REPORT
ON
THE MINERAL EXPLORATION
IN
THE TALAS AREA
THE KYRGYZ REPUBLIC

(PHASE Ⅲ)

MARCH 1997

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

REPORT
ON
THE MINERAL EXPLORATION
IN
THE TALAS AREA
THE KYRGYZ REPUBLIC

(PHASE Ⅲ)

FEBRUARY 1997

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

PREFACE

In response to the request the Government of the Kyrgyz Republic, the Japanese Government decided to conduct the Talas Area Mineral Exploration Project and entrusted the survey to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

JICA and MMAJ sent to the Kyrgyz Republic a survey team headed by Mr. Masaharu Marutani from June 5, 1996 to December 27, 1996.

The team exchanged views with the officials concerned of the Government of the Kyrgyz Republic and conducted a survey in the Talas 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 relation between our two countries.

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

February, 1997

Kimio Fujita

Kimio Fujita
President
Japan International Cooperation Agency

清滝昌三郎

Shozaburo Kiyotaki
President
Metal Mining Agency of Japan

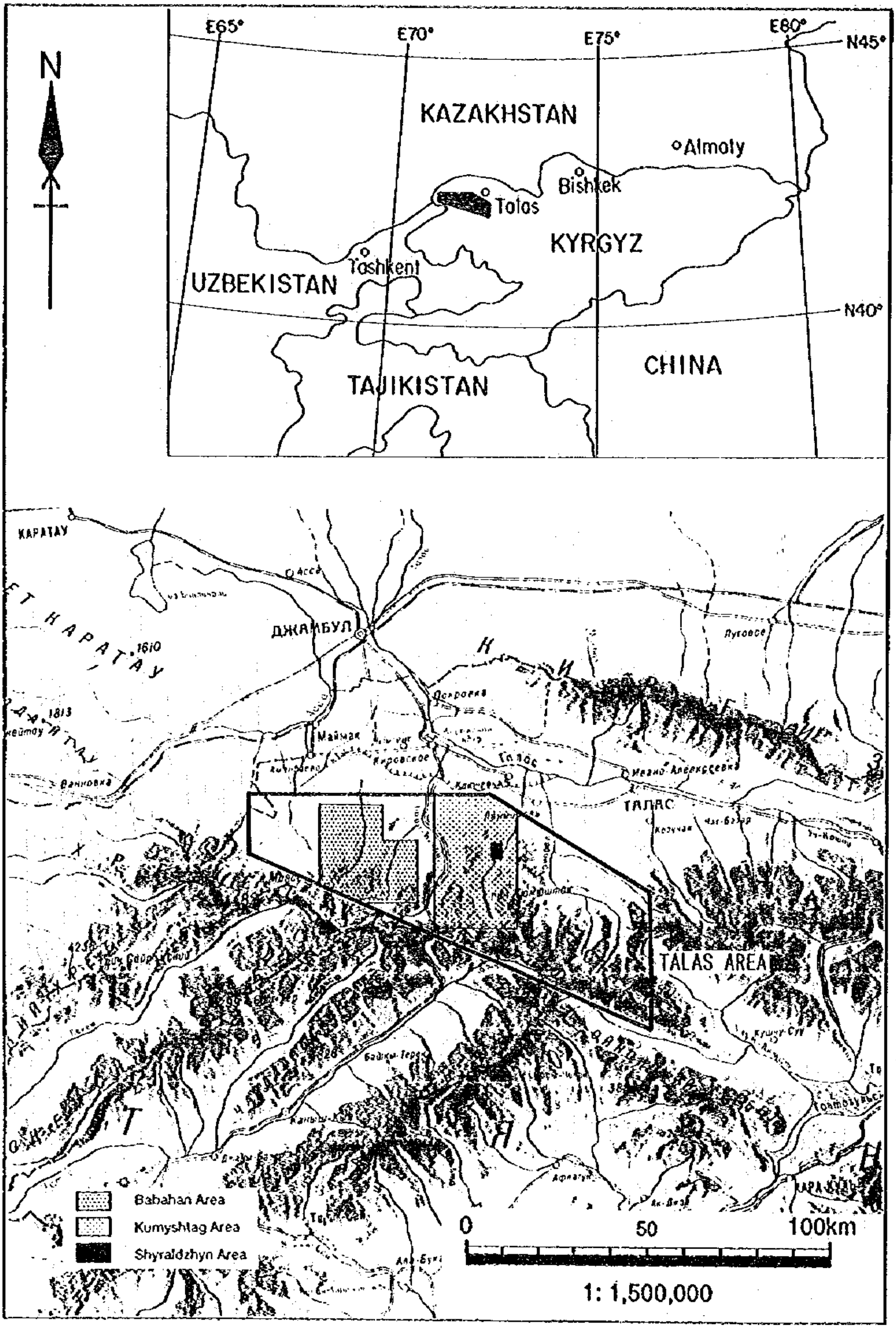


Fig. I-1 Location Map of the Survey Area

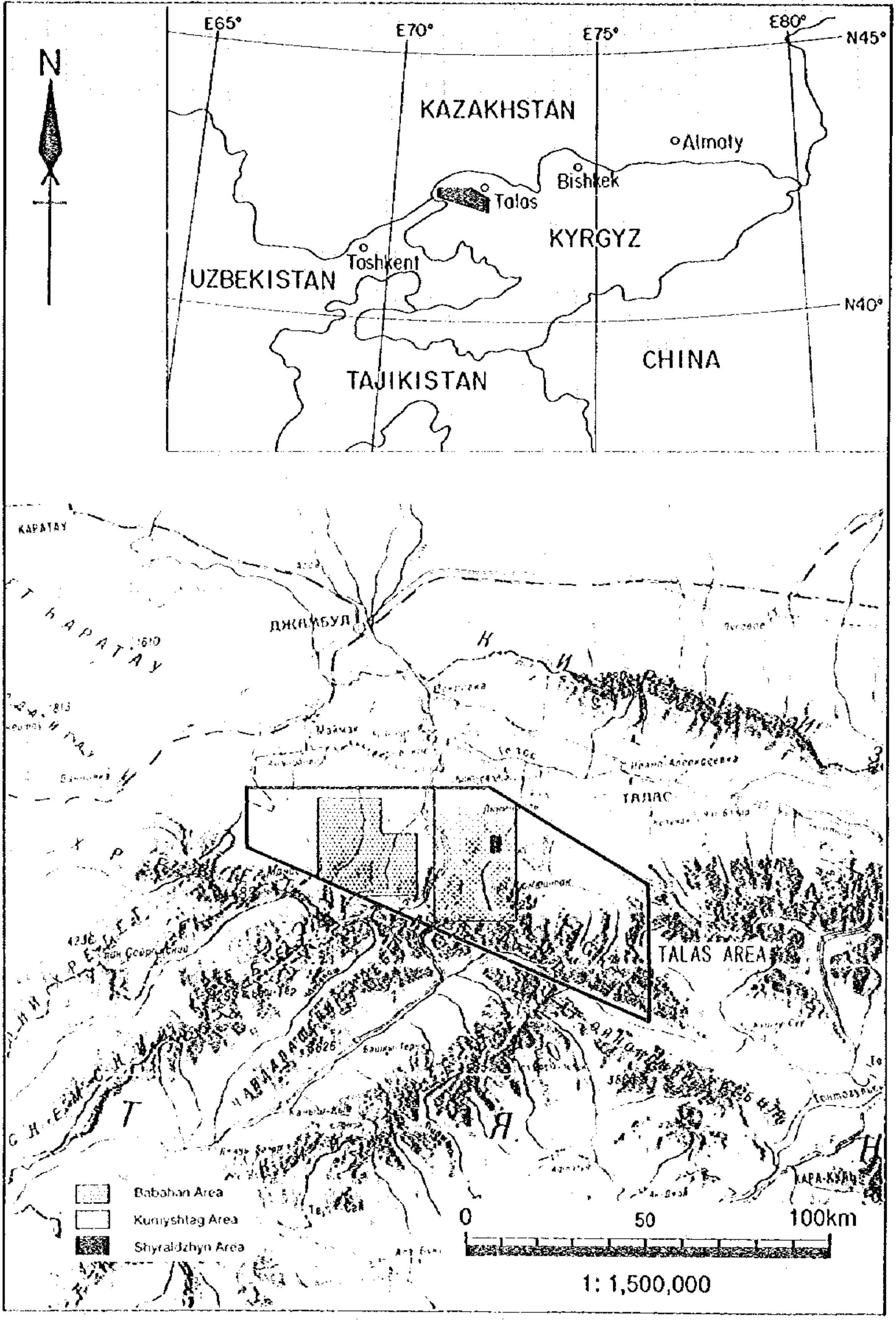


Fig. I -1 Location Map of the Survey Area

SUMMARY

This report is a summary of results of the phase III survey of a technical cooperation project for mineral exploration conducted in the Talas area, Kyrgyz Republic. The survey focuses on clarification of the geology and determination of the mineral potential of the area and exploration for new ore deposits. The field survey was conducted from June to December, 1996.

In the phase III survey, a core drilling survey was performed to directly clarify mineralization in the downward extension of a gold vein in the Shyraldzhyn deposit, because a detailed geological survey had suggested that high grade ore could exist in the lower part of the vein. A total of twelve holes were drilled with a length of 2,560.4 m. Results of the survey and recommendations for the future are summarized as follows:

【Results of the survey】

(1) Mineralized zones of the vein were confirmed to be embedded about 150m beneath surface in the northern part, about 80m beneath surface in the central part and about 200m depth in the southern part.

(2) The quartz - manganosiderite vein has echelon arrangement, strikes NNE-SSW and dips 45° W generally. The average true width of the vein is 2.1 m at surface and 2.6 m in drill holes. The maximum true width is 3.9 m at surface and 10.6 m in the hole.

(3) Grades of vein caught by holes range from 2.5 to 11.3 g/t Au, from 0.3 to 1.4 g/t Ag and 0.24 - 4.54 % Cu. High grade gold ore is embedded in the northern and southern parts. Native gold is found as grains between a few μ m and 70 μ m. It occurs in goethite and quartz, and along fractures of those minerals.

(4) According to the distribution of homogenization temperature, it seem possible that higher temperature zones could exist in the northern and southern parts and gold mineralized zones could be embedded there.

(5) A tentative calculation of ore reserves reveals that possible ore reserves, which are presumed on the basis of drillholes on a 150m grid and trenches, are estimated to be 1,043 thousand tons with 5.2 g/t Au and 5.4 tons of gold. Potential ore reserves, which are hoped for deeper extension of veins under the possible blocks, are expected to be 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold.

【Recommendation】

An increase of ore reserves and a confirmation of high grade ore are necessary for developing this deposit as a small-scale mine. The northern and southern parts of the deposit would be listed as prospective areas, if high grade ore can be expected at depth.

РЕЗЮМЕ

Настоящий отчет является сводом результатов фундаментального исследования по программе сотрудничества в освоении недровых ресурсов на третий год, которое было проведено в Таласской области Республики Кыргызотан. Цель исследования, проводившегося с июня 1996 г. по декабрь того же года, заключалось в выяснении геологических условий и расположения рудных месторождений в названной области.

Исследование на третий год, с учетом рассуждения о том, что с высокой вероятностью жилы с высоким содержанием золота зарождается в нижней части золотоносных залежей в Ширальдинском районе, было проведено исследование с разбуриванием 12 скважин и общей площадью 2560,4 м. км с целью непосредственного уточнения непрерывности в сторону низа залежи и состояния минерализации. В следующем приводим результаты исследования и предложения на будущее:

[Результаты исследования]

(1) Уточнено, что в севернгой части золотосодержащая руда распространялась до глубины под поверхностью земли около 150 м, в центральной части - около 80 м, а в южной части 200 м.

(2) Структура рудной жилы представляет собой кулисообразное расположение. В целом она имеет направленность ССВ - ЮЮЗ с наклоном 45 град З. Предварительно замеренная ширина жилы на поверхности составила 2,1 м в среднем при максимальной в 3,9 м, однако при разбуривании эти показатели были 2,6 м в среднем и 10,6 м максимум.

(3) Содержание Au в обнаруженной жиле составляло 2,5 - 11,3 г/т. Высокое содержание золота было характерно для северного и южного участков. Золото являлось самородным с зернитостью в нескольких микрометров до 70 мкм. Оно выявляется вдоль внутри болотной железной руды и кварца или вдоль трещин в них.

(4) Исходя из гомогенного температурного распределения во включении жидкости, в глубинах северного и южного участков находится часть относительно высокой температуры, что говорит о том, что можно предположить о возможности расположения жилы с высоким содержанием золота.

(5) Результат предварительного расчета запасов руды и предполагаемый

запас (определенный в результате разбуривания по 150-метровой решетке и траншейного исследования на поверхности) составили 1043 тыс. т. Три среднем содержании Au 5,2 г/т и запасе золота 5,4 т. Кроме того, потенциальный запас руды (Запас, определенный с учетом ожидаемого продолжения жилы под участком, на котором определен предполагаемый запас) ожидается составить 1269 тыс. т. при среднем содержании Au 5,0 г/т и запасе золота 6,3т.

[Предложения на будущее]

Для освоения данного месторождения в качестве месторождения с маломасштабной добычей необходимо получение руду с высоким содержанием золота. Глубины северного и южного участков представляют собой участки, на которых ожидается распределение руды с высоким содержанием золота при разведке.

CONTENTS

PART I GENERAL REMARKS

PART II PARTICULARS

PART III CONCLUSION AND RECOMMENDATION

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDIXES

PART I

GENERAL REMARKS

CHAPTER 1 INTRODUCTION

1-1 Background

The Kyrgyz Republic is composed mainly of metamorphic and sedimentary rocks from Precambrian to Paleozoic era which are widely intruded by granite. Potential for the existence of metal deposits is high and gold, silver, copper, lead, zinc, mercury, antimony, tin, tungsten and rare earth minerals occur.

Although the Kyrgyz Republic has many kinds of mineral resources, a lot of deposits have been undeveloped and mining was not promoted during the days of the now defunct USSR, except for mercury and antimony exploitation.

Due to these circumstances, the State Committee on Geology, Usage and Protection of Natural Resources (presently the State Agency of Geology and Mineral Resources) requested, through the State Commission on Foreign Investments and Economic Assistance of the Kyrgyz Republic, a technical cooperation program from the Japanese Government for the survey in April of 1994. For this purpose, a delegation was organized among the Ministry of International Trade and Industry (MITI), Japan International Cooperation Agency (JICA) and Metal Mining Agency of Japan (MMAJ) for the preliminary survey and agreement negotiations. This delegation was dispatched to the Kyrgyz Republic in August of 1994. On August 11, 1994, an agreement on the scope of work for the Talas area project was signed between the parties.

The object of the survey was to explore the survey area and assess the potential for mineral occurrence.

Phase I of the survey involved compilation of previous data combined with analysis of satellite images of the entire survey area, approximately 3,300 square kilometers.

Phase II of the survey included a detailed geological survey of the prospective gold deposit (Shyraldzhyn area). A geological reconnaissance survey was conducted in other promising areas (Kumyshtag and Babahan areas) and a geochemical soil survey was simultaneously implemented.

1-2 Conclusion and recommendation of the phase II survey

1-2-1 Conclusion of the phase II survey

Conclusions of the phase II survey are summarized as follows:

【Shyraldzhyn area】

(1) Shyraldzhyn deposit is composed of gold bearing quartz mangano-siderite veins in Kumyshtag granite of late Silurian to early Devonian age. The deposit consists of four parallel veins, striking NNE-SSW and dipping 70° to 80° W.

(2) The width of main orebody ranges from 0.6 to 3.7 m with an extension of 1,500 m along strike. Gold grade ranges from 1.0 to 19.6 g/t and the average gold grade is 8.6 g/t.

(3) Homogenization temperatures of fluid inclusions in quartz collected from trenches was measured. The average homogenization temperatures ranges from 180° to 150°C. This temperature is lower than the temperature range from 300° to 200°C, which is the most favorable temperature range for gold mineralization of vein-type deposits.

(4) The absolute age of muscovite, produced by greisenization, as measured by the K-Ar method, is 405±21 Ma, which corresponds to late Silurian to early Devonian. This is the same age as the Kumyshtag granite, which was found to be 406±14 Ma by the U-Pb method.

【Kumyshtag area】

(1) Overlapping geochemically anomalous silver, copper, arsenic and antimony zones are widely distributed throughout an area ranging from the Kumyshtag silver deposit to the Uchimcheck arsenic deposit.

(2) Although the Kumyshtag deposit is composed of large-scale silver-bearing manganosiderite veins, gold mineralization is poor. The geochemical gold anomalies are small and scattered.

【Babahan area】

A geochemical silver anomaly was detected on the Dzholsay fault near the Kuru-Bakair silver deposit. The small geochemical anomalies and small-scale silver deposits indicate that a large-scale ore deposit should not be expected near the surface.

【Kumyshtag and Babahan area】

Ground confirmation was performed to check the anomalous zones delineated from the satellite image spectral analysis. The anomalous zones corresponded to limonite disseminated schist in the Uzunahmat group of the Riphean series. The ground confirmation revealed that diagenesis alteration, instead of hydrothermal alteration, had produced the anomalous zones.

1-2-2 Recommendation of the phase II survey

Based upon the results of the phase II survey, the following positive exploration is recommended to be carried out in the phase III survey.

The detailed geological survey suggest that high grade gold ore could exist in the downward extension of the vein in the Shyraldzhyn deposit. A drilling survey will be conducted to directly clarify the downward extension of the vein and the extent of gold mineralization.

1-3 Outline of the phase III survey

1-3-1 Scope and purpose of the survey

A drilling survey was conducted to directly verify the mineralization in the downward extension of the Shyraldzhyn gold deposit. Twelve holes were drilled with a total length of 2,560.4 m.

1-3-2 Method and extent of the survey

A base camp was set up at Talas and a four-wheel drive automobile was used to commute from Talas to the drilling site at Shyraldzhyn. Drilling was conducted by North Kyrgyz Geological Expedition.

The survey of phase III is summarized in Table I-1.

Table I-1 Methods and Contents of the Survey

(Drilling survey)

Drillhole No.	Length(m)	Direction	Inclination
MJKS-1	250.0	90°	-60°
MJKS-2	250.0	90°	-60°
MJKS-3	250.0	90°	-60°
MJKS-4	250.2	90°	-60°
MJKS-5	165.0	90°	-60°
MJKS-6	170.1	90°	-60°
MJKS-7	150.0	—	-90°
MJKS-8	160.0	—	-90°
MJKS-9	130.0	—	-90°
MJKS-10	290.0	145°	-75°
MJKS-11	250.0	—	-90°
MJKS-12	250.0	—	-90°
Total	2,560.4		

(Laboratory studies)

Item	Quantity
Observation of thin section	20 pcs
Observation of polished section	26 pcs
Chemical analyses	
Ore assay (Au, Ag, Cu, As : 4 elements)	243 pcs
X-ray diffraction analysis	29 pcs
Fluid inclusion	15 pcs

1-3-3 Organization of the survey team and period of the survey

Representatives of the Japanese government were dispatched to Kyrgyz during from September 13, 1996 to September 17, 1996 for negotiation and performance of the phase III survey. The delegation members and their counterparts from Kyrgyz are shown below:

From Japan:

Mr. Junichi TOMINAGA	Metal Mining Agency of Japan
Mr. Hirofumi ONO	Metal Mining Agency of Japan
Mr. Tohru NAWATA	Japan International Cooperation Agency

From Kyrgyz:

Mr. Bayseit T. TURSUNGAZIEV	SAG*
Mr. Sheyshenaly M. MURZAGAZIEV	SAG
Mr. Vladimir P. ZUBKOV	SAG
Mr. Alexandar G. KONYUKHOV	SAG
Mr. Victor P. ROGALSKY	SAG
Mr. Lev F. CLEMENTEV	NKGE*
Mr. Vichaclav P. JAKOVENKO	NKGE

* SAG: State Agency of Geology and Mineral Resources

* NKGE : North Kyrgyz Geological Expedition

The leader of the field survey team was dispatched from June 5, 1996 to December 27, 1996. The team members from Japan and their counterparts from Kyrgyz are shown below:

From Japan:

Mr. Masaharu MARUTANI MINDECO* ; Leader and drilling survey

* MINDECO : Mitsui Mineral Development Engineering Co., LTD

From Kyrgyz:

Mr. Georg A. YARUSHEVSKIY	NKGE	; Drilling survey
Mr. Iliya I. RYABKO	NKGE	; Drilling survey
Mr. Tokonazar K. ISMAILOV	NKGE	; Drilling survey
Mr. Boris D. MALYTIN	NKGE	; Drilling survey
Mr. Bolot ALYMKULOV	NKGE	; Drilling survey
Mr. Kamchibek IMANALIEV	NKGE	; Drilling survey
Mr. Torogeldi MALABEKOV	NKGE	; Drilling survey
Mr. Sagynbek KULJIGITOV	NKGE	; Drilling survey
Mr. Syrgak BAYLDCHAEV	NKGE	; Drilling survey

CHAPTER 2 GEOGRAPHY OF THE SURVEY AREA

2-1 Location and access

The Kyrgyz Republic is known for the Tien-Shan mountains, marking 7,000 m altitude class, which is one of the highest mountain ranges in the world. The country stretches the east-west direction along the extension of the Tien-Shan mountains for hundreds of kilometers in southern Central Asia. The longest distance between the east-west point is 925 km and north-south, 454 km. Total area is 198.5 thousand square kilometers which is approximately half area of Japan. The survey area is located in the northwestern part of the Kyrgyz Republic. Location map of the survey area is shown in Fig. I -1.

Talas town, where the field survey is based, is located at about 200 km to the west-southwestern of the capital Bishkek. Absolute elevation of Talas marks about 1,250 m. The town is the central of the Talas oblast, with about 30,000 population.

The following two routes are available to move from Bishkek to Talas. Main route is taken westward to Dzhambul in Kazakhstan, and turned southeastward into Talas. The other route is taken through Kara-Bulta, the Tyuz-Ashuu pass and the Otmek pass. It is available to go to Talas through all year on the former route, 410 km of distance, taking 7 hours by automobile. On the other hand, it is available to pass except snowy season on the latter route, because of bad road condition by snow, avalanches and fallen rocks. Although the distance of the latter is 80 km shorter than the former, it takes almost same hours to be necessary.

Lots of dirt roads are constructed for nomads along the main rivers in the survey area. It is available to go upstream using the four-wheel cars along dirt roads. Furthermore in the steep highland geological survey is carried out by riding.

2-2 Topography and drainage

The Tien-Shan mountain ranges are divided into three parts, that is the Northern Tien-Shan, the Middle Tien-Shan and the Southern Tien-Shan. The survey area is located in the southern part of the Northern Tien-Shan. Talas Ala-Too mountain ranges, marking 4,000 m altitude class, locate in the southern part of the survey area. The mountain ranges trend from northwest to southeast. The highest peak is the Kumyshtag peak, with 4,251 m of elevation, and is located in the central part of the area.

Most high mountains are widely covered with glacier. The rivers, pouring out from glacial troughs, form deep gorges. Most rivers flow to the north and flow into the Talas river, running to the west. The Talas river turns the direction from west to northwest, and separates to the branches and disappears into the Kazakhstan steppe.

The survey area is topographically extremely steep. In the Shyraldzhyn area, relative elevation is 2,810 m between the Kumyshtag river with absolute elevation of 1,440 m and the highest peak with 4,250 m.

2-3 Climate and vegetation

The climate and vegetation in the survey area are characterized by changing of elevation because of 3,000 m in relative elevation. In highland above 3,000 m, grass grows partly. The climate ranging from 2,000 to 3,000 m belongs to the highland zone, and bushes partly grows besides pines, cedars and birches grow along rivers below 2,000 m. In summer season, the slope of mountain is covered with grass, and sheep, cattle and houses are put to pasture.

The monthly average temperature in Talas ranges from -5℃ to -9℃ in January, from 15℃ to 20℃ in July. The annual rain fall shows 290mm. The most monthly rain fall shows 48mm in April and March, and the fewest rains 9mm in September. The thickness of snow show 4cm in the western part of the Talas basin, and 16 cm in the eastern part.

CHAPTER 3 GENERAL GEOLOGY

The survey area is included in Talas marginal massif in geological structure zones of Kyrgyz. This massif is a small one between the Nikolaevsky tectonic line (Talas-Fergansky fault - Nikolaevsky fault) and the Eachkeletau-Susamyrsky fault in the western edge of the Northern Tien-Shan massif. The Talas block is divided into the Uzunahmatsky and the Karagainsky blocks by the Uzunahmat-Kumyshtagsky thrust. The Talas block is characterized by prominent sedimentary rock with carbonate rock and acid igneous rock intruding it, and shows complex structures where many thrust faults and folds are developed. A lot of igneous activities from Proterozoic era to Silurian period are recognized. Many granitic batholith intruded in the Talas block. Many ore deposits of gold, silver, copper and lead are recognized to be related with leucocratic granite of Silurian age.

Basement rock of this survey area is the Riphean system of Proterozoic era which was folded in the Baikalian stage. It is covered with the Vendian system of Upper Proterozoic, Paleozoic group and Cenozoic group unconformably. The block is bordered on the Middle Tien-Shan massif by the Talas-Fergansky fault in the southern edge of the area.

The prominent direction of fold axis and strike is west-northwest, that is, the parallel direction to the main faults mentioned above.

The geological map of the survey area is shown in Fig. I -2, and generalized stratigraphic column in Fig. I -3. The summary of stratigraphic units and lithofacies are as follows:

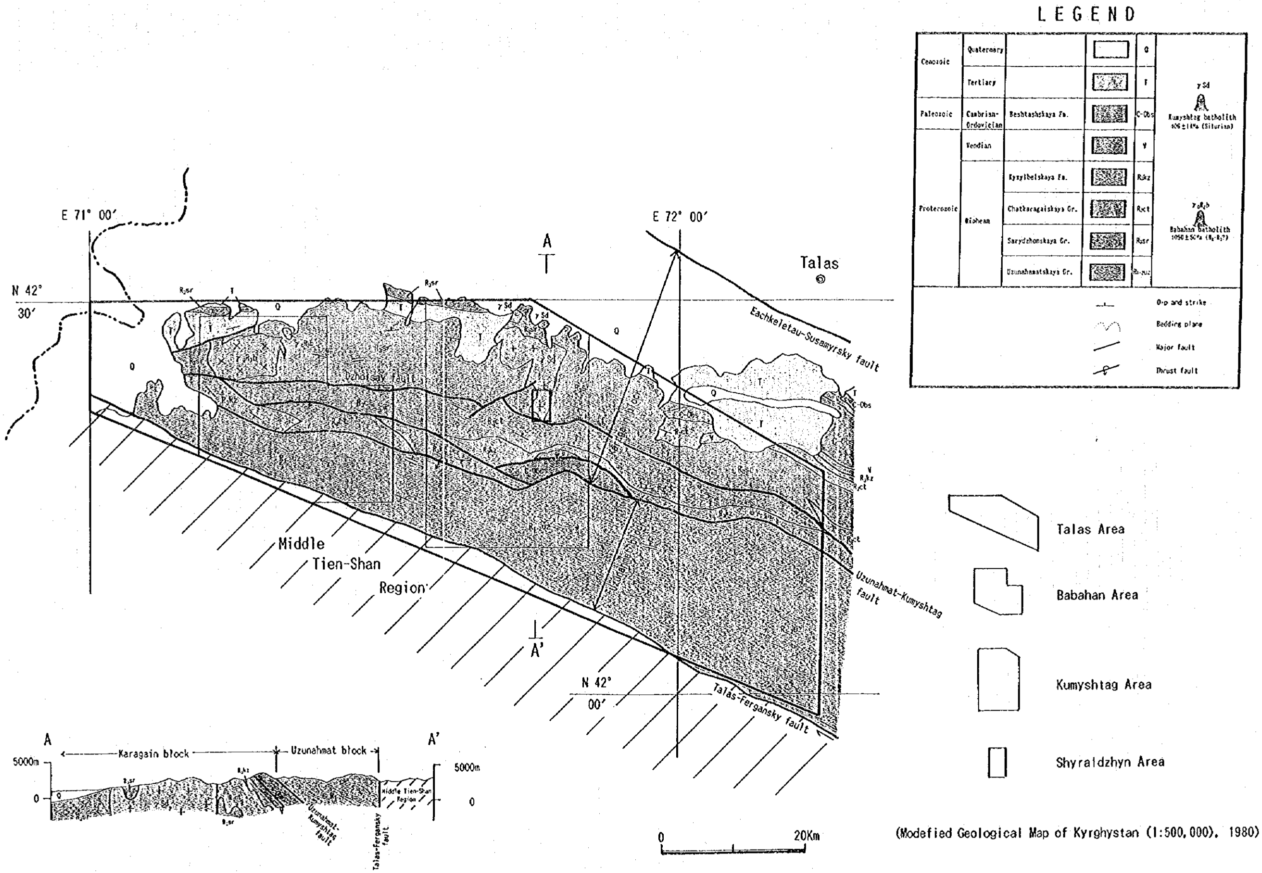
(Age)			(Main lithofacies)
Cenozoic	Tertiary - Recent		: gravel, sand, silt, clay
Paleozoic	Cambrian - Ordovician		: limestone, dolomite
Proterozoic	Vendian		: conglomerate, sandstone
	Riphean	Kyzylbelskaya F.	: siltstone
		Chatkaragaiskaya G.	: limestone, sandstone, shale
		Sarydzhonskaya G.	: sandstone, shale, siltstone
		Uzunahmatskaya G.	: limestone, phyllite, sandstone

This area is intruded by the Kumyshtag intrusive in the Kumyshtag area, and by the Babahan intrusive in the Babahan area.

The Kumyshtag intrusive is exposed in the west of the midstream of the

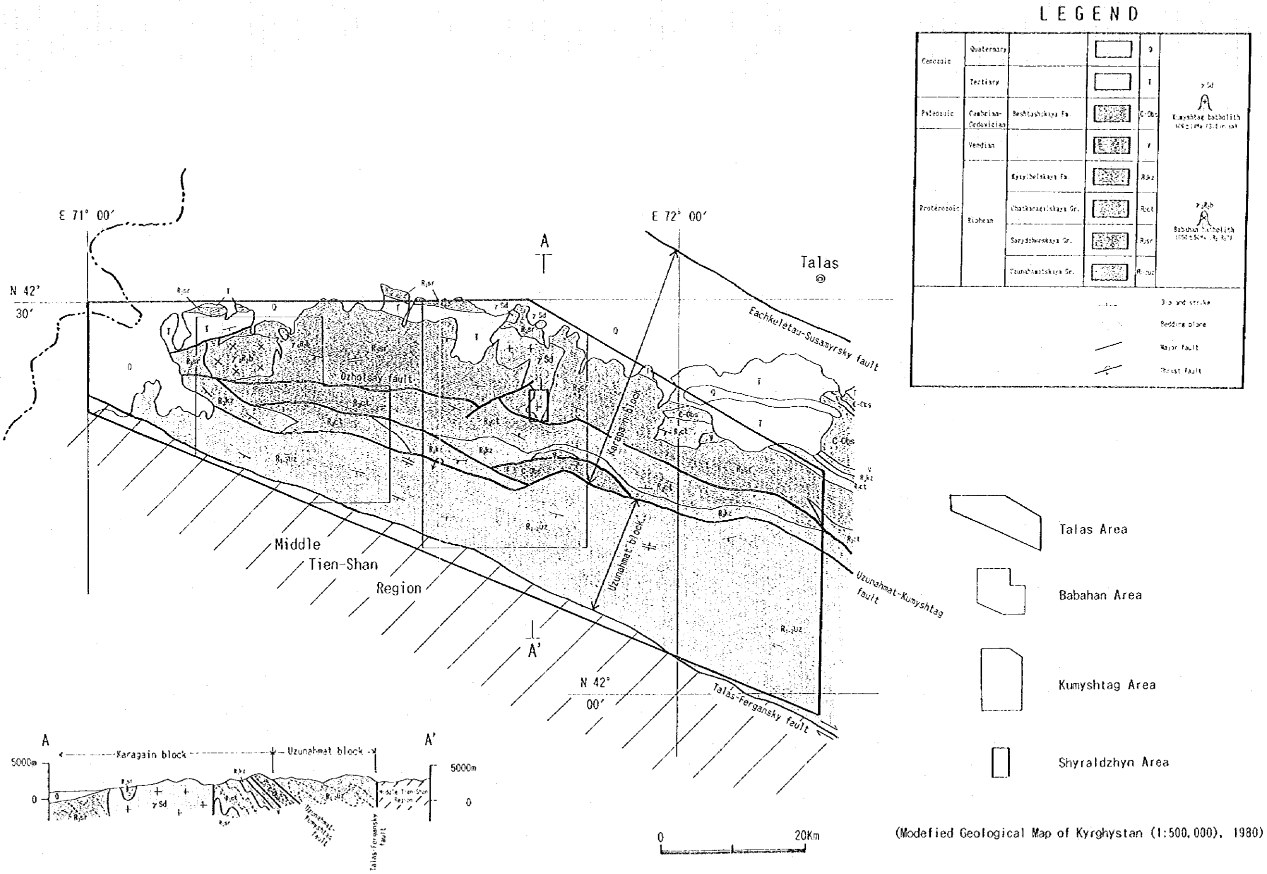
Kumyshtag river, where the width is about 10 km in north and south and about 9 km in east and west. It mainly consists of leucocratic to pink granite. The result of recent absolute age measurement (U-Pb method) of the Kumyshtag intrusive shows 406±14 Ma, which corresponds to late Silurian (S_2) to early Devonian (D_1) age (after Geological Institute of the Academy Science, unpublished).

The Babahan intrusive is exposed in the area between the Babahan and the Suluu-Bakayir rivers, whose the width is about 6 km in north and south and about 10 km in east and west. It mainly consists of tonalite. Intrusion of an aplite dike can be seen at the end of the activity. The result of recent absolute age measurement (U-Pb method) shows 1,050±50 Ma, which corresponds to middle to late Riphean (R_2-R_3) (after Geological Institute of the Academy Science, unpublished).



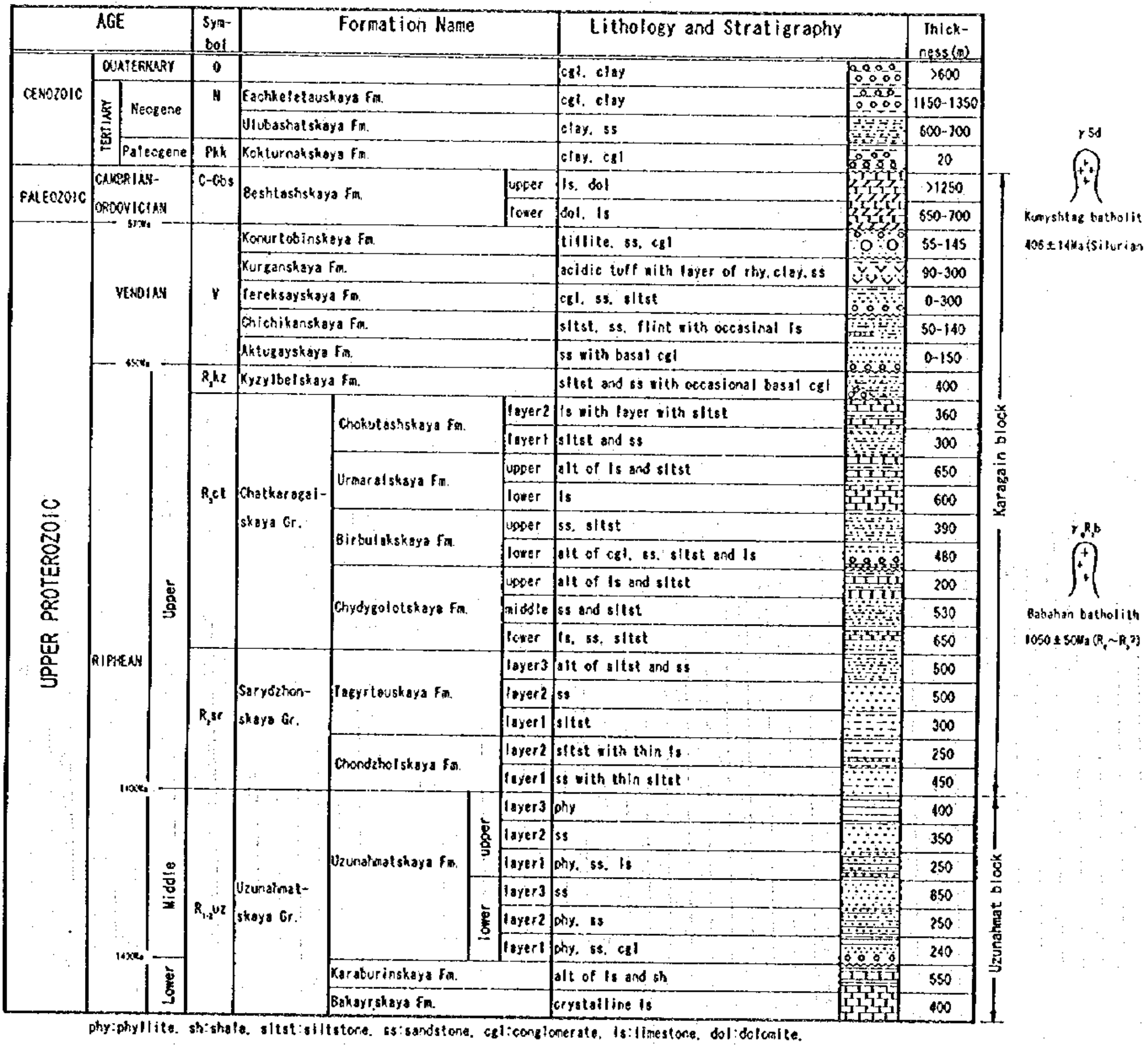
(Modefied Geological Map of Kyrghystan (1:500,000). 1980)

Fig. I-2 Generalized Geological Map of the Survey Area



(Modefied Geological Map of Kyrghystan (1:500,000), 1980)

Fig. I-2 Generalized Geological Map of the Survey Area



AGE				Sym-bol	Formation Name				Lithology and Stratigraphy	Thick-ness(m)
CENOZOIC	QUATERNARY			Q					cgl, clay	>600
	TERTIARY	Neogene		N	Eachkefetauskaya Fm.				cgl, clay	1150-1350
					Ulubashatskaya Fm.				clay, ss	600-700
		Paleogene		Pkk	Kokturnakskaya Fm.				clay, cgl	20
PALEOZOIC	CAMBRIAN-ORDOVICIAN			C-Obs	Beshtashskaya Fm.			upper	ls, dol	>1250
								lower	dol, ls	650-700
UPPER PROTEROZOIC	VENDIAN			V	Konurtobinskaya Fm.				tillite, ss, cgl	55-145
					Kurganskaya Fm.				acidic tuff with layer of rhy, clay, ss	90-300
					Tereksayskaya Fm.				cgl, ss, sltst	0-300
					Chichikanskaya Fm.				sltst, ss, flint with occasinal ls	50-140
					Aktugayskaya Fm.				ss with basal cgl	0-150
	RIPHEAN		Upper	R_3kz	Kyzylbelskaya Fm.				sltst and ss with occasional basal cgl	400
				R_3ct	Chatkaragai-skaya Gr.	Chokutashskaya Fm.		layer2	ls with layer with sltst	360
								layer1	sltst and ss	300
						Urmaralskaya Fm.		upper	alt of ls and sltst	650
								lower	ls	600
						Birbulakskaya Fm.		upper	ss, sltst	390
								lower	alt of cgl, ss, sltst and ls	480
						Chydygolotskaya Fm.		upper	alt of ls and sltst	200
								middle	ss and sltst	530
								lower	ls, ss, sltst	650
				R_3sr	Sarydzhon-skaya Gr.	Tagyrtauskaya Fm.		layer3	alt of sltst and ss	500
								layer2	ss	500
								layer1	sltst	300
						Chondzholskaya Fm.		layer2	sltst with thin ls	250
								layer1	ss with thin sltst	450
			Middle	$R_{1\text{-}2}uz$	Uzunahmat-skaya Gr.	Uzunahmatskaya Fm.	upper	layer3	phy	400
								layer2	ss	350
								layer1	phy, ss, ls	250
							lower	layer3	ss	850
								layer2	phy, ss	250
								layer1	phy, ss, cgl	240
			Lower			Karaburinskaya Fm.			alt of ls and sh	550
						Bakayrskaya Fm.			crystalline ls	400

phy:phyllite, sh:shale, sltst:siltstone, ss:sandstone, cgl:conglomerate, ls:limestone, dol:dolomite,
rhy:rhyolite, alt:alternation, Fm:Formation, Gr:Group

Fig. I-3 Generalized Stratigraphic Column of the Survey Area

CHAPTER 4 COMPREHENSIVE ANALYSIS

4-1 Geological structure, and characteristics and controlling factors of mineralization

The survey area is located in the western edge of the Northern Tien-Shan massif between the Talas-Fergansky fault and the Eachkeletau-Susamyrsky fault, which direct the west-northwest. The area is characterized by prominent sedimentary rock. The prominent direction of fold axis and strike is west-northwest, that is, the parallel direction to the main faults mentioned above.

The results of geological survey of the phase II interpreted that the Kumyshtag silver deposit, the Uchimchek arsenic deposit and the Dzholsay silver deposit are occurred confining along the west-northwest directing faults, the east-west faults and their subordinate faults, or along geological discontinuity. The above mentioned facts presumes that the mineralization has taken place along the fractures related to the north-south stress which formed the west-northwest trending faults.

The Shyraldzhyn area is located in the southeastern part of the Kumyshtag granite. In this area, the north - south and the north-northeast directing fractures and textures are predominant. The deposit consists of gold bearing veins filled with these fractures. The deposit consists of four veins paralleled to each other, striking NNK-SSW. The intervals of veins range from 400 m to 600 m. Veins are composed of quartz and mangano-siderite. Main orebody being largest vein shows echelon arrangement, strikes NNE-SSW and dips 45° westward. Extension of the vein is about 1,400 m, and a total length of mineralized part is about 900 m. The average true width is 2.1 m at the outcrops and 2.6 m in drill holes. Gold bearing quartz mangano-siderite veins occur in greisen in the central and northern parts. Occasionally the veins borders greisen with clay zone at the hanging and foot walls. Clay zone of some ten centimeters in width is mainly composed of sericite. Greisen grades into non-altered granite through weak greisen altered granite. In the southern part, vein occurs in sericitizated granite without greisen.

The result of absolute age measurement of muscovite along the gold vein shows 405±21 Ma, which correspond to late Silurian to early Devonian age. The result of absolute age measurement of the Kumyshtag granite shows almost same age of 406 ± 14 Ma. The above mentioned results of absolute age and the occurrence of veins have suggested that the mineralization in the Shyraldzhyn deposit including greisenization and hydrothermal alteration has taken place gold bearing veins filled with shear fractures, which had been developed in the latest stage of igneous activity formed the Kumyshtag intrusive.

The above mentioned interpretation suggests that the Kumyshtag granite formed during late Silurian to early Devonian age had controlled the mineralization in this area. This is conformable to the suggestion that gold, silver and copper mineralization around the survey area is genetically related to Silurian granites in the Talas massif.

4-2 Potential of an existence of ore deposits

The various types of ore deposits of gold, silver, lead, zinc, arsenic, beryllium, copper and tungsten are known to occur in the survey area. They are classified into the following six types through compilation and analysis of the previous data on geology and mineral deposits of the phase I survey.

① Gold veins in the Kumyshtag granite
② Silver, lead veins in limestone or sandstone of upper Riphean series to Vendian series
③ Massive and disseminated arsenic deposits in limestone or sandstone of upper Riphean series
④ Greisen and stockwork beryllium deposits in the Kumyshtag intrusive
⑤ Copper veins around the Kumyshtag intrusive
⑥ Vein and skarn type tungsten deposits around the Kumyshtag intrusive

The result of the phase II survey suggested that most prospective deposit could be the Shyraldzhyn gold deposit according to scale and grade of deposits in this area.

Ore reserves of the Shyraldzhyn deposit are calculated on the based of the drilling and trench survey. Cut-off grade is determined as 1 g/t Au. Possible ore reserves are limited from the surface to 20m beneath (direction along dip of vein) the mineralized zone confirmed by each drill hole. Potential ore reserves are limited from the bottom of possible reserves to about 300m beneath the surface (an altitude of 2,500m). Possible ore reserves are 1,043 thousand tons with grade 5.2 g/t Au and 5.4 tons of gold. Potential ore reserves are expected 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold. A total of possible and potential ore reserves can be 2,312 thousand tons with 5.1 g/t of average gold grade and 11.7 tons of gold.

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5-1 Conclusion

(1) A drilling survey was conducted in the Shyraldzhyn area. A total of twelve holes were drilled. Nine holes have caught gold bearing quartz - manganosiderite veins. Mineralized zones of the vein were confirmed to be embedded about 150m beneath surface at the northern part of the vein, about 80m beneath surface at the central part and about 200m depth at the southern part.

(2) The vein shows echelon arrangement, strikes NNE-SSW and dips 45° W. The average true width of the vein is 2.1m at the surface and 2.6m in drill holes. The maximum true width is 3.9m at the outcrops and 10.6m in hole

(3) The average gold grades of vein caught by holes range 2.5 to 11.3 g/t, silver grades range from 0.3 to 1.4 g/t and copper grade range from 0.24 to 4.54 %. High gold grade ore exists in the northern and southern parts of vein. Native gold is observed as grains ranging from a few μ m to 70 μ m. It occurs in goethite and quartz, and along fractures of those minerals. On the basis of occurrence and mineral assemblages, the gold mineralization of the deposit is presumed to be formed under the oxidation after the formation of quartz - manganosiderite vein.

(4) The average homogenization temperatures of fluid inclusion in quartz range from 221° to 131°C. These temperatures are lower than temperature ranging from 300° to 200°C, which is the most favorable temperature for gold mineralization. Distribution of homogenization temperature reveals that the temperature shows positive correlation with gold grade. The above mentioned interpretation suggests that higher temperature zones could exist in the northern and southern parts, and gold mineralized zones could be embedded.

(5) A tentative calculation of ore reserves represents that possible ore reserves are estimated to be 1,043 thousand tons with 5.2 g/t Au and 5.4 tons of gold. Potential ore reserves are expected to be 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold.

5-2 Recommendation for the future

As things stand, there is little possibility that the Shyraldzhyn deposit could be developed as a large gold deposit. For developing the deposit as a small-scale mine, an increase of ore reserves and a confirmation of high grade ore are necessary. The northern and southern parts of the deposit could be listed as prospective areas, if the existence of high gold grade ore could be expected at depth.

PART Ⅱ

PARTICULARS

CHAPTER 1 SHYRALDZHYN AREA

1-1 Purpose and methods of survey

1-1-1 Purpose of survey

A drilling survey was carried out in the lower part of the main orebody at the Shyraldzhyn deposit. The purpose of the survey was to directly clarify mineralization in the downward extension of the gold-bearing quartz-manganosiderite vein.

1-1-2 Method of survey

1) Outline of survey

Drilling of twelve drillholes totaling 2,560.4m was conducted. The locations of the respective drillholes are shown in Fig. II-1. The altitude, abscissa and ordinate of each hole were determined by using a simple survey with compass and measuring tape. The base point of the survey is a summit with an altitude of 2,893.4m. The magnetic variation in the area is 4° 45' east of true north.

Three drilling machines made in the former USSR, two SKB-4 (drilling capacity, ϕ 76mm : 500m and ϕ 59mm : 800m) and one of the SKB-5 (drilling capacity, ϕ 76mm : 800m and ϕ 59mm : 1,000m), were used in the work. The drilling operation was performed in two 12-hour shifts, with one foreman and two workers per unit, in principle.

The normal drilling method was applied in the operation in an effort to improve core recovery and work progress.

For the surface soil drilling, metal bits of ϕ 112mm or ϕ 93mm were used. After reaching the bedrock, ϕ 108mm or ϕ 89mm casing pipes were inserted and installed. Afterward, the drilling continued with diamond bits of ϕ 76mm or ϕ 59mm as the final diameter.

Bulldozers were used for transportation of the drilling machines and supplies, road construction, drilling site leveling and preparation. For preparation of mud water, water was conveyed to the drilling site from the nearest stream, which was 10 km away, by a 5 m^3 and two 1.8 m^3 tank trucks.

Core samples of vein and greisen were collected for assay in lengths of one meter in principle. The samples were cut into pairs of half-core. Chemical analysis was performed by the Central Research Laboratory of the State Agency of Geology and Mineral Resources. Gold, silver, copper and arsenic content were analyzed there. The following three methods were used in combination for gold.

	Method	Range	Accuracy	Applied Sample
(a)	Spectral gold	0.005 - 20 g/t	±70%	Low grade ore, soil, rock
(b)	Atomic absorption	0.01 - 20 g/t	±30%	Ore
(c)	Fire assay	0.1 g/t - max.	±30%	Ore

2) Drilling work

The drilling work lasted for 185 days, from June 15 to December 16, 1996. The drilling length, core recovery and drilling efficiency are shown by hole in Table II-1. The consumption of drilling articles and diamond bits are shown in Table II-2 and II-3. The main equipment used, results of the work and progress record are listed in Appendix 3-1 to 3-3.

1-2 Geology and ore deposit

1-2-1 Geology

This survey area is covered with the Sarydzhonskaya group of Riphean system and is intruded by the Kumyshtag granite. They are overlain by the Quaternary sediment. The geological map of this area is shown in Fig. II-2.

The Kumyshtag granite is divided into medium-grained pink granite and white granite porphyry on the surface. Medium-grained pink granite is the prominent rock facies and is exposed broadly in this area. White granite porphyry is exposed in the central area forming crescent-shaped with 500m in east and west and 1,000m in south and north. It is strongly subjected to white alteration.

Medium-grained pink granite is characterized by pink potassium feldspar. Under the microscope, it shows hypidiomorphic-grained texture. It is composed mainly microcline, quartz, plagioclase and biotite, with subordinate amounts of apatite and zircon.

Under the microscope, granite porphyry shows porphyric, glomeroporphyric and hypidiomorphic-grained texture. Phenocrysts are of microcline, quartz and plagioclase, with muscovite, sphene, zircon, apatite and biotite.

The Sarydzhonskaya group composed of hornfels and silicified shale occurs in the southern and eastern part. The Sarydzhonskaya group is expected to be intruded by the granite, partly being in fault contact.

1-2-2 Ore deposit

The deposit is situated in the Kumyshtag granite, and consists of gold-bearing quartz - manganosiderite veins. Total four veins composed of main orebody,

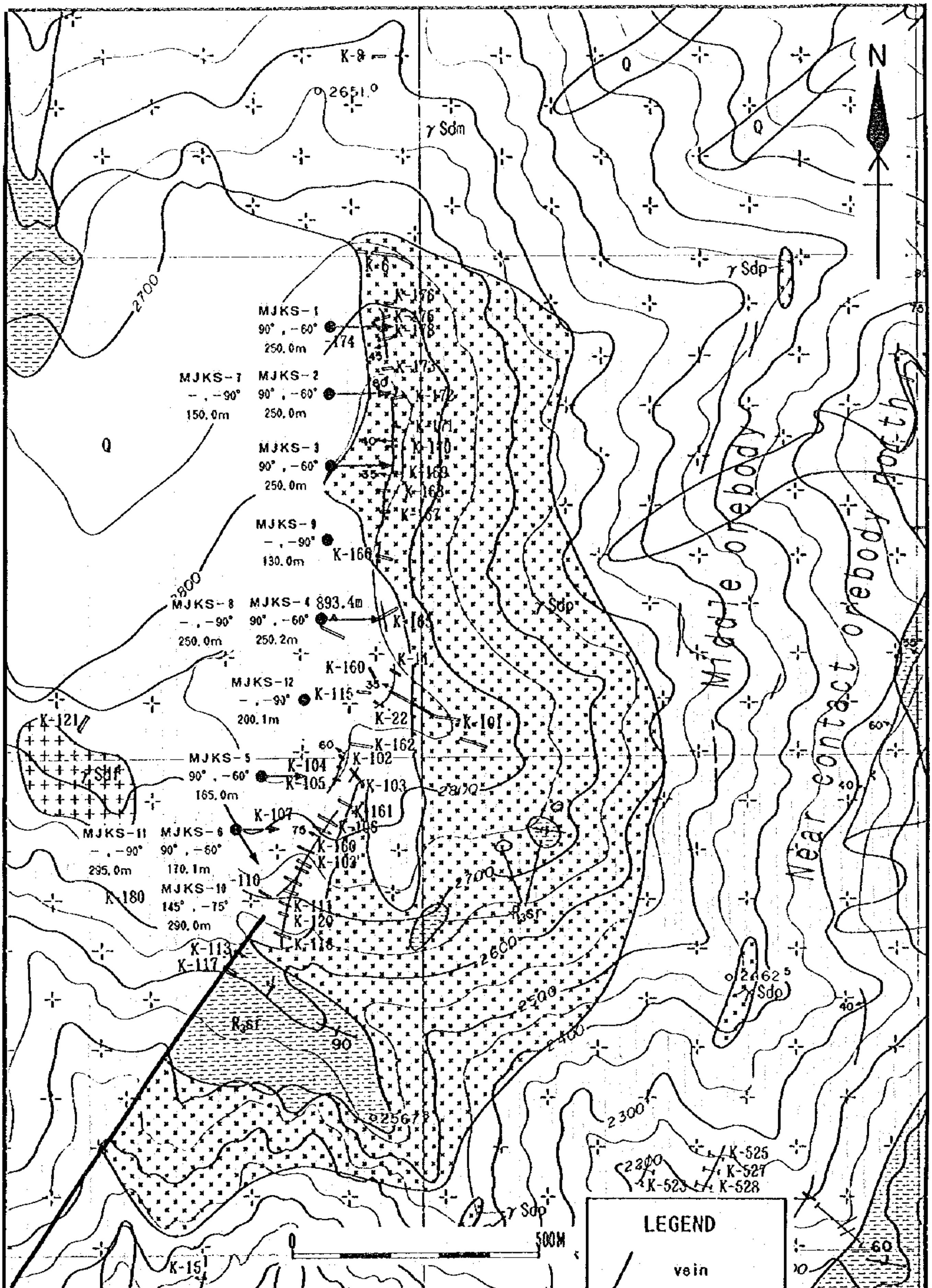


Fig. II-1 Location of the Drillholes

Table II-1 General Results of Drilling Works (1)

Item		MJKS-1	MJKS-2	MJKS-3	MJKS-4	MJKS-5	MJKS-6	Sub total
Period of drilling								
Started date		15 June '96	9 Aug. '96	15 June '96	29 July '96	8 Sept. '96	9 Sept. '96	
Finished date		7 Aug. '96	6 Sept. '96	27 July '96	5 Sept. '96	24 Sept. '96	3 Oct. '96	
Total day		54	29	43	39	17	25	
Drilling machine		SKB-4	SKB-4	SKB-4	SKB-4	SKB-4	SKB-4	
Direction		90°	90°	90°	90°	90°	90°	
Inclination		-60°	-60°	-60°	-60°	-60°	-60°	
Drilled length (m)		250.0	250.0	250.0	250.2	165.0	170.1	1,335.3
Length of core (m)		215.7	209.4	208.45	204.9	134.8	144.4	1,117.7
Core recovery (%)		86.3	83.8	83.4	81.9	81.7	84.9	83.7
Bit	ϕ 132mm	—	2.6m	—	—	—	—	
	ϕ 112mm	0.7m	5.4m	8.8m	14.4m	24.6m	3.6m	
	ϕ 93mm	2.5m	0.5m	—	1.0m	0.5m	0.6m	
	ϕ 76mm	134.2m	241.0m	204.7m	234.8m	139.9m	165.9m	
	ϕ 59mm	112.6m	0.5m	0.5m	—	—	—	
Casing	ϕ 127mm	—	2.6m	—	—	—	—	
	ϕ 108mm	3.2m	8.0m	8.8m	14.9m	24.6m	9.4m	
	ϕ 89mm	26.0m	—	—	—	—	28.9m	
	ϕ 73mm	—	—	—	—	—	—	
Drilling (day)*		43.5	23.5	37.0	35.5	17.0	19.5	176.0
Drilling (day)**		53.5	29.0	43.0	38.5	17.0	25.0	206.0
Efficiency (m/day)*		5.7	10.6	6.8	7.0	9.7	8.7	7.6
Efficiency (m/day)**		4.7	8.6	5.8	6.5	9.7	6.8	6.5

* working days
** including no-working days for regain of accident and others

Table II-1 General Results of Drilling Works (2)

Item		MJKS-7	MJKS-8	MJKS-9	MJKS-10	MJKS-11	MJKS-12	Sub total	Grand total
Period of drilling									
Started date		1 Oct '96	4 Oct '96	5 Oct '96	27 Oct '96	2 Nov. '96	24 Oct '96		
Finished date		14 Oct. '96	29 Oct. '96	18 Oct. '96	7 Dec. '96	16 Dec. '96	12 Nov. '96		
Total day		14	26	14	41	45	20		
Drilling machine		SKB-4	SKB-5	SKB-4	SKB-4	SKB-5, 4	SKB-4		
Direction		-	-	-	145°	-	-		
Inclination		-90°	-90°	-90°	-75°	-90°	-90°		
Drilled length (m)		150.0	160.0	130.0	290.0	295.0	200.1	1,225.1	2,560.4
Length of core (m)		126.5	138.7	108.8	236.4	238.8	164.9	1,014.1	2,131.8
Core recovery (%)		84.3	86.7	83.7	81.5	80.9	82.4	82.8	83.3
Bit	φ 132mm	—	—	2.0m	—	—	—		
	φ 112mm	3.8m	—	12.0m	9.0m	4.2m	6.5m		
	φ 93mm	0.4m	5.8m	—	5.6m	3.2m	21.3m		
	φ 76mm	145.8m	154.2m	101.0m	275.4m	286.1m	172.3m		
	φ 59mm	—	—	15.0m	—	1.5m	—		
Casing	φ 127mm	—	—	—	—	—	—		
	φ 108mm	3.8m	—	—	9.3m	7.0m	6.5m		
	φ 89mm	—	31.0m	24.0m	15..0m	30.0m	31.4m		
	φ 73mm	—	—	—	—	—	—		
Drilling (day)*		14.0	25.5	13	32	33.5	19.5	137.5	313.5
Drilling (day)**		14.0	25.5	13	41	44.5	19.5	157.5	363.5
Efficiency (m/day)*		10.7	6.3	10.0	9.1	8.8	10.3	8.9	8.2
Efficiency (m/day)**		10.7	6.3	10.0	7.1	6.6	10.3	7.8	7.0

* working days

** including no-working days for regain of accident and others

Table II-2 Consumable Drilling Articles (1)

Item	Specifi-Cation	Unit	Quantity						
			MJKS-1	MJKS-2	MJKS-3	MJKS-4	MJKS-5	MJKS-6	Sub total
Light oil		liter	9,780	8,262	9,780	8,262	3,312	3,312	42,708
Gasoline		liter	10	500	10	500	810	810	2,640
Hydraulic oil		liter	55	100	55	100	50	50	410
Drilling oil		liter	0	0	0	0	0	0	0
Mobile oil		liter	313	100	100	100	50	50	713
Grease		kg	34	42	53	0.3	32	32	193
Bentonite		ton	34	45	40	45	33	53	249
Cement		kg	2,895	100	1,750	100	0	0	4,845
Clear mud		m^3	844	610	385	570	242	26	2,677
Soda calcium		kg	325	200	325	200	80	100	1,230
Soda chloride		kg	25	100	125	100	10	20	380
Sodium biocarbonate		kg	300	230	200	245	100	50	1,125
Emulsion		kg	1,450	900	1,600	850	0	0	4,800
Diamond bit	112mm	pc	0	0	0	0	3	2	5
Diamond bit	93mm	pc	0	0	0	0	2	4	6
Diamond bit	76mm	pc	20	38	23	43	32	32	188
Diamond bit	59mm	pc	12	0	0	0	0	0	12
Metal crown	112mm	pc	5	10	15	13	5	10	58
Metal crown	93mm	pc	0	0	0	0	0	0	0
Metal crown	76mm	pc	18	35	10	47	10	20	140
Core box		pc	42	43	43	43	30	30	231

Table II-2 Consumable Drilling Articles (2)

Item	Specification	Unit	Quantity							
			MJKS-7	MJKS-8	MJKS-9	MJKS-10	MJKS-11	MJKS-12	Sub total	Grand total
Light oil		liter	7,351	4,900	4,900	10,896	8,240	567	36,854	79,562
Gasoline		liter	200	0	200	400	200	200	1,200	3,840
Hydraulic oil		liter	20	30	20	0	0	30	100	510
Drilling oil		liter	0	0	0	50	100	0	150	150
Mobile oil		liter	84	0	84	150	100	20	438	1,151
Grease		kg	120	150	150	40	0	40	500	693
Bentonite		ton	38	45	42	20	20	32	197	446
Cement		kg	0	50	0	0	0	0	50	4,895
Clear mud		m^3	184	243	186	432	468	258	1,771	4,448
Soda calcium		kg	30	50	40	100	200	75	495	1,725
Soda chloride		kg	0	0	0	1,000	500	100	1,600	1,980
Sodium biocarbonate		kg	100	100	90	0	50	34	374	1,499
Emulsion		kg	0	0	0	0	0	52	52	4,852
Diamond bit	112mm	pc	0	0	0	0	0	0	0	5
Diamond bit	93mm	pc	0	0	0	2	0	3	5	11
Diamond bit	76mm	pc	20	25	21	45	46	16	173	361
Diamond bit	59mm	pc	0	0	0	0	0	0	0	12
Metal crown	112mm	pc	0	0	0	10	0	12	22	80
Metal crown	93mm	pc	0	0	0	0	0	0	0	0
Metal crown	76mm	pc	10	20	12	0	3	22	67	207
Core box		pc	27	30	24	49	49	35	214	445

Table II-3 Drilling Meter of Diamond Bits

Size	Bits	Drilling meter by drillhole (m)												Total	Efficiency
	(pcs)	MJKS-1	MJKS-2	NJKS-3	MJKS-4	MJKS-5	MJKS-6	MJKS-7	MJKS-8	MJKS-9	MJKS-10	MJKS-11	MJKS-12		(m/bit)
76mm	20	134.2												134.2	6.7
	38		241.0											241	6.3
	23			240.7										240.7	10.5
	43				234.8									234.8	5.5
	32					139.9								139.9	4.4
	32						165.9							165.9	5.2
	20							145.8						145.8	7.3
	25								154.2					154.2	6.2
	21									101.0				101	4.8
	45										275.4			275.4	6.1
	46											286.1		286.1	6.2
	16												172.3	172.3	10.8
Sub total	361	134.2	241.0	240.7	234.8	139.9	165.9	145.8	154.2	101.0	275.4	286.1	172.3	2291.3	6.3
59mm	12	112.6												112.6	9.4
	0		0											0	-
	0			0.5										0.5	-
	0				0									0	-
	0					0								0	-
	0						0							0	-
	0							0						0	-
	0								0					0	-
	0									15.0				15	-
	0										0			0	-
	0											1.5		1.5	-
	0												0	0	-
Sub total	12	112.6	0.0	0.5	0.0	0.0	0.0	0.0	0.0	15.0	0.0	1.5	0.0	129.6	10.8
Grand total	373	246.8	241.0	241.2	234.8	139.9	165.9	145.8	154.2	116.0	275.4	287.6	172.3	2420.9	6.5

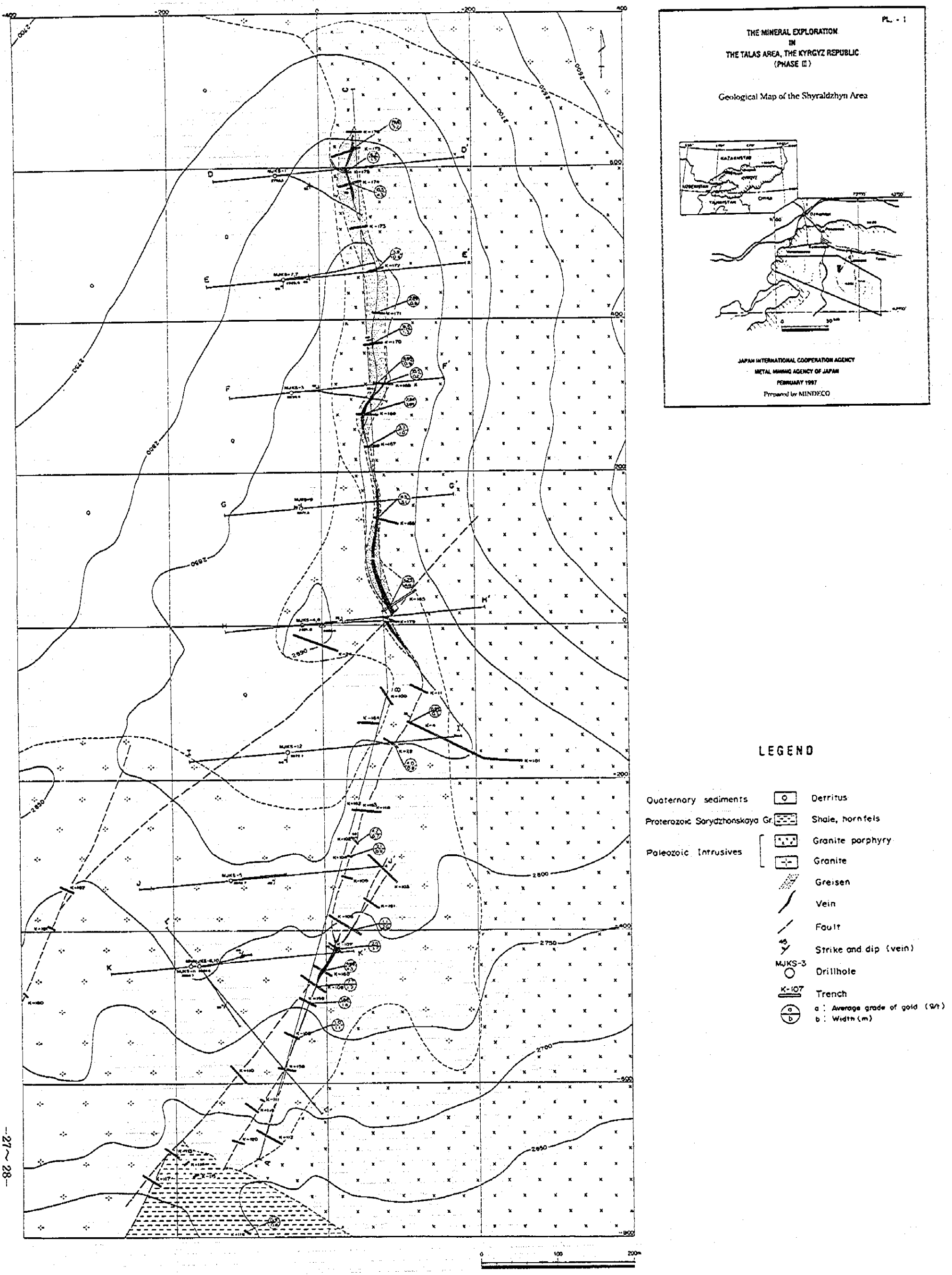


Fig. II-2 Geological Map of the Shyraldzhyn Area

middle orebody, near contact orebody north and near contact orebody south, have been found by the surface investigation.

The main orebody is exposed about 100m to the east of the highest peak with altitude of 2,893m. The width of main vein ranges from 0.6 to 3.7m with extension of 1,400m along strike of vein. It strikes N10° E and dips 35° to 48° W at the outcrops on the ridge. On the slope of mountain, it dips 75° W.

After explosive of leveling at the MJKS-5 site, the manganosiderite veinlets were exposed with 10 and 4cm in width. The former strikes N18° E and dips 55° W, and the latter strikes N35° E and dips 35° W, respectively. These veinlets would be hanging veins parallel to the main orebody according to the location of veins.

Ore collected from trench of the main vein, were shown ranging from 1.0 to 19.6 g/t Au, from 1 to 6.6 g/t Ag, from 0.28 to 2.6 % Cu. Therefore this deposit has a sign of predominant gold mineralization. High gold ore is occurred in the northern part.

Under the microscope, ore is composed mainly of goethite, pyrolusite and cryptomelane, as accessories psilomelane, chalcophanite, pyrite, chalcopyrite, malachite and azurite. Gold occurs in quartz, chalcopyrite, sometimes in goethite mass. Gold forms small crystals of isometric, sometimes elongated, drop-shaped. Size of gold crystal ranges from 0.003 to 0.015mm.

Homogenization temperatures of fluid inclusion in quartz collected from trench were measured. Homogenization temperatures range from 310°C to 120°C, and center ranging from 210°C to 130°C. The average homogenization temperature of each specimen centers ranging from 180°C to 150°C.

This deposit is characterized by greisen ranging from 1 to 10m in width, which occurs between granite of country rock and manganosiderite vein. Occasionally the vein borders greisen with white clay zone with some tens cm in width at both sides of hanging wall and footwall. Greisen grades into non-altered granite through weak greisen altered granite. Greisen consists mainly of quartz and muscovite and often remains equigranular texture of the original rock in the naked eyes. Tourmaline veinlets with 10 cm in width are observed in greisen.

For an isotopic age determination, muscovite is collected from greisen along vein. The result of absolute age determination by K-Ar method represents 405±21 Ma. It corresponds to late Silurian (S_2) to early Devonian age (D_1). This is same age as the Kumyshtag granite, which have been dated as 406±14 Ma by absolute age determination of U-Pb method. This fact indicates that mineralization chained to greisenization in the Shyraldzhyn deposit had been taken place at the latest stage of formation of the Kumyshtag granite

1-3 Results of drilling survey

The drilling survey was performed in the downward extension of the main orebody. A large-scale gold-bearing quartz - manganosiderite vein was confirmed by the drillhole MJKS-6. The respective results of the drillhole are described from the north to the south. The geological cross section along the programmed direction of the drillholes are shown in Fig. II-3 to II-11. Geologic core logs of the drillings are presented in Apx. 1. Major mineralized zones confirmed by the drillings are listed in Table II-4.

1) MJKS-1 (Direction 90°, inclination -60°, drilled length 250.0m)

The drilling was intended to clarify mineralization around the depth of 200m beneath the trench K-178 in the northern part of the main orebody (Fig. II-3).

(1) Geology and alteration

The drillhole is mainly composed of medium-grained pink granite. Between 56.9m and 91.15m, greisen including veins was observed. Pink granite is characterized by potassium feldspar showing pink clearly. Greisen is pale green and composed of quartz and sericite. Under the microscope (Apx. 2-2; 6KS007, 6KS018), it shows glomeroblastic texture, and consists of quartz and muscovite, with lithium mica, calcite, beryl and barite.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS020), clay occurring at 91.17m between vein and epidote altered granite of footwall, is dominant in sericite, quartz and calcite.

(2) Mineralization

Between 62.3m and 62.8m, quartz - manganosiderite veinlet was caught in width of 0.5m (true width: 0.45m). Between 90.1m and 91.15m, manganosiderite vein -- in width of 1.05m (true width: 0.9m), between 96.2m and 96.4m, quartz - manganosiderite vein -- in width of 0.2m. Grades of vein between 90.1m and 91.15m are 2.6 g/t Au, 0.45 g/t Ag and 1.30% Cu (Table II-4).

Chalcopyrite and malachite are recognized in quartz- manganosiderite veins by the naked eyes. As other ore minerals, pyrolusite, psilomelane, goethite, lepidochrocite, pyrite, chalcocite, covellite and native gold are observed under the microscope (Apx. 2-4; 6KS010, 6KS019, 6KS021). According to occurrence and textures under the microscope, manganese oxides, manganese hydrous oxides and ferric oxides are presumed to be formed by oxidation of manganosiderite.

The particles of native gold measure from 0.01 x 0.01mm to 0.024 x 0.025mm. They are observed with hydrous ferric oxides formed on chalcopyrite, and are confined to the fractures in quartz.

Homogenization temperatures of fluid inclusions in quartz collected from quartz - manganosiderite veins of 62.35m and 96.25m, range from 167°C to 152°C and 164°C to 142°C, separately (Apx. 2-8; 6KS010, 6KS021). Individual average temperatures reveal 161°C and 157°C.

According to the locations of the veins confirmed by the trench and this drillhole, veins is presumed to dip 50° W around the hole.

2) MJKS-2 (Direction 90°, inclination -60°, drilled length 250.0m)

At this drillhole, it was aimed to clarify mineralization around the depth of 200m beneath the trench K-172 in the northern part of the main orebody (Fig. II-4).

(1) Geology and alteration

Except granite porphyry near the surface, the drillhole is mainly composed of medium-grained pink granite. Greisenizated granite and greisen including vein were observed between 50.4m and 59.9m, and between 59.9m and 75.1m, respectively. Granite porphyry showing gray is characterized by phenocryst of potassium feldspar with 1cm. Occasionally purple fluorite was observed as spots in pink granite of footwall.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS078), clay occurring at 75.2m between greisen of footwall and epidote altered granite, is dominant in quartz and calcite, including sericite.

(2) Mineralization

Between 65.8m and 68.1m, and between 70.45m and 74.95m, quartz - manganosiderite veins were caught with 2.3m in width (true width: 2.2m) and 4.5m (true width: 4.3m), separately. Respective grades of two veins are 11.3 g/t Au, 0.4 g/t Ag and 2.98% Cu, and 3.3 g/t Au, 0.3 g/t Ag and 0.68% Cu (Table II-4).

Chalcopyrite and malachite are recognized in two quartz- manganosiderite veins by the naked eyes. Pyrolusite, psilomelane, goethite, lepidochrocite, pyrite, chalcocite, covellite, bornite and native gold are observed under the microscope (Apx. 2-4; 6KS067, 6KS069, 6KS072, 6KS076a, 6KS076b).

Native gold forms particles measuring from 0.003 x 0.002mm to 0.03 x 0.028mm. They are accompanied with chalcopyrite, and are observed among goethite formed on pyrite and chalcopyrite.

Homogenization temperatures in quartz collected from veins of 67.4m and

70.0m, range from 172°C to 169°C and 212°C to 192°C, separately (Apx. 2-8; 6KS068, 6KS072). Respective average temperatures reveal 171°C and 202°C.

Veins is assumed to dip 45' W around the hole.

3) MJKS-7 (Direction -, inclination -90', drilled length 150.0m)

It was designed to examine mineralization at the depth of 60m lower extension of quartz - manganosiderite vein caught by MJKS-7 (Fig. II-4).

(1) Geology and alteration

Except granite porphyry near the surface, the hole is mainly composed of medium-grained granite. Greisenizated granite and greisen including vein were observed between 112.5m and 130.1m. Granite is divided into non-altered pink granite, gray to pale greenish gray granite and leucocratic granite.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS173), clay at 119.5m between vein and footwall greisen, is rich in quartz, sericite and calcite.

(2) Mineralization

Between 116.8m and 119.3m, quartz - manganosiderite vein was confirmed with 2.5m in width (true width: 1.8m). Grades of vein are 8.4 g/t Au, 1.4 g/t Ag and 4.54% Cu (Table II-4).

Banded structure composed of quartz and manganosiderite was recognized around 119.1m in vein. Banded angle shows 30' against the drilled direction. In footwall greisen, four clayey veinlets were observed with ranging from 30 to 40cm in width, sometimes associated with partly clayey greisen.

Malachite, chalcopyrite and hematite are recognized in vein. Under the microscope (Apx. 2-4; 6KS172), psilomelane, goethite, pyrite and chalcocite are observed.

Homogenization temperatures at 116.85m are between from 151°C and 138°C (Apx. 2-8; 6KS170). The average temperature reveals 146°C.

Veins is presumed to dip 55' W around the hole.

4) MJKS-3 (Direction 90', inclination -60', drilled length 250.0m)

It was intended to clarify mineralization around the depth of 200m beneath the trench K-169 in the central part of the main orebody (Fig. II-5).

(1) Geology and alteration

The hole is composed of white to pale green granite porphyry and medium-grained pink granite. Greisenizated granite and greisen were observed between 22.8m and 28.45m, and between 31.7m and 39.7m, individually. Greisen including vein was recognized between 71.1m and 78.95m. Granite porphyry is composed of quartz, potassium feldspar and plagioclase. Sphene and orthite are recognized under the microscope in it (Apx. 2-2; 6KS048, 6KS050). Purple fluorite is observed with 2 to 5mm length in greisen between 32m and 39m.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS044), clay 70.9m between vein and epidote altered granite of hanging wall, is dominant in quartz and sericite.

(2) Mineralization

Quartz - manganosiderite vein was confirmed in width of 1.0m (true width: 1.0m) between 71.1m and 72.1m. Grade of vein is 9.0 g/t Au, 0.6 g/t Ag and 0.76% Cu (Table II-4). Hanging wall of vein consists of sheared zone including grayish yellow clay with 1.5m in width. It borders pale green epidote altered granite. Banded structure injecting siderite with 1to 2mm in width, are observed in footwall greisen between 72m and 73m.

Pyrolusite, goethite, pyrite, chalcocite, covellite malachite and native gold are observed under the microscope (Apx. 2-4; 6KS036).

The particles of native gold measure from 0.006 x 0.008mm to 0.042 x 0.018mm. They are observed with hydrous ferric oxides and occur in small fractures in quartz.

Homogenization temperatures at 116.85m reveal between 174°C to 140°C, and the average temperature is 161°C (Apx. 2-8; 6KS036).

Vein is presumed to dip 42° W around the hole.

5) MJKS-9 (Direction -, inclination -90°, drilled length 130.0m)

It was aimed to examine mineralization around the depth of 130m beneath the trench K-166 in the central part of the main orebody (Fig. II-6).

(1) Geology and alteration

The hole is composed of white gray granite porphyry, leucocratic granite and medium-grained pink granite. Greisen including vein was observed between 91.5m and 115.0m.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS203), clay at 109.7m between vein and footwall greisen, is rich in quartz sericite and calcite with fluorite.

(2) Mineralization

Between 105.85m and 109.65m, quartz - manganosiderite vein was caught with 3.8m in width (true width: 3.0m). Grades of vein are 3.0 g/t Au, 0.4 g/t Ag and 0.97% Cu (Table II-4). Banded structure (appearance angle: 20°) composed of quartz and manganosiderite was recognized around 106m in vein.

Chalcopyrite, malachite and hematite are recognized in quartz · manganosiderite vein by naked eyes. Psilomelane, goethite, lepidochrocite, pyrite, pyrrhotite, magnetite and native gold are observed under the microscope (Apx. 2-4; 6KS195). Native gold forms particles measuring from 0.005 x 0.005mm to 0.072 x 0.02mm. They occur among hydrous ferric minerals hydrous manganese.

Homogenization temperatures at 105.9m range from 161°C to 149°C (Apx. 2-8; 6KS194). The average temperature is 154°C.

Vein is assumed to 38° W around the hole.

6) MJKS-4 (Direction 90°, inclination -60°, drilled length 250.2m)

It was aimed to examine mineralization around the depth of 100m below the trench K-165 in the central part of the main orebody (Fig. II-7).

(1) Geology and alteration

The hole is composed of white gray aplite, leucocratic granite and medium-grained pink granite. Between 96.75m and 115.9m, greisen was noticed. Greisen including vein and greisenizated granite were observed between 96.75m and 115.9m. Aplite contains muscovite and fluorite. Under the microscope (Apx. 2-2; 6KS121, 6KS095) it consists of quartz, potassium feldspar, plagioclase and muscovite. Potassium feldspar is microcline showing perthite texture.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS119, 6KS120, 6KS161, 6KS162), clay veins among 48m and 83.6m are predominant in quartz, potassium feldspar, sericite and calcite.

(2) Mineralization

Between 105.0m and 106.8m, quartz · manganosiderite vein was caught with 1.8m in width (true width: 1.8m). Between 111.5m and 111.8m, manganosiderite veinlet was caught with 0.3m in width, separately. Grades of main vein between 105.0m and 106.8m are 2.5 g/t Au, 0.3 g/t Ag and 0.24% Cu (Table II-4).

As ore minerals, pyrolusite, psilomelane, goethite, lepidochrocite, pyrite, pyrrhotite, magnetite chalcopyrite, chalcocite, covelline and native silver(?) are observed under the microscope (Apx. 2-4; 6KS081, 6KS106, 6KS113). Dotted separations of native silver(?) measuring 0.001 to 0.002mm are confined to fractures in quartz.

Homogenization temperatures at 31.14m and 106.2m reveal between 183°C and 169°C and 152°C, respectively (Apx. 2-8; 6KS081, 6KS106). The average temperature of the former is 177°C.

Vein is inferred to dip 35° W around the hole.

7) MJKS-8 (Direction -, inclination -90°, drilled length 160.0m)

It was aimed to clarify mineralization at the depth of 70m lower extension of quartz - manganosiderite vein caught by MJKS-7 (Fig. II-7).

(1) Geology and alteration

The hole is composed of white gray aplite, leucocratic granite and medium-grained pink granite. Between 36.5m and 41.6m and between 131.8 and 140.7m, greisen were noticed.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS221, 6KS220), clay veins among greisen are rich in quartz, sericite, potassium feldspar, and calcite.

(2) Mineralization

Although disseminated manganese oxides are observed in greisen, no quartz - manganosiderite vein is found. Grade of gold in greisen shows less than 0.005 g/t of detection limit.

8) MJKS-12 (Direction -, inclination -90°, drilled length 200.1m)

It was aimed to examine mineralization around the depth of 180m beneath the trench K-4 in the central part of the main orebody (Fig. II-8).

(1) Geology and alteration

The hole consists of pink granite and epidote altered granite. No greisen is noticed. Clay veins intersected altered granite among 65m and 1171m are rich in quartz and sericite with potassium feldspar and calcite according to the X-ray diffraction analysis (Apx. 2-7; 6KS222, 6KS223, 6KS226).

(2) Mineralization

Between 132.25m and 132.65m, calcite veinlet was found with 0.4m in width. Manganosiderite veinlets were caught between 180.0m and 180.2m and between 184.8m and 184.9m, with 0.2m and 0.1m in width, separately. Vein would dip 45° W around the hole. Mineralization is presumed to be poor herein.

9) MJKS-5 (Direction 90°, inclination -60°, drilled length 165.0m)

It was aimed to examine mineralization around the depth of 140m beneath the trench K-104 in the southern part of the main orebody (Fig. II-9).

(1) Geology and alteration

The hole is mainly composed of pink granite. Between 23.2m and 24.45m, greisenizated granite was noticed. Between 140.9m and 147.5m, beresitizated granite was recognized. Beresitizated granite shows pale greenish gray. Under the microscope (Apx. 2-2; 6KS132, 6KS156) it mostly consists of quartz, potassium feldspar, plagioclase and sericite, with calcite, apatite, rutile and pyrite.

According to the mining encyclopedia published in USSR, beresite is metasomatic rock, composed of quartz, albite, sericite, carbonate minerals and enrich by pyrite. Beresite develops in reaction rims of quartz vein containing gold, in acidic and intermediate rocks by influence of higher acid solution in middle or shallow depth. Beresite named from the Beresovskoe gold deposit in the Ural. People say that gold exploration in Russia had been started from this deposit.

On the basis of mineral assemblages, beresitization is correspond to sericitization in the Western world.

According to the X-ray diffraction analysis (Apx. 2-7; 6KS164, 6KS165), clay veins penetrated epidote altered granite of hanging wall are composed of quartz, sericite, potassium feldspar and calcite.

(2) Mineralization

Between 122.9m and 122.98m, quartz - manganosiderite veinlet was caught with 0.08m in width. Quartz -manganosiderite vein intersects between 142.5m and 145.1m with 2.6m (true width: 2.5m). Grades of main vein are 2.6 g/t Au, 0.3 g/t Ag and 1.05% Cu (Table II-4).

Hematite and chalcopyrite and malachite are observed in quartz - manganosiderite by naked eyes. As other ore minerals, pyrolusite, psilomelane, goethite, lepidochrocite, pyrite, chalcocite, covelline and native gold are observed under the microscope (Apx. 2-4; 6KS130, 6KS133, 6KS134). The particles of native gold range from 0.012 x 0.009mm to 0.042 x 0.015mm. They are occurred in goethite and hydrous manganese oxides.

Homogenization temperatures at 123.3m and 142.8m reveal between 149°C and 124°C and between 168°C and 142°C, respectively (Apx. 2-8; 6KS131, 6KS133). The average temperatures are 177°C and 151°C.

Vein is inferred to dip 48° W around the hole.

10) MJKS-6 (Direction 90°, inclination -60°, drilled length 170.0m)

It was aimed to examine mineralization around the depth of 160m beneath the trench K-107 in the southern part of the main orebody (Fig. II-10).

(1) Geology and alteration

The hole is chiefly composed of pink granite. No greisen was recognized. Between 130.6m and 147.0m, beresitizated granite was recognized. Beresitizated granite is pale greenish gray. Under the microscope (Apx. 2-2; 6KS138, 6KS153) it mostly consists of quartz, potassium feldspar, plagioclase and sericite, with calcite, apatite, rutile and leucoxene.

Clay veins were not found in vein and beresitizated granite. Clay veins at 35m apart from hanging wall side of ore vein, and at 10m from footwall, are rich in quartz and potassium feldspar with sericite and calcite.

(2) Mineralization

A large-scale quartz -manganosiderite vein intersects between 133.9m and 145.2m with 11.3m (true width: 10.6m). Grades of this vein are 6.4 g/t Au, 0.7 g/t Ag and 1.31% Cu (Table II-4).

Chalcopyrite and malachite are observed in ore vein by naked eyes. As other ore minerals, pyrolusite, psilomelane, goethite, lepidochrocite, pyrite, chalcocite, covelline and native gold are observed under the microscope (Apx. 2-4; 6KS140, 6KS141, 6KS144,6KS145, 6KS148). The particles of native gold range from 0.005 x 0.006mm to 0.012 x 0.015mm. They are occurred among quartz and feldspar with goethite, and in goethite replaced chalcopyrite.

Banded structure (appearance angle: 60°) composed of quartz and manganosiderite was distinct around 134m in ore vein. Upper 5m of ore vein is predominant in quartz and lower 6m is rich in manganosiderite.

Homogenization temperatures at 134.7m and 139.2m reveal 162°C and between 223°C and 218°C, respectively (Apx. 2-8; 6KS140, 6KS145). The average temperature of the latter is 221°C.

Vein is assumed to dip 45° NW around the hole.

11) MJKS-11 (Direction -, inclination -90°, drilled length 295.0m)

It was designed to examine mineralization at the depth of 110m lower extension of quartz - manganosiderite vein caught by MJKS-6 (Fig. II-10).

(1) Geology and alteration

The hole is mainly composed of pink granite. Beresitizated granite continues between 185.2m and 237.0m. According to the X-ray diffraction analysis (Apx. 2-7; 6KS258), clay vein penetrated beresitizated granite at 217.35m is rich in quartz, sericite and calcite.

(2) Mineralization

Manganosiderite veinlets occur with 0.5cm to 1cm in width between 204.0m and 204.15m in beresitizated granite. Manganosiderite veinlet occurs with 0.45m in width between 210.15m and 210.6m therein. Between 228.5m and 230.55m, quartz

Table II-4 Major Mineralized Zones Confirmed by Drilling in the Shyraldzhyn Deposit

Hole No.	Depth (m)	Width(m)	True width(m)	Au (g/t)	Ag (g/t)	Cu (%)	As (%)	Mineralization
MJKS-1	90.1-91.15	1.05	0.9	2.6	0.45	1.30	<0.03	Manganosiderite vein
MJKS-2	65.8-68.1	2.3	2.2	11.3	0.4	2.98	<0.03	Quartz Manganosiderite vein
	70.45-74.95	4.5	4.3	3.3	0.3	0.68	<0.03	Quartz Manganosiderite vein
MJKS-3	71.1-72.1	1.0	1.0	9.0	0.6	0.76	<0.03	Quartz Manganosiderite vein
MJKS-4	105.0-106.8	1.8	1.8	2.5	<0.3	0.24	<0.03	Quartz Manganosiderite vein
MJKS-5	142.5-145.1	2.6	2.5	2.6	0.3	1.05	<0.03	Manganosiderite vein
MJKS-6	133.9-145.2	11.3	10.6	6.4	0.7	1.31	<0.03	Quartz Manganosiderite vein
MJKS-7	116.8-119.3	2.5	1.8	8.4	1.4	4.54	<0.03	Quartz Manganosiderite vein
MJKS-9	105.85-109.65	3.8	3.0	3.0	0.4	0.97	<0.03	Quartz Manganosiderite vein
MJKS-11	228.5-230.55	2.05	1.2	2.8	0.7	0.43	<0.03	Quartz Manganosiderite vein

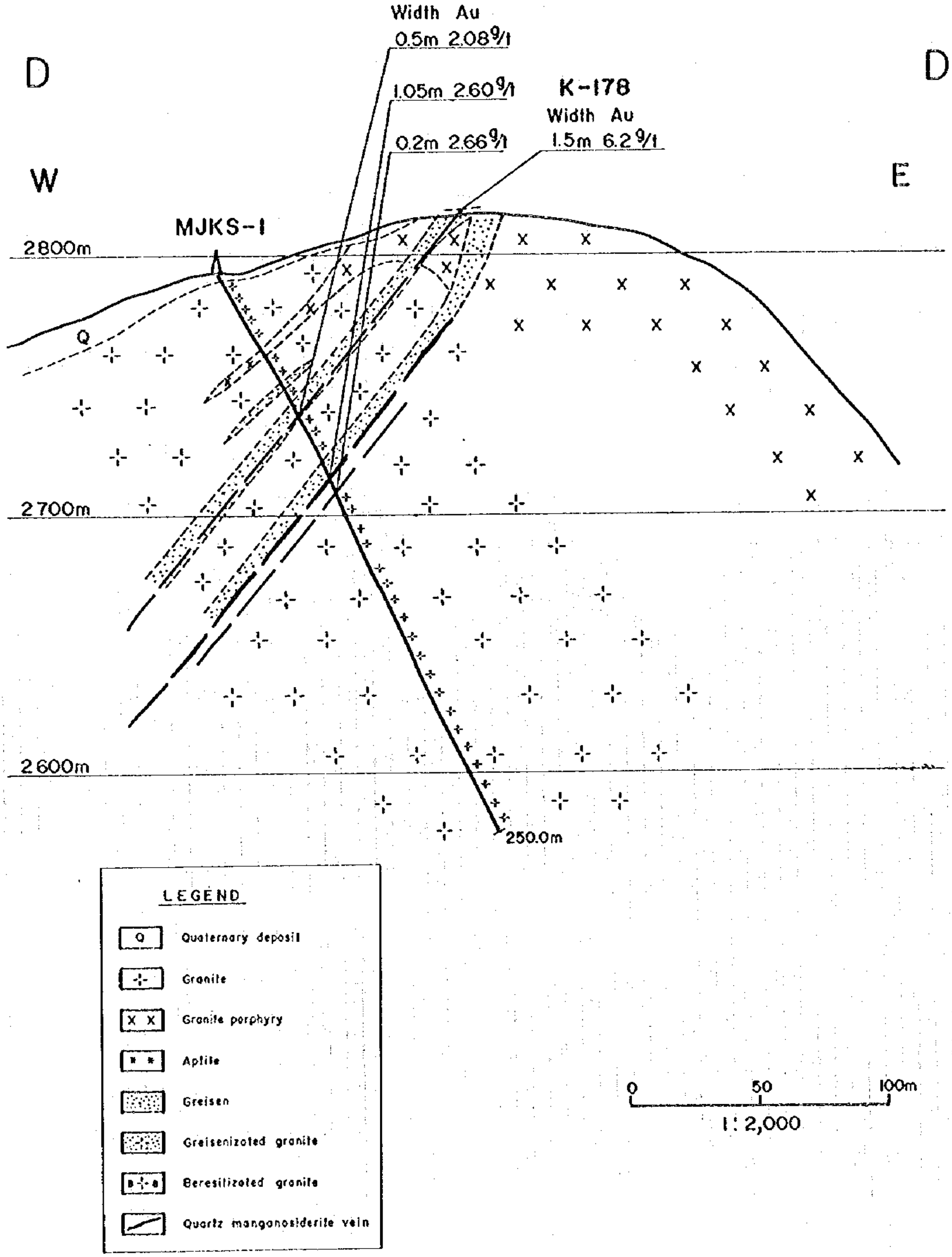


Fig. II-3 Geological Cross Section along MJKS-1

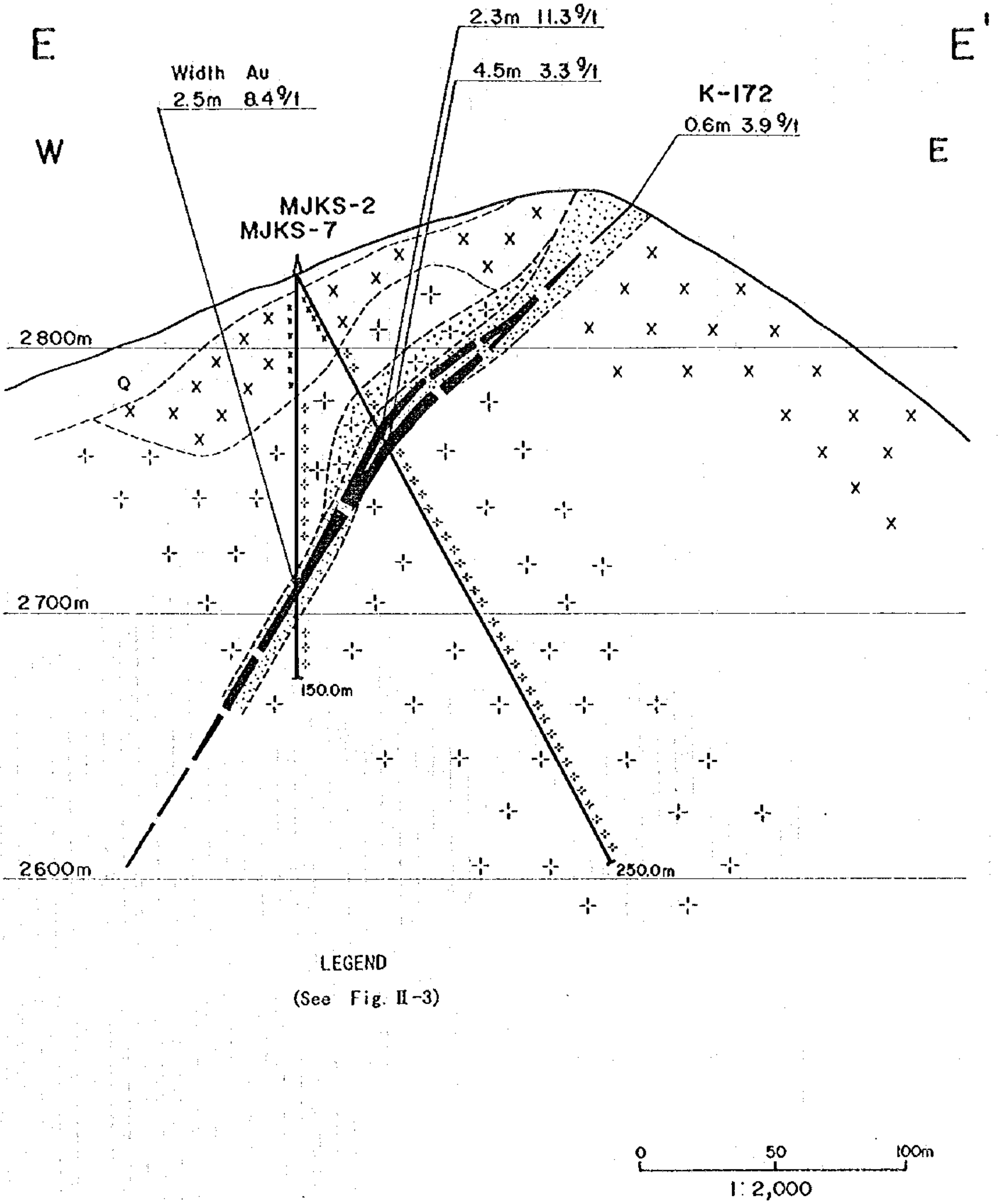


Fig. II-4 Geological Cross Section along MJKS-2 and 7

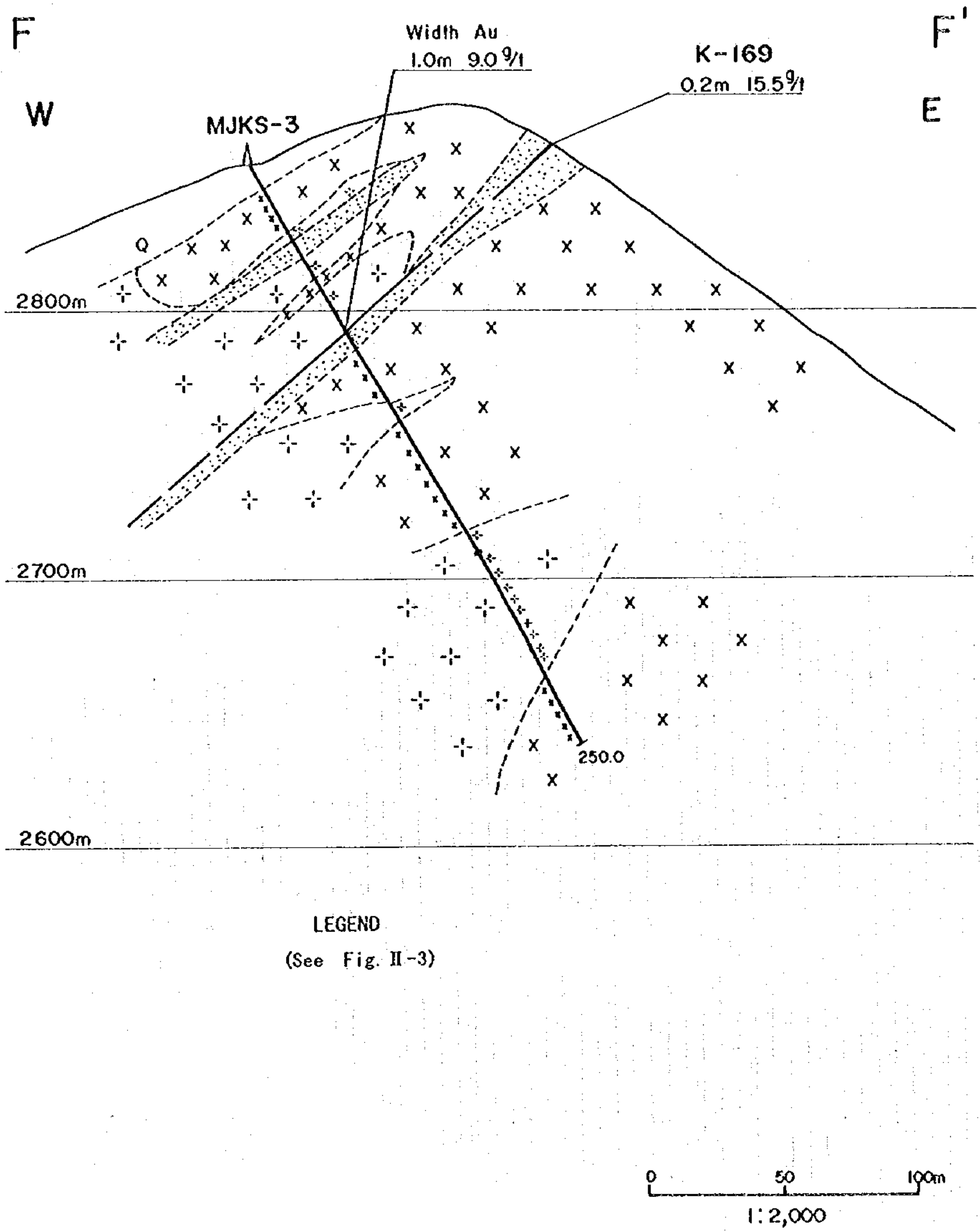
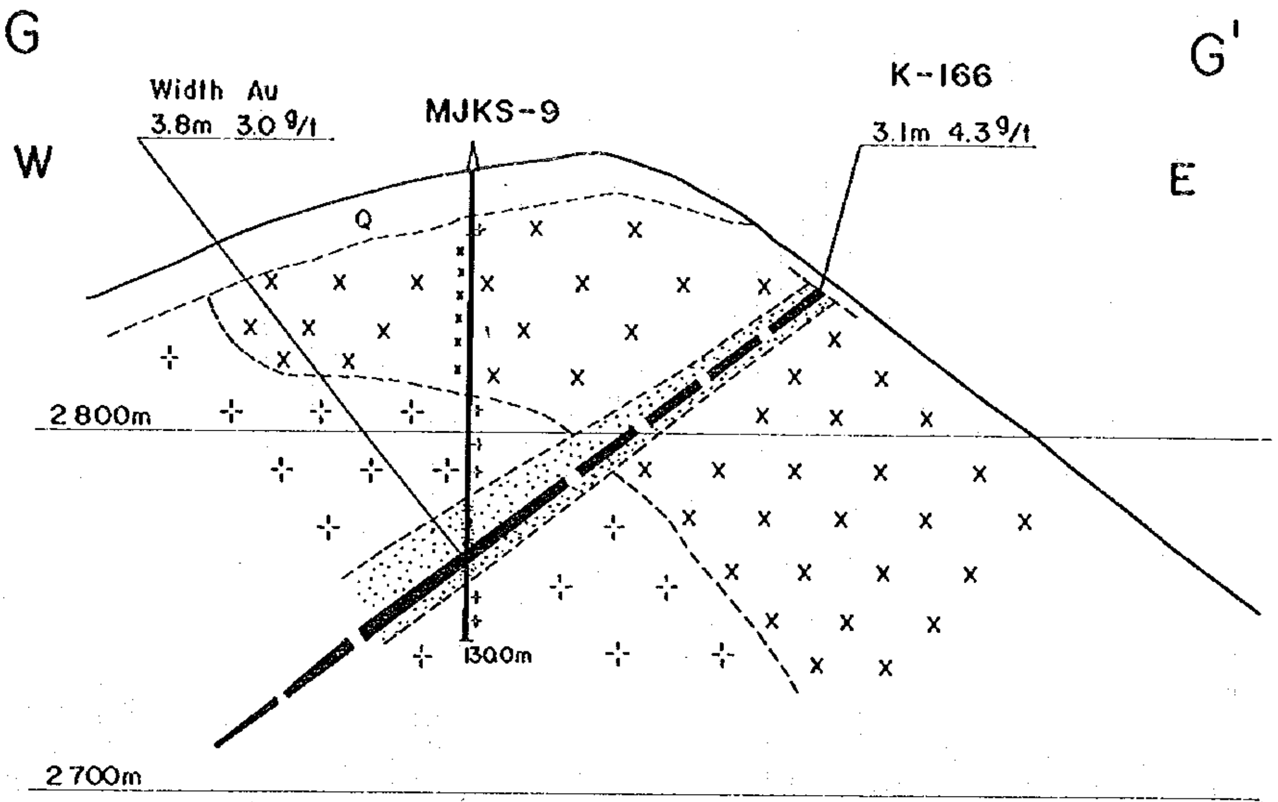


Fig. II-5 Geological Cross Section along MJKS-3



LEGEND
(See Fig. II-3)

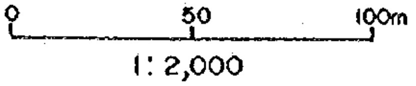


Fig. II-6 Geological Cross Section along MJKS-9

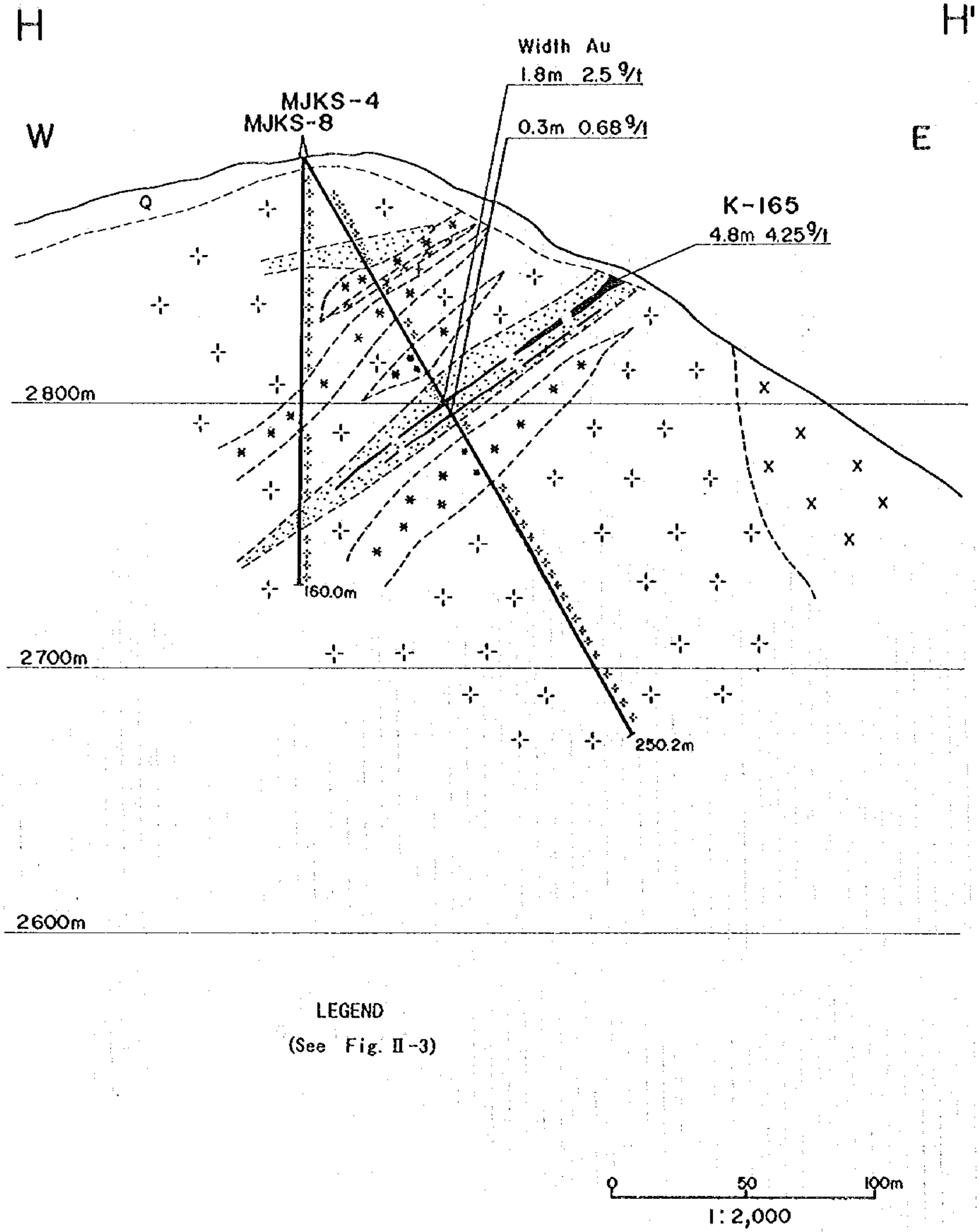


Fig. II-7 Geological Cross Section along MJKS-4 and 8

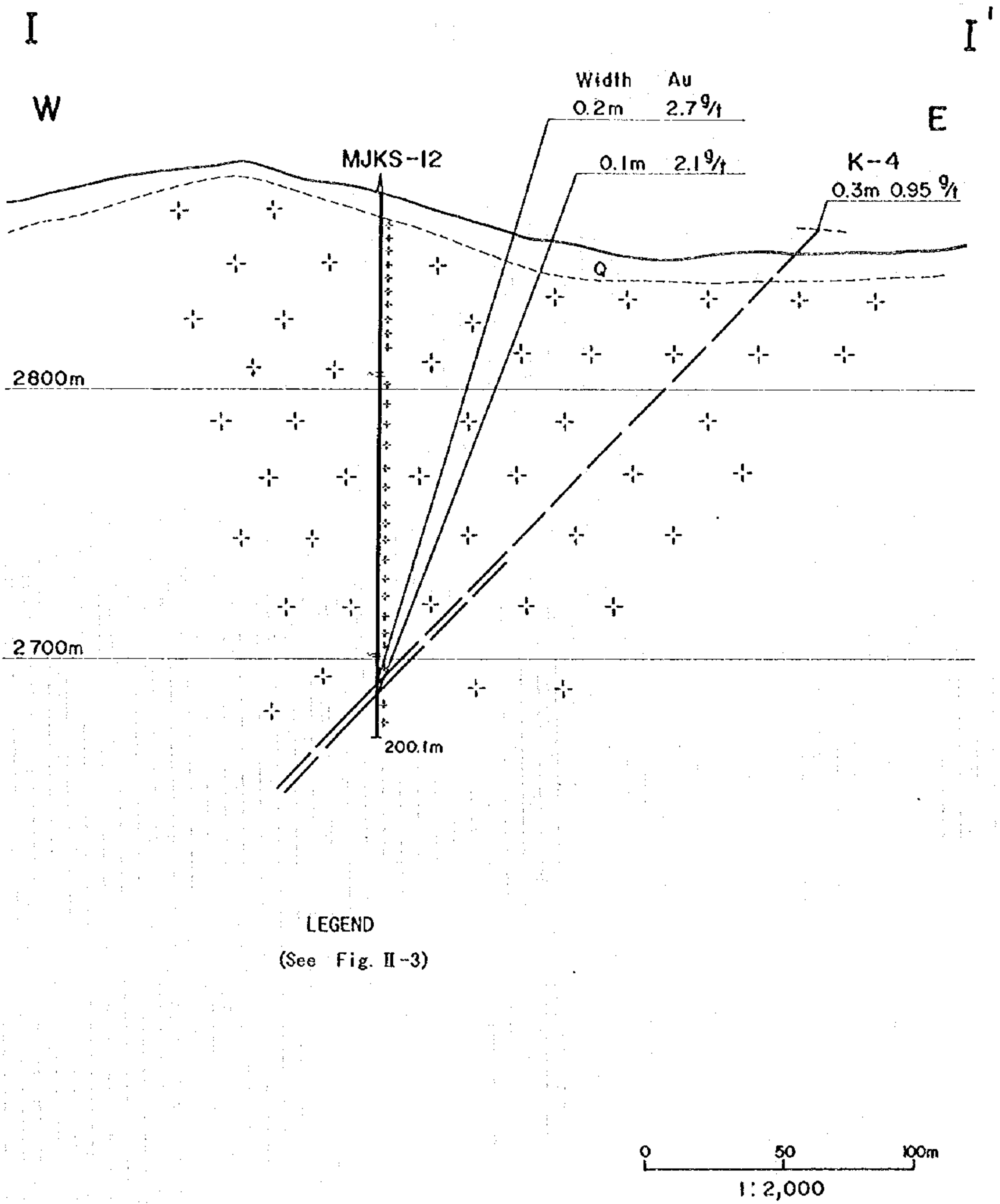


Fig.II-8 Geological Cross Section along MJKS-12

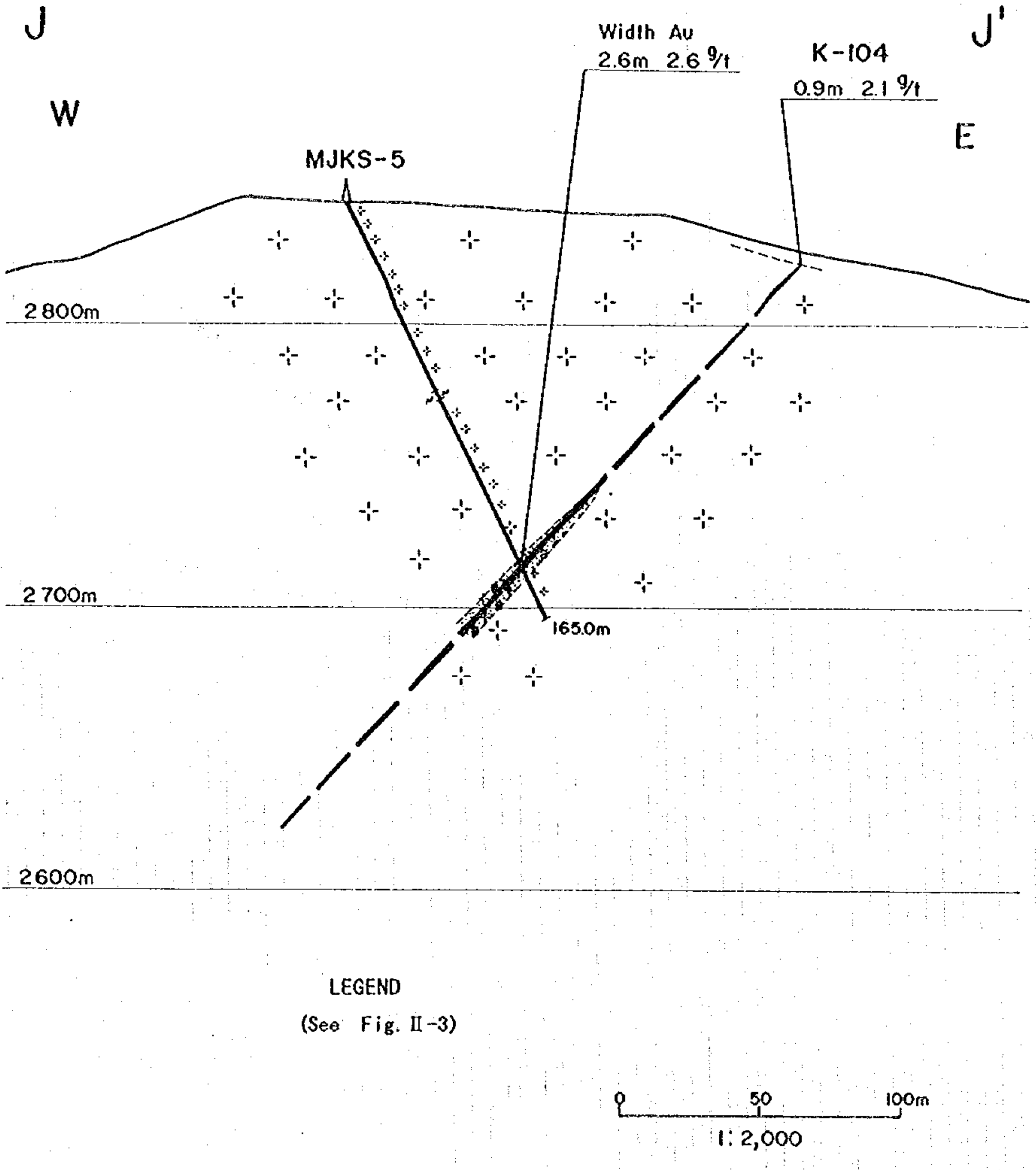


Fig. II-9 Geological Cross Section along MJKS-5

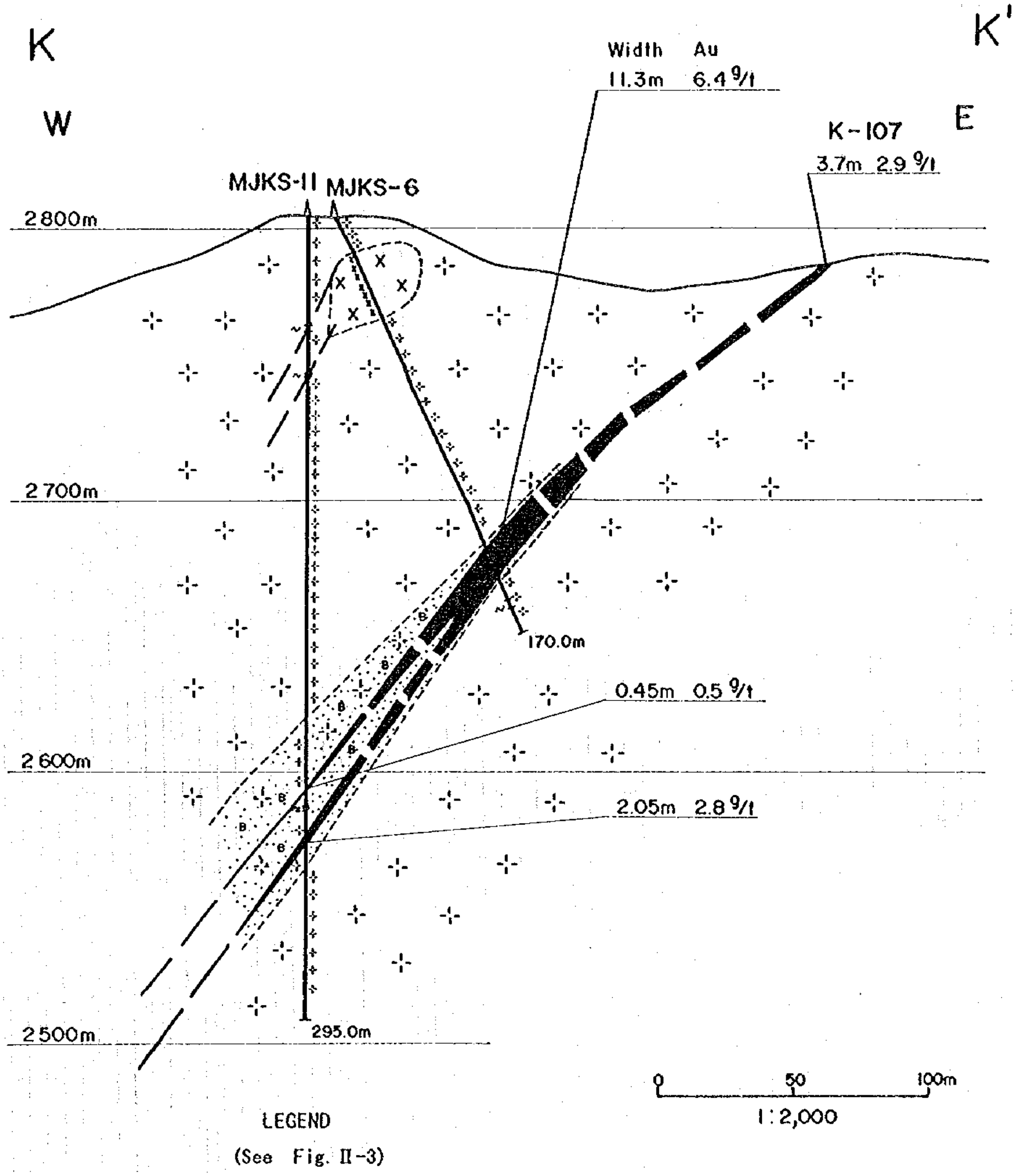


Fig. II-10 Geological Cross Section along MJKS-6 and 11

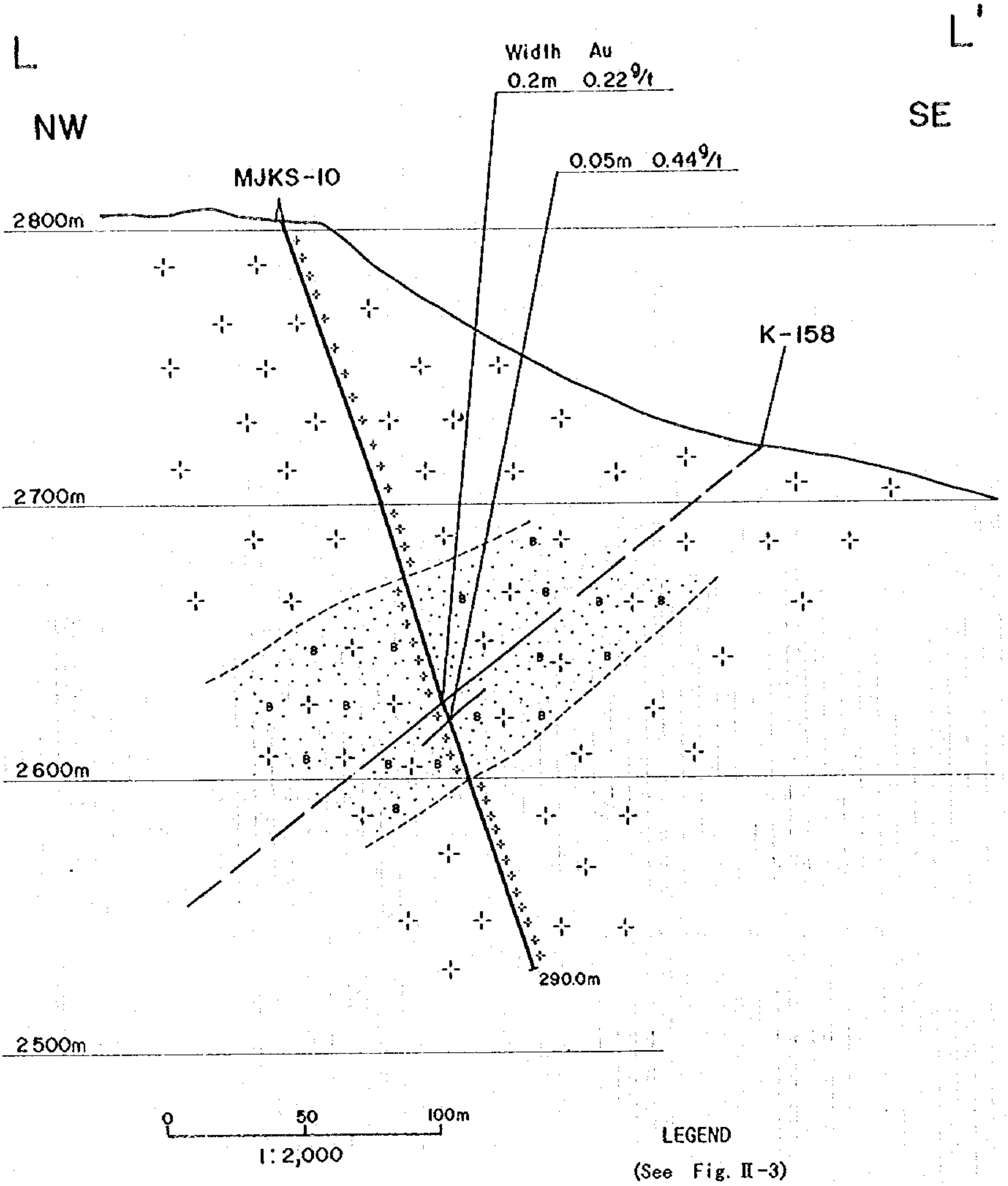


Fig. II-11 Geological Cross Section along MJKS-10

- manganosiderite vein is confirmed with 2.05m (true width: 1.2m). Grades of main vein are 2.8 g/t Au, 0.7 g/t Ag and 0.43% Cu (Table II-4).

Under the microscope (Apx. 2-4; 6KS251, 6KS271), pyrolusite, psilomelane, goethite, lepidochrocite, pyrite chalcocite, covelline, native gold and native silver are observed. Native gold is observed in the shape of oval inclusions in chalcopyrite, ranging from 0.01 x 0.007mm to 0.013 x 0.005mm. Other particles of native gold are observed among goethite mass in the shape of flakes between 0.004 x 0.001mm and 0.006 x 0.005mm. native silver is observed among goethite masses in the shape of dotted separations measuring 0.005 x 0.005mm.

Homogenization temperatures at 230.2m ranges from 210℃ and 198℃ (Apx. 2-8; 6KS271). The average temperature reveals 204℃.

Veins is presumed to dip 55° NW around the hole.

12) MJKS-10 (Direction 145°, inclination -75°, drilled length 290.0m)

It was designed to examine mineralization at the depth of 60m southeastern extension of quartz - manganosiderite vein confirmed by MJKS-6 (Fig. II-11).

(1) Geology and alteration

The hole is mainly composed of pink granite. Beresitizated granite continues between 138.3m and 217.55m. According to the X-ray diffraction analysis (Apx. 2-7; 6KS230, 6KS231), clay veins penetrated beresitizated granite at 144.8m and 175.6m are rich in quartz, sericite, potassium feldspar and calcite.

(2) Mineralization

Although calcite veinlets occur with 0.2m in width between 187.3m and 187.5m in beresitizated granite and quartz veinlet occur with 0.05m between 194.0m and 194.05m, mineralization therein is weak.

Homogenization temperatures at 194.0m ranges from 137℃ and 129℃ (Apx. 2-8; 6KS233). The average temperature reveals 133℃.

1-4 Consideration

A total of twelve holes were drilled in the Shyraldzhyn area in the phase III survey. As results of the survey, nine holes have confirmed gold mineralization. The average grades of intersected veins range from 2.5 to 11.3 g/t Au, 0.3 - 1.4 g/t Ag, 0.24 - 4.54 % Cu. High gold grade ore exists in the northern and southern parts of the main vein.

The maximum true width of vein is 3.9m and the average is 2.1m on the surface. At the drillholes, the average true width is 2.6m, though the maximum shows 10.6m at hole MJKS-6 in the southern part.

As results of drillholes of MJKS-1, 2 and 7, gold-bearing ores were confirmed at the depth of 150m beneath the surface in the northern part. In the central part, gold-bearing ores were proved at the depth of 80m by the drillholes of MJKS-3, 9 and 4. On the other hand, gold mineralization was not dominant in the underground, from the summit to 120m of southern extension therefrom. In the more southern part, gold-bearing ores were certain at 200m depth by the drillholes of MJKS-6 and 11.

The vein shows echelon arrangement. It strikes NNE-SSW. According to the drilling survey, it dips between 35' W and 55' W, the average dip reveals 45' W.

Two veins striking NNE-SSW and N-S intersect near the trench K-107, and form a bonanza there. MJKS-6 caught vein of 6.4 g/t Au with 10.6m in true width from the depth of 134m. This hole is presumed to penetrate a lower extension of the bonanza. In this case, plunge of orebody would dip 40' westward.

The quartz - manganosiderite veins occur in greisen in the northern and central parts, occasionally border greisen with white clay zone composed of sericite with some tens cm in width at both sides of hanging wall and footwall. Greisen grades into non-altered granite through weak greisenizated granite. Such a sequence of between vein and non-altered granite shows as same as their occurrence in surface. On the other hand, vein appears not in greisen but in sericitizated granite at the deeper extension of the southern part.

As ore minerals, pyrite, chalcopyrite, chalcocite, covelline, malachite, native gold, pyrolusite, psilomelane, goethite and lepidochrocite are observed. According to occurrence and textures under the microscope, manganese hydrous oxides and ferric oxides are presumed to be formed by oxidation of manganosiderite.

Gold mineralization more than 1 g/t is confined to quartz - manganosiderite vein. Gold mineralization is partly recognized in greisen contacted with vein.

The particles of native gold measure from 0.07 x 0.02mm to 0.003 x 0.002mm. They are observed in goethite and quartz, and along fractures of those minerals, as idiomorphic forms, elongated and dotted signs. On the basis of occurrence and mineral paragenesis, the gold mineralization of the deposit is presumed to be formed under the oxidation after the formation of quartz - manganosiderite vein.

In general, alteration of gold-bearing quartz vein is characterized by addition of potassium feldspar and sericite. Clay near vein confirmed by holes is predominant in sericite and potassium feldspar. Therefore this vein is widely embedded under the favorable condition for gold deposition.

The average homogenization temperature of quartz ranging from 223°C to 124°C, centers between 180°C to 150°C (Apx. 2-8). Individual average temperature reveal ranging from 221°C to 131°C. Relation between the average homogenization temperature and the gold grade of ore samples caught by holes are shown in Fig. II-12. Furthermore the average homogenization temperature and the gold grade collected from trenches in the phase II survey, are also plotted in the same figure.

Looking at the above figure, those points are classified as a high grade group (H) ranging 9 to 14 g/t Au and a low grade group (L) ranging 1 to 7 g/t Au. Further the high grade group is divided into two subgroups of H1 and H2, and the low one is also divided into two subgroups of L1 and L2. According to subgroups, it indicates that homogenization temperature seem to be correlated with the gold grade. Ores of high grade group are collected from MJKS-2, 3, 7 in the northern part and MJKS-6 in the southern. This fact suggests that high grade ores are embedded in the northern and southern parts.

A favorable temperature that gold precipitates from hydrothermal solution, is different from individual deposit. In general, homogenization temperatures from gold vein-type deposits represent ranging from 300°C to 200°C. The average homogenization temperature in this deposit reveals lower temperature compared with the above mentioned favorable temperature for gold deposition. In general, homogenization temperature grades high in deeper and inner parts of vein. Distribution of homogenization temperatures along a strike of vein is shown in Fig. II-13. Looking at this figure, temperatures at the lower parts of the hole MJKS-6 and 11 in the south represent more than 200°C. Their temperatures is higher than those of upper parts. The fact support partly that homogenization temperature in this deposit is correspond to a general variable tendency of temperature.

It is inferred from the above that higher temperature zones would exist and high gold grade zones would be embedded in the deeper extensions of this vein in the northern and southern parts.

For evaluation of this deposit, a tentative estimation of ore reserves was outlined on the basis of drilling survey performed in this year combined with trench survey on the surface. Cut-off grade is determined as 1 g/t Au. Taking solid continuity of the vein into consideration, ore blocks were set up, centering mineralized zones caught by drillholes. As intervals among holes in this survey are roughly about 150m, ore reserves between mineralized zones by holes and trenches are correspond to possible reserves (a C2 category in Kyrgyz classification). Ore reserves expected extensions of vein below possible reserves are potential reserves

(P1 category).

Ore blocks of possible reserves are established from the surface to 20m beneath ore mineralized zones by holes. Ore block are set up by individual drillholes. Ore blocks of potential reserves are established at the lower extensions of possible ones. The bottom of potential blocks is determined to mark 2,500m of altitude, where is 80m beneath mineralized zone by MJKS-11, the deepest hit hole. Schematic section of ore reserves is presented in Fig. II-14. Possible block was not set up around MJKS-12, because the true widths of drillholes and trenches are less than 1m and the gold mineralization may be poor. Further the potential block was not set up at the deeper extension beneath the possible block No. 5, because no vein was confirmed by MJKS-8. A volume of block is the product among a true width of vein, a length along dip and an elongation along strike.

On the occasion of estimation of potential reserves, possibility of existence of vein is determined to be 75%. Concerning grades of potential blocks, grades of the upper possible blocks were adapt as it is.

Describing on the phase II report, a specific gravity of ore in this deposit was 3.6. Before a calculation of ore reserves, specific gravity of ores collected from drillings and trenches was measured. The measured gravity is 2.86 as listed in Table II-5. It has decreased 20% compared with a former value.

The tentative calculation of ore reserves is given in Table II-6. Possible reserves (C2) are estimated to be 1,043 thousand tons, average grade 5.2 g/t Au and 5.4 tons of gold. Potential reserves (P1) are expected to be 1,269 thousand tons, average grade 5.0 g/t Au and 6.3 tons of gold.

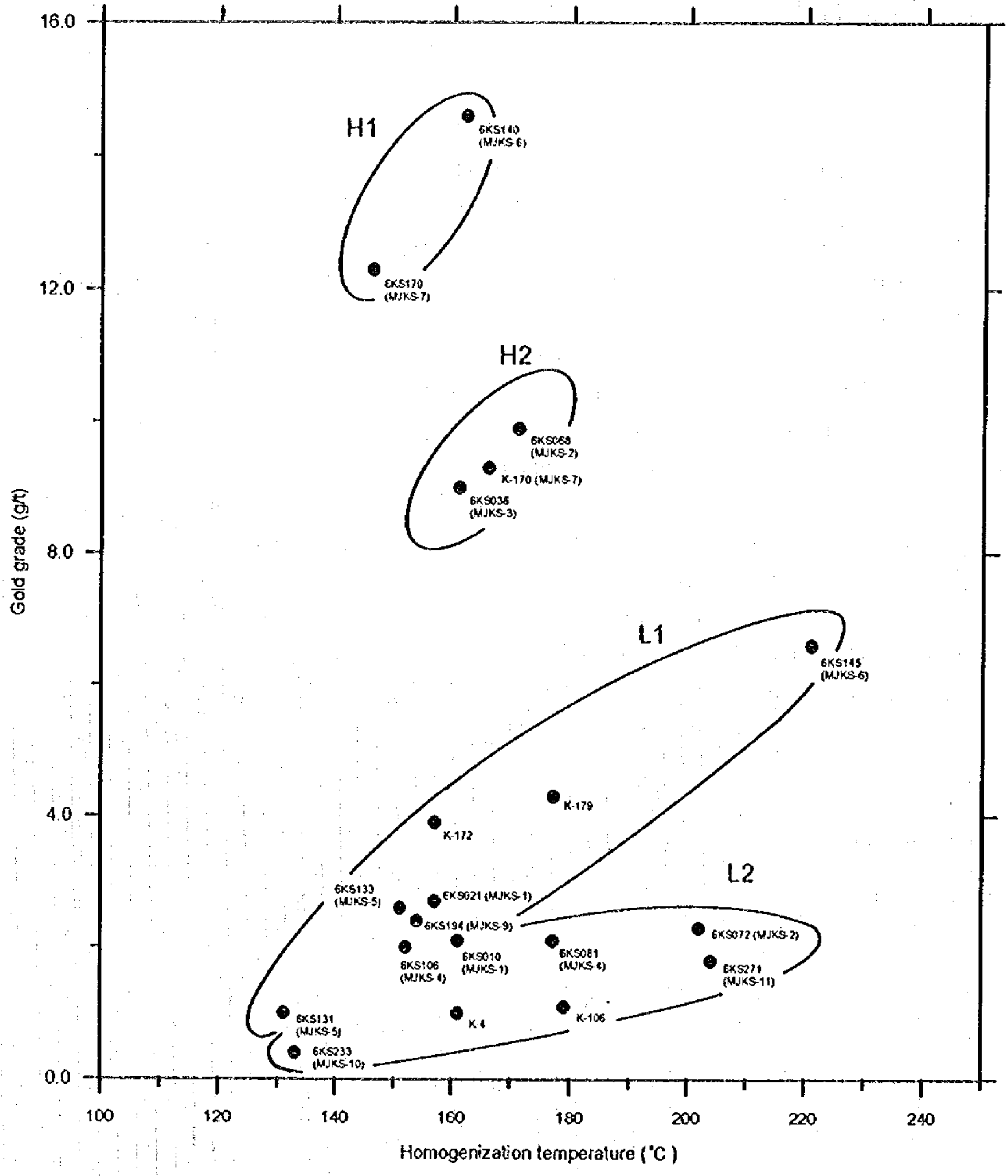


Fig. II-12　　Relation between Homogenization Temperature and Gold Grade

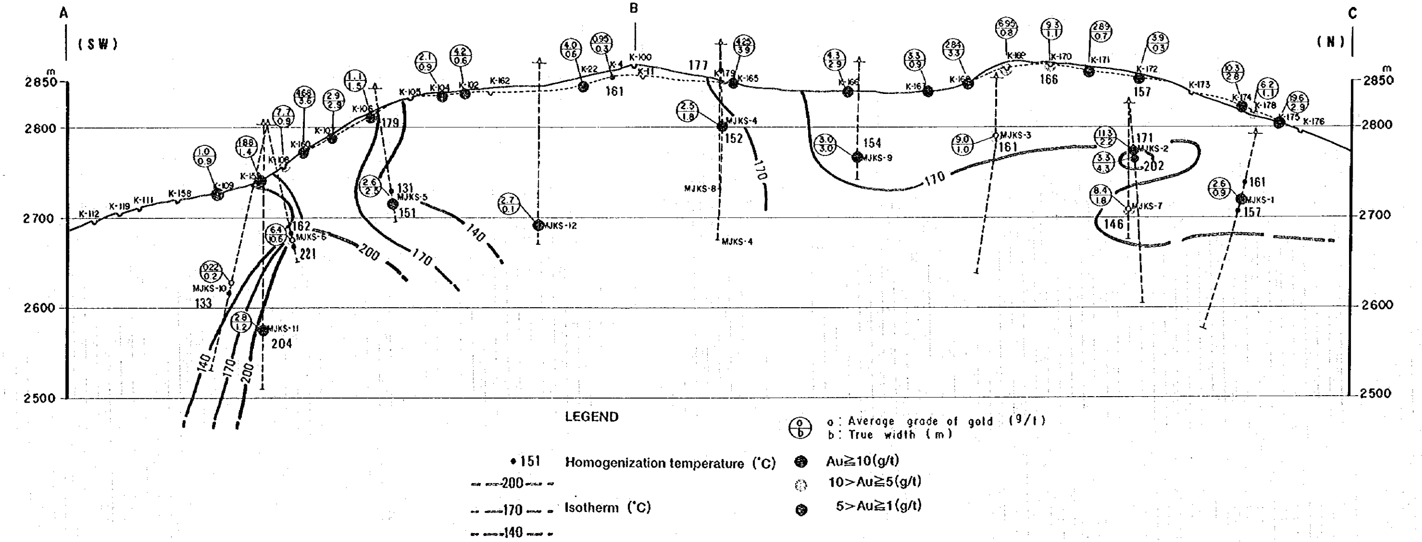


Fig. II-13 Distribution of Homogenization Temperature of Fluid Inclusion

Table II-5 Result of Specific Gravity Test

No.	Sample No.	Location	Kind of ore	Specific gravity (g/cm3)
1	G-1	Trench K-165	Manganosiderite ore	2.77
2	G-2	Trench K-166	Quartz manganosiderite ore	2.77
3	G-3	Trench K-170	Manganosiderite ore	2.76
4	G-4	Trench K-174	Manganosiderite ore	2.80
5	G-5	Trench K-175	Manganosiderite ore	2.89
6	G-6	Trench K-102	Manganosiderite ore	2.71
7	G-7	Trench K-106	Manganosiderite ore	3.22
8	G-8	Trench K-107	Manganosiderite ore	3.00
9	G-9	Trench K-108	Manganosiderite ore	2.74
10	G-10	Trench K-109	Manganosiderite ore	3.03
11	G-11	MJKS-6 134.2-134.28m	Quartz manganosiderite ore	2.63
12	G-12	MJKS-5 143.2-143.26m	Manganosiderite ore	2.94
13	G-1	MJKS-7 118.9-118.95m	Manganosiderite ore	2.86
14	G-14	MJKS-9 107.5-107.59m	Manganosiderite ore	2.86
15	G-15	MJKS-1 62.7-62.77m	Manganosiderite ore	2.99
Average				2.86

Table II-6 Calculation of Ore Reserve of Shyraldzhyn Deposit

(C2)

Block No.	Trench		Drill hole		Average		Volume of block				S.Gravity	Possible	Metal of
	True width (m)	Au (g/t)	True width (m)	Au (g/t)	True width (m)	Au (g/t)	True width (m)	Length (m)	Depth along dip (m)	Volume (m3)	(t/m3)	ore reserve (t)	gold (Kg)
1	2.3	13.6	0.9	2.6	1.6	10.5	1.6	115	150	27,600	2.86	78,900	828
2	0.5	3.2	3.9	6.4	2.2	6.0	2.2	138	210	63,760	2.86	182,400	1,094
3	1.5	4.6	1.0	9.0	1.3	6.4	1.3	155	120	24,180	2.86	69,200	443
4	2.9	4.3	3.0	3.0	3	3.6	3.0	150	145	65,250	2.86	186,600	672
5	3.9	4.25	1.8	2.5	2.9	3.7	2.9	128	100	37,120	2.86	106,200	393
6	1.0	2.0	2.5	2.6	1.8	2.4	1.8	125	165	37,130	2.86	106,200	255
7	2.5	4.3	5.9	6.0	4.2	5.5	4.2	90	290	109,620	2.86	313,500	1,724
Total	2.1		2.6		2.4	5.2	2.4	901		364,660	2.86	1,043,000	5,409

(P1)

Block No.	Au (g/t)	Volume of block				Gravity	Possibility	Potential	Metal of
		True width (m)	Length (m)	Depth along dip (m)	Volume (m3)	(t/m3)	of existance	ore reserve (t)	gold (kg)
1	10.5	1.6	115	260	47,840	2.86	0.75	102,600	1,077
2	6.0	2.2	138	220	130,550	2.86	0.75	280,000	1,680
3	6.4	1.3	155	420	84,630	2.86	0.75	181,500	1,162
4	3.6	3.0	150	430	193,500	2.86	0.75	415,100	1,494
5	3.7	2.9	128	0	0	2.86	0.75	0	0
6	2.4	1.8	125	300	104,630	2.86	0.75	224,400	539
7	5.5	4.2	90	80	30,240	2.86	0.75	64,900	357
Total	5.0	2.4	901		591,390	2.86	0.75	1,268,500	6,309

(C2+P1)

Block No.	Au (g/t)	Total ore reserve (t)	Metal of gold (kg)
1	10.5	181,500	1,906
2	6.0	462,400	2,774
3	6.4	250,700	1,605
4	3.6	601,700	2,166
5	3.7	106,200	393
6	2.4	330,600	793
7	5.5	378,400	2,081
Total	5.1	2,311,500	11,718

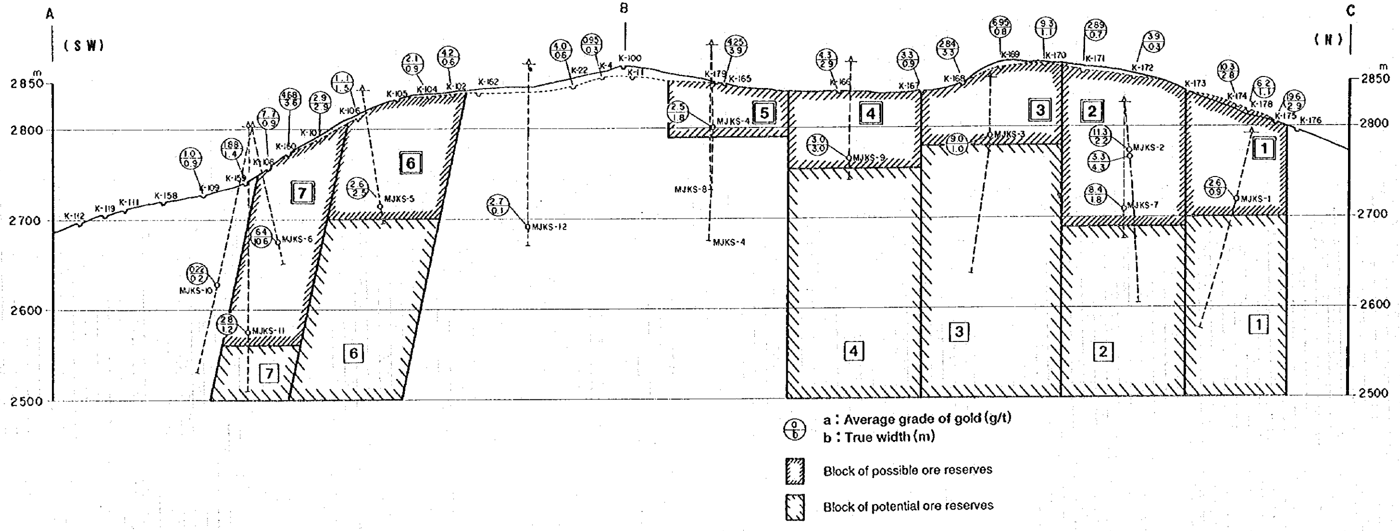


Fig. II-14 Schematic Section of Ore Reserves

PART Ⅲ

CONCLUSION AND RECOMMENDATION

CHAPTER 1 CONCLUSION

The following conclusions were reached on the basis of the drilling survey in the Shyraldzhyn area.

(1) A drilling survey was conducted in the Shyraldzhyn area. A total of twelve holes were drilled. Nine holes have caught gold bearing quartz - manganosiderite veins in granite. Mineralized zones of the vein were confirmed to be embedded about 150m beneath surface at the northern part of the vein by hole MJKS-1, 2, 7, and about 80m beneath surface at the central part by MJKS-3, 9, 4, and about 200m depth at the southern part by MJKS-6, 11.

(2) The vein shows echelon arrangement, strikes NNE-SSW and dips 45° W. Average true width of the vein is 2.1 m at the surface and 2.6 m in drill holes. The maximum true width is 3.9 m at the surface and 10.6 m in hole MJKS-6.

(3) The average grades of vein caught by holes range from 2.5 to 11.3 g/t Au, with ranging from 0.3 to 1.4 g/t Ag and 0.24 - 4.54 % Cu. High gold grade ore exists in the northern and southern parts.

(4) Native gold is observed as grains ranging from a few μ m to 70 μ m. It occurs in goethite and quartz, and along fractures of those minerals. On the basis of occurrence and mineral paragenesis, the gold mineralization of this deposit is presumed to be formed under the oxidation soon after the formation of quartz - manganosiderite vein.

(5) Distribution of homogenization temperature reveals that temperatures seem to be correlated with gold grades. The fact suggests that higher temperature zones could exist in the northern and southern parts, and gold mineralized zones could be embedded there.

(6) A tentative calculation of ore reserves reveals that possible ore reserves are estimated to be 1,043 thousand tons with 5.2 g/t Au and 5.4 tons of gold. Potential ore reserves are expected to be 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold.

CHAPTER 2　RECOMMENDATION

As a result of the drilling survey of the Shyraldzhyn deposit this year, gold mineralization has been confirmed about 150m below surface in the northern part, about 80m in the central part and about 200m depth in the southern part.

A tentative ore reserves calculation suggests that possible ore reserves are estimated to be 1,043 thousand tons with grade of 5.2 g/t Au and 5.4 tons of gold. Potential ore reserves are expected to be 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold.

As things stand, there is little possibility that the Shyraldzhyn deposit could be developed as a large gold deposit. For developing the deposit as a small-scale mine, an increase of ore reserves and a confirmation of high grade ore are necessary. The northern and southern parts of the deposit could be listed as prospective areas, if the existence of high gold grade ore could be expected at depth.

REFERENCES

1. Bakirov A. B. and Kiselev V. V. ed (1998) : Precambrian and Lower Paleozoic of Tien-Shan. Ilim press. Furunze. 155p. (in Russian)
2. Bakirov A. B. and Kotov V. V. (1988) : Eclogite-bearing metamorphic formation - Indicators of joining zones of ancient continents. in "Precambrian and Lower Paleozoic of Tien Shan." p.4-24 (in Russian)
3. Bekker A. U., Makarov B. A. and Razboynikov A. G. (1988) : New data on the stratigraphy of Karagainskaya formation in Talas Ala-Too (Northern Tien-Shan). in "Precambrian and Lower Paleozoic of Tien Shan." p.100-126 (in Russian)
4. Geological Department, Kyrgyz SSR (1987) : Schematic geological map of Shyraldzhyn gold deposit. 1:10,000.
5. Hayashi M. (1979) : Quantitative Descriptions of Cores and Cuttings from Geothermal Wells. J. Geothermal Research Soc. of Japan. vol.1 no.2 p.103-116 (in Japanese)
6. Hedenquist J. W. and Henley R. W. (1984) : Effect of CO_2 on freezing point measurements of fluid inclusions-evidence from active geothermal systems and application to epithermal ore deposits. Econ. Geol.
7. Kiselev V. V., Bekker A. U. and Apayarov F. H. (1988) : Epibaikalsky Precambrian of Tien-Shan. in "Precambrian and Lower Paleozoic of Tien Shan." p.127-144 (in Russian)
8. Levingson A. A. (1973) : Introduction to exploration geochemistry. Applied Publishing Ltd. Calgary. 612p.
9. Magakyan I. G. (1979) : Metallogeny. Gendaikougakusha Press 394p. (in Japanese)
10. Mining Encyclopedia (1984) : Sovetskaya Encyclopedia Press (in Russian)
11. Ministry of Geology, USSR (1980) : Geological map of Kyrghyzstan of USSR. 1:500,000.
12. MMAJ (1994) : Circumstance on mineral exploration in the Kyrgyz Republic. 80p. (in Japanese)
13. Ryabko I. I. (1992) : Brief summary of mineral resources in Talas ore area of the Republic of Kyrghyzstan. Northern-Kyrgyzskaya geological expedition. (in Russian)
14. Roedder E. (1984) : Fluid inclusions. Reviews in Mineralogy vol.12, 644p. Min. Soc. Amer., Washington

15. Rossiter A. G. (1980) : Jubilee Plunger Au deposit, Georgetown Inlier, QLD. Jour. Geochemi. Explo. vol.12, no.2/3, p.324-327.
16. Sokolov B. S. (1979) : Vend. Principle of isolation, boundary and time-scale. "Stratigraphy of upper Proterozoic in USSR". Nauka, p.43-61. (in Russian)
17. Sokolov B. S. (1984) : Vendian system, Position on stratigraphic scale. "27th Stratigraphy". Nauka, p.111-127. (in Russian)
18. Togashi Y. (1988) : On visit to gold deposits in the Western America. Chishitsu News (Geological News). vol.411, p.44-59. (in Japanese)

APPENDICES

APPENDIX. 1

Geological Core Log of the Drillings

LIST OF APPENDIXES

Appendix 1 Geologic Core Logs of the Drillings

LEGEND

▥ Sludge

∘○ Quaternary deposit

+ + Granite

× × Granite porhyry

x x Aplite

∴ Greisen

+∴ Greisenizated granite

+∴ Beresitizated granite

~ ~ Clay, Shear zone

▨ Vein

30 dip(banded structure)

50 dip(joint, fracture, vein)

Abbreviations

csg : coarse-grained
mdg : medium-grained
fng : fine-grained
cp : chalcopyrite

Sample for Laboratory Test

T : Thin section
P : Polished section
X : X-ray diffraction analysis
F : Fluid inclusion test

Assay Results

SAMPLE No.	ASSSAY RESULT			
	Au	Ag	Cu	As
6KS123	6.6	0.70	1.50	<0.03

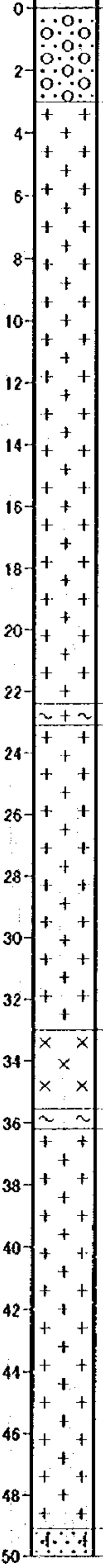
Assay unit:
Au(g/t), Ag(g/t), Cu(%), As(%)

GEOLOGIC CORE LOG OF MJKS-1 (1/5)

1/200

MJKS-1 (1/5) 0m ~ 50m

Level 2,793.3m Direction 90°
X -56.4m Inclination -60°
Y 590.0m Length 250.0m



DEPTH (m)	DESCRIPTIONS	DEPTH (m)	SAMPLE No.	Au	Ag	Cu	As	LAB. TEST
3.0	0-3.0m, talus with granite pebbles							
22.4	3.0-22.4m, pinkish K-feldspar rich medium-grained granite							
23.1	22.4-23.1m, sandy crushed pinkish medium-grained granite, water leakage zone							
33.0	23.1-33.0m, pinkish K-feldspar rich medium-grained granite							
35.55	33.0-35.55m, pale white altered granite porphyry, epidote alteration							
36.2	35.55-36.2m, fracture zone with cream yellow clay 30cm in width, water leakage zone		6KS163					X
49.1	36.2-49.1m, pinkish K-feldspar rich medium-grained granite							
	49.1-51.6m, pale green greisenizatied granite, crushed, containing muscovite and epidote	49.1	6KS001	0.007	<0.3	0.005	<0.03	

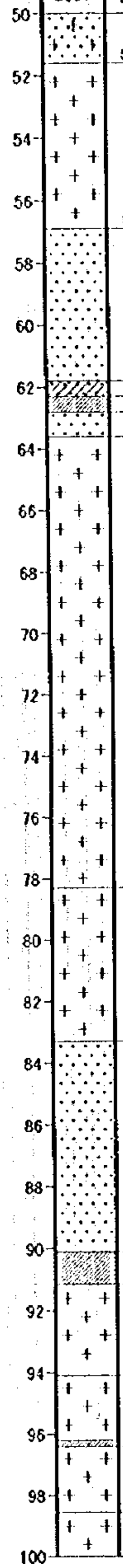
0
10
20
30
35.8
40
50

GEOLOGIC CORE LOG OF MJKS-1 (2/5)

1/200

Level 2,793.3m Direction 90°
X -56.4m Inclination -60°
Y 590.0m Length 250.0m

MJKS-1 (2/5) 50m～100m



DEPTH (m)	DESCRIPTIONS
51.6	49.1-51.6m, pale green greisenizatied granite, crushed containing muscovite, epidote
56.9	51.6-56.9m, pinkish K-feldspar rich medium-grained granite. 52.0m tourmaline, quartz, fluorite spot, 1X2cm 53.7m tourmaline, quartz spot, 2X3cm 56.6m tourmaline, quartz spot, 2X2cm
61.8	56.9-61.8m, pale green greisen, muscovite, quartz rich
62.3	61.8-62.3m, crushed greisen with manganese siderite network.
62.8	62.3-62.8m, quartz-Mn siderite vein, cp. py. malachite imp.
63.6	62.8-63.6m, pale green greisen, muscovite quartz rich
78.3	63.6-78.3m, greenish gray medium-grained altered granite, chlorite alteration
83.3	78.3-83.3m, pink K-feldspar rich medium-grained granite
90.1	83.3-90.1m, pale green greisen, quartz muscovite rich,
91.15	90.1-91.15m, Mn siderite vein, cp, malachite imp.
94.1	91.15-94.1m, epidote altered granite, sheared. 91.15m W=4cm clay vein, 91.4m W=4cm clay vein
96.2	94.1-96.2m, greenish chlorite altered granite, 94.1m W=4cm clay vein
96.4	96.2-96.4m, quartz-Mn siderite vein, py. malachite imp.
98.55	35 96.4-98.55m, greenish chlorite altered granite, Mn-siderite imp.
	45 98.55-126.8m, pink K-feldspar rich coarse-grained granite partly porphyritic texture

DEPTH (m)	SAMPLE No.	ASSAY RESULT			
		Au	Ag	Cu	As
50.1	6KS002	<0.005	0.5	0.004	<0.03
51.1	6KS003	<0.005	<0.3	0.003	<0.03
51.6					
56.9	6KS004	<0.005	<0.3	0.003	<0.03
57.9	6KS005	0.007	<0.3	0.005	<0.03
58.9	6KS006	0.005	<0.3	0.005	<0.03
59.9	6KS007	<0.005	0.3	0.003	<0.03
60.9	6KS008	0.007	<0.3	0.003	<0.03
61.8	6KS009	0.24	<0.3	0.25	<0.03
62.3	6KS010	2.08	0.45	0.80	<0.03
62.8	6KS011	0.009	<0.3	0.004	<0.03
63.6					
83.3	6KS012	0.03	0.5	0.005	<0.03
84.3	6KS013	0.007	<0.3	0.007	<0.03
85.3	6KS014	0.00	<0.3	0.004	<0.03
86.3	6KS015	0.07	<0.3	0.004	<0.03
87.3	6KS016	0.012	<0.3	0.009	<0.03
88.3	6KS017	0.03	<0.3	0.012	<0.03
89.3	6KS018	0.012	<0.3	0.004	<0.03
90.1	6KS019	2.60	0.45	1.3	<0.03
91.15	6KS020	0.07	<0.3	0.02	<0.03
92.15					
96.2	6KS021	2.66	0.4	0.56	<0.03
96.4					

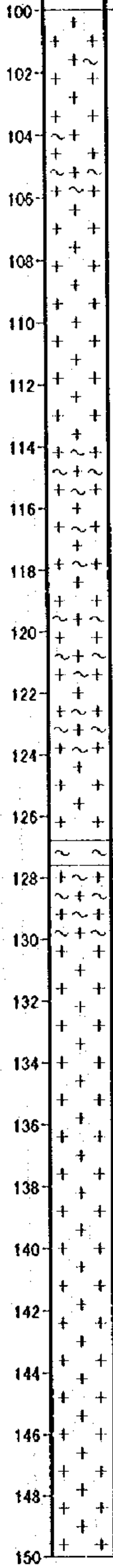
LAB. TEST	Depth
T	60.8
F	62.35
P	62.7
T	89.7
P	91.0
X	91.17
F	96.25
P	96.3

GEOLOGIC CORE LOG OF MJKS-1 (3/5)

1/200

Level 2,793.3m Direction 90'
X -56.4m Inclination -60'
Y 590.0m Length 250.0m

MJKS-1 (3/5) 100m ~ 150m



DEPTH (m)	DESCRIPTIONS
	98.55-126.8m, pink K-feldspar rich coarse-grained granite, showing partly porphyritir structure, partly crushed
	126.5m, W=20cm yellowish gray clay
126.8 127.6	126.8-127.6m, W-80cm purplish gray to yellowish gray clay, sticky
	127.6-219.55 m, pink K-feldspar rich coarse-grained granite, showing partly porphyritio structure
	128-130m, sandy crushed

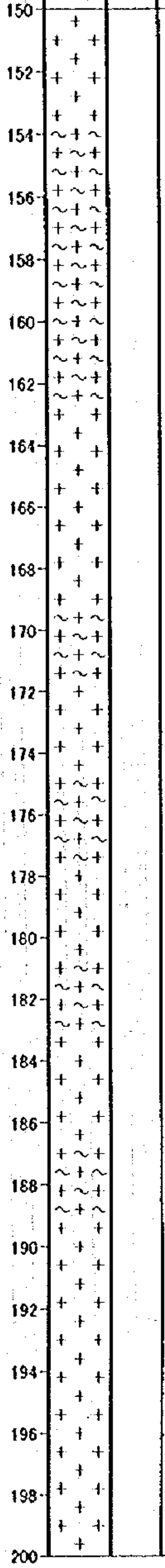
DEPTH (m)	SAMPLE No.	ASSAY RESULT Au	Ag	Cu	As	LAB. TEST	
							100
							110
							120
						X	126.9
126.8 127.6	6KS045	<0.005	<0.3	0.03	<0.03		
							130
							140
							150

GEOLOGIC CORE LOG OF MJKS-1 (4/5)

1/200

MJKS-1 (4/5) 150m ~ 200m

Level	2,793.3m	Direction	90°
X	-56.4m	Inclination	-60°
Y	590.0m	Length	250.0m

LITHO-LOGY	DEPTH (m)	DESCRIPTIONS	DEPTH (m)	SAMPLE No.	ASSAY RESULT Au	Ag	Cu	As	LAB. TEST
		127.6-219.55m, pink K-feldspar rich coarse-grained granite							
		154.0-162.3m, sandy crushed							
		169.4-171.9m, sandy crushed							
		175.0-177.3m, sandy crushed							
		181.3-182.6m, sandy crushed							
		187.4-188.8m, sandy crushed							

-150
-160
-170
-180
-190
-200

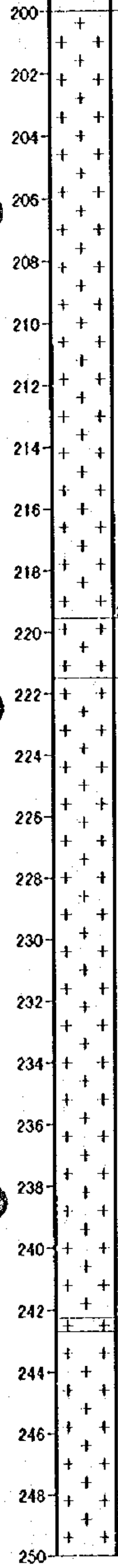
GEOLOGIC CORE LOG OF MJKS-1 (5/5)

1/200

Level 2,793.3m Direction 90°
X -56.4m Inclination -60°
Y 590.0m Length 250.0m

MJKS-1 (5/5) 200m ~ 250m

LITHOLOGY



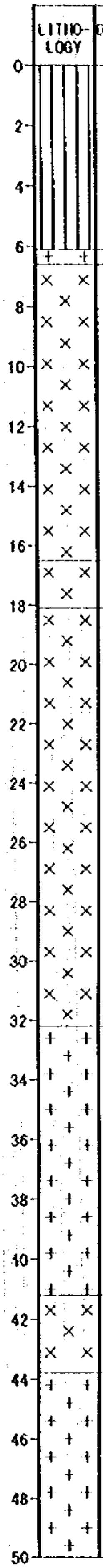
DEPTH (m)	DESCRIPTIONS	DEPTH (m)	SAMPLE No.	ASSAY RESULT				LAB. TEST
				Au	Ag	Cu	As	
	127.6-219.55m, pink K-feldspar rich coarse-grained granite containing biotite							
	210.6m, joint with Mn-oxide film (30)							
219.55	219.55-221.5m, strong chloritizatied granite							
221.5	221.5-242.25m, pink K-feldspar rich csg granite							
242.25	242.25-242.7m, chlorite and epidote altered granite							
242.7	242.7-250.0m, csg pink K-feldspar rich granite							
250.0								

GEOLOGIC CORE LOG OF MJKS-2 (1/5)

1/200

Level 2,825.9m Direction 90˚
X -46.6m Inclination -60˚
Y 454.7m Length 250.0m

MJKS−2 (1／5) 0 m ～ 5 0 m



DEPTH (m)	DESCRIPTIONS	DEPTH (m)	SAMPLE No.	ASSAY RESULT Au	Ag	Cu	As	LAB. TEST
6.1	0-6.1m, sludge with pink K-feldspar rich granite pebbles							
6.6	6.1-6.6m, csg pink K-feldspar rich granite, showing partly porphyritic texture							
16.5	6.6-16.5m, gray granite porphyry							
18.1	16.5-18.1m, pink granite porphyry							
32.2	18.1-32.2m, gray granite porphyry							
41.2	32.2-41.2m, gray fng granite, epidote and chlorite alteration, Mn-oxide imp.							
43.8	41.2-43.8m, gray mdg granite porhyry							
	43.8-50.4m, pink granite							

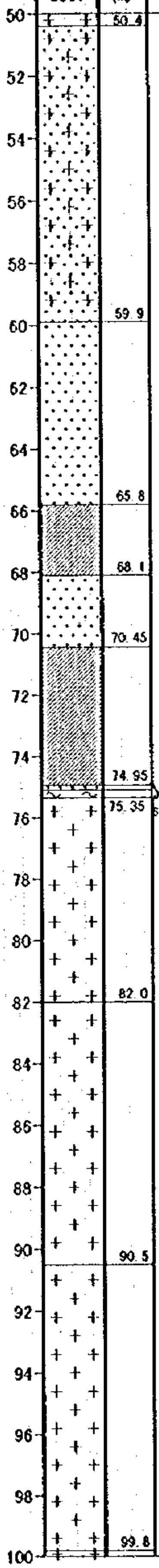
0
10
20
30
40
50

GEOLOGIC CORE LOG OF MJKS-2 (2/5)

1/200

Level	2,825.9m	Direction	90°
X	-46.6m	Inclination	-60°
Y	454.7m	Length	250.0m

MJKS-2 (2/5) 50m ~ 100m



DESCRIPTIONS

50.4-59.9m, gray greisenizatied granite, containing muscovite

59.9-65.8m, brownish pale green greisen, muscovite rich

62.6-65.8m, limonitization predominant

65.8-68.1m, quartz Mn-siderite vein, chalcopyrite, malachite imp.

68.1-70.45m, olive gray greisen

70.45-74.95m, quartz Mn-siderite vein
70.4-72.1m siderite rich,
72.1-74.95m Mn-siderite rich

around 74m, malachite imp.

74.95-75.1m, greisen

75.1 75.1-75.35m, brownish gray clay with Mn-siderite vein of 1 cm

60

75.35-82.0m, altered granite, epidote and chlorite

82.0-90.5m, leucocratic granite

90.5-99.8m, grayish white granite,
partly showing porphyritic texture

99.8-101.5m, epidotizatied granite

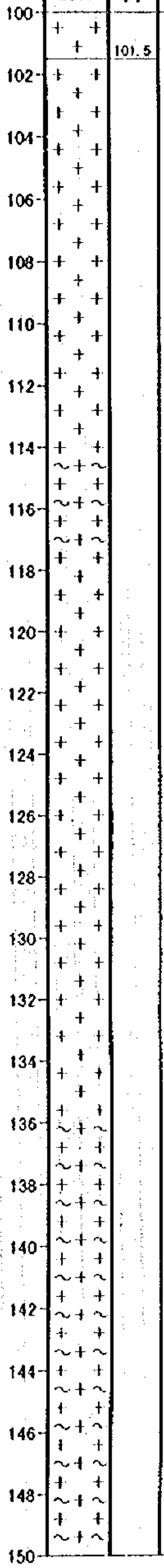
DEPTH (m)	SAMPLE No.	ASSAY RESULT				LAB. TEST	
		Au	Ag	Cu	As		
50.4	6KS052	0.12	<0.3	0.15	<0.03		-50
51.4	6KS053	0.10	<0.3	0.007	<0.03		
52.4	6KS054	0.30	<0.3	0.004	<0.03		
53.4	6KS055	1.44	<0.3	0.003	<0.03		
54.4	6KS056	0.12	<0.3	0.003	<0.03		
55.4	6KS057	0.30	<0.3	0.007	<0.03		
56.4	6KS058	0.03	<0.3	0.007	<0.03		
57.4	6KS059	0.12	<0.3	0.004	<0.03	T	58.3
58.4	6KS060	0.12	<0.3	0.003	<0.03		-60
59.9	6KS061	0.15	<0.3	0.004	<0.03		
60.9	6KS062	0.90	<0.3	0.012	<0.03		
61.9	6KS063	0.70	<0.3	0.015	<0.03		
62.9	6KS064	6.20	0.4	0.20	<0.03		
63.9	6KS065	2.00	0.3	0.02	<0.03		
64.9	6KS066	3.90	0.3	0.20	<0.03	P	66.3
65.8	6KS067	10.1	0.3	2.55	<0.03	F	67.4
66.8	6KS068	9.9	0.4	3.48	<0.03	P	67.9
67.8	~~6KS069~~	~~>20.0~~	~~0.4~~	~~2.75~~	~~<0.03~~		
68.1	6KS070	1.64	<0.3	0.30	<0.03	T	69.2
69.1	6KS071	0.32	<0.3	0.05	<0.03	F	-70 70.7
70.45	6KS072	2.30	0.3	1.12	<0.03	P	70.9
71.1	6KS073	4.30	0.3	0.09	<0.03		
72.1	6KS074	3.20	0.3	0.95	<0.03		
73.1	6KS075	2.80	0.3	0.86	<0.03	P	74.3
74.1	6KS076	3.40	0.3	0.50	<0.03	P	74.9
74.95	~~6KS077~~	~~0.40~~	~~<0.3~~	~~0.009~~	~~<0.03~~		
75.1	~~6KS078~~	~~1.14~~	~~0.3~~	~~0.04~~	~~<0.03~~	X	75.2
75.35	6KS079	0.09	<0.3	0.004	<0.03		
76.35							
	6KS069	>20.0	0.4	2.75	<0.03		
	6KS077	0.40	<0.3	0.009	<0.03		
	6KS078	1.14	0.3	0.04	<0.03		-80
							-90
							-100

GEOLOGIC CORE LOG OF MJKS-2 (3/5)

1/200

MJKS-2 (3/5) 100m ~ 150m

Level 2,825.9m Direction 90°
X -46.6m Inclination -60°
Y 454.7m Length 250.0m



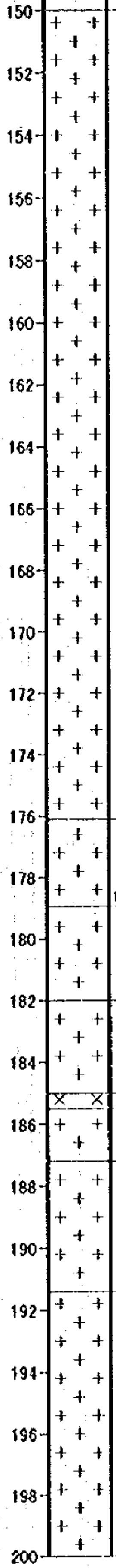
LITHO-LOGY	DEPTH (m)	DESCRIPTIONS	DEPTH (m)	SAMPLE No.	ASSAY RESULT				LAB. TEST	
					Au	Ag	Cu	As		
										100
	101.5	99.8-101.5m, epidotizatied granite								
		101.5-178.95m, mdg pink granite								
										110
										120
										130
				6KS118					T	133.5
		135.7-136.4m, containing purple fluorite								
										140
										150

GEOLOGIC CORE LOG OF MJKS-2 (4/5)

1/200

MJKS−2 (4/5) 150m ～ 200m

Level	2,825.9m	Direction	90°
X	-46.6m	Inclination	-60°
Y	454.7m	Length	250.0m



DEPTH (m)	DESCRIPTIONS
	101.5-178.95m, pinkish mdg granite
	156.2-165.0m, leucocratic granite, containing muscovite and fluorite
176.1	176.1m W=3cm calcite quartz vein, specularite Imp.
178.95	178.95-182.0m, leucocratic granite
182.0	182.0-185.0m, epidotizatied altered granite
185.0	185.0-185.5m, pink granite porphyry
185.5	185.5-187.2m, epidotizatied altered granite
187.2	187.2-191.4m, pale pink mdg granite
191.4	191.4-214.95m, pink mdg granite

DEPTH (m)	SAMPLE No.	ASSAY RESULT				LAB. TEST
		Au	Ag	Cu	As	
176.1	6KS122	0.03	1.2	0.003	<0.03	P