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

(CONSOLIDATED REPORT)

MARCH 1997

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

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

JICA and MMAJ sent survey teams headed by Mr. Masaharu Marutani to the Kyrgyz Republic over a three year period from 1994 to 1996. The survey and investigation was completed on schedule under close cooperation with the officials of the Government of the Kyrgyz Republic concerned.

This report summarized the results of the survey and investigation executed during these three years.

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

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

February, 1997

Kimio Fujita
President
Japan International Cooperation Agency

Shozaburo Kiyotaki
President
Metal Mining Agency of Japan

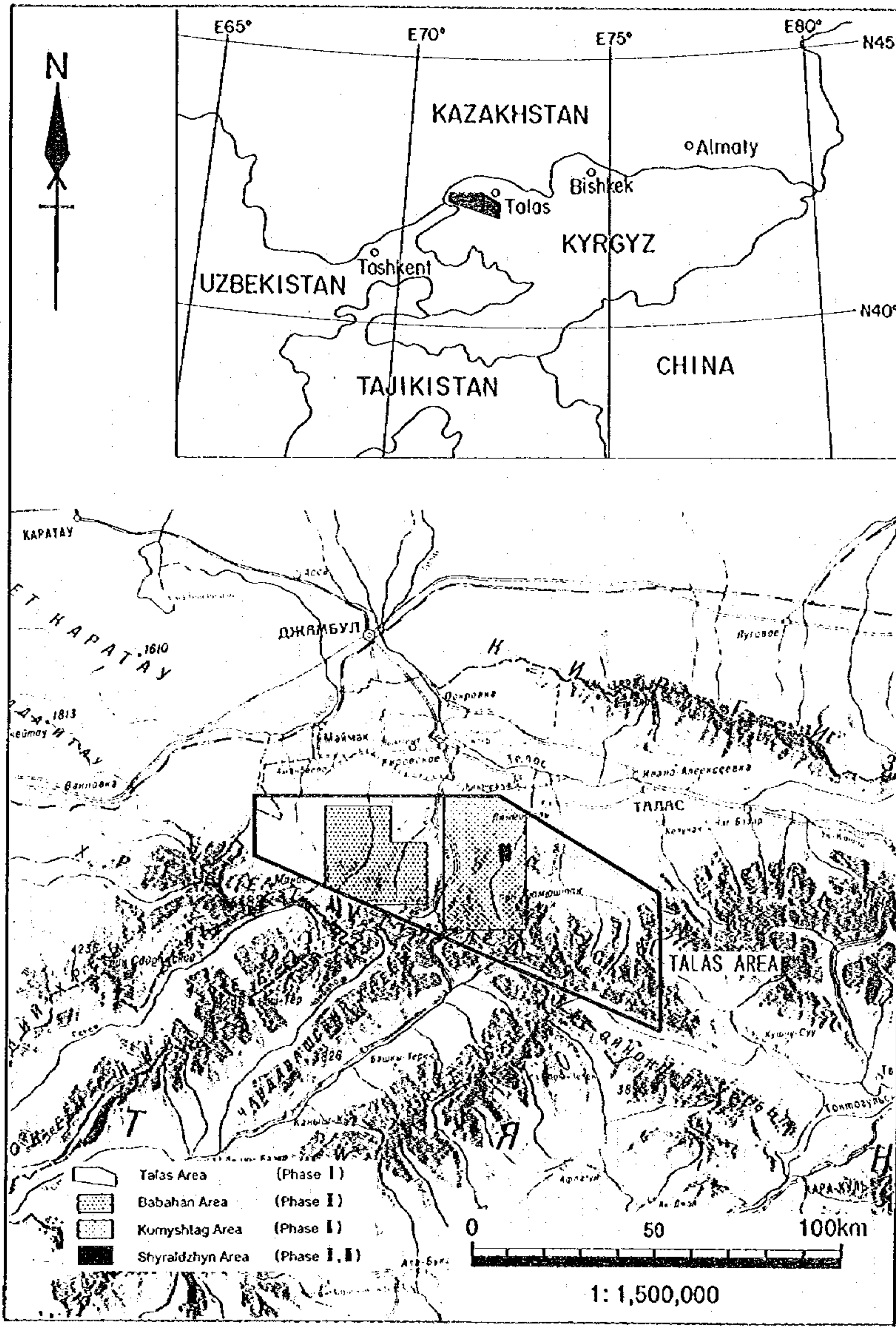

Fig. I-1 Location Map of the Survey Area

РЕЗЮМЕ

В настоящем отчете представлено обобщенное изложение о результатах фундаментальных исследований по программе технического сотрудничества в освоении недровых ресурсов, которые проводились в Таласской области Республики Кыргызстан в течение 3 лет с 1994 по 1996 г.г. Цель данных исследований заключалась в выяснении геологических характеристик и распределения ресурсов полезных ископаемых в данном регионе, а также в том, чтобы найти новые месторождения.

В первом году: Анализ существующих материалов и информации, а также фотоизображений, снятых со спутника в пределах участка площадью 33000 кв.км.

Во втором году: Ширальджинский район, подробная геологическая разведка, общая площадь 12 кв. км.

Кымштагский и Бабаханский районы, геологическая разведка, общая площадь 1220 кв. км.

Геохимическая разведка, грунт 768 образцов.

В третьем году: Ширальджинский район, разведка с разбуриванием 12 скважин в 2560,4 м.

Обобщенное изложение о результатах представленных выше исследований приведено в следующем:

Результаты исследований

(1) Судя по геологической структуре, распределения и типов месторождений, минерализация в данном регионе разделяется на образование жилы по сбросам и побочным трещинам и массовую минеразацию; образование жилы в Кымштагской гранитовой породе позднего Силурийского и раннего Девонского периодов, крайзенскую минерализацию и скарнизацию.

(2) Фотоизображение, снятое со спутника

В результате спектрального анализа фотоизображений участков анамалиев, снятых со спутника, выяснено, что участки аномалиев относятся к Рифейской серии протерозойской эры, отражая минерализацию с образованием лимонита с диагенезом, но не

относится к аномалиям, вызываемым гидротермическим изменением.

(3) Кмыгштагский район

В широких пределах от Кмыштагского месторождения серебра до места зарождения Учимчекского месторождения мышьяка наблюдаются комплексные геохимические аномалии серебра, меди и мышьяка. Несмотря на то, что кмыштагское месторождение является масштабной ферромарганцовой жилой с доминированием серебра, оно характеризуется весьма вялой минерализацией золота и результаты геохимической разведки не показали наличия аномалий золота.

(4) Бабаханский район

Обнаружены геохимические анамалии серебра вблизи курбакайльского месторождения серебра, но они были маломасштабными. Масштаб месторождений серебра поблизости также был малым. Исходя из этого, расположение масштабного месторождения считается маловозможным.

(5) Ширальдинский район

Это месторождение, которое является единственным месторождением золота среди объектов исследования, представляет собой жилу золотосодержащего кварца и ферромарганца, зарождающую в кмуштагском граните.

В результате разведки с разбуриванием под ширальдинской жилой было уточнено распределение золотовключающей руды до глубины под поверхностью около 150 м в северной части, около 80 м в центральной части и около 200 м в южной части района. Структура рудной жилы представляет собой кулисообразное расположение. В целом она имеет направленность ССВ - ЮЮЗ с наклоном 45 град З. Продолжительность жилы около 1400 м, из которой около 900 м была рудоносной. Предварительно замеренная ширина жилы оставила 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. 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. 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. 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. при 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. В сумме предполагаемого и потенциального запасов общий запас руды - 2312 тыс. т., при среднем содержании Au 5.1 г/т., золота 11,7 т.

В результате рассмотрения программы освоения месторождения определено следующее: возможный запас руды к добыче - 644 тыс.т., золото - 3,3 т, что говорит об очень малом количестве и большой бремени на инвесторов. Следовательно, следует отметить, что освоение месторождения на данном этапе - затруднительно.

Советы по освоению месторождения:

Программа освоения ширальдинского месторождения была рассмотрена на различных предпосылках. Хотя на данный момент освоение месторождения представляется затруднительным, его возможность может образоваться при условии улучшения предпосылок. К этому относятся, например, снижение содержания Au, сокращение расходов на создание предприятия, строительство совместного золотоaфинировочного завода, повышение стоимости золота на рынке.

SUMMARY

This report is a summary of results of a technical cooperation project for mineral exploration conducted in the Talas area, Kyrgyz Republic. The survey was performed over a three year period from 1994 to 1996. The survey focuses on clarification of the geology and determination of the mineral potential of the area and exploration for new ore deposits.

Respective survey of each year is as follows:

Phase I : Compilation of previous data, analysis of satellite images: 33,000km^2

Phase II: Shyraldzhyn area: Detailed geological survey: 12km^3

: Kumyshtag and Babahan areas: Geological survey: 1,220km^2

Geochemical survey: 768 soil samples

Phase III: Shyraldzhyn area: Drilling survey: 12 holes, 2,560.4m bore

Results of the survey and recommendations are summarized as follows:

【Results of survey】

(1) Compilation of previous data

According to geological structures and characteristics of ore deposits in this area, mineralization is classified into two groups: one is vein-type or massive mineralization related to the Uzunahmat-Kumyshtagsky thrust fault and its subordinate faults, the other is vein, greisen and skarn type mineralization related to the Kumyshtag granite.

(2) Analysis of satellite images

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

(3) Kumyshtag area

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. 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.

(4) Babahan area

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

(5) Shyraldzhyn area

The Shyraldzhyn deposit consists of gold-bearing quartz-manganosiderite veins in the Kumyshtag granite. As results of core drillings conducted at the lower extension of the vein, gold mineralized zones were confirmed to be embedded about 150m beneath surface at the northern part, about 80m beneath surface at the central part and about 200m depth at the southern part. The vein shows echelon arrangement, strikes NNE-SSW and dips 45° W. Although elongation of vein along strike exceeds 1,400m, the mineralized part extends only 900m. 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. Grades of the vein caught by holes range from 2.5 to 11.3 g/t Au. High gold grade ore is embedded in the northern and southern parts. Native gold is found as grains between a few μ m and 70 μ m, occurring in goethite and quartz, and along fractures of those minerals. On the basis of occurrence and mineral assemblages, gold mineralization of the deposit is presumed to have formed under the oxidation after the formation of the quartz - manganosiderite vein. According to distribution of homogenization temperatures, it seem possible that higher temperature zones could exist in the northern and southern parts and gold mineralized zones could be embedded there.

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 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. A total of possible and potential ore reserves can be 2,312 thousand tons with 5.1g/t Au and 11.7 tons of gold.

A mining development program was performed to investigate possible ore reserves. Crude ore reserves are estimated to be 644 thousand tons with 3.3 tons of gold. It is concluded that mining development would be difficult, as things stand.

【Recommendation for mining development】

Although a program of development of mining at the Shyraldzhyn deposit was studied considering various conditions, it is concluded that the development would be difficult. There may be possibility that the deposit could be developed if the conditions improve in the future. Lowering of cut-off grade, reduction of operation costs, construction of a cooperating gold refinery and appreciation in gold are listed as conditions influencing revenue and expenses.

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PART I

GENERAL REMARKS

CHAPTER 1 INTRODUCTION

1-1 Survey area and purpose

The survey area is situated in Talas oblast in the northwestern part of the Kyrgyz Republic, and located in the Northern Tien-Shan ranges with 4,000m altitude. The survey area covers an areas of approximately 3,300 square kilometers. The following five points are of the boundaries of the survey area (Fig. I-1).

42° 30' north latitude, 71° 00' east longitude
42° 30' north latitude, 71° 45' east longitude
42° 17' north latitude, 72° 15' east longitude
41° 58' north latitude, 72° 15' east longitude
42° 22' north latitude, 71° 00' east longitude

In response to the request the Government of the Kyrgyz Republic, the Japanese Government decided to conduct a mineral exploration in Talas area.

The exploration survey had started on the basis of the scope of work to the Talas area project signed between the both parties on August 11, 1994.

The purpose of the survey is to clarify the geology , to assess of the mineral potential of the area and to explore new deposits.

1-2 Methods and contents of survey

The survey were performed over three years from 1994 to 1996. Survey methods of each year are summarized in Fig. I-2. Contents by respective survey are given Table I-1. Selection of prospective area is conducted by flow chart presented in Fig. I-3.

Phase I of the survey was carried out by previous data compilation combined with the satellite image analysis of entire survey area. Phase II of the survey was performed by detailed geological survey in the Shyraldzhyn area, 12km^2. Geological reconnaissance survey was conducted in the Kumyshtag area of 700km^2 and the Babahan area of 520km^2 and geochemical soil survey was simultaneously implemented. Phase III of the survey was conducted by drilling of twelve holes with a total length of 2,560.4m in the Shyraldzhyn area.

1-3 Periods and members of survey

Periods of the field survey and analysis during three years are given in Table I-2. Members of the survey are presented in Table I-3.

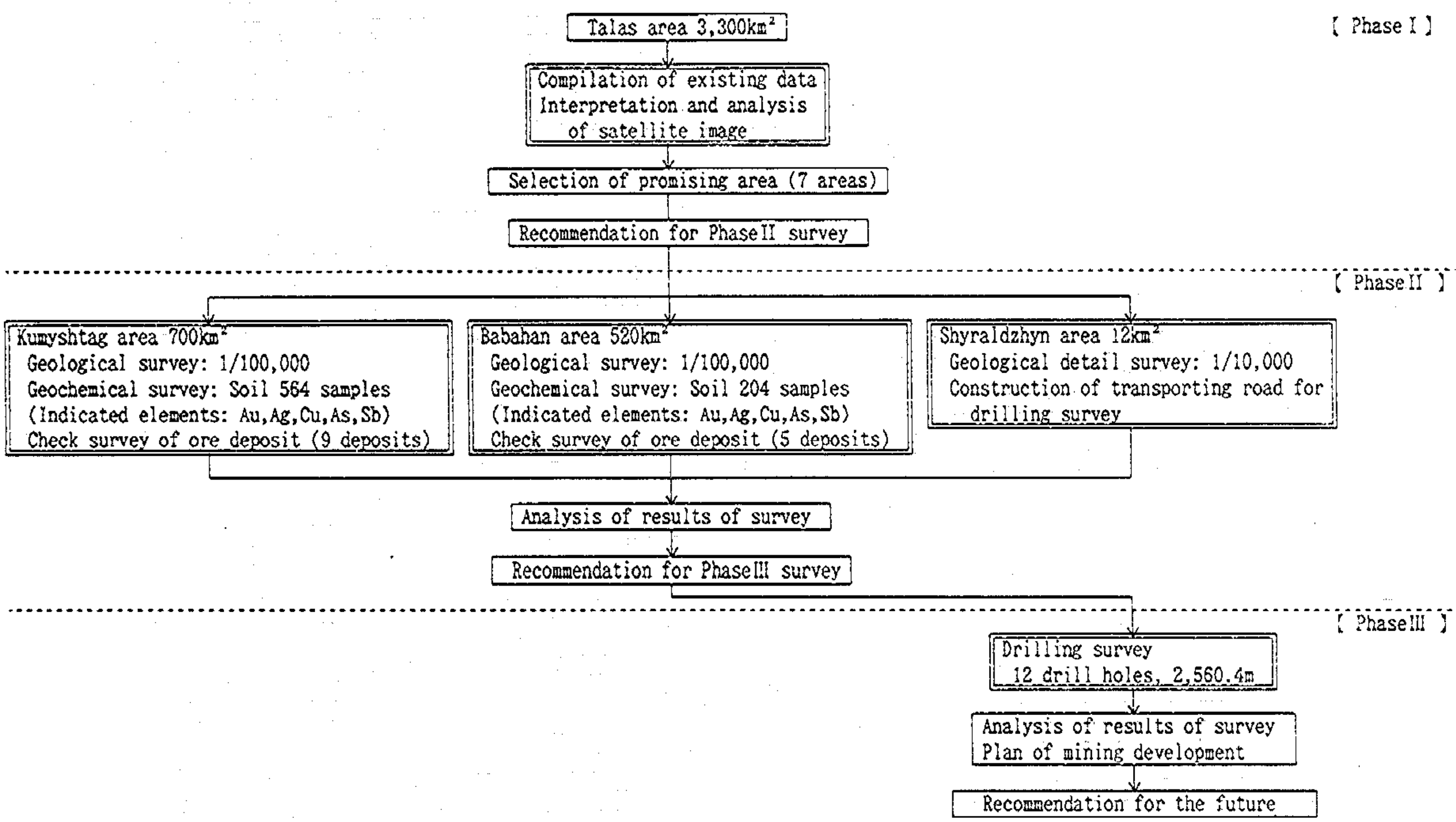


Fig. I-2 Flow Sheet of the Survey

Table I -1 Methods and Contents of the Survey

	Phase I (1994)	Phase II (1995)				Phase III (1996)	Total (1994-1996)
	Whole area	Kumyshtag	Babahan	Shyraldzhyn	Whole area	Shyraldzhyn	
Satellite image analysis (km^2)	3,300						3,300
Geological survey (km^2)		700	520	12			1,232
Length of route (km)		175	60	26			261
Geochemical soil (pcs)		564	204				768
Drilling survey							
Road construction (km)				24.33			24.33
Dirt road construction (km)				10.11			10.11
Previous road clearing (km)				14.22			14.22
Number of drill holes (hole)						12	12
Length of drilling (m)						2,560.4	2,560.4
Laboratory studies							
Thin section (pcs)					11	20	31
Polished section (pcs)					20	26	46
Chemical analysis							
Soil (pcs)					768		768
Ore assay (pcs)					60	243	303
X-ray diffraction analysis (pcs)					20	29	49
Fluid inclusion (pcs)					11	15	26
Isotopic dating (K-Ar) (pcs)					2		2

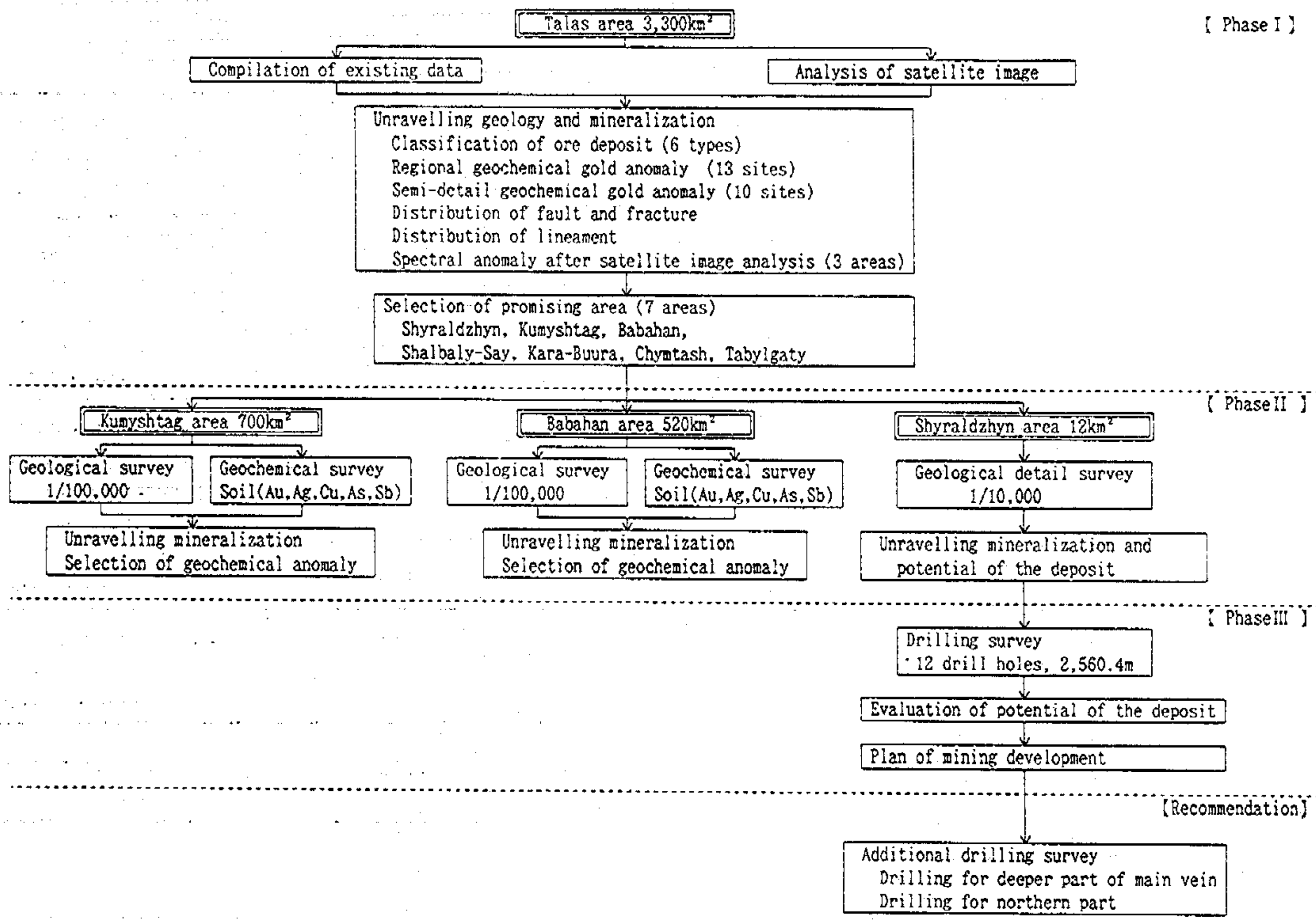


Fig. I-3 Flow Chart of Selection of the Promising Area

Table I-2 Period of the Survey

Phase	Period of Field Survey	Period of Analysis
Phase I	Dec. 1, 1994 - Jan. 24, 1995	Jan. 25, 1995 - Feb. 28, 1995
Phase II	July 16, 1995 - Dec. 9, 1995	Dec. 10, 1995 - Feb. 28, 1996
Phase III	June 5, 1996 - Dec. 27, 1996	Dec. 28, 1996 - Feb. 28, 1997

Table I-3 Members of the Survey (1)

(Planning and Negotiation)

Japanese side		Kyrgyz side	
(Phase I)		(Phase I)	
Mr. Jiro OSAKO	MMAJ	Mr. S. M. MURZAGAZIEV	SCG
Mr. Hirofumi ONO	MITI	Mr. A. G. KONYUKHOV	SCG
Mr. Kenichi TAKAHASI	JICA	Mr. A. V. KAREV	SCG
Mr. Taro KAMIYA	MMAJ	Mr. K. KAKITAEV	SCG
(Phase II)		(Phase II)	
Mr. Junichi TOMINAGA	MMAJ	Mr. B. T. TURSUNGAZIEV	SCG
		Mr. S. M. MURZAGAZIEV	SCG
		Mr. V. A. STAVINSKY	SCG
		Mr. A. G. KONYUKHOV	SCG
		Mr. V. P. ROGALSKY	SCG
		Mr. L. F. CLEMENTEV	NKGE
		Mr. V. P. ZUBKOV	NKGE
		Mr. V. P. JAKOVENKO	NKGE
(Phase III)		(Phase III)	
Mr. Junichi TOMINAGA	MMAJ	Mr. B. T. TURSUNGAZIEV	SAG
Mr. Hirofumi ONO	MMAJ	Mr. S. M. MURZAGAZIEV	SAG
Mr. Toru NAWATA	JICA	Mr. V. P. ZUBKOV	SAG
		Mr. A. G. KONYUKHOV	SAG
		Mr. V. P. ROGALSKY	SAG
		Mr. K. KAKITAEV	NKGE
		Mr. L. F. CLEMENTEV	NKGE
		Mr. V. P. JAKOVENKO	NKGE

MITI: Ministry of International Trade and Industry

JICA: Japan International Cooperation Agency

MMAJ: Metal Mining Agency of Japan

SCG: State Committee on Geology, Usage and Protection of Natural Resource

SAG: State Agency of Geology and Mineral Resources

NKGE: North Kyrgyz Geological Expedition

Table I-3 Members of the Survey (2)

(Field survey)

Japanese side			Kyrgyz side		
(Phase I)			(Phase I)		
Mr. Masaharu MARUTANI	(L, G)	MINDECO	Mr. A. G. KONYUKHOV	(G)	SCG
Mr. Kiyohisa SHIBATA	(G)	MINDECO	Mr. V. P. PAHOLUX	(G)	SCG
Mr. Noboru FUJII	(G)	MINDECO	Mr. A. G. RAZBOYNIKOV	(G)	SCG
			Mr. F. A. APAYAROV	(G)	NKGE
(Phase II)			(Phase II)		
Mr. Masaharu MARUTANI	(L, G)	MINDECO	Mr. V. M. SHUBIN	(G)	NKGE
Mr. Tsuyoshi YAMADFA	(G)	MINDECO	Mr. F. A. APAYAROV	(G)	NKGE
Mr. Shoji KUMITA	(G)	MINDECO	Mr. V. M. ANTSFROV	(G)	NKGE
			Mr. A. F. LOPIN	(G)	NKGE
			Mr. Y. I. KOSTENKO	(G)	NKGE
			Mr. S. I. KORSHUNOV	(G)	NKGE
			Mr. E. A. INABEKOV	(G)	NKGE
			Mr. T. K. ISMAILOV	(D)	NKGE
			Ms. V. N. STESHENKO	(D)	NKGE
(Phase III)			(Phase III)		
Mr. Masaharu MARUTANI	(L, D)	MINDECO	Mr. G. A. YARUSHEVSKIY	(D)	NKGE
			Mr. I. I. RYABKO	(D)	NKGE
			Mr. T. K. ISMAILOV	(D)	NKGE
			Mr. B. D. MALYUTIN	(D)	NKGE
			Mr. B. ALYMKULOV	(D)	NKGE
			Mr. K. IMANALIEV	(D)	NKGE
			Mr. T. MALABEKOV	(D)	NKGE
			Mr. S. KULJIGITOV	(D)	NKGE
			MR. S. BAYLDCHAEV	(D)	NKGE

MINDECO: Mitsui Mineral Development Engineering Co., Ltd.

(L): Leader, (G): Geology, (D): Drilling

CHAPTER 2 PREVIOUS SURVEY

Regional geological survey of the survey area was firstly conducted by Ministry of Geology in 1963, for Geological Map of USSR, Series of Northern Tien-Shan , "K-42- X III" and "K-42- X VIII", although a part of the area has been investigated.

Regarding geological investigation of ore deposits, a geochemical survey for heavy sand using panning was done by Ministry of Geology (1963), and geological investigation of the known mineral deposits of the Central part of Talas mountain range with geochemical survey of stream sediments have been done by Geological Department, Kyrgyz SSR in 1987.

CHAPTER 3 GENERAL GEOLOGY

The survey area is included in the 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 sedimentary rocks with carbonate rocks and acid igneous rocks intruding them, 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.

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 -4, and generalized stratigraphic column in Fig. I -5. 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.

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

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

γSd Kunyshtag batholith 406±14Ma(Silurian)

$\gamma R_3 b$ Babahan batholith 1050±50Ma(R_3~R_2)

Fig. I-5 Generalized Stratigraphic Column of the Survey Area

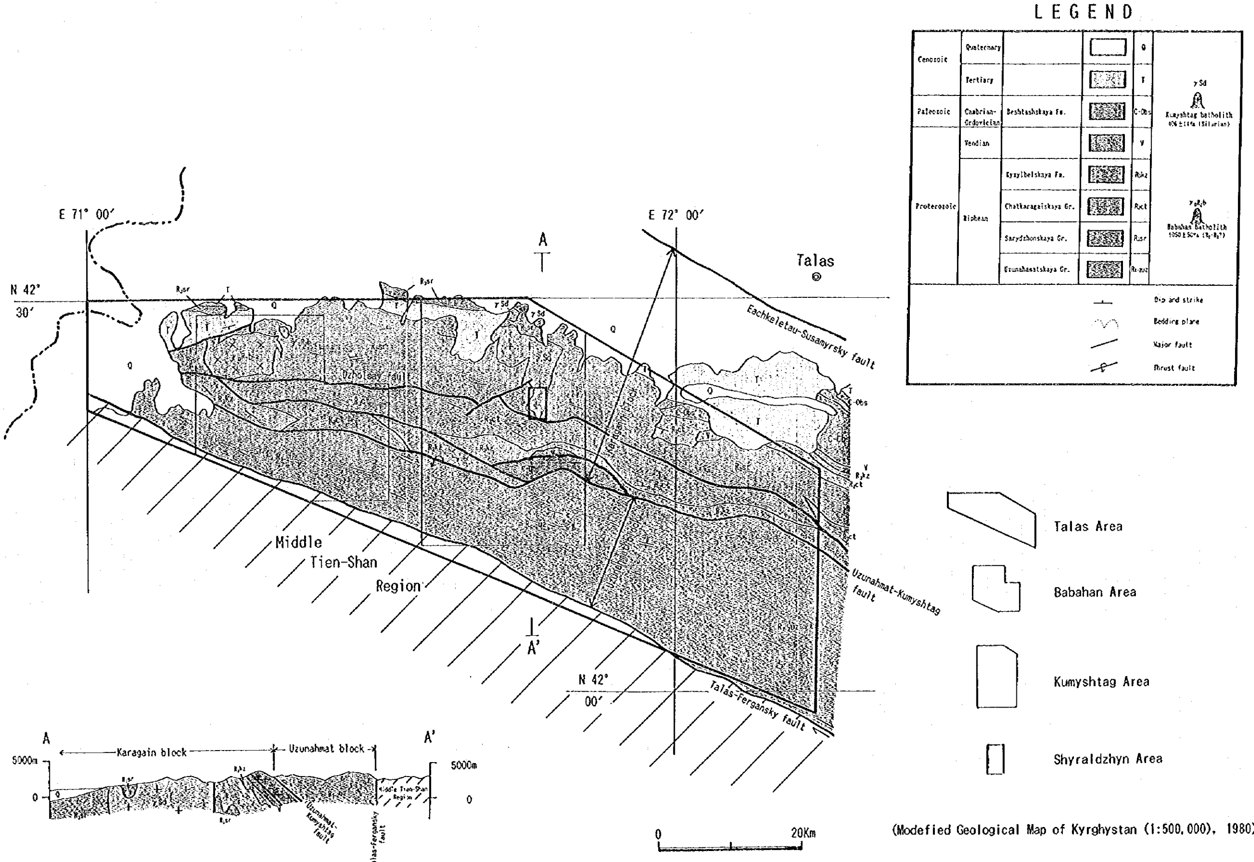


Fig. I-4 Generalized Geological Map of the Survey Area

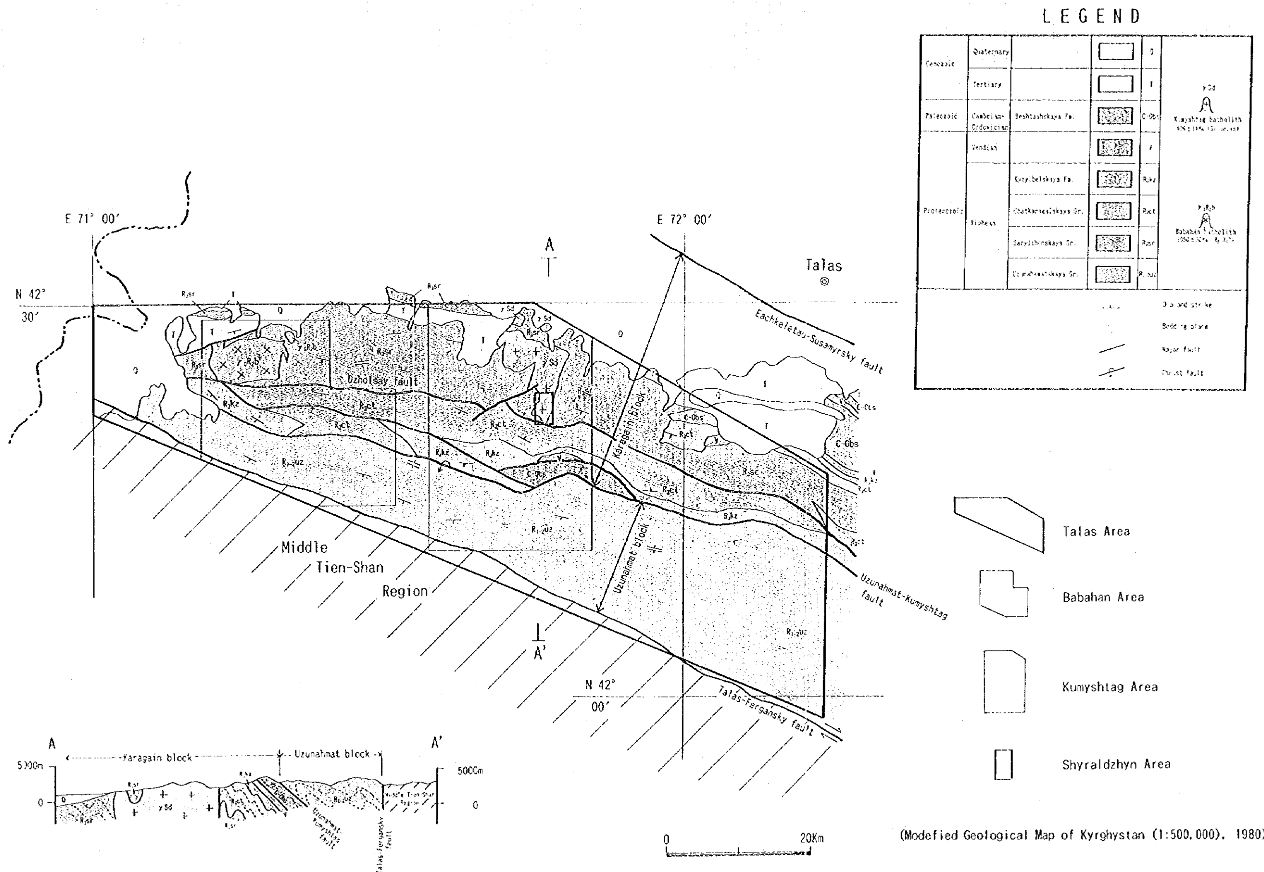


Fig. I-4 Generalized Geological Map of the Survey Area

CHAPTER 4 GEOGRAPHY OF THE SURVEY AREA

4-1 Location and access

The survey area is situated in the northwestern part of the Kyrgyz Republic, and located at the northern slope of the Talas Ala-Too mountains in the Northern Tien-Shan ranges. The area has a total area of approximately 3,300 km^2, 100km from east to west, 30km from north to south. Almost whole area belongs to the Talas oblast administratively. Talas, 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. Talas is the central of the region with about 30,000 population.

An ordinary route from Bishkek to Talas pass through Dzhambul in Kazakhstan, and turns southeastward into Talas. It is available to go to Talas through all year at 410 km of distance, taking 7 hours by automobile.

4-2 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. The survey area is topographically extremely steep.

Most high mountains are widely covered with glacier. The streams, pouring out from glacial troughs, form deep gorges. Most streams 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. A lot of dirt roads are constructed for nomads along the main streams in the survey area. It is available to go to upstream using the four-wheel drive car along dirt roads.

4-3 Climate and vegetation

The climate and vegetation in the survey area are characterized by changing of elevation because of 3,000m in relative elevation. In highland above 3,000m, grass grows partly. The climate ranging from 2,000 to 3,000m belongs to the highland zone, and bushes partly grows besides pines, cedars and birches grow along rivers below 2,000m. 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 shows 9mm in September. The thickness of snow show 4cm in the western part of the Talas basin, and 16cm in the eastern part.

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5-1 Conclusion

5-1-1 Whole area

(1) The survey area is composed of the various geological units from Proterozoic to Cenozoic Era which are intruded by the granite of Kumyshtag and Babahan.

(2) Many types of ore deposits and manifestations of gold, silver, zinc, lead, arsenic, beryllium, copper and tungsten are located in the area. The mineralization has taken place in the limestone and sandstone of the Upper Riphean - the Vendian series, and in the Kumyshtag granite of late Silurian to early Devonian age.

(3) According to the geological structures and characteristics of ore deposits in this area, the mineralization is classified into the following two groups: one is vein-type or massive mineralization related to the Uzunahmat-Kumyshtagsky thrust fault and its subordinate faults, the other is vein, greisen and skarn type mineralization related to the Kumyshtag granite.

(4) Ground confirmation was conducted to check the anomalous zones delineated from the spectral analysis of satellite image. The anomalous zones correspond to limonite disseminated schist of the Riphean series. The ground confirmation revealed that diagenesis alteration, instead of hydrothermal alteration, had produced the anomalous zones.

5-1-2 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.

5-1-3 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.

5-1-4 Shyraldzhyn area

(1) Shyraldzhyn deposit being only one gold deposit in the Talas area, is composed of quartz - manganosiderite veins in the southeastern part of the Kumyshtag granite.

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

(3) A drilling survey was conducted in the Shyraldzhyn deposit. 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 at 200m depth at the southern part.

(4) The vein shows echelon arrangement, strikes NNE-SSW and dips 45° W. Although elongation of the vein along strike exceeds 1,400m, gold mineralized part extends only 900m. 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 the hole.

(5) The average gold grades of vein confirmed by drillholes range 2.5 to 11.3 g/t. High gold grade ore exist in the northern and southern part of vein.

(6) 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.

(7) It has been pointed out that homogenization temperature shows positive correlation with gold grade. The interpretation suggests that higher temperature zones could exist in depths in the northern and southern parts, and gold mineralized zones could be embedded there.

(8) A tentative calculation of ore reserves represents that possible ore reserves which are presumed on the basis of drillholes among 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 vein under the possible blocks, are expected to be 1,269 thousand tons with 5.0 g/t Au and 6.3 tons of gold.

(9) A mining development program was performed to investigate possible ore reserves. Cut-off grade is determined as 4 g/t Au by operation cost. Crude ore reserves are estimated to be 644 thousand tons with 3.3 tons of gold. It is concluded that mining development would be difficult, as things stand.

5-2 Recommendation for the future

A program of mining development at the Shyraldzhyn deposit was studied considering various conditions. Although it is reached that the development would be difficult, there may be possibility that the deposit could be develop if conditions improve in the future. Lowering of cut-off grade, reduction of operation costs, construction of a cooperating gold refinery and appreciation in gold are listed as conditions influenced revenue and expenses.

Cut-off gold grade was determined by the sum of mining and refining operation costs. If operation costs reduce, the cut-off grade would be low and crude ore reserves would increase. After all, it will be connect with reduction of initial investment cost per ton.

Ore haulage costs occupy about 25% in the operation cost. This program has been investigated considering information of those costs at an operating gold mine in Kyrgyz. Therefore it will be important that the cost reduction at the operating mine is given attention and the costs in this plan are modified to reduce through new eyes.

Gold deposits, such as the Jeruy and the Andash, are located around Talas. The Jeruy deposit estimated 83 tons of gold with 6 g/t Au, has been considering to develop. The Andash deposit calculated 13 tons of gold with 2 g/t Au, has been prospecting. If a gold refinery is built to develop those gold deposits, it would be possibility that gold ore produced from the Shyraldzhyn deposit is sent to a future cooperating refinery.

The price of gold is assumed to be 360 $/TOZ in this plan. If price fluctuates to be 454 $/TOZ, revenue and expenses keep the balance at production of 100 tons per day.

The northern and southern parts of the deposit would be listed as prospective areas if high grade ore can be expected at depth.

PART Ⅱ

PARTICULARS

CHAPTER 1 ANALYSIS OF SATELLITE IMAGE

1-1 Methods of analysis

A series of satellite image interpretation including classification of geological units, lineament analysis and detecting anomalous area possibility indicating mineralized alteration, has been conducted.

Four scenes of LANDSAT TM data of Path 152 - 153 / Row 30 - 31 have been used for this analysis. The area of these scenes and the data are shown in Fig. II-1. The data analysis has been done in the following procedure.

(1) Preparation of digital mosaic

As the objective area is divided into four scenes in the satellite image, a digital mosaic data to cover the whole area into one scene have been prepared and used for analysis.

(2) Preparation of false color synthetic image

The most adequate combination of bands was selected. As the results, the false color image of Band 1 (blue), 4 (green) and 5 (red) was considered to be reflected the topographic information most well and it was expected that the difference of tone in the image may represent different lithofacies.

(3) Photogeologic interpretation

Using a false color synthetic image, extraction of lineaments and classification of geological units were performed by photogeologic technique.

(4) Preparation of alteration extraction image

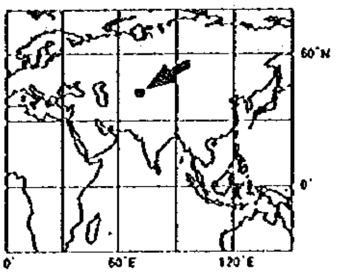
The existing analytical methods effective to extract alteration zone have been investigated. As the results, a false color image, assign red for ratioing Band 3 / Band 1 and green for the second principal component in the directed principal component analysis (DPCA), was produced.

(5) Extraction of spectral anomaly areas

The zone where both ratioing Band 3 / Band 1 value and the second principal component in DPCA is high, is presumed to be the highest possibility of alteration zone. Therefore this zone was extracted as spectral anomaly areas.

1-2 Lineament analysis

Lineament map interpreted from false color synthetic image (Fig. II-2) is shown in Fig. II-3. Comparing the distribution of lineaments interpreted from the image with the distribution of the ore deposits and manifestations in the survey area, the following are described.



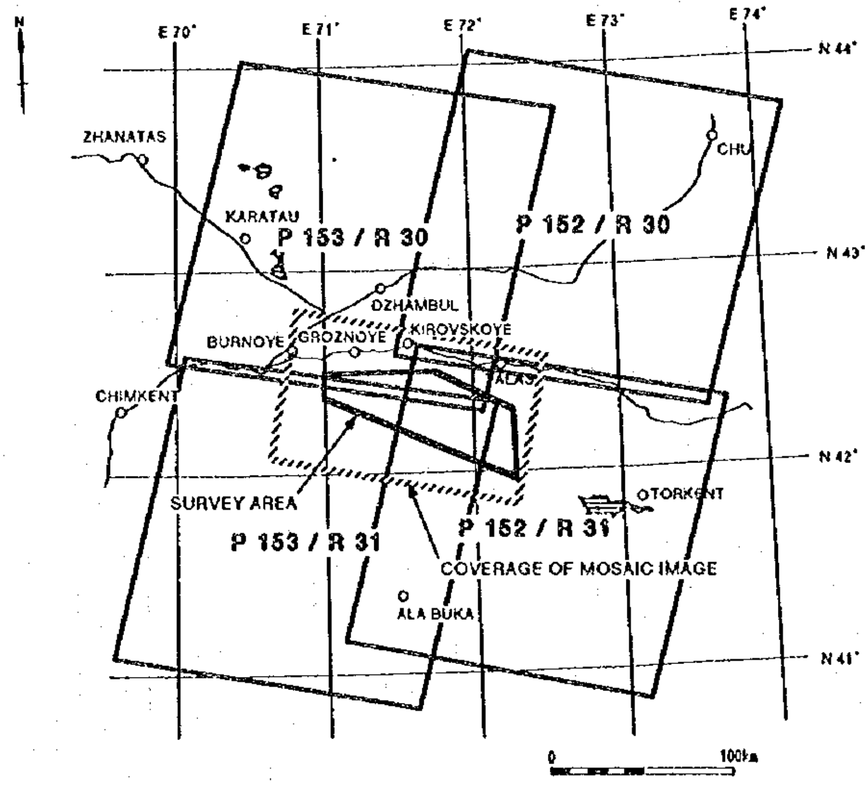
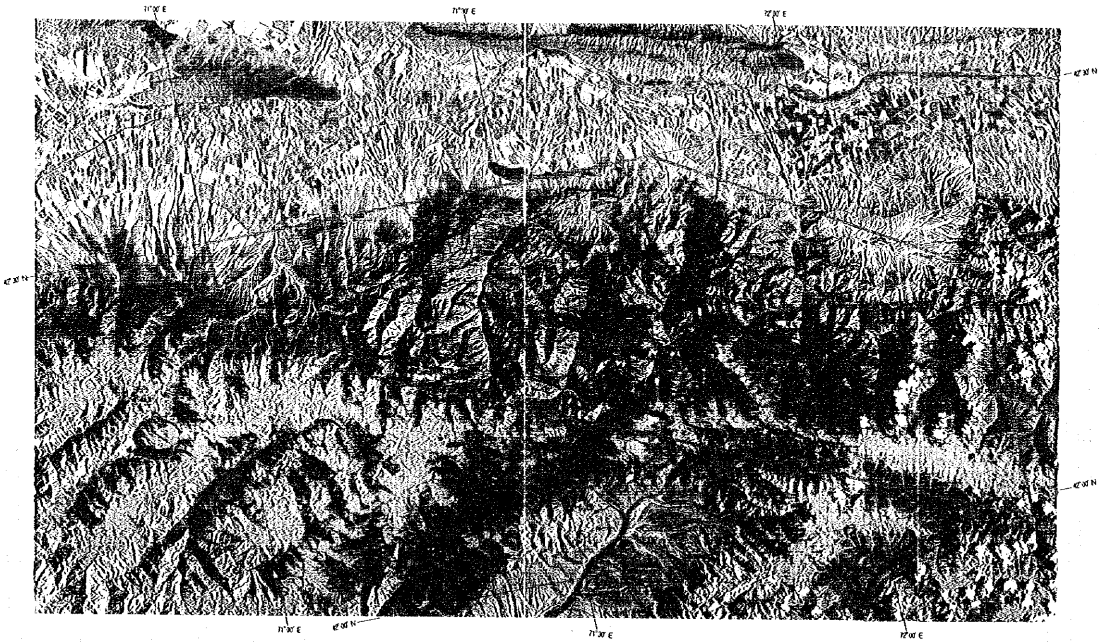


Fig. II-1 Ground Coverage of Satellite Data



THE MINERAL EXPLORATION
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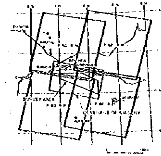
THE KYRGYZ REPUBLIC
(PHASE I)

LANDSAT TM DIGITAL MOSAIC IMAGE



THE JAPAN INTERNATIONAL COOPERATION AGENCY

THE METAL MINING AGENCY OF JAPAN

FEBRUARY, 1995

Data Acquisition Date:

Path 152 Row 30 July 27, 1990
Path 152 Row 31 July 03, 1993
Path 153 Row 30 Sept. 04, 1990
Path 153 Row 31 July 02, 1990

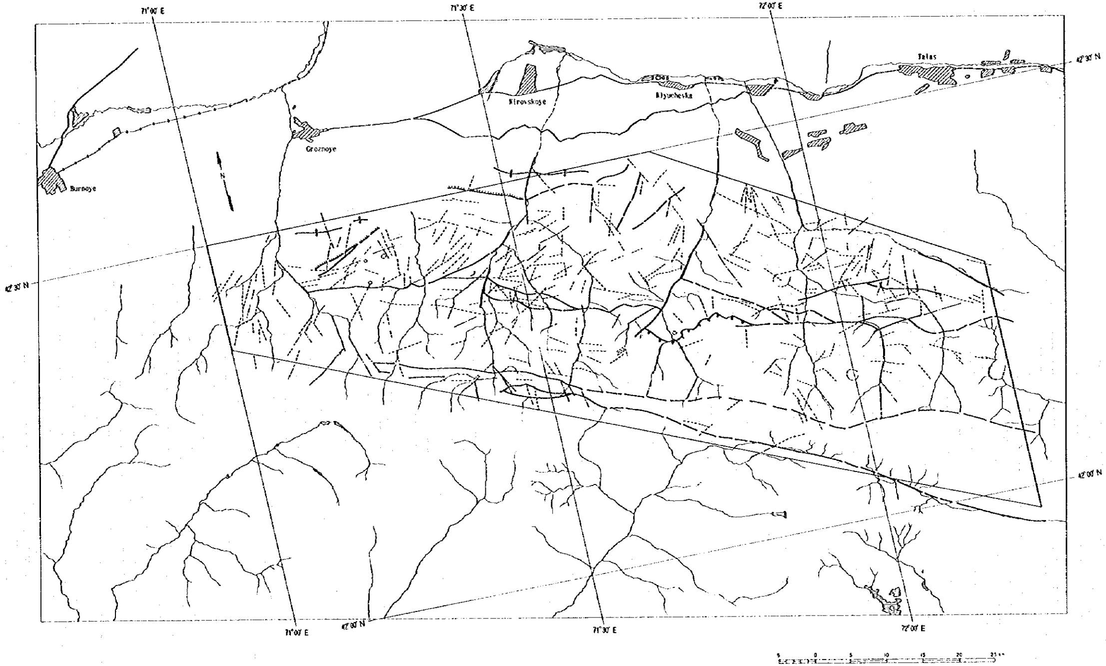
Color Combination:

Band 1 = blue
Band 4 = green
Band 5 = red

5 0 5 10 15 20 25km

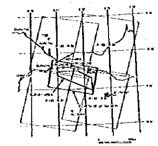
Prepared by Mitsui Mineral Development
Engineering CO., LTD. (MINDECO)

Fig. II-2 LANDSAT TM False Color Digital Mosaic Image



THE MINERAL EXPLORATION
IN THE TALAS AREA,
THE KYRGYZ REPUBLIC
(PHASE I)

LINEAMENT MAP OF LANDSAT TM IMAGE



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LEGEND

- Fault (barbs on downfall side)
- Inferred Fault (barbs on downfall side)
- Thrust Fault
- Major Lineament
- Minor Lineament
- Circular Structure
- Anticline
- Drainage
- Lake, Pond
- Urban Area
- Major Road
- Rail Way

Fig. II-3 Lineament Map of LANDSAT TM Image

(1) Area of silver deposits in the western part of the area

It is recognized that ore deposits and manifestations such as the Dzholsay silver deposit are located along the E-W faults and their subordinated NE-SW lineaments. It has been possible that silver mineralization was controlled by the fracture zone of the same series.

(2) Area of ore deposits and manifestations in the eastern part

Lots of ore deposits such as the Kumyshtag silver deposit and manifestations of silver, lead, zinc, arsenic and tungsten are situated in a triangle area surrounded by the E-W thrust, the NE-SW fault and the NW-SE lineaments. It has been possible that these mineralization was formed with controlled by the fractures zone which was equivalent to the N-S stress formed the E-W thrust.

1-3 Classification of geological unit

Thirteen geological units in the survey area are classified, according to the false color synthetic image. Geologic interpretation map of units is presented in Fig. II-4. Photogeologic characteristics of each geological unit and the comparison with a 1:500000 geological map are given in Table II-1. Comparing the geologic units map with the distribution of ore deposits and manifestations, the followings are described.

(1) Area around Unit Gr3 in the central part of the area

This unit corresponds to the Kumyshtag granite. Near the boundary of this unit, many ore deposits such as the Shyraldzhyn gold deposit and manifestations of copper, lead, tungsten and beryllium are distributed. It has been indicated the possibility that these deposits and manifestations were formed in relation to the contact metamorphism resulted from the intrusion of granitic rock or to the hydrothermal activities where intrusive rock worked as a heat source.

(2) Southeast of Unit Gr1 in the western part

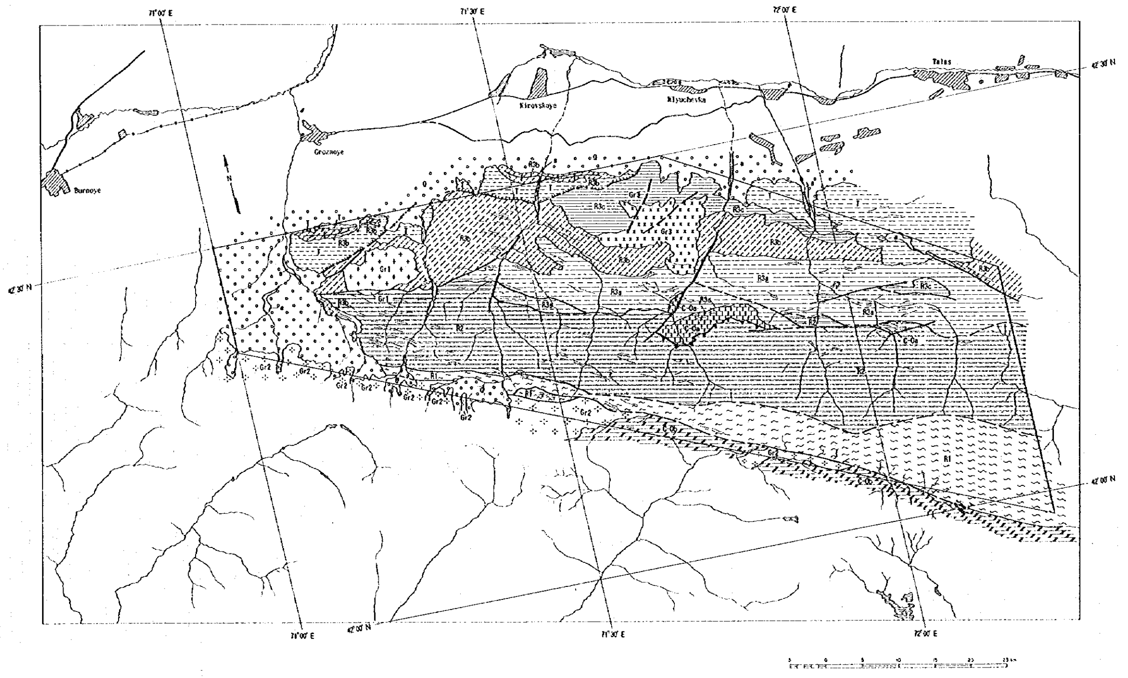
The silver deposits and manifestations such as the Dzholsay deposit are located from the south to the southeast around this unit. As above described, the E-W lineaments and the NE-SW lineaments are dominant in this area. It has been indicated the possibility that the mineralization was controlled by the E-W or the NE-SW fractures, and the Babahan granite worked as a heat source.

1-4 Spectral analysis

The spectral anomalies interpreted from the analysis image for extraction of hydrothermal alteration zone are represented in Fig. II-5.

Table II-1 Photogeologic Characteristics of Interpretation Units

No.	Units	Color	Tone	Drainage			Geomorphological aspects					Vegetation Density	Landuse	Correlation	Rock Types
				Pattern	Density	Cross Profile	Resistance	Texture	Bedding, Schistosity	Lineament Density	Landform				
1	a	green, red-brown	moderate	contorted	moderate	gentle U-shape	very low	smooth	none	very low	valley, basin	high	frequent	Q	gravel, loam
2	Q	green, red-brown	light	radial	high	gentle V-shape	low	smooth	none	low	alluvial fan	low	sparse	Q	gravel, loam
3	T	reddish brown	moderate	pinnate	high	sharp V-shape	moderate	rough	very poor	moderate	hilly	very low	none	N1-2, P3-N1	clay, sandstone
4	C・Oa	purple, red brown	dark, light	parallel	high	shallow V-shape	moderate	rough	very well	low	hilly	low	none	C・O2 fs	limestone
5	C・Ob	green	moderate	dendritic	moderate	gentle V-shape	moderate	smooth	poor	low	hilly	high	none	C・O2 fs	limestone
6	R3c	reddish brown	light	dendritic	high	shallow V-shape	low	rough	very poor	moderate	hilly	sparse	none	R3sr	shale, siltstone, sandstone
7	R3b	reddish brown	moderate	dendritic	high	V-shape	moderate	rough	poor	high	hilly	sparse	none	R3sr	shale, siltstone, sandstone
8	R3a	purplish brown	dark	pinnate	moderate	deep V-shape	high	fine	well	high	mountainous	moderate	none	R3sr, R3ct	shale, siltstone, sandstone
9	R2	grey-blue, brown	dark	dendritic	moderate	deep V-shape	high	smooth	fine	moderate	mountainous	high	none	R3ct, R1-2kb	sandstone, shale, phyllite, limestone
10	R1	greyish blue	moderate	parallel	moderate	shallow V-shape	moderate	fine	well	low	mountain range	high	none	R1-2kb	phyllite, limestone
11	Gr3	green	light	dendritic	moderate	gentle V-shape	moderate	smooth	none	low	hilly	very high	none	γSd	granite
12	Gr2	greenish brown	moderate	parallel	high	shallow V-shape	moderate	fine	none	low	hilly	high	none	-	granite ?
13	Gr1	reddish brown	light	dendritic	high	shallow V-shape	moderate	rough	none	moderate	hilly	low	none	γOv ?	granite



THE MINERAL EXPLORATION
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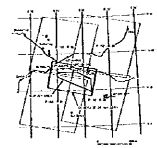
(PHASE I)

GEOLOGIC INTERPRETATION MAP OF
LANDSAT TM FALSE COLOR IMAGE



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FEBRUARY, 1995

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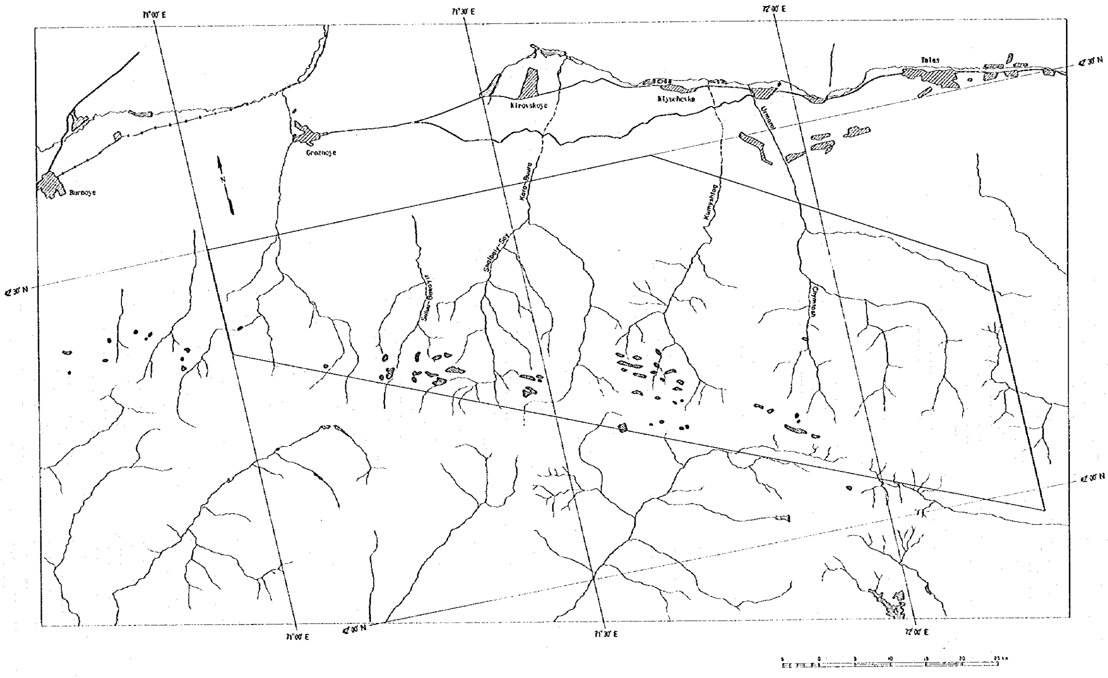
Symbol	Unit	Correlation with Geologic Map	Probable Rock Type
	a	Q	gravel, loam
	Q		
	T	N1-2, Pg N1	clay, sandstone
	C-Oa	C-O1 ls	limestone
	C-Ob		
	R3c	R3v	shale, siltstone, sandstone
	R3b		
	R3a	R3w, R3v	shale, siltstone, sandstone
	R2	R3d, R1-2b	sandstone, shale, phyllite, limestone
	R1	R1-2b	phyllite, limestone
	Gr3	γ5d	granitic rock
	Gr2		granitic rock ?
	Gr1	γO1-?	granitic rock

Symbol	Explanation
	Bedding Trace or Schistosity (arrows show dip direction)
	Fault (ticks on downfall side)
	Inferred Fault (ticks on downfall side)
	Thrust Fault
	Anticline
	Drainage
	Lake, Pond
	Urban Area
	Major Road
	Rail Way

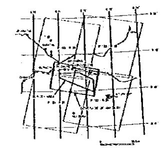
Fig. II-4 Geologic Interpretation Map of LANDSAT TM False Color Image

A lot of extracted spectral anomalies are distributed in Unit R1 and R2, and are especially located near the WNW-ESE faults which bordered on Unit R1. Anomalies show a stretched form parallel to the strike of faults. Therefore the extracted spectral anomalies might suggest that the hydrothermal activities had existed through passes along the WNW-ESE faults.



THE MINERAL EXPLORATION
IN THE TALAS AREA,
THE KYRGYZ REPUBLIC
(PHASE I)

DISTRIBUTION OF SPECTRAL ANOMALIES
ON LANDSAT TM IMAGE



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
FEBRUARY, 1995

LEGEND

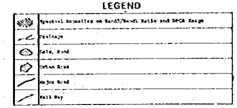


Fig. II-5 Distribution of Spectral Anomalies on LANDSAT TM Image

CHAPTER 2 COMPILATION OF PREVIOS DATA

2-1 Ore deposit

The various types of ore deposits of gold, silver, lead, zinc, arsenic, beryllium, copper and tungsten are known to occur in the Talas are. They are classified into the following six types:

① Gold-bearing vein in the Kumyshtag granite

② Silver-lead vein in limestone and sandstone of Upper Riphean - Vendian system

③ Massive to disseminated arsenic deposits in limestone and sandstone of Upper Riphean system

④ Greisen and stockwork beryllium deposits in the Kumyshtag granite

⑤ Copper vein around the Kumyshtag intrusive

⑥ Vein and skarn types tungsten deposits around the Kumyshtag intrusive

Furthermore these ore deposits are classified into two groups on the basis of types of ore deposits and the controlled geological structures:

(1) Vein and massive type mineralization related to the Uzunahmat-Kumyshtagsky thrust fault and its subordinate faults and fractures (② and ③).

(2) Vein , greisen and skarn type mineralization related to the Kumyshtag granite (①,④, ⑤ and ⑥).

2-2 Geochemical anomaly and mineralization

Geological department of the now defunct Kyrgyz SSR had carried out a reconnaissance geochemical prospect using heavy mineral panning from all the streams in the survey area. As the results of the reconnaissance geochemical survey, the gold concentration has been formed in thirteen places. It has been indicated that gold mineralization distributed near the Uzunahmat-Kumyshtagsky thrust fault

Geological department of the Kyrgyz SSR had also performed geochemical semi-detailed prospect using stream sediment near the Kumyshtag stream. The semi-detailed geochemical survey has revealed that the mineralization of gold, tin, tungsten, beryllium and rare metals is related to the Kumyshtag intrusive.

Geochemical anomalies in the survey area has suggested that mineralization of known ore deposits have been intensely controlled by the geological structures as the Uzunahmat-Kumyshtagsky fault and the Kumyshtag granite.

The results of the analysis of satellite image as well as the compilation are summarized in Fig. II-6, taking notice of gold which is important in economics. In addition considering the distribution of known ore deposits, the following six areas has been extracted as high possible area where gold deposit is presumed to exist: in order of possibility, Kumyshtag, Kara-Burra, Babahan, Shalbaly-Say, Chymtash and Tabylgaty areas.

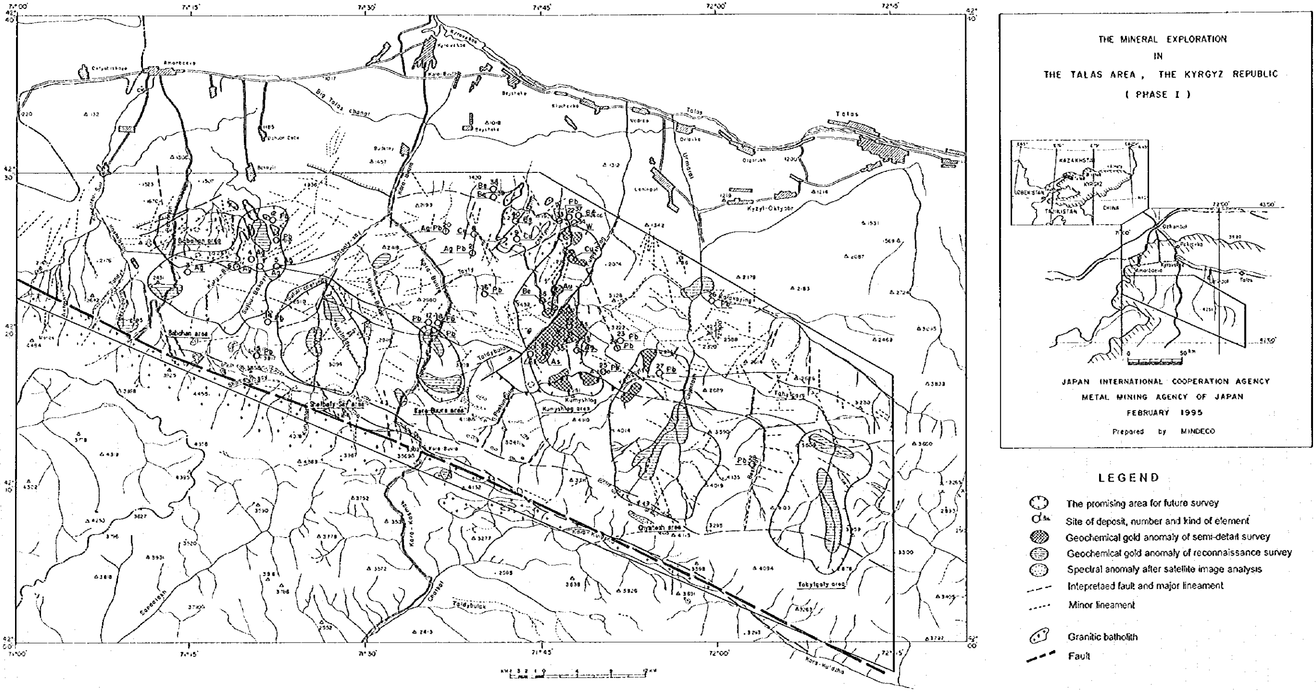


Fig. II-6 Summary of the Compilation

CHAPTER 3 KUMYSHTAG AND BABAHAN AREAS

As the stratigraphic units and the geological structure are almost same between the Kumyshtag and the Babahan areas, those are described together with both areas.

3-1 Geological survey

3-1-1 Outline of geology

Basement rock of both areas is the Uzunahmatskaya group of the Riphean system, is covered with the Sarydzhonskaya group, the Chatkaragaiskaya group, the Kyzylbelskaya formation unconformably, and moreover is overlain by the Vendian and the Cambrian-Ordovician systems.

They are intruded by the Kumyshtag batholith in the northern part of the Kumyshtag area, and is covered with Tertiary system in the west of the batholith. They are also intruded by the Babahan batholith in the northwestern part of the Babahan area, and is overlaid with Tertiary system in the northwest of the batholith.

Prominent direction of folding axis and strikes of bedding is WNW-ESE with complex folding structure. The geological maps and profiles of both areas are represented in Fig. II-7 and II-8.

3-1-2 Stratigraphy

(1) Uzunahmatsky group

This group is composed of a block which is occupied between the Uzunahmat-Kumyshtagsky thrust and the Talas-Fergansky fault.

(Distribution) It widely covers around the upper reaches of the Kumyshtag river and the Talas Ala-Too mountain ranges in the Kumyshtag area. It covers a widespread area ranging from the upper reaches of the Shalbaly-Say river, those of the Suluu-Bakayir river to those of the Babahan river in the Babahan area.

(Rock facies) It mainly consists of carbonate rocks of marble, limestone and dolomite, and clastic rock of phyllite, sandstone and shale.

(Thickness) 3,290m.

(Structure) It chiefly trends WNW-ESE with steep dipping south or north and shows complex folding structures.

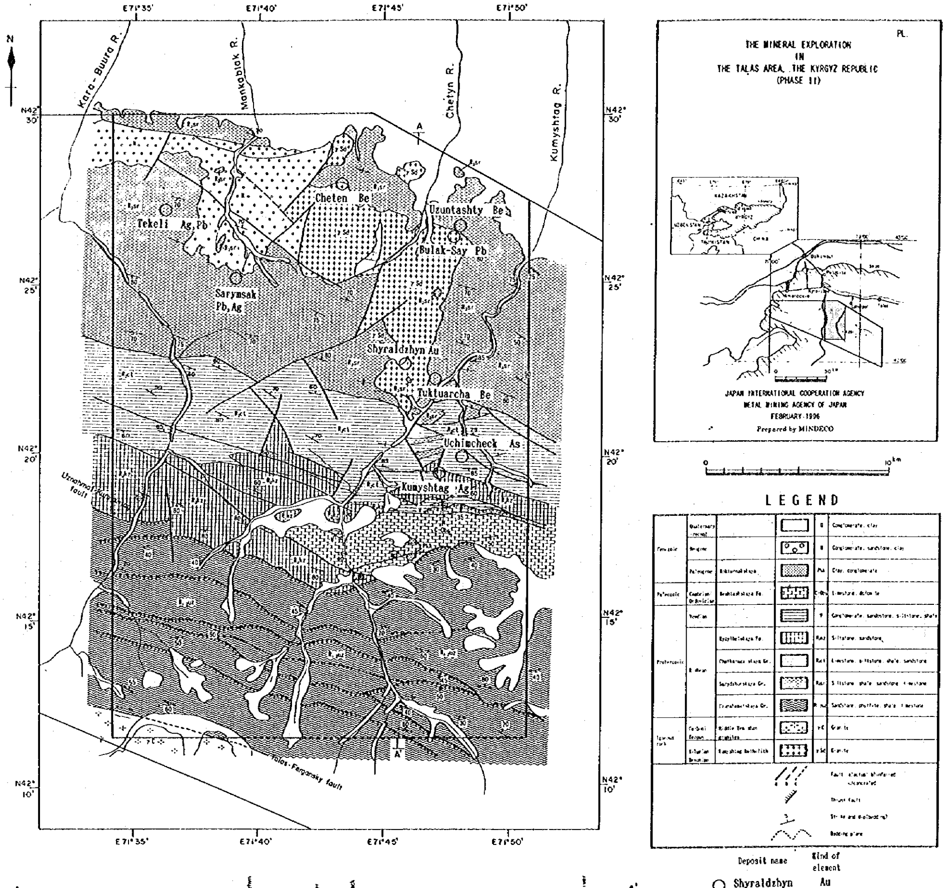
(Relationship with surrounding formations) The southern edge of this group borders on granite which belongs to the Middle Tien-Shan massif, by the Talas-Fergansky

fault. The northern edge of this group borders on the Chatkaragaiskaya group and the Kyzylbelskaya formation of Riphean system and the rock of Cambrian-Ordovician system, by the Uzunahmat-Kumyshtagsky thrust fault.
(Age) Lower to Middle Riphean.

The Karagainsky block which covers the north area over the Uzunahmat-Kumyshtagsky thrust fault, is overlain by the rocks Riphean system (mainly carbonate and clastic rock), Vendian system (mainly tillite and tuff) and Cambrian-Ordovician system (mainly carbonate rock). Riphean system of the Karagainsky block is composed of the Sarydzhonskaya group, the Chatkaragaiskaya group and the Kyzylbelskaya formation.

(2) Sarydzhonskaya group
(Distribution) It widely covers over the lower reaches of both Kumyshtag river and Kara-Buura in the northern part of the Kumyshtag area. It covers over the middle reaches of both Suluu-Bakayir river and Babahan in the northern part of the Babahan area
(Rock facies) It mainly consists of clastic rock of sandstone, shale and siltstone.
(Thickness) 2,000m
(Structure) The prominent direction of formation is WNW-ESE with steep dipping south or north, though the formation trends northwest to north-northwest and dips west steeply in the west of the Babahan river.
(Relationship with underlying formations) Unknown.
(Age) Upper Riphean.

(3) Chatkaragaiskaya group
(Distribution) It crops out the middle reaches of both Kumyshtag river and Kara-Buura in the Kumyshtag area, and crops out the middle reaches of both Shalbaly-Say river and Suluu-Bakayir in the Babahan area.
(Rock facies) It consists of predominantly carbonate rock of limestone and silty limestone, and clastic rock of sandstone, shale and siltstone.
(Thickness) 4,160m
(Structure) It trends west-northwest and dip south or north steeply.
(Relationship with underlying formations) It is contact with the underlying Sarydzhonskaya group by fault.
(Age) Upper Riphean.



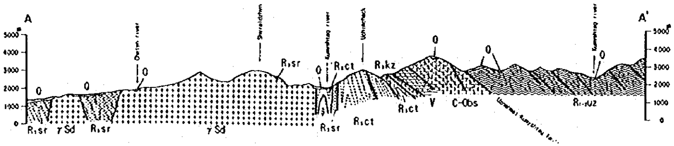
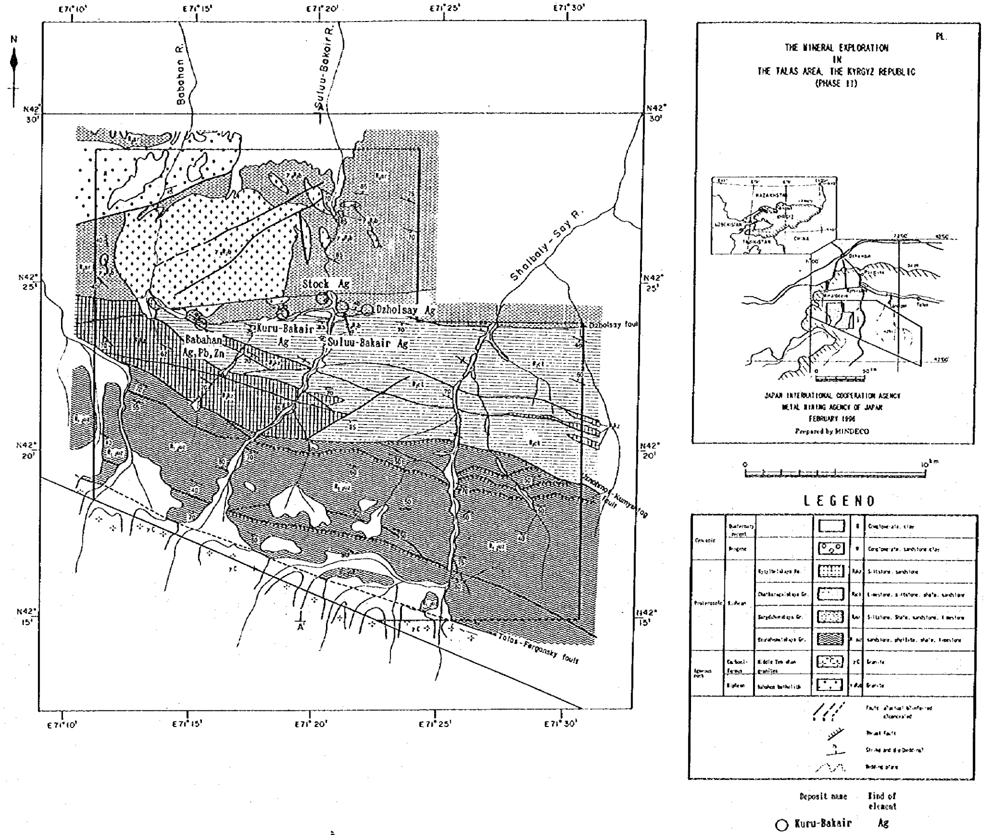


Fig. II-7 Geological Map and Distribution of Ore Deposit in the Kumyshtag Area



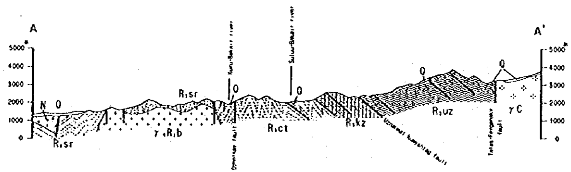


Fig. II-8 Geological Map and Distribution of Ore Deposit in the Babahan Area

(4) Kyzylbelskaya formation

(Distribution) It crops out distributing between the Uzunahmatskaya and the Chatkaragaiskaya group, in the upper reaches of both Kumyshtag river and Kara-Buura in the Kumyshtag area and in the middle reaches of both Suluu-Bakayir river and Babahan in the Babahan area.

(Rock facies) It mainly consists of red, purple and green siltstone which form alternating beds ranging from 5 to 20 m in interval, and is separated from the other formations characteristically.

(Thickness) 400m

(Relationship with underlying formations) It is fault contact with the Chatkaragaiskaya group and partly covers the latter unconformably.

(Age) Upper Riphean.

(5) Vendian system

(Distribution) It crops out a small-scaled area on the northern slope of the Kumyshtag peak.

(Rock facies) It consists of sandstone, siltstone and conglomerate containing tillite in the upper bed.

(Thickness) 195m - 1,035m

(Relationship with underlying formations) It has an unconformable relationship with the underlying Riphean system.

(6) Cambrian-Ordovician system

(Distribution). It distributes with Vendian system between the Uzunahmatskaya group and the Kyzylbelskaya formation in the upper reaches of the Kumyshtag river.

(Rock facies) Limestone and dolomite are predominant in this formation.

(Thickness) > 2,00m

(Relationship with underlying formations) It is fault contact with the Uzunahmatskaya group and the Kyzylbelskaya formation.

(7) Paleogene system

(Distribution). It crops out within the Beshtashskaya formation of Cambrian-Ordovician system.

(Rock facies) It consists of pleochroic clay and granule conglomerate.

(Thickness) 20m

(8) Neogene system
(Distribution). It overlies around the Sarymsak stream in the northwestern part of the Kumyshtag area.
(Rock facies) It consists of sandstone, conglomerate and clay.
(Thickness) 1,750m - 2,050m

(9) Kumyshtag granite
(Distribution) It is exposed in a width of about 9 km in east and west and about 10 km in north and south, and intrudes in the Sarydzhonskaya group.
(Rock facies) The prominent facies is potassium feldspar-rich medium-grained pink granite.
(Relationship with surrounding formations) It is intruded in the Sarydzhonskaya group or fault contact with the group.
(Age) 406±14 Ma (U-Pb) corresponded late Silurian to early Devonian.

(10) Babahan granite
(Distribution) It is exposed in a width of about 10 km in east and west and about 6 km in north and south.
(Rock facies) The prominent facies is medium-grained light gray to pale orange tonalite.
(Relationship with surrounding formations) It intrudes in the Sarydzhonskaya group.
(Age) 1,050±50 Ma corresponded middle to late Riphean.

3-1-3 Geological structure
(1) The beds in the survey area trends west-northwest and dips west or north steeply with complex folding.
(2) The prominent fractures in this area shows direction of west-northwest which is parallel to the Talas-Fergansky fault and the Uzunahmat-Kumyshtagsky thrust fault. The fractures crossing with above described direction shows the trend of north-northeast and north-northwest.
(3) Direct evidence showing a presence of the Talas-Fergansky fault was not recognized. But the fault has been presumed to exist because straight valleys and a topographically linear structure were recognized. On the other hand, the Talas-

Fergansky fault has been clearly detected on the satellite image.

(4) It has suggested that the Uzunahmat-Kumyshtagsky thrust fault could exist, because an existence of clayey fracture zones with a large-scale of about 100m width, difference of rock facies between hanging and footwall of the fault, and discontinuity of strikes and dips of beds,

(5) Ground confirmation was conducted to check the anomalous zones delineated from the satellite image spectral analysis. These zones corresponded to limonite disseminated schist of the Uzunahmat group. The ground confirmation suggested that diagenesis alteration, instead of hydrothermal alteration, had produced the anomalous zones.

3-2 Mineralization

Ore deposits and manifestations in the both areas of the Kumyshtag and the Babahan are listed in Table II-2, and are represented in Fig. II-7 and II-8.

As the results of field survey, the following are cleared up.

(1) According to the geological structures and characteristics of ore deposits, the mineralization is classified into two groups: one is vein-type and massive mineralization related to the Uzunahmat-Kumyshtagsky thrust fault and its subordinate faults, the other is vein, greisen and skarn type mineralization related to the Kumyshtag granite.

(2) Although the Kumyshtag deposit is composed of a large-scale silver-bearing manganosiderite veins, gold mineralization is poor.

(3) The Shyraldzhyn gold deposit has been expected to be the most profitable deposit from the points of the scale and grade of deposits in this area..

3-1 Geochemical survey

Soil samples for geochemical survey were simultaneously collected with implementation of the geological survey for possibility of an existence of unknown prospective gold deposits. Gold, silver, copper, arsenic and antimony were analyzed.

As the background of rock facies is almost same between the Kumyshtag and the Babahan areas, a statistical processing was conducted together with both areas. A cumulative frequency distribution was plotted on normal probability graphs, and the relevant threshold value was extracted as the bending point of the cumulative frequency distribution curve, which would discriminate between the background and anomaly values. Geochemical anomaly maps were is drawn on the basis of the threshold values. The threshold values and the statistical values of mean and

Table II-2 List of Ore Deposits (1)

No.	Deposit Name	Geology	Formation	Kind of element	Description of occurrences	Present condition	Note
1	Shyraldzhyn	Granite	Kumyshtag batholith	Au	Vein type deposit in Kumyshtag batholith. Manganosiderite,quartz vein. Strike and dip of vein: N5°~20°E, 35°~82°W Width of vein:0.3~3.7m Length of vein:200~1,400m Gold grade:0.6~28.4 g/t	About 90 trenches and 5 adits are presen 1 adit is possible to enter. Most trenches are burried by soil and pebbles.	P1 reserve:8.1t of gold P2 reserve:8t of gold with totally average gold grade of 5g/t
2	Kumyshtag	Sandstone/shale	Kyzylbelskaya Fm, Chatkaragaiskaya Gr	Ag	Vein type deposit in sandstone/shale near boundary of Kyzylbelskaya Fm and Chatkaragaiskaya Gr. Manganosiderite vein. Paralleled 5 main veins at main deposit. Strike and dip of vein: NE-SW, 30°~50°SE Width of vein:1cm~3m Length of vein:350~600m Silver grade:1,928g/t (ore from waste)	1 adit with waste and about 10 trenches are present. Adit is closed and trenches are burried by soil.	C2+C1 reserves:1,523t of silver with average silver grade of 256 g/t Chalcocite,bornite,tetrahedrite, tennantite,jamesonite and bismuthinite are observed in the ore from the waste.
3	Tekeli	Sandstone/shale	Sarydzhonskaya Gr	Ag,Pb	Silver bearing manganosiderite veins.	1 adit with waste,some trenches and ruin of building are present. Adit is possible to enter up to about 100m from enterance.No vein at inside. Trenches are burried by soil and pebbles.	No ore is observed in trench and waste.
4	Sarymsak	Sandstone/shale	Sarydzhonskaya Gr	Pb,Ag	Silber bearing manganosiderite veins. Width of vein:0.71m Silver grade:1.6~202.4 g/t Average lead grade:2.38% Average zinc grade:1.36%	1 trench with waste is present. Trenche is burried by soil and pebbles.	No ore is observed in trench and waste.
5	Bulak-Say	Granite	Kumyshtag batholith	Pb	Quartz-carbonate veins with galena and chalcopyrite.	2 trenches are present. Trenches are burried by soil and pebbles.	Strong siliceous alteration is observed around the trenches. No ore is observed from trenchs.
6	Uchimcheck	Sandstone, limestone, shale	Chatkaragaiskaya Gr	As	Massive and disseminated arsenopyrite ore Length on the strike:60~180m Width:0.5~15m Length on the dip:40~350m	1 adit,two open pit ,mark of winch and ruin of many buildings is present.	Host rocks around the deposit have undergone limonitization. 2 white argillization zones are present in the open pit. Arsenopyrite,pyrite and native silver are observed in ore from the open pit.
7	Cheten	Granite, limestone/ sandstone(shale)	Kumyshtag batholith Sarydzhonskaya Gr	Be	Pegmatite and granite porphyry veins. Strike and dip of vein: N15°E, vertical Width of vein:0.3~1m	1 adit with waste and over 10 trenches ar present. Trenches are burried by soil and pebbles.	No ore is observed in trenches and waste.
8	Uzuntashty	Limestone/shale	Sarydzhonskaya Gr	Be	Skarn type deposit. Diopside,epidote,amphibole,vesuvianite, fluorite and calcite bearing garnet skarn with magnetite ore in limestone/shale.	1 small pit and over 50 trenches are present. Trenches are burried by soil and pebbles.	Especially strong of metasomatic garnet alteration is adjacent granite.
9	Tuktuarcha	Hornfels	Sarydzhonskaya Gr	Be	Vein and veinlet type deposit in hornfels Quartz veins are present along host rock lamination. Strike and dip of vein: N80°W, 78°~80°W Width of vein:20cm	3 adits with wastes and over 50 trenches are present. 1 adit is possible to enter up to 100m from enterance. Trenches are burried by soil and pebbles.	Veins of epidote and garnet skarn are observed in the ore from the waste.

Table II-2 List of Ore Deposits (2)

No.	Deposit Name	Geology	Formation	Kind of element	Description of occurrences	Present condition	Note
10	Babahan	Limestone/shale	Chatkaragaiskaya Gr	Ag,Pb,Zn	Vein type deposit in limestone/shale. Quartz vein between shale and limestone. Strike and dip of vein: N60°~70°W, vertical Width of vein:5~15cm	1 adit with waste,about 100 trenches and ruin of lodge and office are present. Adit is possible to enter up to about 100 from enterance. Trenches are burried by soil.	Sphalerite,chalcopyrite,pyrite and tetrahedrite are observed in the ore from the waste.
11	Kuru-Bakair	Sandstone/shale	Sarydzhonskaya Gr	Ag	Vein and lens type deposit in limestone/shale. Quartz vein and manganosiderite vein. Silver grade:14.6 g/t	About 20 trenches,4 drilling hole and rui of office are present. Trenches are burried by soil and pebbles.	Continuous manganese gossans are present around the deposit. Goethite,pyrolusite,chalcopyrite and pyrite are observed in manganese gossan
12	Stock	Sandstone/shale	Sarydzhonskaya Gr	Ag		1 adit with waste is present.	No ore is observed from waste.
13	Suluu-Bakai	Shale/sandstone	Sarydzhonskaya Gr	Ag		1 vertical shaft,some trenches and ruin o lodge are present.	No ore is observed from trenches.
14	Dzholsay	Shale/sandstone	Sarydzhonskaya Gr	Ag	Vein type deposit in shale/sandstone. Manganosiderite and quartz-manganosiderit veins Strike and dip:E-W, steeply Width of vein:about 1.5m Silver grade:4.5~16.5 g/t	2 adits and over 100 trenches are present Both adits are closed. Almost trenches are burride by soil.	Goethite and manganoxide are observed in the ore from the vein.

Table II-3 Geochemical Threshold of Soil Samples

Area	Statistical element	Au (ppm)	Ag (ppm)	Cu (ppm)	As (ppm)	Sb (ppm)
Total area	Number of Sample	768	768	768	768	768
	Maximum	3.000	>100	10,000	>10,000	5,000
	Minimum	<0.005	<0.3	5	<70	<10
	Mean	0.010	1.4	91	126	24
	Standard Deviation	0.109	6.7	439	727	240
	Threshold	0.060	10	630	1,600	170
Kumyshtag	Number of Sample	564	564	564	564	564
	Maximum	3.000	>100	10,000	>10,000	5,000
	Minimum	<0.005	<0.3	5	<70	<10
	Mean	0.012	1.7	112	159	30
	Standard Deviation	0.127	7.7	510	845	280
	Threshold	0.060	10	630	1600	170
Babahan	Number of Sample	204	204	204	204	204
	Maximum	0.030	30	90	70	50
	Minimum	<0.005	<0.3	15	<70	<10
	Mean	0.004	0.5	34	36	5.2
	Standard Deviation	0.001	2.1	14	4.8	3.1
	Threshold	0.060	10	630	1600	170

standard deviation are shown in Table II-3.

In a general view of geochemical anomaly map in the Kumyshtag area (Fig. II-9), the following are described.

Geochemical anomalous zones of gold appeared in a scattered area at the eastern slope of the Shyraldzhyn deposit, around the Kumyshtag deposit, near the upper reaches of the Kumyshtag river and near the middle reaches of the Kara-Buura.

Overlapping geochemically anomalous silver, copper arsenic and antimony zones were widely distributed throughout an area ranging from the Kumyshtag silver deposit to the Uchimcheck arsenic deposit, where a width is about 5 km in east and west and about 5 km in south and north.

On the other hand in the Babahan area, a geochemical silver anomaly was detected on the Dzholsay fault near the Kuru-Bakair silver deposit. The small scale of the geochemical anomalies and silver deposit indicate that a large-scale ore deposit should not be expected near the surface in the Babahan area.

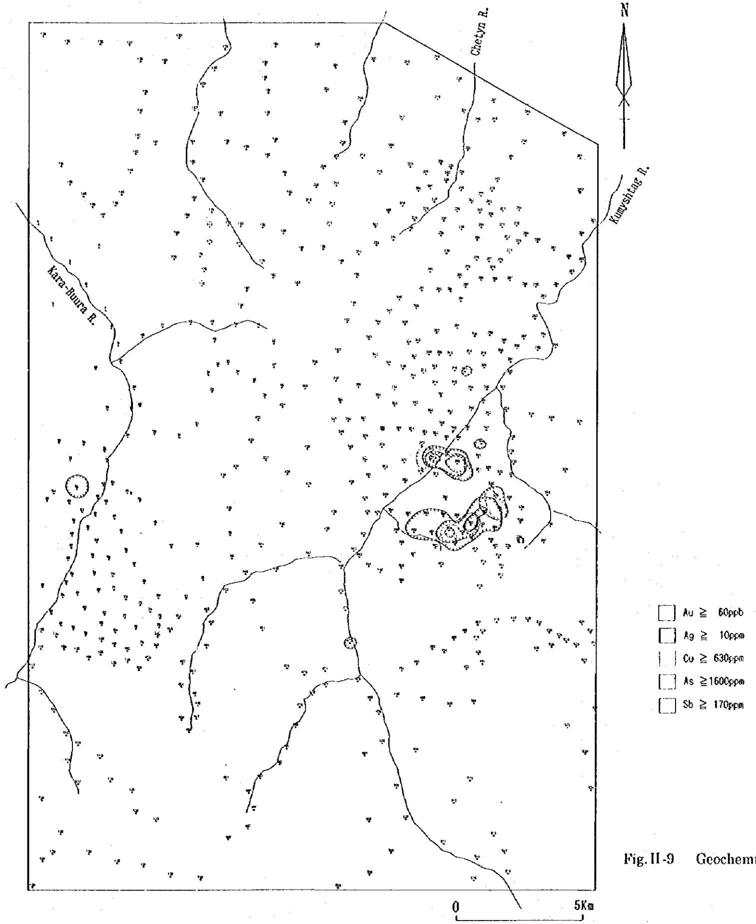


Fig. II-9 Geochemical Anomaly Map in the Kumyshtag Area

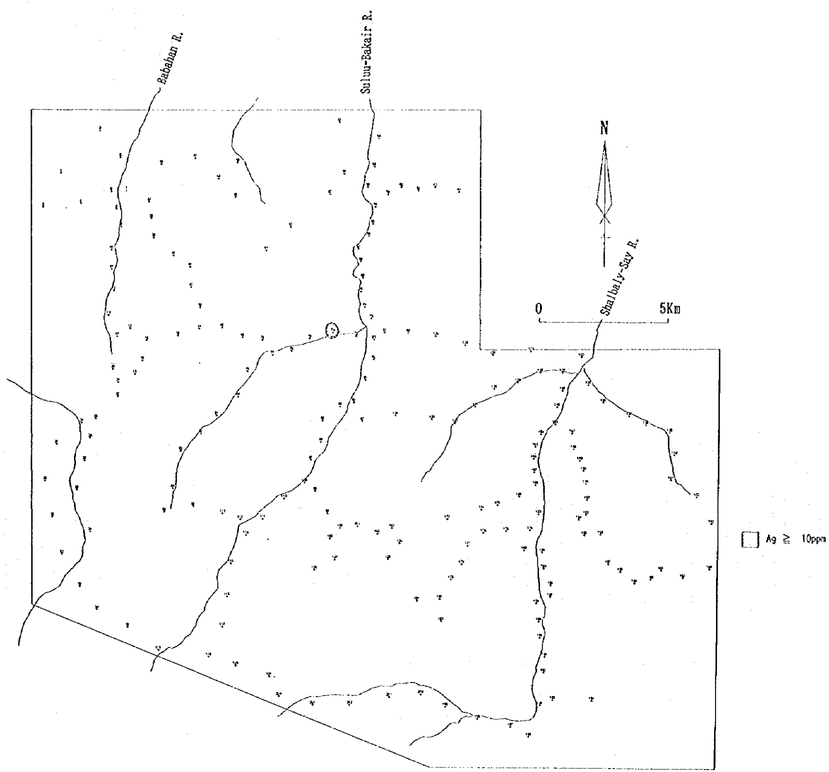


Fig.II-10 Geochemical Anomaly Map in the Babahan Area

CHAPTER 4 SHYRALDZHYN AREA

4-1 Geology

This survey area is covered with the Sarydzhonskaya group of Riphean series and is intruded by the Kumyshtag granite. They are overlain by Quaternary sediment. The geological map of this area are shown in Fig. II-11.

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. As other rocks, aplite was found at the depth of 50m to 150m below the surface at the summit by drilling survey of phase III.

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.

Aplite is composed of muscovite and fluorite by the naked eyes. Under the microscope, it consists of quartz, potassium feldspar, plagioclase and muscovite.

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.

4-2 Mineralization

The Shyraldzhyn area is situated in the southeastern part of the Kumyshtag granite and is abundant in fractures and joints directing N-S to NNE-SSW. The deposit is gold-bearing vein type filled with above mentioned fractures. The deposit consists of quartz - manganosiderite veins A total of four veins are found parallel to each other apart a distance ranging from 400m to 600m.

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

Ores collected from trench of the main vein, were represented 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 particles of isometric, sometimes elongated, drop-shaped. Size of gold particles ranges from 0.003 to 0.015mm.

Homogenization temperatures in quartz collected from trenches of all the veins range from 310°C to 120°C, and center ranging from 210°C to 130°C. Homogenization temperature from main vein centers ranging from 180°C to 150°C.

This deposit is characterized by greisen ranging from 1m to 10m in width, which occurs between granite of country rock and manganosiderite vein. Occasionally vein borders greisen with white clay zone with a few tens cm in width at both sides of hanging 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 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 (D_1). This is same stage 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

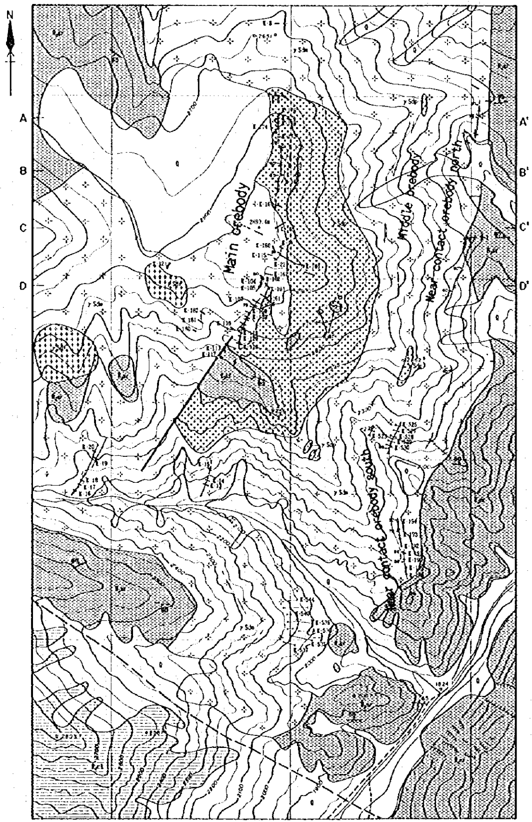
4-3 Drilling survey

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

4-3-1 Outline of survey

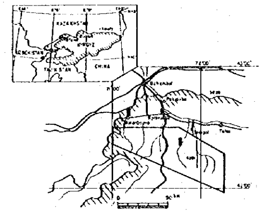
The core drilling work of twelve drillholes totaling 2,560.4m was conducted. The location of the respective drillholes are presented in Fig. II-12.

Three drilling machines - two of the defunct USSR-made SKB-4 and one of the



PL.

THE MINERAL EXPLORATION
IN
THE TALAS AREA, THE KYRGYZ REPUBLIC
(PHASE II)



JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN
FEBRUARY 1996
Prepared by MINDECO

0 500 1000m

LEGEND

Quaternary-recent sediments — Q Loams, detritus

Proterozoic
- Chatkaragaiskaya Gr. — Rct Limestone, calcareous shale, calcareous sandstone
- Sarydzhonskaya Gr. — Rsr Shale, sandstone, limestone

Paleozoic Intrusives
- γSdp Granite porphyry
- γSdf Fine medium grained granite
- γSdm Medium grained granite

Vein a) already known b) presumed

Fault a) actual b) inferred

Strike and dip (bedding)

Strike and dip (vein)

K-170 K-330 Trench

Adit

Fig. II-11 Geological Map in the Shyraldzhyn Area

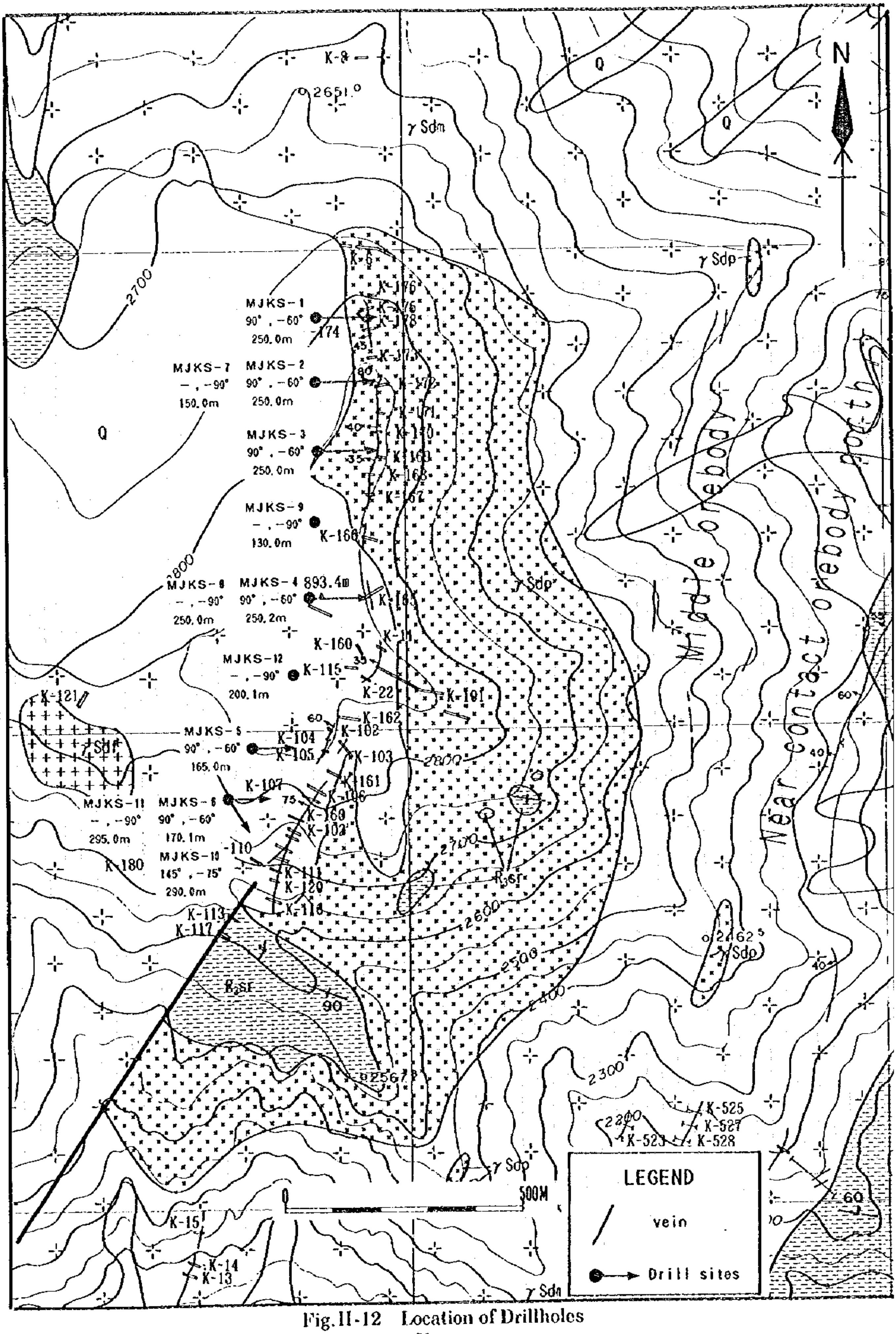


Fig. II-12 Location of Drillholes

Table II-4 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-4 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

SKB-5 were used for the work. The normal drilling method was applied to the operation in an effort to improve core recovery and work progress. Diamond bits of ϕ 76mm or ϕ 59mm were used as the final diameter. Bulldozers were used for the transportation of drilling machines and supplies, road construction, drilling site leveling and preparation. Water was conveyed from the nearest stream to the drilling site by a 5 m^3 and two 1.8 m^3 tank trucks. The drilling length, core recovery and drilling efficiency by hole were given in Table II-4.

4-3-2 Results of drilling survey

A large-scale gold-bearing quartz - manganosiderite vein was confirmed by the drillhole MJKS-6. The geological map of main orebody is shown in Fig. II-13. The geological cross sections of the respective drillholes are presented in Apx. 1.

(1) A total of twelve holes were drilled and nine holes have confirmed gold mineralization. As results of drillholes of MJKS-1, 2 and 7, gold ores were confirmed at the depth of 150m beneath surface in the northern part. In the central part, gold ores were proved at 80m depth by the drillholes of MJKS-3, 9 and 4. On the other hand, gold mineralization was poor in the underground from the summit to 120m of southern extension therefrom. In the more southern part, gold ores were certain at 200m depth by the drillholes of MJKS-6 and 11.
(2) The vein shows echelon arrangement. It strikes NNE-SSW generally. According to the drilling survey, it dips between 35° W and 55° W, the average dip reveals 45° W. 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 MJKS-6 in the southern part.
(3) Assay result of the major mineralized zones is given in Table II-5. 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 ores exist in the northern and southern parts.
(4) 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 at 134m depth. This hole is presumed to penetrate a lower extension of the bonanza.
(5) The quartz - manganosiderite veins occur in greisen in the northern and central parts, occasionally border greisen with white clay zone composed of sericite with a few tens cm in width at both sides of hanging and footwall. Greisen grades into non-altered granite through weak greisenizated granite. Such a sequence of between vein and non-altered granite is the same occurrence on surface. On the

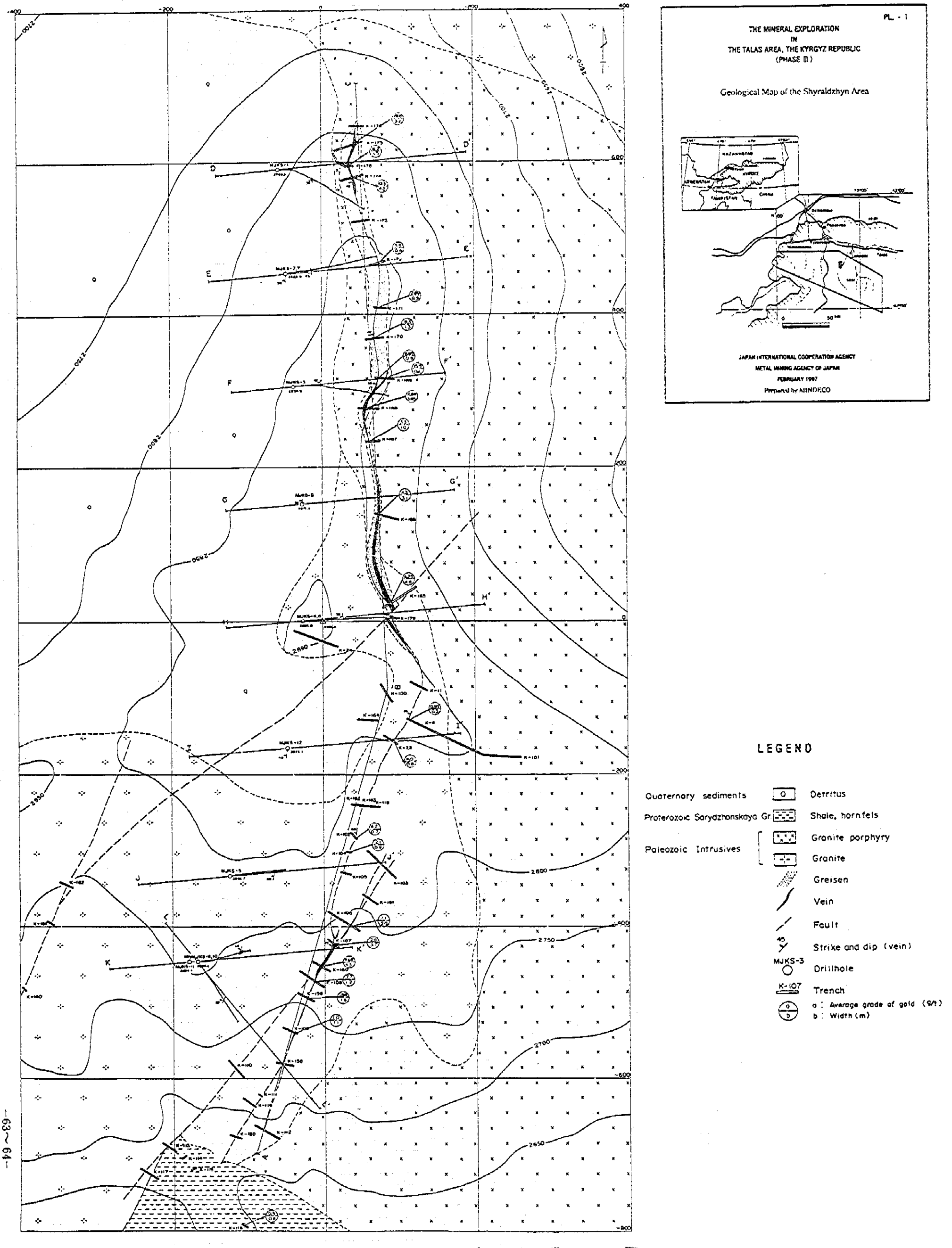


Fig.II-13 Geological Map of Main Orebody in the Shyraldzhyn Area

Table II-5 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

other hand, vein appears not in greisen but in sericitizated granite at the deeper extension of the southern part.

(6) The vein mainly consists of quartz and manganosiderite. Both minerals are mixed in general. Occasionally banded structures composed of both minerals are observed. Quartz occurs in the outer side of the vein rather than the inner one.

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

(8) Gold mineralization more than 1 g/t Au is confined to quartz - manganosiderite vein. Gold mineralization is partly recognized in greisen contacted with vein. The particles of native gold measure ranging from a few μ m to 70 μ m. 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.

(9) The average homogenization temperatures of quartz ranging from 223℃ to 124℃, centers between 180℃ to 150℃. Relation between the average homogenization temperature and the gold grade of ore samples caught by holes are shown in Fig. II-14. Looking at the above figure, it suggests that homogenization temperature seem to be correlated with gold grade by each group. Ores of high grade group are collected from the northern and southern parts.

(10) The average homogenization temperatures in this deposit reveal lower temperatures compared with a favorable temperatures for gold deposition. Distribution of homogenization temperatures along a strike of vein is shown in Fig. II-15. Looking at this figure, it is presumed that hydrothermal solution had flown up from the deeper parts of the northern and southern parts. The temperatures at the lower parts of the hole MJKS-6 and 11 of the south represent more than 200℃. Their temperatures is higher than those of upper parts. The fact support partly that homogenization temperature in this deposit is correspond to a general tendency of temperature in a deposit. It is inferred 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

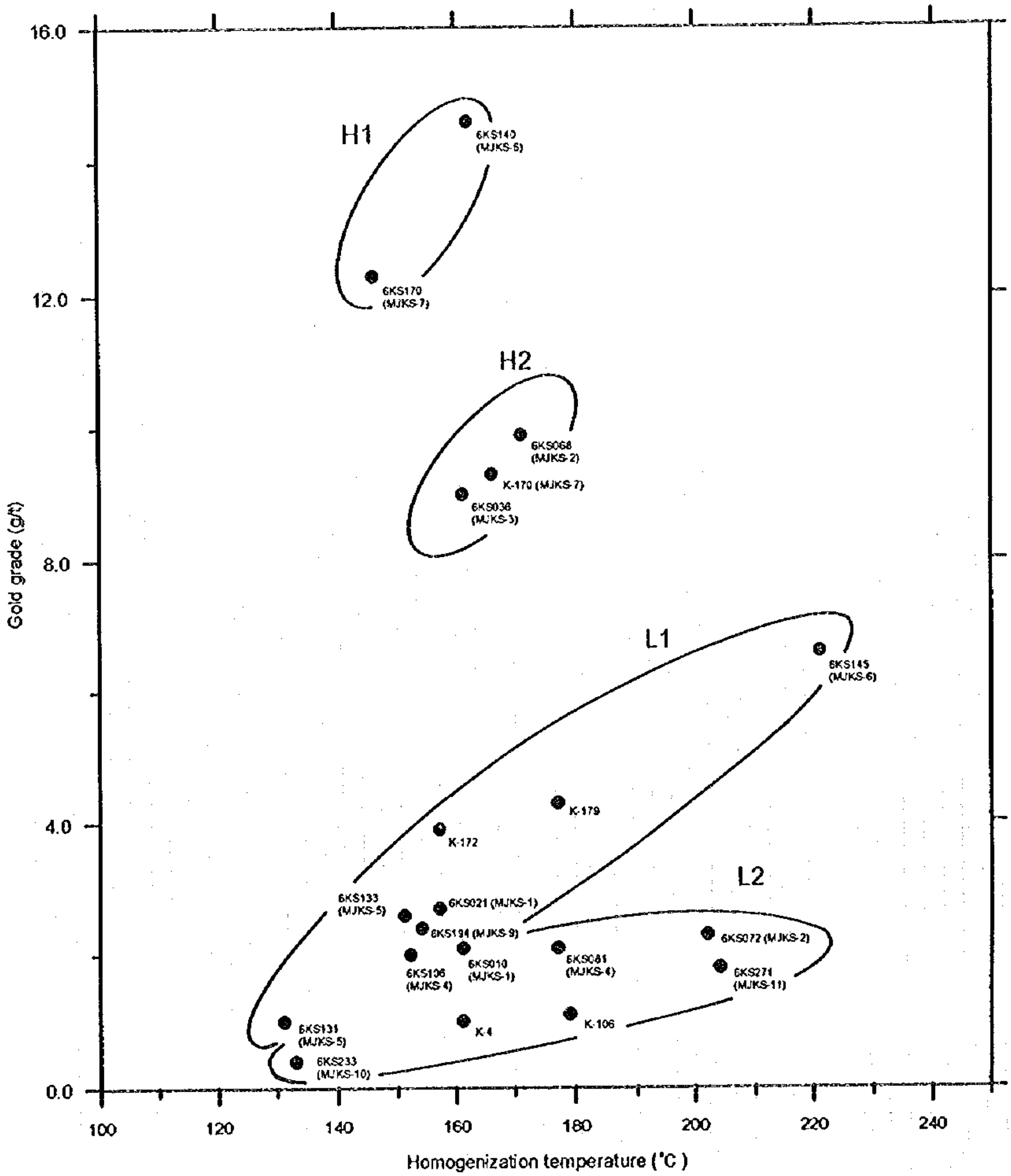


Fig.II-14 Relation between Homogenization Temperature and Gold Grade

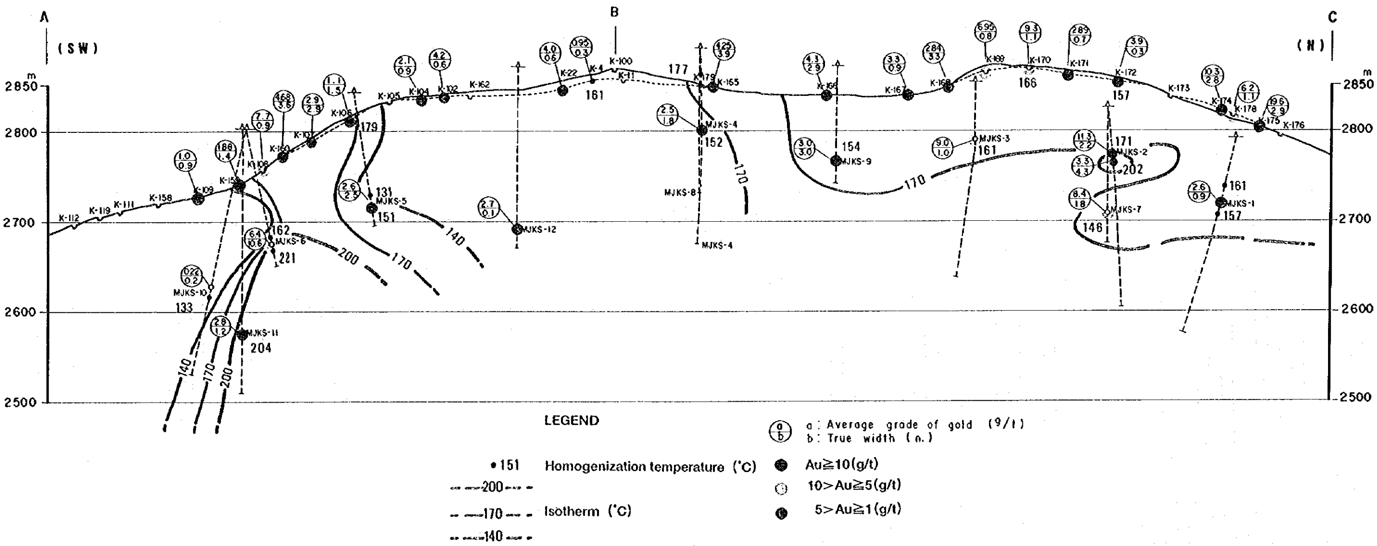


Fig. II-15 Distribution of Homogenization Temperature of Fluid Inclusion

4-3-3 Tentative estimation of ore reserves

For evaluation of this deposit, a tentative estimation of ore reserves was performed. Cut-off grade was set up as 1 g/t. Taking solid continuity of the vein into consideration, ore blocks were decided. As intervals among holes in this survey are roughly 150m, ore reserves between mineralized zones by the holes and the trenches are correspond to possible reserves (a C2 category in Kyrgyz classification). Ore reserves expected extensions of the vein under the possible reserves are potential reserves (P1 category). Ore blocks of the possible reserves are established from the surface to the depth of 20m beneath ore mineralized zones caught by holes. Ore blocks are set up by individual drillholes. Ore blocks of the potential reserves are established at the lower extensions of possible ones. The bottom of the potential blocks is determined to be 2,500m in altitude, where is 80m beneath ore mineralized zone by MJKS-11, the deepest hit hole. Schematic section of ore reserves is presented in Fig. II-16. On the occasion of estimation of potential reserves, possibility of existence of the vein is determined to be 75%. Before a calculation of ore reserves, specific gravity of ores collected from the drillings and the trenches was measured. The measured gravity is 2.86 which has decreased 20% compared with a former value of this deposit.

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. The sum of possible and potential ore reserves are 2,312 thousand tons, average grade 5.1 g/t Au and 11.7 tons of gold.

4-4 Mining development program

A mining development program was conducted to investigated. A detailed content of the program is given in Apx. 2. The possible ore reserves are studied as the object. When a cut-off grade is determined as 4 g/t Au by the sum of mining and refining costs, crude ore reserves are estimated to be 644 thousand tons with 5.1 g/t Au and 3.3 tons of gold.

Considering conditions of the development plan, a productive method of truck-less mining is selected and a gold refinery where green gold before an electrorefining process is produced, is adopted to build.

The conditions of revenue are refining recovery of 85% and electrorefining recovery of 95%. When the price of gold is 360 $/TOZ, a total of income is 47.7 $ per tons of crude ore.

Table II-6 Calculation of Ore Reserves of Shyraldzhyn Deposit

(C2)

Block No.	Trench		Drill hole		Average		Volume of block				S.Gravity (t/m3)	Possible ore reserve (t)	Metal of gold (Kg)
	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)			
1	2.3	13.6	0.9	2.6	1.6	10.5	1.6	115	150	27,600	2.86	78,900	328
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 (t/m3)	Possibility of existance	Potential ore reserve (t)	Metal of gold (kg)
		True width (m)	Length (m)	Depth along dip (m)	Volume (m3)				
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

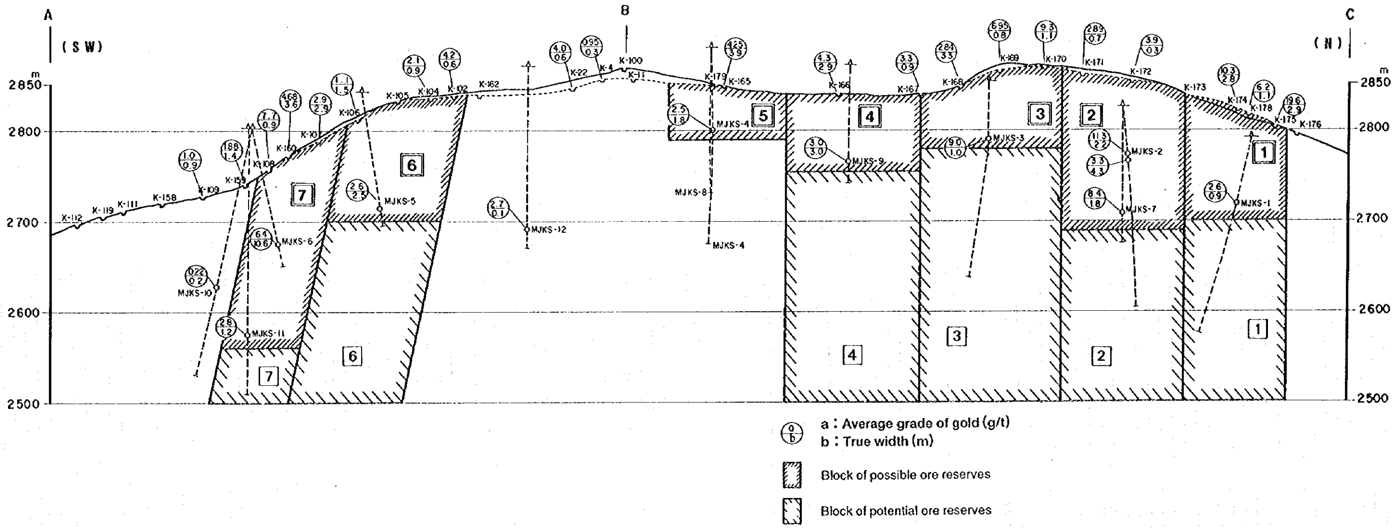


Fig. II-16 Schematic Section of Ore Reserves

As the results of tentative calculation of six daily production cases ranging from 100 to 600 tons, the case of 100 tons per day is the minimum expenses (Fig. II-7). In this case, initial investment cost per ton is estimated to be 23.2 $, operating cost including general management cost is 36.1 $ and detailed prospecting cost is 0.9 $. The sum of all the costs is 60.2 $. Therefore a loss is estimated to be 12.5 $/t in the case of the optimum condition.

According to various studied conditions, it is reached that the mining development at the Shyraldzhyn deposit would be difficult, as things stand. There may be possibility that the deposit could be developed if the conditions improve as follows:

1) Lowering of cut-off grade

Cut-off gold grade was determined by the sum of mining and refining operation costs. If the operation costs reduce, the cut-off grade would be low and crude ore reserves would increase. After all, it will be connect with reduction of initial investment cost per ton. When the operation cost reduce 8 $/t, the cut-off grade would be 3 g/t Au, the crude ore reserves would increase by 1.4 times and the initial investment cost would reduces 30 %. The loss would be minimized to be 3 $/t in the case of 100 t/d production.

2) Reduction of ore haulage cost

Ore haulage costs occupy about 25% in the operation costs. A reduction of the ore haulage costs have a large influence to the operation costs. Methods of ore haulage are listed a dump truck, a belt conveyer and a rope way. The most economical method is the dump truck when 650 thousand tons of crude ore are transported. The dump truck has been planned to use. This program has been investigated considering information of those costs at an operating gold mine in Kyrgyz. After a independence from the defunct USSR, the prices of fuel and oils have soared and resulted in to be the almost same price in the free nations. Profits at the operating mines have compressed by reason of the rising operation costs. Therefore it will be important that the cost reduction at the operating mine is given attention and the costs in this plan are modified to reduce through new eyes.

3) Construction of a cooperating gold refinery

Gold deposits, such as the Jeruy and the Andash, are located around Talas. The Jeruy deposit estimated 83 tons of gold with 6 g/t Au, has been considering to develop. The Andash deposit calculated 13 tons of gold with 2 g/t Au, has been prospecting. If a gold refinery is built to develop those gold deposits in future, it would be possibility that gold ore produced from the Shyraldzhyn deposit is sent to a new cooperating refinery, and the initial investment costs is expected to reduce.

4) Appreciation in gold

The price of gold has been supposed to be 360 $/TOZ in this plan. The gold has a heavy fluctuation in price. If price fluctuate to be 454 $/TOZ, revenue and expenses keep the balance at production of 100 t/d.

Table II-7 Comparison of Production Cost and Profit at the Shyraldzhyn

Crude Ore 644,000t, Au Grade 5.1g/t

Production (t /day)	100		200		300		400		500		600	
Production (thou.t/year)	30		60		90		120		150		180	
Mine Life (years)	21.5		10.7		7.2		5.4		4.3		3.6	
Au Production (kg/year)	124		247		371		494		618		741	
	($)	($/t)	($)	($/t)	($)	($/t)	($)	($/t)	($)	($/t)	($)	($/t)
Income	1,435,370	47.7	2,859,164	47.7	4,294,534	47.7	5,718,328	47.7	7,153,698	47.7	8,577,492	47.7
Initial Investment	14,914,637	23.2	17,341,140	26.9	19,136,149	29.7	21,389,863	33.2	22,904,000	35.6	24,653,353	38.3
Infrastructure	5,712,000		5,712,000		5,712,000		5,712,000		5,712,000		5,712,000	
Drilling Equipment	328,000	1	656,000	2	656,000	2	984,000	3	984,000	3	1,312,000	4
Load Haul Dump	598,000	2	897,000	3	1,196,000	4	1,794,000	6	2,093,000	7	2,392,000	8
Others (Mining)	755,000		755,000		755,000		755,000		755,000		755,000	
Main Tunnel	4,360,000		4,360,000		4,360,000		4,360,000		4,360,000		4,360,000	
Refining Plant	3,161,637		4,961,140		6,457,149		7,784,863		9,000,000		10,132,353	
Mining Cost	618,772	20.6	1,087,155	18.1	1,467,533	16.3	1,990,924	16.6	2,371,308	15.8	2,839,690	15.8
Personnel (staff)	8		8		8		8		9		9	
(worker)	20		32		45		57		69		81	
Wages	71,632		97,839		124,045		150,252		176,459		202,665	
Explosives	41,635		83,269		124,904		166,539		208,173		249,808	
Rock Tool	14,112		28,224		42,336		56,449		70,561		84,673	
Fuel, Lubricant	24,646		43,330		62,014		80,698		99,382		118,066	
Tire	20,553		41,105		61,658		82,210		102,763		123,315	
Rock bolt	48,700		97,400		146,100		194,800		243,500		292,200	
Electricity	14,194		28,388		42,582		56,776		70,970		85,163	
Maintenance	242,000		385,000		410,000		638,000		693,000		836,000	
Ore Freight	141,300		282,600		423,900		565,200		706,500		847,800	
Refining Cost	366,000	12.2	732,000	12.2	1,098,000	12.2	1,464,000	12.2	1,830,000	12.2	2,196,000	12.2
Wages	78,000		153,000		234,000		312,000		390,000		468,000	
Materials	177,000		354,000		531,000		706,000		885,000		1,062,000	
Electricity, water	48,000		96,000		144,000		192,000		240,000		288,000	
Maintenance	63,000		126,000		189,000		252,000		315,000		378,000	
General Management	98,477	3.3	181,916	3.0	256,554	2.9	345,492	2.9	420,131	2.8	503,569	2.8
Annual Operating Cost	1,083,249	36.1	2,001,071	33.4	2,822,093	31.4	3,800,416	31.7	4,621,439	30.8	5,539,259	30.8
Prospecting Cost		0.9		0.9		0.9		0.9		0.9		0.9
Total Cost		60.2		61.1		62.0		65.8		67.3		70.0
Profit	-8,024,240	-12.5	-8,655,360	-13.4	-9,209,200	-14.3	-11,662,840	-18.1	-12,628,840	-19.6	-14,367,640	-22.3