dominated by lapilli tuff with intercalations of coarse to very coarse sandstone which continues up to 68.30 m. The lower part of the drill hole is mainly characterized by siltstone and medium to coarse sandstone with minor lapilli tuff. Numerous quartz veins/veinlets cut the core at the highly silicified zone which is situated at the upper part of the core, generally ranging from 10.00 to 26.00 m. The zone is similar to the silicified zone in MJPC-3 where white quartz veins are present with large amount of dolomite and pyrite. Strong epidotization is also discernible along the coarser lapilli tuff sequences. The drill core is generally schistosed, usually around 25-35 degrees, which is very clear within the lapilli tuff layer where the fragments are flattened due to metamorphism. Minor faulting are present in the drill hole mainly in the metagabbroic intrusive and along some silicified zones which present some shearing. Around 67.15 m shearing structures along the silicified zone are inclined at around 70 degrees.

Based on the results of ore analysis, values of 0.3 to 1.1 g/t Au were observed at depths of 6.00 to 11.10 m, and values of 0.2 to 0.4 g/t Au at depths of 18.60 to 25.90 m. The former is interpreted to be in a fault due to presence of strong alteration with high content of quartz and dolomite, though we can not discern the original rock because of the advanced alteration to almost soil. The latter corresponds to the breccia part of the contact between the metagabbro and sediments or the strong silicified part within the metagabbro. In the deeper part from around 25.90m, the Au grade suddenly decrease and strong epidotization is also discernible.

MJPC-5: The drill hole plunges 60 degrees towards N50° E with a total length of 132.70 m. The first 26.80 m of the drill core is mainly defined by interbeds of medium to coarse sandstone and interlaminated yellow green and brownish black siltstone. The metagabbroic intrusive is penetrated from 26.80 to 41.45 m with about 3 m chilled margin. After the metagabbro, interbedded coarse sandstone and the interlaminated yellow green to brownish black siltstone reappeared up to 60.45 m. This is followed by interbeds of lapilli tuff and coarse to very coarse sandstone with minor siltstone interbeds which continues up to 99.60 m. The lower part of the drill core is represented by interbeds of coarse sandstone and siltstone with minor lapilli tuff interbeds. The first 50.00 m of the core is generally silicified with distinctive presence of numerous white quartz veins with cream-colored dolomite and minute quartz veinlets. Highly silicified part within the metagabbro contains large amount of pyrite. Within the sedimentary sequence, some highly silicified zone with pyrite are also present. Strong epidotization is discernible on the coarser sediments and as interlaminations on the siltstone. Generally the sedimentary rocks within the drill core are schistosed with inclination ranging from 45 to 60 degrees with some reaching 70 degrees. Some faulting are also recognized in which major faults could be traced; one at around 50.00 m in which strong shearing is recognized within the silicified zone and the others around 68.00 to 68.40 m, 84.90 to 85.70 m and 106.60 to 114.80 m which is characterized by highly fragmented core recovery and presence of slickensides on some fragments.

Based on the results of ore analysis, the first 50.00 m yields values of 0.1 to 2.7 g/t Au. A roughly 4 m thick zone at depth of 26.80 to 30.85m corresponding to the strong silicified zone from the contact between metagabbro and sediments to the upper part of metagabbro a 1.5 g/t Au in average was determined. An associated quartz vein of 15 cm width has value of 1.1 g/t Au at a depth of 60.45 m, and the silicified sheared zone yields values of 0.2 to 0.4 g/t Au at depths of 68.00 to 69.50 m.

MJPC-6: The drill hole plunges 60 degrees towards north with a total length of 100.25 m. Interbeds of medium to coarse sandstone and siltstone are encountered at the first 28.80 m of the drill core. The metagabbroic intrusive is penetrated at a depth of 28.80 to 41.00 m with distinctive siderite and magnetite. The metagabbro is followed by interbeds of coarse sandstone and siltstone up to 59.10 m, then turns into coarser lapilli tuff and coarse to very coarse sandstone interbeds with minor siltstone up to 90.00 m. The lower part of the core is represented by interbeds of sandstone and siltstone. The core is highly silicified at the level ranging from 8.00 to 41.10 m with numerous dolomite - quartz veins/veinlets and large amount of pyrite. The character of the silicification is very similar to the silicified zone of MJPC-5. In this core, notably high silicification within the metagabbro was penetrated. Some minor silicification are penetrated at the level of 65.00 to 87.00 m within the sandstone, siltstone and lapilli tuff sequences. Strong epidotization is present at the deeper part of the core particularly at around 70.00 m up to the end of the core. The sedimentary part of the core is generally schistosed with inclination of 40-60 degrees with respect to the core. Faulting is also encountered within the core along highly silicified zones and some along the schistosed sedimentary rocks at around 57.00 m and 73.00 m.

Based on the results of ore analysis, values of 1.0 to 1.4 g/t Au were observed at depths of 4.70 to 8.00 m, values of 0.7 to 1.2 g/t Au at depths of 14.00 to 23.80 m and values of 0.2 to 0.4 g/t at depths of 33.30 to 41.10 m. The first high grade Au part is clearly affected by supergene enrichment related to weathering and ground water activity. The next high Au grade part at a depth of 14.00 to 23.80 m is characterized by strong dolomitizaton and sericitization, and it is curious to note that quartz is not recognized in the X-ray Diffraction Analysis. At a depth of 33.30 to 41.10 m, the silicified zone within the metagabbro is characterized by large amount of quartz and dolomite.

Platform 3: This is the site for drill holes MJPC-7, MJPC-8 and MJPC-9.

MJPC-7: The drill hole makes an angle of 60 degrees towards S50° W with a length of 57.80 m. The upper part of the core is characterized by interbeds of schistosed medium to coarse sandstone and siltstone which continues up to 42.55 m where the upper 20.40 m is highly weathered with some argillization. At a depth of 1.20 m to 19.80 m, it is possible that a metagabbro occurs because the strong argillization is mainly composed of kaolinite and sericite. The outcrop then turns into greenish gray, coarse grained metagabbroic intrusive up to 52.70 m. The core ends with the fine sandstone and siltstone interbeds. The core is slightly affected by quartz vein/veinlets which does not reveal the presence of any mineralization. Generally, the core is epidotized particularly at the lower part of the drill core. The core is schistosed with inclination of around 30-40 degrees. High fracturations leading to poor recovery is present at a depth of 28.60 to 48.60 m which maybe due to the presence of a fault in this level.

Based on the results of ore analysis, values of 0.2 to 0.6 g/t Au were observed at depths of 8.00 to 20.40 m with the strong weathering and argillization.

MJPC-8: The drill hole plunges 60 degrees towards east (E) with a total length of 110.50 m. The core begins with a highly weathered zone up to 20.50 m. The zone is coarse grained and might be metagabbro. This is followed by very coarse sandstone and lapilli tuff interbeds with minor fine to medium sandstone which extends up to 59.00 m. Yellow green and brownish black laminations of siltstone with medium sandstone interbeds are penetrated up to 81.25 m before the contact with the metagabbroic intrusive which is represented by a silicified zone. The metagabbro continues up to 106.25 m and contains siderite which are aligned subparallel to the schistosity. The lower part of the core cuts through the coarse sandstone and siltstone interbeds. From around 30.00 m, the core is affected by numerous quartz veins/veinlets with varying inclination but is generally sub-perpendicular to the schistosity. Numerous quartz veinlets are present within the metagabbro which also shows some silicification similar to the silicified zones of MJPC-5 and MJPC-6 and contains sulfide minerals. Epidotization is weak in this core and the schistosity is generally around 35-45 degrees with minor presence of lowly inclined schistosity (around 10 degrees). Faulting are present at around 20.50 to 36.05 m and 57.50 to 61.40 m as indicated by poor core recovery and the presence of slickensides on some fragments.

Based on the results of ore analysis, values of 2.3 g/t Au were observed at depths of 19.50 to 20.00 m, and values of 0.2 to 1.2 g/t Au at depths of 81.75 to 87.00 m. The former is within the strongly argillized part and is mainly composed of kaolinite and sericite. It seems that the high Au grade part is affected by the supergene enrichment related to the weathering and ground water activity. The latter corresponds to the contact between the metagabbro and sediments or the strongly silicified part within the metagabbro. At a depth of 83.20 to 84.20 m, Au content of 1.2 g/t occurs in quartz veinlets with large amount of pyrite. A spot sample in which limonite concentrate yields value of 2.6 g/t Au.

MJPC-9: The drill hole plunges 60 degrees towards N50° E with a total length of 100.15 m. Soil and highly weathered rock is penetrated up to 23.00 m. This continues into the lapilli tuff and medium to coarse sandstone interbeds with siltstone extending up to 61.00 m. The metagabbroic intrusive is then encountered at 79.10 m with notable siderite crystals. The lower part of the core is characterized by fine sandstone and siltstone and medium to coarse sandstone interbeds. Numerous quartz veinlets is present within the metagabbro which also present a strong silicification. Highly silicified zones reveal the presence of quartz veins/veinlets with high concentrations of dolomite and pyrite. Strong epidotization is mainly present on the sedimentary rock especially on the lapilli tuff layers. The core presents high inclination of schistosity ranging from 60 to 80 degrees. Faulting is also present at around 26.00 m, 56.00m and 78.00 m. The fault at around 78.00 m is also silicified and marks the contact between the lower part of metagabbro and sediments.

Based on the results of ore analysis, values of 1.9 g/t Au were observed at depths of 7.00 to 10.00 m and values of 0.7 to 1.3 g/t Au at depths of 16.00 to 22.00 m. Besides the strongly sheared zone at depths of 55.10 to 58.00 m the gold content is 0.2 to 0.3 g/t. The metagabbro and its contacts with sediments at depths of 59.85 to 79.10m yield values of 0.1 to 0.8 g/t Au. Content of 0.8 g/t Au was observed at the contact between the lower part of the metagabbro and sediments at a depth of 78.20 to 79.10 m and at the deeper level, the mineralization yields value of 1.2 g/t Au at a depth of 83.20 to 84.20 m within the MJPC-8.

Platform 4: This is the site of drill holes MJPC-10 and MJPC-11.

MJPC-10: The drill hole makes an angle of 60 degrees towards S50° W with a total length of 100.90 m. The upper 18.00 m is characterized by highly weathered rock which is followed by a greenish coarse metagabbro up to 33.35 m suggesting that the highly weathered part is most probably metagabbro also. The metagabbro is followed by interbeds of coarse sandstone and siltstone interbeds up to 48.65 m. This grades into a very coarse sandstone or lapilli tuff and siltstone dominated sandstone/siltstone/shale interbeds up to 73.70 m. Another metagabbroic intrusive is then penetrated which extends up to 88.25 m with about 1.0 m chilled margin. The deeper part of the core is represented by medium to coarse sandstone and siltstone interbeds with minor very coarse sandstone and lapilli tuff. The drill core is generally affected by numerous quartz veins/veinlets particularly along strongly silicified sequence. Highly silicified zones occur within the coarse sandstone and siltstone interbeds at around 36.00, 38.00 and 42.00 m and usually with pyrite dissemination. Strong silicification is also recognized within the deeper metagabbro intrusive with large amount of sulfide minerals generally pyrite at around 81.00 to 85.50 m. The type of mineralization is similar to the silicified zones of MJPC-5. Epidotization is not so strong in this core except for some layers within the laminated shale. The core generally presents low angle of schistosity (10-30 degrees) which is subparallel to the bedding. No major fault is penetrated within this core except for some minor faulting at around 88.25 m and 92.00 m. The upper part of the core is highly fractured which could be due to the presence of faults.

Based on the results of ore analysis, values of 0.2 to 0.6 g/t Au were observed at depths from surface down to 8.65 m and associated with the strong weathering. Values of 0.2 to 1.6 g/t Au were observed at depths of 20.70 to 33.35 m corresponding to the strongly silicified zone from the lower part of metagabbro to the footwall in contact with sediments. Value of 2.8 g/t Au was recognized at strongly silicified part at a depth of 38.45 to 38.85 m.

MJPC-11: This drill hole plunges 60 degrees towards N50° E with total length of 100.30 m. The core starts with the metagabbro observable up to 58.55 m. The lower part of the core is generally characterized by interbeds of medium to coarse sandstone and laminated shale/siltstone intercalations. A small metagabbro dike is penetrated at 76.50 to 82.60 m cutting the sandstone/siltstone/shale interbeds. Numerous quartz veins/veinlets are present within the entirety of the drill core with higher concentrations within highly silicified zones. Strong silicification with large amount of pyrite is mainly confined on the upper metagabbro sequence particularly around 27.00, 41.50 and 51.90 m. Epidotization is slightly stronger on the deeper part of the core from 82.60 m up to the end of the core. The schistosity is highly inclined ranging from 45 to 60 degrees on the upper part of the core and around 30 degrees on the deeper part within the sedimentary rocks. Faulting is discerned from the highly fractured character and poor recovery of the core around 30.85 to 35.25 m within the metagabbro. A 1 m fault zone is also penetrated at around 70.00 m.

Based on the results of ore analysis, the core yields values of 0.1 to 0.4 g/t Au as a whole. A concentration of about 0.8 g/t Au is recognized at depths from surface down to 6.0 m because of the supergene enrichment. The strongly silicified zone within the metagabbro yields relative high value of 0.6 g/t Au.

Platform 5: This is the site of MJPC-12 which inclines 60 degrees to the N50° E with a total length of 100.30 m.

MJPC-12: The drill core starts with the medium to coarse sandstone to 18.15 m in depth and then turns into laminated yellow green and brownish black shale where the brownish black shale predominates. These fine sediments continue up to a depth of 39.00 m and in contact with coarse greenish gray metagabbro. The lower boundary of the metagabbro is 52.65 m where it is in contact with interbeds of fine to medium sandstone and yellow green/brownish black shale extending to a depth of 72.00 m. The deeper part of the core has penetrated the lapilli tuff with interbeds of very coarse sandstone. Quartz veins/veinlets are in higher concentrations within the metagabbroic intrusive and within or near highly silicified zones in the sedimentary rocks and the veins usually cuts the schistosity. A 15 cm thick quartz vein is penetrated at around 8.25 m with dolomite and minor chlorite. A 15 - 35 cm thick highly silicified zones occur within the sedimentary host rock at depths of 18.25 to 19.75 m, 35.50 m and 58.50 m. Within the metagabbro, highly silicified zones of 10 to 45 cm in thickness occurs at around 39.75 m, 41.80 m and 44.65 m. Silicified zones usually contain sulfide minerals usually pyrite. Slightly strong epidotization is clear within the deeper part of the core from 60.00 to 92.55 m and particularly in the lapilli tuff layer. The core is generally schistosed including the metagabbro with inclination of around 45 to 60 degrees and is subparallel to the bedding of the sedimentary sequences. Minor faulting are recognized within the drill core and some of these faults became zones of silicification (18.25-19.75 m) as suggested by the high degree of shearing within the silicified zones. Some microfaults are also present as suggested by some small displacement of quartz veinlets.

Based on the results of ore analysis, a quartz vein of 15 cm width yields value of 0.1 g/t Au at a depth of 8.25 m.

1-2-4 Consolidation of survey results

(1) Geology; Based on the data from the surface geology, trenches and log of the drill cores, we could recognized at least two major lithofacies. One is the host metamorphosed sedimentary rocks which is generally characterized by interbeds of lapilli tuff, sandstone of varying grain sizes and laminated yellow green to brownish black shale/siltstone. These volcano-sedimentary sequences are generally folded with and in some cases suggesting tight folding. The other rock formation is the greenish gray metagabbro intrusive with notable presence of siderite and magnetite. It is notable that some parts of the metagabbro also shows some schistosed structures suggesting that during metamorphism of the volcano-sedimentary sequence, the metagabbro was already intruded. Since the metagabbro was also affected by mineralization and usually cut by numerous quartz veins/veinlets, a younger intrusive would have been present in the area (probably the equivalent of Batalay Intrusives). This younger intrusive was the one responsible for the mineralization in the area.

The greenschist originates from shale, siltstone, sandstone and lapilli tuff which have basaltic composition. The schistosities generally trend NW-SW subparalleling the fault sheared zone. From microscopic observations, though it is highly altered and the ratio of the rock forming minerals was different from the original rock, the greenschist is mainly composed of albite, quartz, chlorite, epidote, sericite and carbonates with small amount of amphiboles, pyrite, magnetite and chalcopyrite. From the results of X-ray diffraction analysis, smectite is often recognized in the rock.

Frequently the metagabbro has the schistosities subparalleling the sheared zone as well as the greenschist. Most of the metagabbro, occurring in the form of sheets in the Catanduanes Formation, occur as strata. When it is observed with the naked eye, the metagabbro is hard to distinguish from the coarse sandstone and lapilli tuff of the Catanduanes Formation because it is strongly altered in the area. From microscopic observations, the metagabbro is mainly composed of albite, chlorite, epidote, carbonates and quartz with generally small amount of sericite, orthopyroxene, clinopyroxene, siderite, pyrite, magnetite, hematite and chalcopyrite. From the results of chemical analysis, the content of SiO_2 in the slightly altered metagabbro ranges from 41.96 % (MJPC-5, 33.15 m) to 46.89 % (MJPC-3, 18.85 m) corresponding to the ultrabasic to basic compositions (Table 16). Some gabbroic rocks similar to the metagabbro yield ages of 82.85±2.6 Ma (ER-120), 95.35±5.7 Ma (HR-028) corresponding to the Cretaceous ages.

(2) Mineralization; From the results of drilling survey, the silicified zones delineated on the surface were found to continue to deeper levels. The strongly silicified zone continues from the surface to about 30 m below as observed in 4 holes (MJPC-3, 4, 5, 6) which were carried out on platform 2. The other silicified zone occurs at deeper levels (44 - 86 m below the surface) than the above-mentioned silicified zone and was recognized in the holes MJPC-8 and 9 that were carried out on platform 3. The major portion of the mineralization usually occurs within the metagabbro intrusives and near the contacts between the metagabbro and the host schistosed volcano-sedimentary sequences (Fig. 5).

Based on the results of ore analysis, only Au has the high potential, though there are some samples containing slightly high concentrations of Cu and Zn. As to the Au grade, the samples yield values of 1.5 g/t (MJPC-5, 26.80 - 30.85 m) in the silicified zone at shallower levels and values of 1.2 g/t (MJPC-8, 83.20 - 84.20 m) in the silicified zone at deeper levels.

The gold mineralization in Carorongan Area is characterized by silicification with strong carbonatization, sericitization and pyritization. Epidotization was generally recognized around the silicified zone, especially at deeper levels. The following characteristics are very notable regarding the occurrences of iron-bearing minerals and carbonates; the iron-bearing minerals are generally composed of pyrite while the carbonates are mainly composed of dolomite - ankerite series minerals in the high Au zone; whereas in the low Au zone the iron-bearing minerals are generally composed of magnetite or hematite, while the carbonates are mainly composed of calcite. Based on the results of bulk analysis, the weight percentage of SiO_2 of the strongly silicified zone increase only by about 10 %. It seems that the other elements were also transported or moved in small amount. Therefore, it is assumed that the carbon dioxide and sulfur originating from H_2S were mainly added to the mineralization zone by hydrothermal fluids.

The homogenization temperatures of quartz fluid inclusions have the peak at around 250 - 300° C and tend to be higher by about 50° C than the trench samples.

The results of ore analysis were shown in Appendix-1.

1-2-5 Discussion

The metagabbro is relatively strongly altered with attendant gold mineralization than the greenschist of Carorongan Area. The brittle lithologic character (usually brecciated) of the metagabbro during an earlier deformational phase due to faulting and folding might have serve as good sites for mineralization. It seems that some parts of the faults have accomplished the role as paths for mineralization fluids. These suggest that tectonism (faulting and folding) in Carorongan Area has contributed to the mineralization that occurred.

As to the origin of the gold, although the data were not enough to discuss it at the present, but taking into consideration the data presented, the gold might have originated from the Catanduanes Formation which was mainly composed of mafic materials or from the metagabbro which intruded during Cretaceous ages. The later volcanic activity related to Batalay Intrusives, however, may have contributed on the final stage of gold mineralization because the metagabbro had already been affected by a strong hydrothermal alteration.

It seems that the ore deposits recognized in this survey is sub-economical to develop at present because the deposits are slightly low gold grade as a whole and of limited size particularly concerning the high gold portions. It is notable, however, that the gold contents of the metagabbro tend to be more than 0.1 g/t where the metagabbro was altered. Therefore, Carorongan Area and its vicinity must have a huge gold potential. At present, it is difficult to conclude whether the area was the center of hydrothermal activity which brought about the gold mineralization or not.

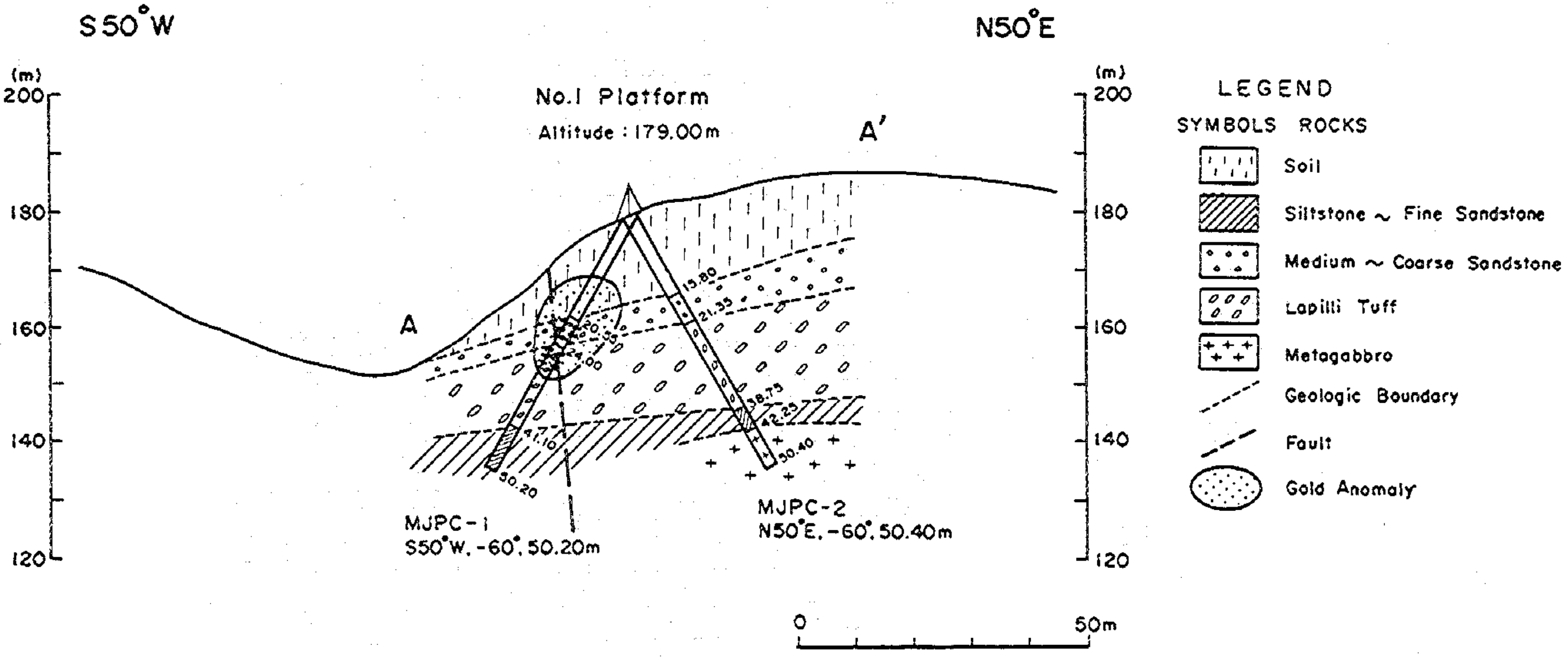


Fig. 5 Geologic Profile of Drilling (1)

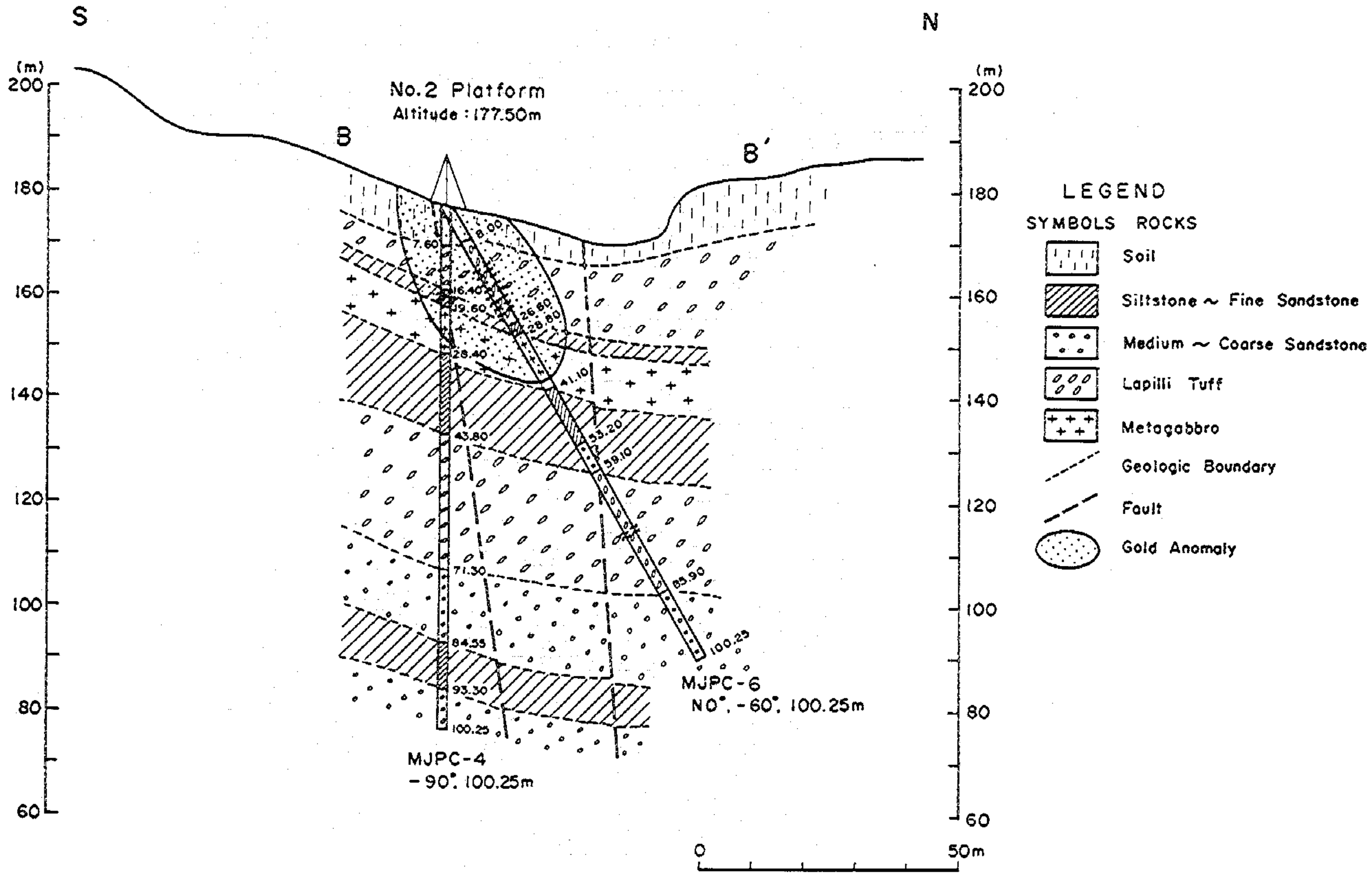


Fig. 5 Geologic Profile of Drilling (2)

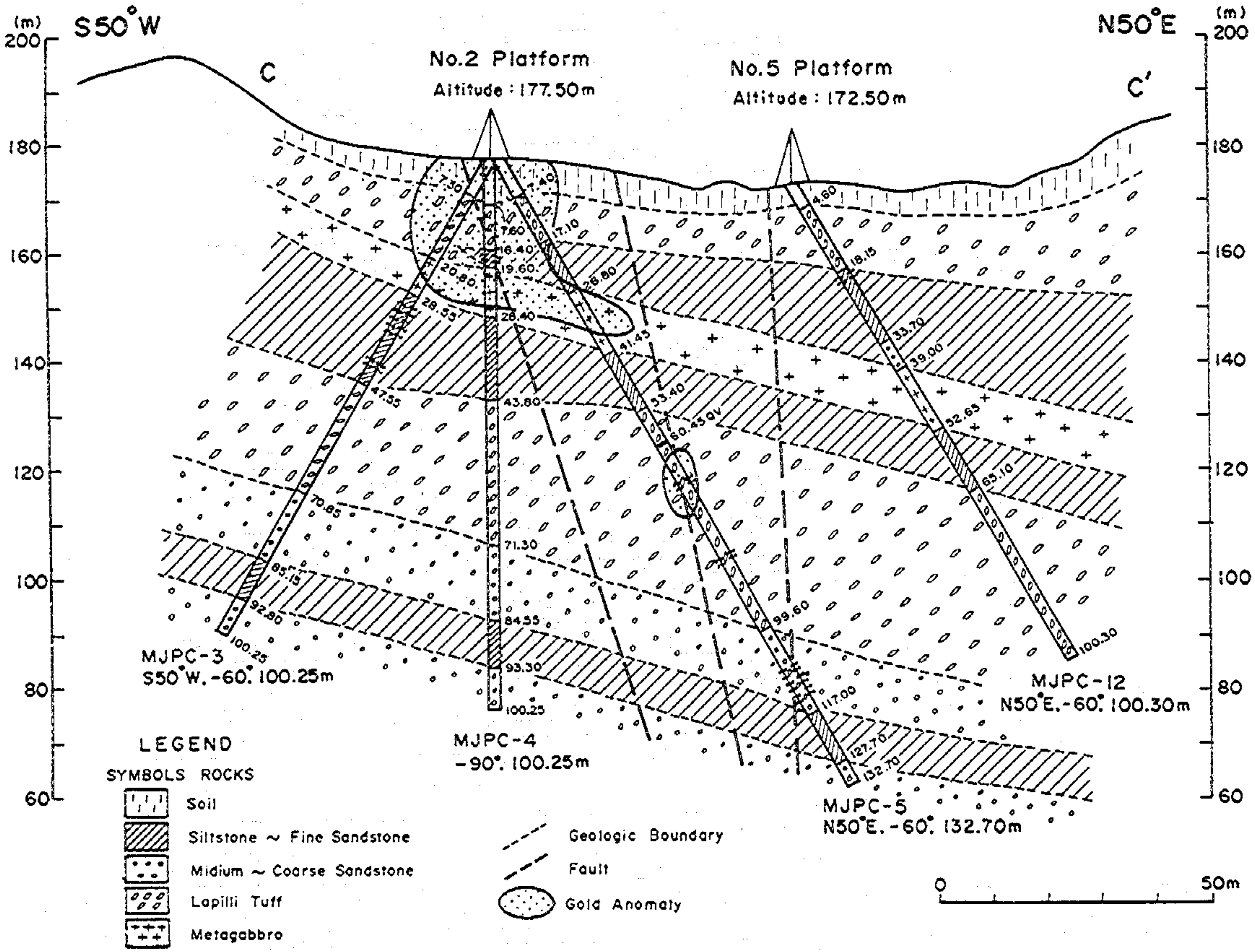


Fig. 5 Geologic Profile of Drilling (3)

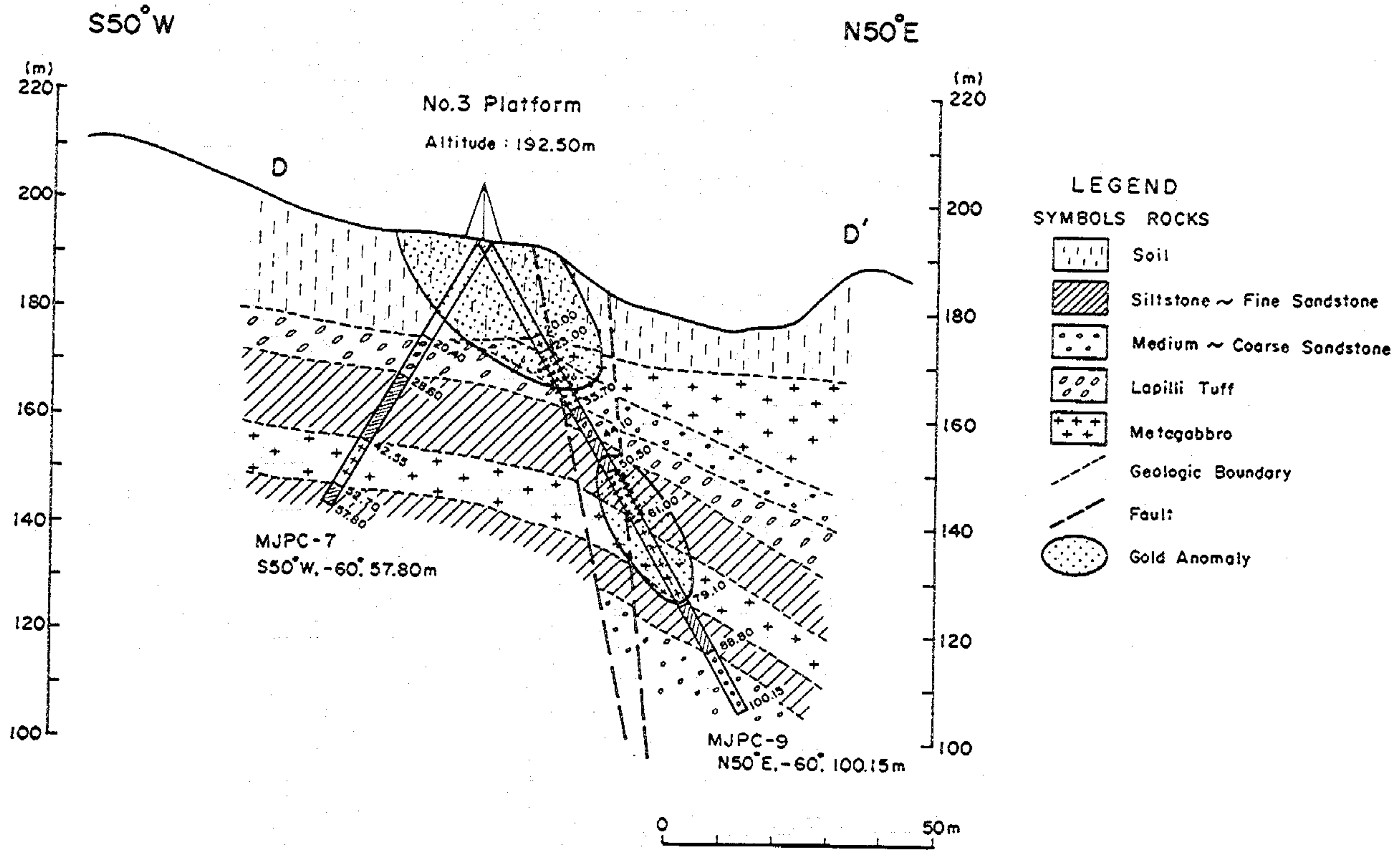


Fig. 5 Geologic Profile of Drilling (4)

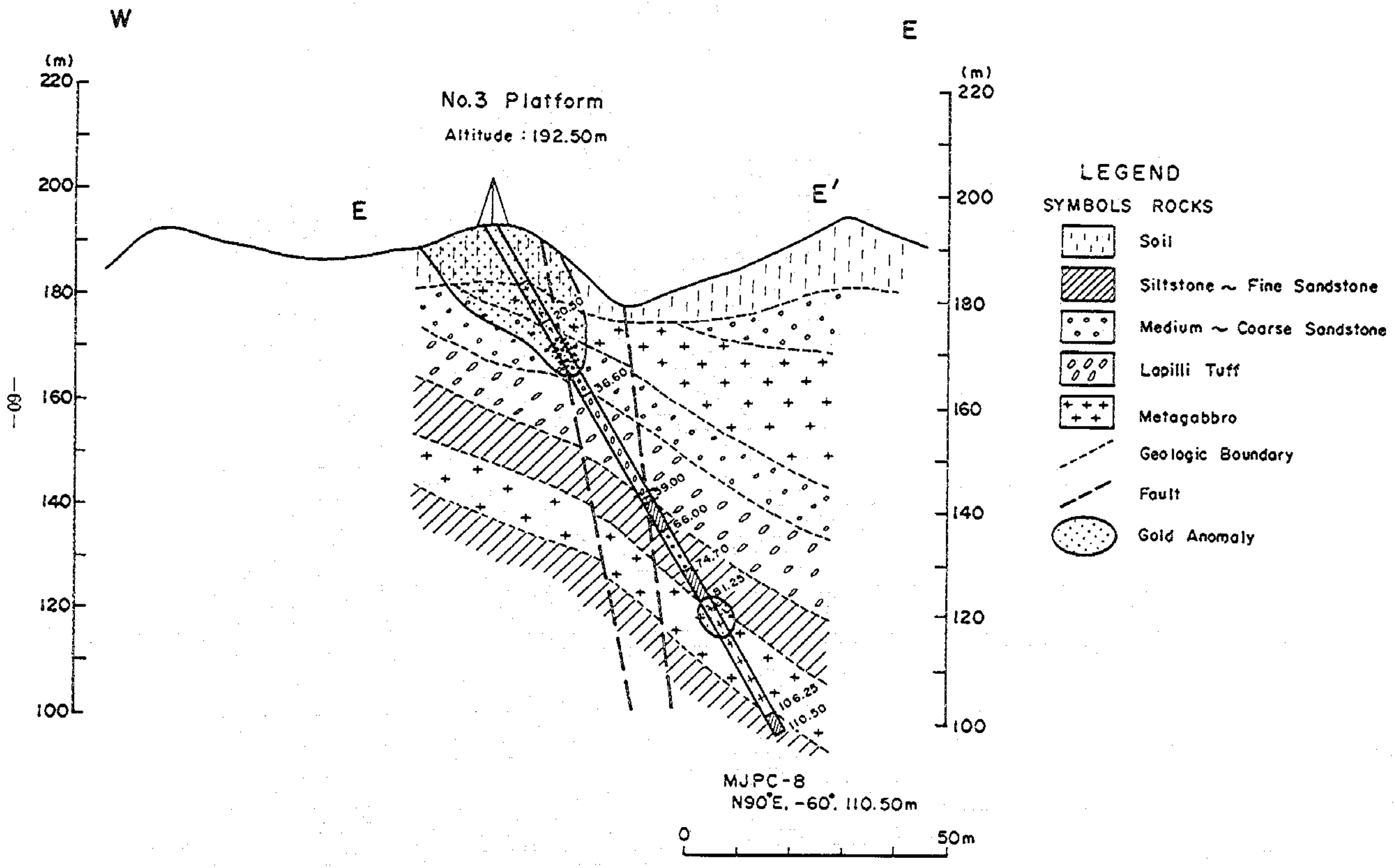


Fig. 5 Geologic Profile of Drilling (5)

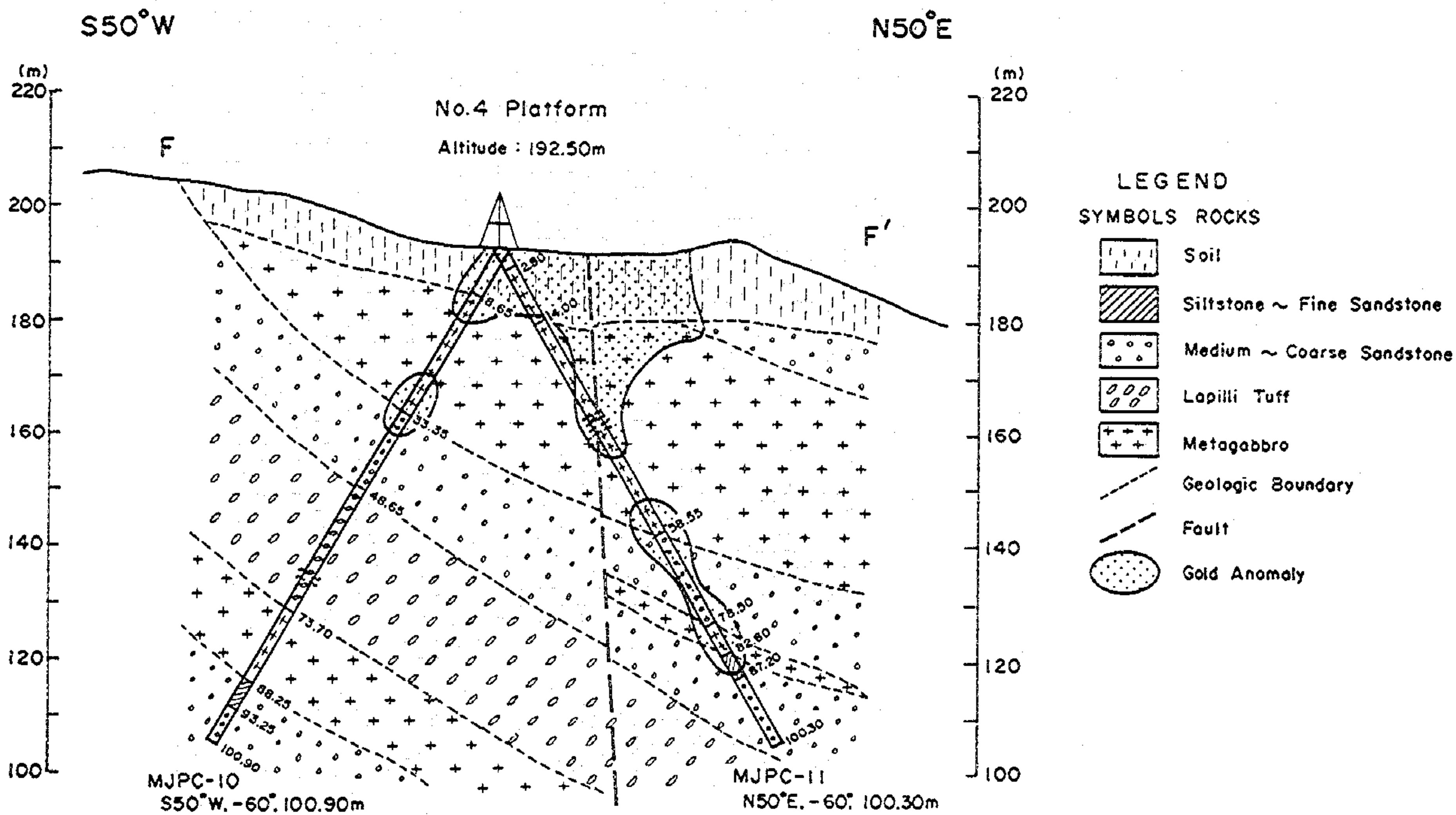


Fig. 5 Geologic Profile of Drilling (6)

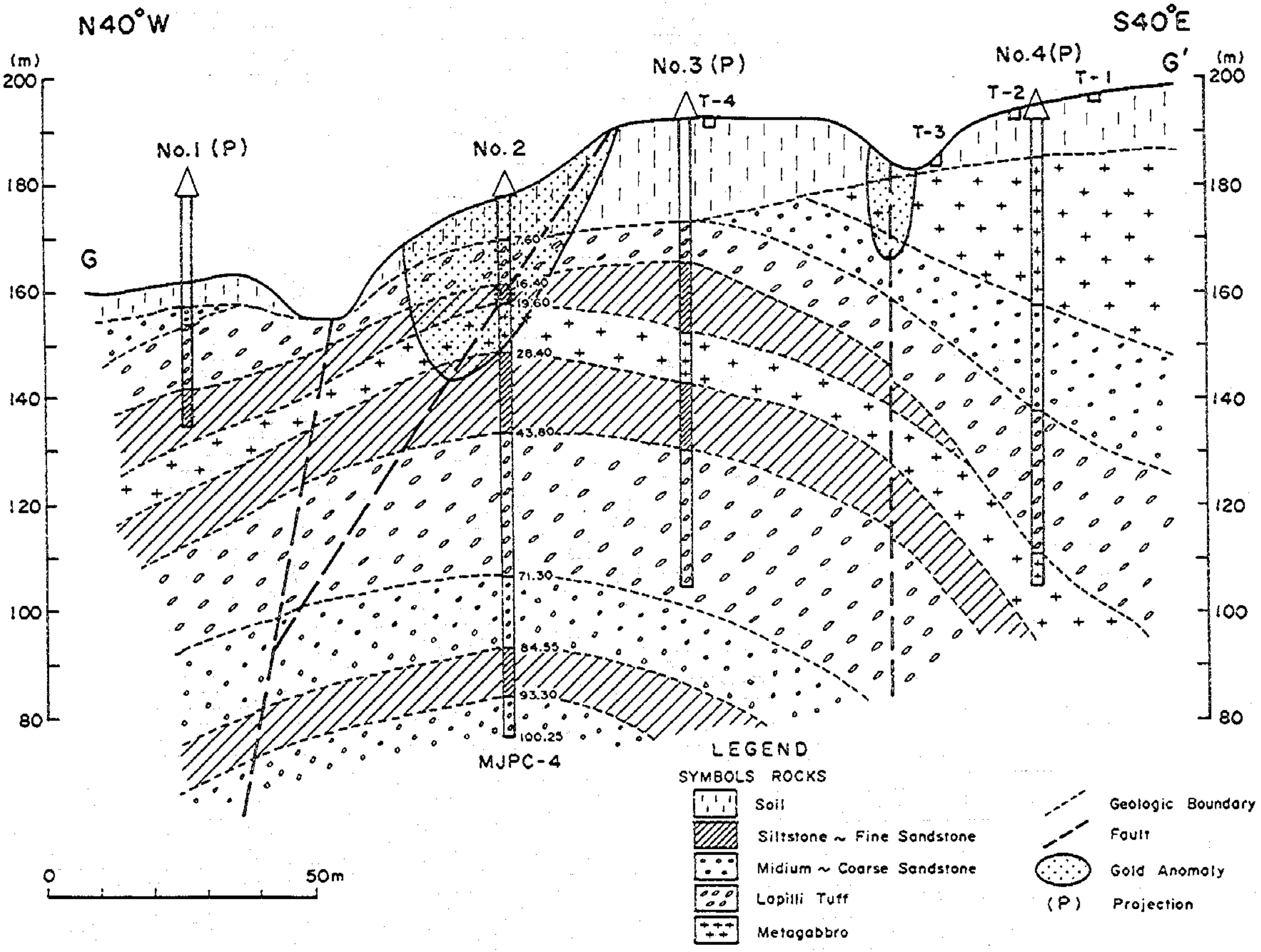


Fig. 5 Geologic Profile of Drilling (7)

Chapter 2 Kampayas Area

2-1 Geochemical Survey

2-1-1 Purpose of the Survey

The survey was executed in Kampayas Area in order to pick out the geochemical anomalies from the analyses of soil samples and to know the potential of the area and consequently select the prospective sections.

2-1-2 Contents of the Survey

(1) The range of sampling was shown in Appendix-5.

(2) During the survey, topographic surveying by compass was carried out to confirm the sampling locations and to produce reliable topographic map.

(3) In case of discovering mineralization zones and outcrops, these were observed as detailed as possible. Sketches and photographs were taken at the important outcrops.

2-1-3 Geology and Mineralization

Kampayas Area is located at the southern part of Carorongan Area. Both areas were divided by Ogbon Fault trending NW-SE.

The geology is mainly composed of dark green colored, medium to coarse sandstones with obscure bedding and might have originated from the pyroclastic rocks of the Catanduanes Formation. These volcano-sedimentary rocks are cut by dolerite and gabbro of Cretaceous ages and by andesite porphyry and diorite of Batalay Intrusives (Fig. 6).

The geological structure of the area was transacted by two NNE-SSW oriented faults passing by Kampayas creek and the ridge around peak 379 m. Therefore, the strike of the area between both faults showed NE-SW orientation which was different from the general strike (NW-SE trend) of the region. At the ridge around peak 379 m, numerous floats of andesite porphyry and microdiorite were recognized indicating that the ridge might be underlain by Batalay Intrusives which could be responsible for the mineralization of the area.

Geological mapping indicates that the whole survey area is silicified in which very strong silicification with large amount of pyrite crystals was identified on the west-central part of the survey area. In other parts of the area, some traces of pyrite could be observed on slightly silicified portions. Generally, the area was affected by numerous NW-SE and NE-

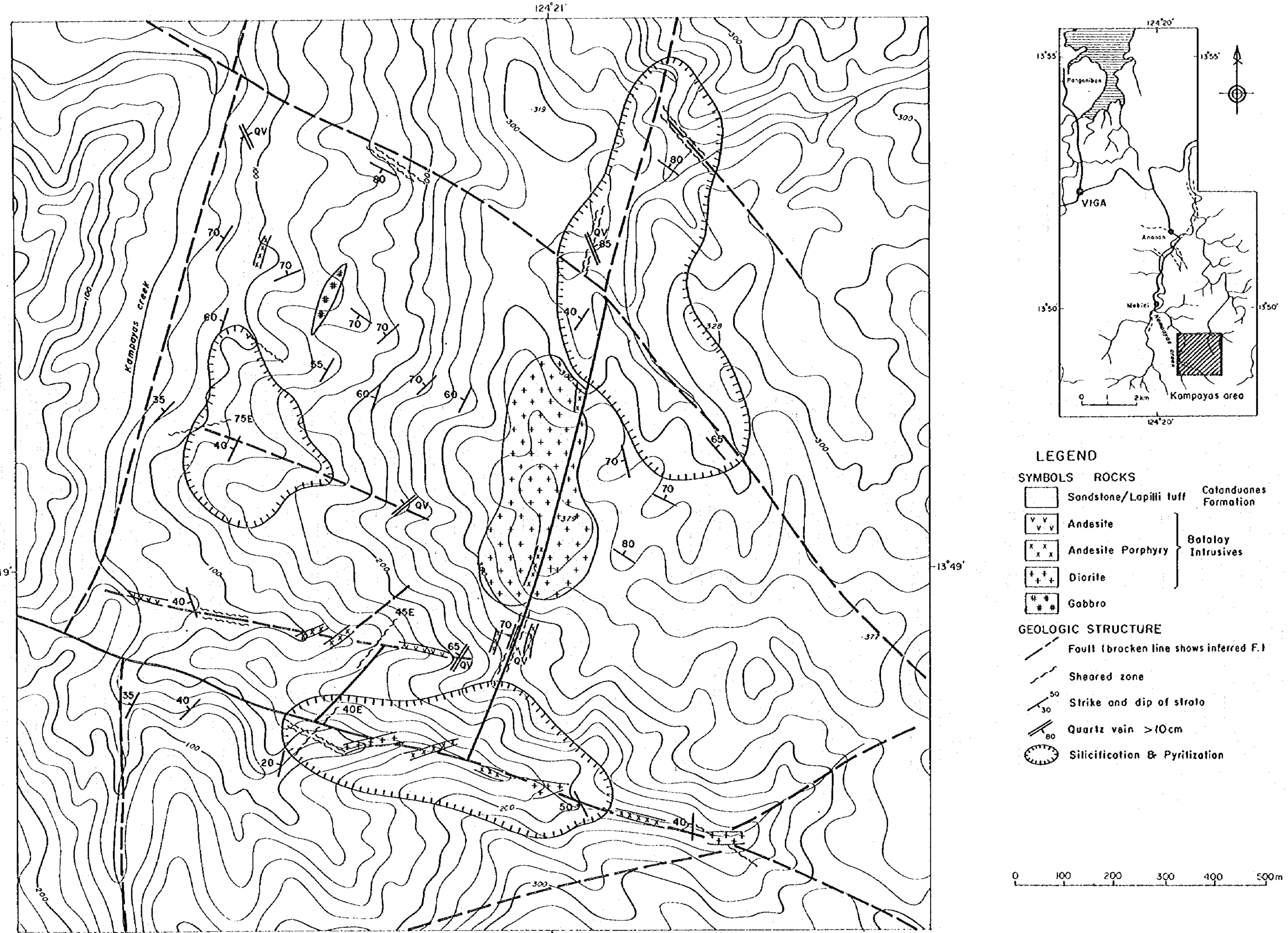


Fig. 6 Schematic Geologic Map and Mineral Occurrences in Kampayas Area