CAHAN GEOLOGY

GIANT COPPER

REPORTS

800065

# PRELIMINERLY REPORT OF GEOLOGICAL AND GEOCHEMICAL EXAMINATION

of

## GIANT COPPER PROPERTY

### ABSTRACT

Geological and Geochemical examination of the Giant Copper property, started on August 19, 1968, has been made to finding our geologic criteria for further exploration and adaptability of a geochemical method.

The following three conditions would be a basic importance in the exploration work:

1.) Structural intersection.
2.) Close to the Invermay stock.
3.) Presence of mafic sills and dykes.

On the basis of these criteria, further geologic work is recommended in the southwestern parts of the property. Soil copper analysis has been found out useful. A very high copper anomaly of 0.20% Cu was detected through the geochemical work.

### GEOLOGY

Geological phenomena observed in the studied area are summarized in Table 1. The Geology is also shown in Figure 1.

### DEWDNEY CREEK GROUP

The sedimentary rocks of the Dewdney Creek group are largely composed of fine-grained sandstone - a coarser facies, and shale - a finer facies, in the Giant Copper area. The latter shows two varieties such as a black shale and a lighter colored

*****************************************************************

siliceous shale. Thin beds of dacitic tuff and mafic sandstone occur in certain horizons.

The tuff could be used as a key bed; however, the exposures are limited only in the eastern parts of the property.

Table 1. Summary of Giant Copper Property:

Sulfides metallization (mainly chalcopyrite, pyrrhotite, pyrite)

Hydrothermal alteration (chloritization best clue)

Tourmalinization (silicification)

Thermal metamorphism (biotitization) with minor amounts of sulfides.

Breccia

| | |
|---|---|
| | Tourmaline quartz monzonite (irregular dyke like form) |
| | Granodiorite porphyry - quartz monzonite porphyry (dyke) = "Feldspar porphyry" |
| Invermay Granodiorite Stock | Porphyritic biotite-hornblende quartz monzonite (marginal phase) |
| | Fine-medium grained hornblende-biotite granodiorite (main phase) = "diorite or quartz diorite" |
| | Porphyritic quartz diorite (marginal, earlier ?) |

Mafic dyke and sill (gabbroic-dioritic composition)

--------------------deformation--------------------

Siliceous shale and black shale = argillite

Fine grained (siliceous) sandstone = quartzite

Dacitic pyroclastic rocks

Fine to medium-grained mafic sandstone -- (outside of property)

Although there seems to be no distinct relationship between major two facies, ie: sandstone and shale, and copper mineralization, it has been recognized useful subdivision of the sedimentary rocks for analysis of their structural charactors, especially of folding. It is worth to subdivide the sedimentary rocks in detail.

The Dewdney formation generally strikes NNW and dips steeply. The strike swings slightly from NW to N-S direction around the main parts of the 15th level tunnel. This could have been caused by intrusion of the Invermay stock or the stock would have intruded into the regional structural bent previously formed. Several folding axes have been noticed, some of which are possibly due to tilting of fault movement, which means that they are not purely a fold. Minor internal folding is clear in shale or alternated bands of shale and sandstone in several places.

The bedding is well disturbed in places by block movement due to numbers of strike fault and late cross cutting faults. The Giant Copper ore body is the most extreme example.

MAFIC INTRUSIVE ROCKS:

Mafic ingeous rocks intruded along mainly strike faults and partly cross cutting faults of the sedimentary rocks, meaning that they are essentially dyke but most of them now look like sill. They occur more around Giant Copper orebody. The rocks are gabbro to quartz diorite in composition but mainly diorite. The texture also varies from coarse-grained hornblende dioritic rocks (stubby hornblende less than 6mm in length) to a dense rock. It is seen in most of the rocks plagioclase lath and/or hornblende needles. These intrusives vary texturely and compositionally even in single unit.

Weak iron sulfide dissemination has been observed in some of these intrusives with weak hydrothermal alteration. This is probably brought by the rock itself in the deuteric stage, however, most of the other iron and copper sulfides mineralization are related to the intrusion of Invermay stock.

Since these mafic instrusives are distributed only around Invermay stock and cut sedimentary rocks, they are not concordant sill but instrusion bodies after the deformation of the sedimentary rocks. The intrusives are cut by and contained as xenolith in the Invermay stock series rocks. They are an earlier intrusion than the Invermay stock.

INVERMAY GRANODIORITE STOCK:

This stock invades the previously described rocks, and forms an irregular stock roughly trending NW. The stock has many apophyses toward different direction, which often accompany breccia zones with or without copper mineralization. The stock can be divided into 5 phases as shown in Table 1. Perhaps, 98% of the constituents is relatively homogenons biotite bearing hornblende granodiorite. The most mafic phase of porphyritic quartz diorite exposes in the Pass breccia area. Porphyritic quartz monzonite occurs also in the Pass breccia area and 15th tunnel. Quartz monzonite porphyry, called feldspar porphyry by the Cominco group people, is always dyke in form scattered around the stock. Tourmaline quartz monzonite is propbably a latest phase, and is distributed mainly at margin of the stock and around the Invermay desposits. Iron and copper sulfide dissemination has been found in may places but the major mineralization in the stock itself is that of the Invermay deposit.

Close spacial relation between breccia zones and tips of stock branches indicate that the stock must have been the source igneous activity of the ore breccia.

Among alteration helos around the stock, biotitization generally extends further than tourmalinization from the border. It could be possible to know using the alteration helos location of a hidden cupola of the granodiorite apophyses.

BRECCIA ZONE:

Breccia zones in sedimentary rocks consist of, in order of abundance, fragments of sedimentary rocks, mafic intrusives, and granodiorite, filled with the same powdered material and various hydrothermal minerals. The formation should have been as late as the deuteric stage of the granodiorite.

The Giant Copper breccia is located in the regionally commonest NW (35°) - trending area. Numerous mafic dykes intrude along the strike and possibly strike faults. Small numbers of mafic dykes show EW to NEE trend, so that the cross cutting fault system began to develop as early as or slightly later the formation of the NW system.

The later formation of the NE system is also indicated by quartz monzonite porphyry dykes, tourmaline-quartz alteration and pebble dykes, which are well brecciated dykes less than one foot in width and contain hydrothermal minerals. The southern parts of the breccia have been probably dislocated by the NE faults system.

There must be many other directions of subsidiary faults in the breccia. A strong structural weakness has been detected by a geophysical method. However, the basic pattern of the fracture systems in and around the Giant Copper breccia still remained in the NW-NE combination during the block movement. The intersection was well brecciated and magmatic stoping of the Invermay stock enforeed the brecciation. Vapour activity (especially when $P_{H_2O}$ exceeded $P_{rock}$) was also a very important agent for the brecciation. Sulfides were probably fixed right after the chemical abruption.

Composition of the country rocks also effected sulfide mineralization to certain degree. For example, iron sulfide dissemination is very commonly observed in mafic dykes throughout the surveyed area. Detailed studies should be done on the mafic rocks in and around the Giant Copper breccia in this subject.

No strong intersecting fractures have been so far observed in other breccia zones, such as Camp No. 6 and Pass breccia. Both alteration and mineralization are weak in these breccias including newly found breccia on a ridge opposite to the Silverdaisy mountain.

Much information has not been taken, in the Invermay ore breccia. In reference to the old Cominco maps, the low grade copper deposit seems to be not purely a breccia but controlled more, strongly by fracture systems. The strongest one is obviously lead and zinc veins of NEE trend. The mineralization followed NNE-NE joint system of the Invermay stock. Hence, the ore veins would show a horse tail figure. There must be another structual weakness crossing the veins, because horizontal drill holes on the 5th level reveal a high copper content zone towards NNW-NW direction.

GEOCHEMISTRY

Results of soil analyses made for copper are plotted in Figure 2. Soil samples taken from road-side cutting are usually much higher than neighbouring soils in copper.

Copper contents are much more in lower parts of known mineralized area. There is an exception of the Pass breccia, which showed low values (<30ppm) even in and near the breccia.

Around the Giant Copper breccia, high values of 100-200 ppm were observed at west of the breccia. Contents between 100-400 ppm were known at southeast of the same breccia. These are probably an expression of subsidiary mineralization related to that of the known ore body. Three samples taken around New breccia area were between 150 and 250ppm.

A extremely high copper value, 2000 ppm Cu, was detected at 800 feet north of the 10th level portal. The same spot was re-examined and also the surrounding area was inspected with a grid sampling of 100 feet intervals. Copper contents are relatively higher even in the soil of normal status. According to limited information from underground and surface, there are some geologic factors good for mineralization around the area, which are dikes of the Invermay stock series rocks, hydrothermal alteration around the margin, and structural disturbance in sedimentary rocks.

RECOMMENDATION:

Following geological and geochemical examinations above mentioned, generalized clues to further exploration programs are induced as follows:

1.) Structural intersection (in) and around the Invermay stock, particularly of branches, along the major axis.

2.) Place where many mafic dykes are distributed.

3.) Chloritization and tourmalization preferably enclosed by a lower-grade hydrothermal alteration.

4.) Soil sampling for copper distribution in overburden.

Practical examinations are expected in the following co-ordinated areas.

1.) Continuous studies in the southwestern property (7,000-12,000N, 5,000-9,000E.)

2.) An area between two large apophyses of the Invermay stock menbers in the 15th level tunnel and around tips of the granodiorite (10,500-14,000N, 10,500-12,500E.) Underground information is required in this work.

Shunso Ishihara

____________________________

Motomu Kiyokawa

____________________________

/ss

September 26th, 1968