REPORT
ON
THE MINERAL EXPLORATION
IN
THE SAN JOSE AND ARROYO GRANDE AREA, THE ORIENTAL REPUBLIC OF URUGUAY

(PHASE I)

MARCH 2001

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

In response to the request of the Government of the Oriental Republic of Uruguay, the Japanese Government decided to conduct a Mineral Exploration Project in the San Jose and Arroyo Grande Area and entrusted the project to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

JICA and MMAJ sent to Uruguay a survey team composed of 5 members from January 2001 to March 2001.

The team exchanged views with the officials concerned of the Government of Uruguay and conducted a field survey in the San Jose and Arroyo Grande Area. After the team returned to Japan, further studies were made and the present report has been prepared. This report includes the survey results of geological and geochemical surveys carried out during Phase I.

We hope that this report will be useful for the development of the mineral resources in Uruguay and contribute to the promotion of friendly relations between Japan and Uruguay.

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

March 2001

Kunihiko Saito
President
Japan International Cooperation Agency

Naohiro Tashiro
President
Metal Mining Agency of Japan

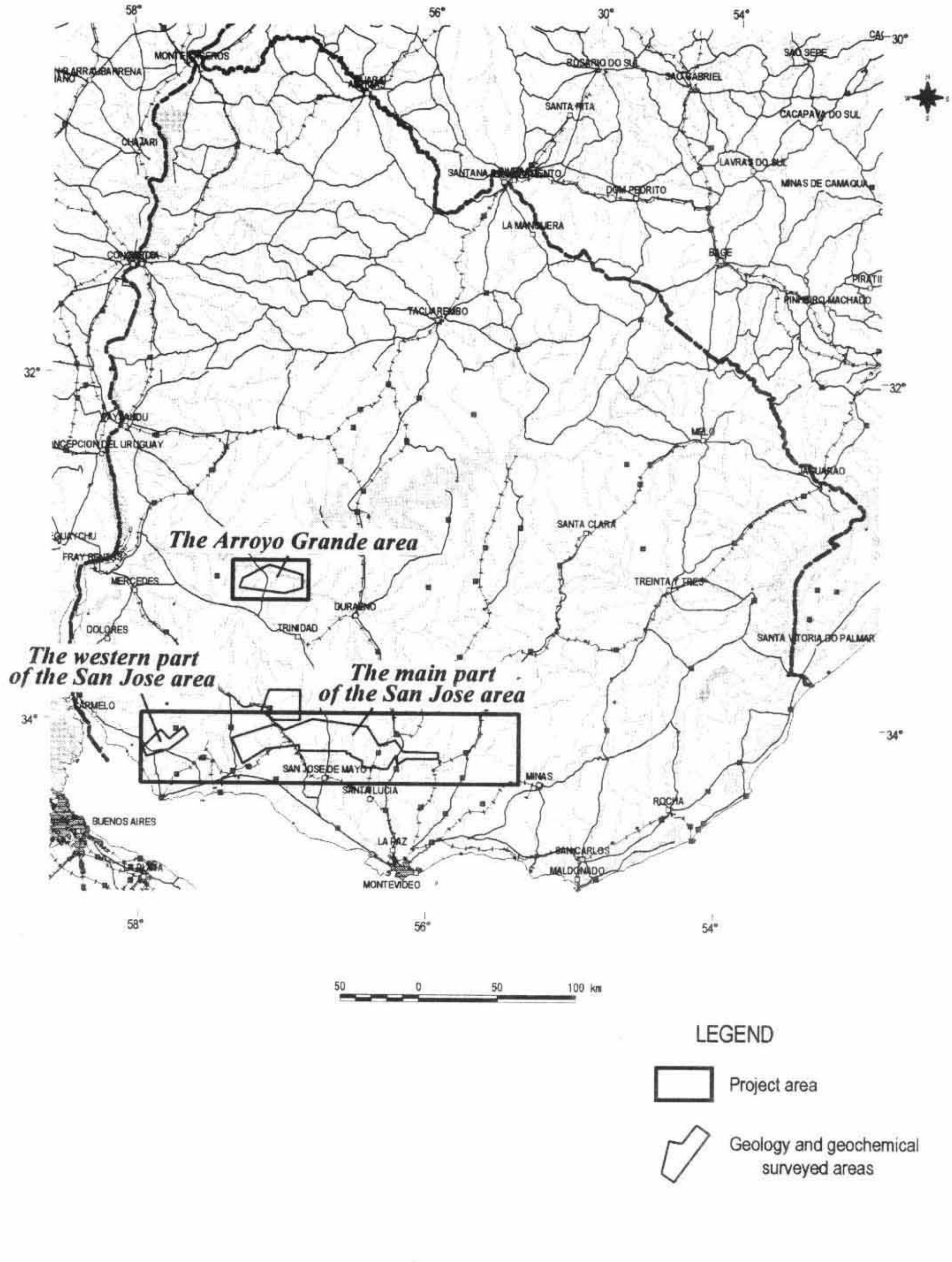

Fig.1 Location map of the project area

ABSTRACT

This survey is based on the Scope of Work signed between the Japanese government and the Oriental Republic of Uruguay on 24 November, 2000. The purpose of this survey is to clarify both the geologic appearance and the occurrence of the ore fields of mineral deposits in the San Jose Area and Arroyo Grande Area of this country, with the aim of discovering new ore deposits. In addition, another purpose is to transfer the technology to the involved organizations of the object country.

The survey is conceived as a three-year project initiated in 2000, and this fiscal year falls on the first phase. This survey consists of the existing data analysis, the geological interpretation of satellite image data, the geological survey and geochemical prospecting. The object area (2,500km^2) where the geological survey and geochemical prospecting should be implemented and the greenstone is distributed, was appointed from the project area of 12,000km^2, according to the result of the existing data analysis and the geologic interpretation of satellite image data. The result of the field survey is summarized below.

The geological formation of this area mainly consists of basement complex (pCCcb and pCCanf), greenstone (pCCps, pCCsj, pCCag and pCCsjo), older granite intrusive rocks (pCCG) and younger granite intrusive rocks (pCC) (Fig. II-3-2, Plate II-3-1～Plate II-3-4).

The basement complex is mainly composed of gneiss, schists, migmatite and amphibolite. The granite intrusive rocks of both pCCG and pCC, are composed of granite, granodiorite, leucogranodiorite and diorite. The latter is rather heterogeneous. Each of them partially comes under mylonitization and the foliation is recognized.

The greenstone is mainly composed of greenschist, basic to acidic volcanic rocks (metabasalt to metarhyolite), amphibolite, quartz schist, quartzite, metasandstone and slate to phyllite. Adding to this, the San Jose and the Arroyo Grande formations are slightly intercalated with thin gneiss beds and the Cerros de San Juan formation with limestone and dolomite beds.

As the result of the field survey, the following 13 zones were found, where the quartz vein had been developed (Fig. II-3-7). Descriptions about each zones are resumed in Tab. I-5-1.

The main part of the San Jose area (10 zones)

A: Surrounding area of the Mahoma mine (20km EW × 15km NS)

B: Nueva Helvecia (the western extremity of the area : 10km × 18km)

C: Arroyo del Medio (6km × 15km)

D: Canada de Cabrera (8km × 4km)

E: Arroyo charruzo (10km × 12km)

F: Tala I (3km × 4km)

G: Tla II (9km × 14km)

H: West of 25 de Mayo (6km × 8km)

I: South of 25 de Mayo (10km × 10km)

J: San Ramon (the eastern extremity of the area : 10km × 5km)

The western part of the San Jose area (1 zone)

K: San Carlos (21km × 13km)

The Arroyo Grande area (2 zones)

L: Rio Negro I (10km × 15km)

M: Rio Negro II (25km × 10km)

The primary ore deposit in this area is a gold-bearing quartz vein deposit and is impregnated with basement complex (pCCcb), older granite intrusive rocks (pCCG) and greenstone (pCCps, pCCsj, pCCag and pCCsjo).

Regarding the wall rock alteration, it is observed that from the edge of the quartz vein outwards, the mineral assemblages consist of quartz – sericite – (pyrite) and chlorite – epidote – (albite).

As for the disposition pattern of the quartz vein, two preferred directions of the veins are observed; the NE-SW to E-W and the NW-SE. The former is approximately concordant with the large-scale fracture zone displaying left lateral slip, while the latter displays right lateral slip sense owing to the left echelon disposition. Faults with the same sense are developed along with the latter veins. It is considered that the NW-SE faults can be a conjugate set with the NE-SW to E-W veins.

According to the result of the polished section observation of both the quartz vein and the wall rock of the deposit, ore mineral was hardly found in the quartz vein except a little limonite and partially an infinitesimal amount of pyrite. A small amount of pyrite – (chalcopyrite) dissemination was recognized in green rocks and some of the quartz vein. According to the assay result, the maximum assay value was 19,890ppb.

From the lithologic character of the quartz vein, it was classified into three types, ①milky translucent quartz, ②colorless to white transparent quartz and ③dark gray transparent quartz. Considering the zonal distribution, which is locally recognized, and their appearance of interpenetration, it is estimated that these different stages of each quartz type become recent in this order from ① to ③ in a chronological relationship.

As the result of the fluid inclusions analysis, the homogenization temperature was estimated to be 447.7°C at the highest and 85.6°C at the lowest, and the histogram had three peaks at around 300°C, 250°C and 200 to 150°C, which could be considered to correspond to milky translucent quartz, colorless to white transparent quartz and dark gray transparent quartz, respectively. According to the result of measurement, the salinity was 4.2 to 35% (NaCl % equivalent), which indicates a coexistence of quartz formed under high and low pressure.

As the result of a bivariate analysis of data obtained by soil geochemical prospecting, the Au anormaly zone was extracted from the mineral showings H and L, while the As anormaly zone was extracted from the B, E, G, northern part of G, H, I and the eastern part of K, L and M. As the result of a multivariate analysis (factor analysis), factors which could be associated with the Au mineralization (Factor4: Au, As, K, V) were extracted. When examining the relation between the soil geochemical anormalies and the mineralized zone, the mineral showings A, B, E, G, H and L stood out as the place which the anormalies of Au and As, and high score zone of Factor4 had been duplicated.

As the result of a bivariate analysis of data obtained by rock geochemical prospecting, the Au anormaly zone was extracted from the mineral showings B, E, G, J, K, L and M as well as the mineral showing A around the Mahoma mine. As the result of a multivariate analysis (factor analysis), factors associated with the Au mineralization (Factor2: Au, Ag) were extracted. Examining the relation between the rock geochemical anormalies and the mineralized zone, the mineral showings A, E, G, H, K and L loomed up as the place which the anormalies of Au and As, and high score zone of Factor 2 had been duplicated.

A gold-bearing quartz vein deposit associated with fracture zone is expected because of such aspects as the structural control recognized in the ore deposit, several ore-forming stages exist, the Au content is not partialized in a specific rock and related igneous rock is hardly determined. Basically it can be considered that the ore-forming fluid containing Au (the origin of Au is unknown) had ascended along the NE-SW to E-W trending fracture zone and the NW-SE trending fracture zone as conjugate sets, and then Au had precipitated on an oxidation-reduction condition.

Geological descriptions including mode of the occurrence and scale of each mineral showing, the result of the laboratory experiments and analyses, and a comprehensive evaluation are summarized in Tab. I-5-1. The location of each mineral showing is plotted on the geological map along with the Au anormalies (Fig. I-5-1).

Among the above-mentioned object survey area, the most promising areas expected to bear ore deposit were conclusively extracted and marked as the recommendation area with lines in red on the map (Fig. I-5-1. It is considered that the following prospecting methods are effective for these promising areas. Comprehensive evaluation in ranks from A to D to define priority and an effective prospecting method are indicated in Tab. I-5-1.

Mineral showing A, including surrounding area of Mahoma Mine : detailed geological survey and rock geochemical prospecting, complete soil geochemical prospecting

Mineral showings H to G : detail geological survey and rock geochemical prospecting and complete soil geochemical prospecting

Mineral showings L to partial M : detail geological survey and rock geochemical prospecting and, complete soil geochemical prospecting

Mineral showing B : detail geological survey and detail complete geochemical prospecting

Mineral showing E : detail geological survey and detail complete geochemical prospecting

The result of Phase I was obtained from limited amount of outcrops, so it necessary to implement the airborn geophysical for prospect a wide area.

From the field prospecting of this year the high potential zone was recognized extending widely to the southwestern field of Mahoma Mine, consequently it is recommended that geochemical prospecting of riverside weathered soil should be implemented over a $100km^2$ area.

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