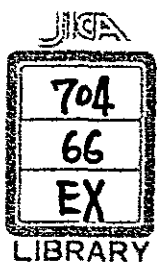


派 (派) 74-19

SURVEY REPORT ON COPPER RESOURCES IN CHILE

August 1974



Japan International Cooperation Agency (JICA)

SURVEY REPORT ON COPPER RESOURCES IN CHILE

JICA LIBRARY



1026049[5]

August 1974

Japan International Cooperation Agency (JICA)

国際協力事業団

受入 月日 '84. 5. 14	704
登録No. 04290	66
	EX

SURVEY REPORT ON COPPER RESOURCES IN CHILE

Aug., 1974

Since its political system change in 1973, the Government of Chile has attached much importance to the promotion of copper deposit exploitation with which to reconstruct its economy, and through the offices of the Japanese Embassy in Chile requested the Government of Japan to extend technical assistance in mineral exploration.

Fully realizing the significance of the request, the Japan International Cooperation Agency organized a survey team consisting of the following four experts on behalf of the Government of Japan, and dispatched it to Chile to undertake the investigation of the new copper exploration projects of Corporacion del Cobre (CODELCO) and ENAMI for a period of June 13 to July 9, 1974.

Formulation

Toru Miura

Hokuichiro Ohmachi

Yoichi Iwase

Kanehide Nishikawa

The following is a summary of the investigated regions and the technical opinion of the survey team.

The Mocha copper deposits associated with intermediate porphyry bodies intruded into Hauavina Formation belonging to Lower Cretaceous System. The deposits is a porphyry copper occurrence in Mesozoic age volcanic wall rocks which are intruded by upper cretaceous tonatite-dacite stock and principal mineralized zones include Cerro Colorado area and San Enrique area.

With these mineralized zones at center, there is a vast expanse of sericite-quartz alteration zone. However, no potassic alteration is observed on the ground surface. For the purpose of obtaining basic information such as scale of ore deposits and their change in copper grade with depth, it will be necessary to conduct a detail geological survey about the direction of fissure, faults and fractures, I.P. prospecting method on mineralized zones and scout

diamond drilling depending on their results.

The Cerro Colorado Copper deposits are associated with intermediate porphyry bodies intruded into Lower Cretaceous System. They are similar to those in Mocha. As a matter of fact, Cerro Colorado also has a large expanse of sericite-quartz alteration zone that stands comparison with that in Mocha. Near the peak of Mt. Colorado (2,655 m elevation), there is a breccia pipe occurring together with tourmaline. Its under part, which is covered with Neocene Formation, is found by I.P. prospecting method to have an anomalous zone. It is also evidenced by a diamond drilling that there is a disseminated copper ore zone. It is therefore required to make clear, by grind diamond drilling exploration (averages vertical depth: 300 m), the distribution of concealed porphyry copper deposits in the south-west of Cerro Colorado mineralized zone, including I.P. anomalous zone. Potassic alteration is not noticed on the ground surface, and it is important to clarify whether this kind of alteration is present in the depth or not.

The deposits in the Sagasca Mine are altratiform oxide copper ore deposits occurring in the Lower Conglomeratic Formation of Neogene System (Miocene to Pliocene) which unconformably covers Lower Cretaceous System. There is seen developed of three stratiform oxide copper ore beds in the said Conglomeratic Formation having averages thickness of 30 m.

At present, open pit mining is carried out at the Sagasca Mine. In addition, exploration is being pushed forward for Cascadas deposits and Querade Sagasca deposits. In Chile, the exploration of above copper deposits will amass weight in the future.

Chuquicamata Mine forms the most largest porphyry copper deposits in the southern hemisphere. These are stockwork and disseminated copper ores developed in associated with Chuquicamata porphyry (quartz monzonite) intruded in Neogene age. In the northern part of Chuquicamata copper deposits, the ore body from oxide zone to secondary enriched zone is in process of exploitation, while in the southern part, the mining of the ore body from secondary enriched

zone to primary zone is in progress. Accordingly, Copper ores from the Chuquicamata ore body is occupied by sulphide copper ores (chalcocite, enagite, chalcopyrite, bonite, etc.) rather than by oxides ores.

In the northern part, further progress of open cut is largely dependent on the way of the exploitation and overburden stripping plan. In the southern part, on the other hand, where the depth of the open-cut mining has already attained 600 mm from surface, subsequently, the problem is how to change the open cut mining to underground mining.

For the purpose of increasing copper ore production from Chuquicamata mine, it will be of very important problem to increase supplies to the Chuquicamata copper refinery by expanded planning of exploration and development such as Exotica mine, Pampa Norte Property and El Abra property.

Exotica mine are stratiform oxide copper ore deposits occurring in the Lower Pleiocene formation which unconformably covering Paleozoic metamorphic rocks and granites. The averages thickness of the deposits is 55 m and the workable area consists of about 1,200 m by 2,200 m. in size. The lower layer consists of high-grade oxide copper ores (chrysocolla, pitch copper, malachite), and has an average thickness of 35 m. The upper layer comprises oxide copper ores (atacamite, copiapite, manganocopiapite copper wad) in which clay minerals (kaolinite, montmorillorite) are mixed, and has an average thickness of 20 m.

Now, the high-grade oxide copper ores alone in the lower layer are conveyed to the Chuquicamata mine, and the oxide copper ores and mixed copper ores in the upper layer are in store. As these ores have been succeeded in processing tests, and their dressing plant is going to be built.

El Abra deposits are in the process of exploration by diamond drilling and tunnelling by Cobre-Chuqui.

The deposit occurs just east of the northward projection of the West Fissure fault at Chuquicamata and within the principal porphyry copper belt of Chile. The deposit is near the northwest contact of an acid intrusive body emplaced in Jurrassic sediments and andesitic volcanics.

Deposits is a well-zoned porphyry copper deposit, forming disseminated-stockwork-veinlet in quartz porphyry-quartz monzonite. Their hydrothermal alteration zone extends over a wide range. It is characterized in that sericitization and pyritization are not remarkable. On the ground surface, silicification is noticeable, sulphide ores are in the form of limonite, and potassic alteration spreads over an area of 2,000 m² partially spotted with molybdenite.

According to the results of exploration now in progress, it is reported that up to 100 m of a depth below the ground surface is oxide zone, and that the more deeper layer has developing of primary ore zone directly with the secondary enriched zone missed out.

The site is well endowed with a large zone of mineralization, and diamond drilling exploration is carried out with center on the potassic alteration zone. Perhaps, we can expect large-scale porphyry copper deposits.

The vicinity of Andacollo mine, andesite which was active in Cretaceous ages is widely distributed with granodiorite in late Paleozoic as a basement. The deposits are porphyry copper deposits created concurrently with late Tertiary quartz porphyry intruded into Mesozoic age andesite in the form of stockwork or dyke. The alteration zone extends over an area of 5,000 m by 3,000 m in size and quartz-sericite alteration and potassic alteration are recognized.

Put to operation now is Andacollo deposit only. There are known three satellitic copper deposits around it.

For the purpose of large-scale operation covering both Andacollo and satellitic deposits, it will be necessary to settle the problems concerning mine claim and secure ore dressing water (particularly sea water for beneficiation).

Los Prelambres deposits are porphyry copper deposits developed concurrently with late Tertiary granitic rock intruded into andesite rock (pyroclastic rocks, lavas) which was active in the Jurassic age.

It is revealed by diamond drilling that there is no growth of oxide zone or secondary enriched zone, and that primary ore zone directly meets with the ground surface. According to a drilling core assay, dissemination of chalcopyrite and pyrite is noticed, partly concurrent with molybdenite.

In future, it is required to determine proved ore reserve by intensive grid diamond drilling (50 m x 25 m).

The explored projects have been summarized above. and our survey team would like to ask your understanding and cooperation about the following matters.

- (1) Simultaneous exploration of three sites, Quebrada Blanca - El Abra, Los Pelambres - Río Blanco, and the neighborhood of El Teniente is difficult.
- (2) We would like to place the first priority on Quebrada Blanca - El Abra, expand its exploration range up to 200 km by 40 km and then impound target regions.
- (3) In the Japanese budgeting system, the account is closed every year. It is therefore hoped to settle the account every year and continue the exploration project for three consecutive years.
- (4) Smooth operation of aerial surveying (photogeology)
- (5) It is desired that the account payable for the supporters to be prepared by the Chilean Government is borne by the Chilean Government.
- (6) The Chilean Government is requested to expedite customs formalities concerning the delivery of exploration equipment.
- (7) We should be much obliged if the Chilean Government would permit us to freely bring out of Chile samples and other data acquired by exploration for the purpose of further investigation and analysis in Japan.
- (8) The Chilean Government is requested to guarantee the surveyors' status.

