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Report on the Bulk,Claims, Porpyhyry Creek, B.C.

By

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INTRODUCTION

The Bulk Claims comprise a group of 32 claims which center around an extensive gossan zone on both banks of the Bulkley R. near Beament Station on the CNR line. Geolggical mapping and a study of the jointing directions and veining directions in the gossan zone and in nearby areas of unaltered rock were carried out. The purpose was to determine whether there is a Cu, Mo-bearing intrusive in the vicinity of the gossan zone which might be a potential drill target.

PREVIOUS WORK

The claims were previously part of the Orbi group held by Utah Construction and Mining Co. According to the Minister of Mines, B.C., Annual Rept., 1967, p. 85, Utah did geological mapping, geophysical surveying (IP, electromag and Mag.), geochemical soil-sampling and diamond-drilling on a Cu-Zn-Pb prospect, presumably on the E. side of the Bulkley R. No further information was available in the Mining Recorder's office, but Utah should be approached for their data.

G. Stewart of Nadina Mines examined the highly altered outcrops during the time we were working on the claims. In his report, he concluded that the main gossanous zone does not display porphyry Cu type alteration, and that " the amount of Cu in the outcrops appears to be insignificant in a commercial sense". He did not note any intrusives and thought that the strong pyrite might "indicate an old volcanic vent as the source of the solfataric activity". In addition, he thought the target to be a massive sulfide and recommended that particular attention should be paid to the presence of gold and silver.

GENERAL GEOLOGY

The area is underlain predominantly by flat-lying porphyritic andesitic lavas which are interbedded with water-lain tuffs and quartz and jasper pebble conglomerates with watenffaceous matrix. According to the compilation map by Kirkham and Carter of the B.C. Dept. of Mines, which includes the area of the claims, their age is Lower Cretaceous and they belong to the Brian Boru formation.

Pyrite occurs disseminated and in patches up to 1 ft. in diameter in rocks throughout the map area, but significantly increases in the main gossan zone. Cherty, black to sugary white quartz-pyrite veins and barren calcite veins are also found throughout the area but again significantly increase in number in the main gossanouaazone,

NE to ENE trending faults with minor displacement but having extensive parallel pyrite filled fractures cut the rocks in the map area. Similar faults were laso noted in the andesite and conglomerates outcropping along Hwy. 16, th the N of the claim group

LOCAL GEOLOGY

Description of the Rock Units

a) Porphyritic Andesite

This is by far the predominant rock type in the area. It is a medium grained green,rock, commonly with feldspar and/or hornblende phenocrysts. The feldspar phenocrysts are subhedral and rounded but sometimes appear to be fragmented. The hornblende phenocrysts are euhedral to subhedral in shape. Bedding is difficult to distinguish in this unit which outcrops massively and is often well jointed.

Locally, patches of breccia or agglomerate with a matrix of porphyritic andesite are found.

In the main gossanous zone, the andesite is tuffaceous, containing lapilli size fragments and it grades locally into massive andesite on the one hand and a tuffaceous conglomerate on the other.

In some areas the andesite is very fine grained and grey in colour, fractures conchoidally and contains some carbonate. Where it is coarse graained, it has an intrusive texture and even contains small books of a euhedral light brown mica (phlogopite or bleached biotite). It ressembles diorite in appearanne, but contacts were nowhere seen to be intrusive. In general, none of these varieties of the andesite can be traced laterally for any distance.

Disseminated pyrite occurs almost everywhere in the andesite, varying from less than 1% to more than 5%, but generally averaging around 1%. Variation in pyrite content has resulted in differences in weathering characteristics of the andesite so that it may appear green, light brown or almost white in outcrop. The fine grained matrix is generally most affected by weathering and turns rusty, while the feldspar phenocrysts appear white and kaolinitic.

b) Tuffaceous Conglomerate

In themmain gossanous zone and elsewhere in irregular patches with contacts which cannot be traced laterally, a conglomerate with a matrix consisting of lapilli tuff was found. The well-rounded quartz, jasper, porphyritic andesite, and rhyolite boulders and pebbles vary in size from over 30 cm in diameter to less than $\frac{1}{2}$ cm . The matrix consitts of a porphyritic dark green to light green tuff. Pyrite is disseminated throughout the matrix and is also found in some of the rhyolite and andesite boulders. In some places the matrix and boulders appear to be of the same composition and the rock has a close affinity to agglomerate.

The rock is massive and bedding cannot be distinguished.

c) Pyritic Tuff

The only unit in which bedding can be distinguished is a fine-grained well consolidated, rhyolitic tuff, which is almost invariably contains more than 5% disseminated pyrite. It is white to grey on fresh surface and weathers rusty red and yellow. The only outcrop of this unit is in the main gossanous zone. Laterally and vertically it appears to grade into the other two units, but stratigraphic relationships are boscured by the rubbly weathering caused by oxidation of the pyrite.

d) Basalt Dike

A dark, dense fine grained basaltic dike with zoned hornblende phenocrysts (up to 1 cm. long) was found in one outcrop along Hwy 16. It could not be traced along strike.

ZONES OF GOSSAN

Gossanous areas are fonnd irregularly distributed throughout the map area, but oxidation of pyrite is particularly intense in outcrop along the Bulkley River at the N. end of the map area. As mentioned, pyrite is disseminated in the tuffaceous matrix and in some of the pebbles and boulders of conglomerate, in rhyolitic tuff and in porphyritic andesite.

Oxidation of the pyrite and concomittant formation of limonite-goethite is responsible for the extensive yellow-brown gossan zone. There is apparently no jarositic alteration present (G. Stewart, personal communication). In intensely altered areas, feldspar may be white and chalky in appearance and the groundmass rusty and red. No evidence of sericite, chlorite or silica alteration was seen anywhere and there is no reason to suspect that the alteration observed is due to any cause other than intense weathering.and shearing accompanying faulting . Often, the topographically higher portions of outcrop seem to be more intensely altered, which confirms that weathering is mainly resppnsible for the alteration. A white sulfate was observed on outcrops in a railroad cut which is protected from direct precipitation.

Quartz-pyrite veins, in which the quartz is sugary white or more frequently black and cherty in appearance also increase in size (up to 2" wide, but averaging ½ to ¼") and frequency (up to 8 to 10 veins per linear foot, but up to 30 or 40) in this main zone of gossan. Up to 50% by volume of finely disseminated pyrite is found in these veins. Banded calcite veins with minor pyrite cut and are later than the quartzpyrite veins. These calcite veins are usually less than 2" wide, but may be up to 6" wide. No economic minerals were fondd in these veins or anywhere in the map area, but traces of Mo and cp. have been reported by G. Thomassen and J. Gillan & are shown on the map.

and areshown of the map;

A greenish mineral, ressembling malachite in colour was found as a halo around some pyrite grains in areas of moderate alteration. It is suspected that this may be celadonite and is thus not necessarily indicative of Cu.

Structural Geology

a) Faults and Shear Zones

According to GSC Map 971A (1949) of the Smithers-Fort St. James area, a prominent regional fault strikes at 145° along the Bulkley Valley, cutting the NE corner of our map area.

The majority of faults and shear zones on the map area strike NE to ENE and dip steeply to the NW. In the main gossan zone, N-S trending shear zones are common. Also it is likely that the course of the river and the steep cliffs at the N end of the gossanous area are controlled by an ENE trending zone of faulting and/or shearing.

b) Statistical Study of Joint and Vein Directions

A preferred orientation or a radial arrangements of joints and quartz veins has been noted in and around Cu-Mo bearing porphyritic stocks at Endako, Kennco's Berg deposit and Noranda's Morrison property.

At Endako the Qtz-Mo stockwork is thought to have formed along an elongated E-W dome at the intersection of regional E-W andNW fault systems during repeated periods of uplift. Kimura and Drummond (CIMM Bull., 1969, 62, p/699 ff.) found that Qtz-Mo veins in the ore-body show a preferred orientation, but have variable dip between two sub-areas of the deposit. Joints and unmineralized faults in the same sub-areas also show a preferred orientation, which is different from that of the Qtz-Mo veins. They conclude that the attitudes of pre-mineralization dikes and faults, mineralized veins and post-mineral faults are concordant to regionally developed fault systems and use the concept of antithetic faulting to explain the spatial orientation and distribution of veins within the stockwork.

At the Berg deposit, there is a radial arrangement of Quartz- Mo veins in the quartz-biotite alteration zone, which may be related to the intrusion of quartz monzonite.

All rocks at Noranda's Morrison property are intensely fractured, mainly in N-S and E-W directions and many fractures are healed by 1/8 to $\frac{1}{4}$" quartz veinlets containing pyrite and lesser amounts of chalcopyrite.

In the map area, jointing and shearing are extensive and there are numerous quartz-pyrite and calcite-pyrite veins in the gossanous areas. The directions of several hundred joints and veins were measured and plotted on lower hemisphere equal-area projections to determine any preferred orientation. The data is illustrated on the stereograms (Figs. 1 - 11) and in Table 1.

Joints were measured separately in two of the main rock units at the S. end of the map area (the Control Area) where alteration and weathering are minor, to provide control on jointing directions outside the area of heavy pyrite mineralization. The main gossan zone was divided into four convenient sub-areas and the data from each sub-area was plotted separately and then together. The compilations obtained were then compared with the data from the control area.

Our interpretation of the data presented on the equal-area stereograms is as follows:

1. The broad similarity of jointing attitudes in the control area and jointing and veining attitudes in the main gossan zone suggests that these directions represent a regional pattern.

For example, the attitude 120 - 130/80SW may reflect a trend sub-parallel to the regional falult striking at 145°.

2. There is no radial joint pattern and no random orientation to the Qtz-py veins (as in a stockwork) to indicate a near-surface intrusion under the main zone offfgossan.

3. The pyritic veins in the main gossanous zone show a definite preferred orientation (055-060/80-85 SE) which is identical to the main jointing direction in this zone. This suggest that the attitude of veins was controlled by jointing, or that both were related to the NE trending shear and fault zones prominent in the map area.

4. Jointing directions vary with rock type. In the control area, the main jointing directions in the porphyritic andesite and the conglomeratic tuff are different.

GEOCHEMISTRY

A "B" horizon soil survey on a 400 ft. square grid over the original 20 claims staked was carried out by D. Helgesen's crew. The E. side and W. sides of the Bulkley R. were staked and subsequently soil sampled separately; therefore there is a base line running approximately N-S on each side of the river. The analytical results were plotted by D. Helgesen on two separate grids, Bulk group E and Bulk Gp. W., at a scale of 1" = 800 ft.

To allow interpretation of the soil survey data, the Cu and Mo analyses were plotted separately on overlays at the same scale as the air photos and the geological map (1" = 515 ft.). Considerable juggling was required to fit the sample points between the base lines and the river into the distance available. On the E. side of the Bulkley, very few sample locations had been marked; therefore, they could not be plotted accurately using the air photo. The distribution of Cu and Mo values is shown in the table below.

70 % of the Cu analyses are less than 20 ppm and 20 ppm is considered to be background level. The highest Cu value, 80 ppm, is only 4X background and is probably not significant because it is an isolated high. The broader anomaly (up to 65 ppm Cu) on Chive Hill is explained by the fact that there is little glacial till on this hill and outcrop is close to the surface.

Mo, on the other hand shows significant anomalies, Since almost 90% of the soils analysed contained less than 2 ppm Mo, anything greater t than 2 ppm can be considered to be anomalous. Areas of anomalous Mo correspond roughly to areas where andesite had an "intrusive" texture and contained biotite phenocrysts. More samples should be taken in these areas on a closely space survey controlled grid (200 X 50') to delineate the anomalies more specifically.

The poor quality of the geochemical survey precludes any conclusive interpretation of the data. In general the control on sample locations was not accurate enough, the samples were too widely spaced to give sufficient data in the anomalous areas and in some cases the A_h horizon was sampled rather than the B horizon.

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CONCLUSIONS

1. Evaluation of the economic potential of these claims must await the results of assays of rock chip samples collected along the base of the main gossanous zone on the W. side of the river and from outcrops along the highway and railroad.

2. If these assay results are not encouraging (i.e. if they show less than 0.1 % Cu), further work on the Bulk claims is not warranted.

2. The occurrence of only minute amounts of visible cp and Mo in the map area and the lack of porphyry Cu type alteration are discouraging.

3. The results of the jointing study as well as the fact that there is no warping of bedding demonstrate that it is unlikely that there is an igneous intrusion in the vicinity of the main zone of gossan.

4. The Mo anomaly in soils collected on the E. side of the Bulkley R. in the vicinity of the creek is significant, but the samples are too widely spaced to allow a meaningful interpretation to be made.

5. If several representative samples had been assayed at the initiation of this program on the Bulk claims, this report would have been either much more conclusive or nonexistent.

RECOMMENDATIONS

1. Before any further work is carried out, Utah Construction and Mining Co should be approached for information on work done on the Orbi claims.

2. The pyritiferous zones may represent peripherla alteration to an intrusive body. On the basis of:

a) the soil anomaly

b) the Mo showing indicated 1½ mi E of the mouth of Porphyry Ck on Kirkham and Carter's compilation map and

c) the fact that Utah carried out extensive work on a Cu-Pb-Zn prospect on the Orbi claims, it is recommended that further regional work be done, particularly on the E. side of the Bulkley R. This work should include:

(i) Stream sediment sampling for Cu, Mo, Zn and Ag.

(ii) Soil sampling at 50 ft. intervals along lines spaced 200 ft. apart in all areas where Mo values were obtained on the 400 ft. grid. It might also be worthwhile to extend lines to the E. on both sides of the small creek.

If B horizon samples are being collected, car should be taken to obtain samples from this horizon only. However, since fairly thick glacial till underlies the soil in this area, A_h horizon samples might reflect the geochemistry of the underlying bedrock better than B horizon samples. Soil samples should be analysed for Cu, Mo, and Ag, as well as As if A_h samples are collected.