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Memo: To George Stewart.
From Jim Fyles
Re: Battle Mountain Canada Inc. (BMCI) exploration for gold on the Phoenix property 1990-1992.

SUMMARY

The BCMI work produced significant and valuable results for Kettle River Resources including;
--organization of a huge mass of historic exploration and mining data.
--systematic and enlightened review of the geology, including critical work on the ground in key areas and identification of relevant models of mineralization.
--good and consistent geophysics and geochemistry.
--drilling which has all but eliminated some geological environments for gold but which has confirmed others.

CONCLUSIONS

- (1) The presence of Tertiary gold mineralization is established with certainty.
- (2) This mineralization is in or near structures which are mainly subsidiary to, and superimposed on the low dipping detachment faults.
- (3) The northwest-southeast trends of some of these structures is substantiated. Significant zones are the Crown-Wendy and Sylvester K-Brooklyn-Stemwinder. There are other trends and probably other zones.

RECOMMENDATIONS

Reevaluate all data from the perspective that the search is for Tertiary fracture controlled gold mineralization.
(2) Design new programs to test specifically the results of this work.

James T. Fyles
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November 12 1992.

EXPLORATION FOR GOLD BY BATTLE MOUNTAIN CANADA INC. ON THE
PHOENIX PROPERTY 1990-92

INTRODUCTION

This report is a review, made at Greenwood on November 8-12 1992, of the work done on the Phoenix property by Battle Mountain Canada Inc (BMCI) in 1990-1992. In this review I studied the documents listed at the end of this report, scanned the sorts of things that are filed in the basement of the Kelly house (much of which I had worked with in the past) and began to go through the rolled maps left by BMCI people but not entered into the system. In these rolled maps the plots of the 1991 holes not included in the assessment report KRR #694, the colored maps on the walls and the detailed field compilations on squared paper are particularly interesting. Not seen were the results of the 1992 drilling (which I am only generally familiar with from talking to BMCI people in August 1992) and other data to be submitted as a requirement of the termination of the BMCI option agreement.

In my opinion BMCI did a first class technical job on this project. In my few contacts with their people during the field seasons I was impressed by their persistent, searching and imaginative work; their use of modern techniques and their follow-up on the ground. Outlined in the following are a few ideas coming from my own background and the review of these documents.

DATA COMPILATION

BMCI did a tremendous job of sorting, housing and cataloguing the huge volume of exploration and mining data on the Phoenix area. The documents filed in the Kelly house are sorted by subject and quite easy to use. Only a few of the drawings of the BMCI work are filed and I do not see any reports or notes that bridge the gap between the field notebooks and the assessment reports submitted to KRR. Probably all the drawings used for reports are contained in the rolls on the tables, and a few working maps such as the field compilation sheets (1:1000 scale) are there also or pinned on the wall. When BMCI sends in the final material it would be a good idea to look for interim internal reports by Dawson, Stanley, Kyba, Bottril, Carron etc. and to ask for them if they are not sent.

The Minquest bibliographic and stacked map project could be a useful tool as indicated in assessment report KRR #207. The target areas defined in that report show a very strong bias toward the "R. Longe stratabound" model of

mineralization and I am not impressed by the targets selected. However, the system and those particular target areas can be readily re-assessed for some other model by superimposing the data sheets on the light table and digging out the reports listed. The database described in this report does not appear to contain the BMCI data as it was concluded in October 1990, but this should be checked.

KRR will want to enter the BMCI data into the system. As a first step the rolled maps should be labelled and filed systematically either folded in file drawers or hung in a new cabinet (present cabinets 1-4 are full). The cost, difficulty and usefulness of adding the BMCI data to the Minquest database and map system should be assessed by someone who knows more than I do about these systems.

GEOLOGICAL WORK

The background geology and its appraisal by BMCI in the 1990 season is summarized in the report by Caron and others (KRR #659A pp.7-32).

The observations about the skarn alteration (pp.19-22) are new and give a good picture of the skarn mineralogy and its development. In 1991 during mapping of the pit, significant quantities of microdiorite of the Providence lake suite (Triassic) were identified and they are shown on some of the new geological maps. They also found small bodies of Cretaceous (Nelson) intrusions including a small breccia pipe near the Snowshoe (p.11 in KRR report 659A). BMCI geologists also mapped a significant number of additional faults, among them a series of faults trending northwest and others trending north with the bedding in the Brooklyn rocks.

Assessment report KRR #659A gives a good description (p31) of the epithermal veins one of which is described as cutting the Tertiary arkose of the Kettle River formation. The suggestion is made (p. 29) that the granular pyrite (Type 2 mineralization) in the Sylvester K deposit is epithermal, perhaps Tertiary.

Four genetic models for the mineral deposits on the Phoenix property have been considered in the past and were pushed by various workers in the BMCI project. Included are the following;

(1) Stratabound mineralization. One model of stratabound mineralization has sulphides preferentially deposited with the calcareous argillites in the transition zone between the first Brooklyn sharpstone and the Brooklyn limestone. This is what I call the Robert Longe model which is used to define the targets in the computer analysis of historic data (KRR report # 207). The Sylvester K deposit fits this model.

After it was found, much of my work for KRR in mapping the Brooklyn and determining its stratigraphy tested this model but it failed to produce a single new deposit. I do not think that most of the BMCI workers considered this to be an applicable model. Neither did they consider the Sylvester K to be a volcanic massive sulphide deposit (KRR report #659A p.29). In my view the deposits that we see today on the Phoenix property do not fit either of these stratabound models, but it is probable that early stratabound mineralization was the source of at least some of the iron, copper and(?) gold which was later redistributed into lenticular skarn and structurally controlled copper-gold deposits.

(2) Skarn deposits. The BMCI work clarified the distribution of the skarn alteration and shows the place of the copper/gold mineralization within it. The source of the metals and the configuration of the heat cell was not defined but they found some evidence for the heat source to be old and related to the Triassic microdiorite. Because of the small and very irregular shapes and distribution of these intrusions a complex distribution of the skarn zones is implied.

One significant fact of the geology of these deposits is that they have been transported and tilted in the Tertiary extension. Structures and deposits that were horizontal just before the extension have been tilted down 35 to 40 degrees about an approximately north-south axis. A complex listric detachment fault or fault system passes under all the Phoenix skarn deposits. It is referred to in KRR report #659A p.16 ff. as a thrust fault, but was recognized by BMCI people as a feature of the Tertiary extension. It is described herein as the Phoenix detachment and has an apparent offset of a kilometre or more implying that the root of these deposits should be found in rocks beneath the fault a kilometre or more to the east. When formed, the dip of the rocks enclosing the deposits was much shallower than at present. On the other hand the Tertiary epithermal mineralization (see below) was controlled by structures that are related to this faulting and may not have been tilted at all.

(3) Epithermal mineralization. The BMCI work documented many examples of epithermal mineralization (KRR report #659A p.31), and showed that at least some of it is Tertiary. Most of the fractures occur above the Phoenix detachment within both the Brooklyn and Knob Hill rocks. They contain sheared, crushed and altered rock and/or short and narrow calcite-quartz veins which may be barren or contain up to an ounce per tonne in gold. Local attitudes vary from place to place depending on rock type or structural setting.

Two zones, both with a general northwest-southeast orientation are known which contain significantly higher than average gold some of it fracture controlled. They are the Sylvester K-Brooklyn-Stemwinder zone and the Crown - Wendy zone. These zones, had been identified by KRR and referred to as trends rather than distinct zones of gold mineralization. Neither has been specifically targeted for exploration, although considerable incidental work has been done along them. BMCI makes reference to other fracture controlled mineralization in the Victoria, Monarch and War Eagle areas in assesment report KRR# 694 p.6. Also described in that report are the few occurrences of talc-serpentine-carbonate-gypsum mineralization encountered in some earlier drill holes. Regionally, serpentinite derived from the Paleozoic ophiolite suite has been injected along Tertiary (and Mesozoic) faults and locally carries free gold or contains gold-bearing quartz-carbonate veins. None containing gold has yet been found on the Phoenix property.

GEOPHYSICS AND GEOCHEMISTRY

While I do not have the expertise to judge the technical aspect of these surveys, I have the impression that they are the best that have been done in this area to date. They systematically cover a large area on a well marked and surveyed grid, with good base data and control. Interpretations that were made were coordinated closely between surveys and with the geologists and the geological map and concepts. It would appear that there was a bias toward copper-gold skarn mineralization in planning and interpreting these surveys.

DRILLING

The 1991 drilling program was carried out to evaluate soil geochemical anomalies outlined in 1990 which were primarily associated with copper-gold skarn mineralization. The area was that of the old Snowshoe, Rawhide and Monarch mines southeast of the main pit. Drilling of the copper-gold skarns returned gold values very similar to historic grades from copper production. In my opinion the results of that drilling could have been predicted from earlier work.

Three of ten holes were designed to test gold anomalies in a thick mass of the basal Brooklyn sharpstone to the south and west, which are associated with fracture controlled mineralization. These holes, total length about 300 m encountered shear zones and mineralized fractures up to a metre long containing as much as 14.67 grammes per tonne Au (KRR report #694 p.11). In my view these results while, discouraging in quantity and grade, are significant in emphasizing the presence of fracture controlled gold mineralization.

CONCLUSIONS AND RECOMMENDATIONS

The BMCI exploration directs the emphasis for further gold exploration in this area toward structurally controlled zones with epithermal characteristics. The Crown-Wendy trend and the Sylvester K-Stemwinder trends have been incompletely explored and it is likely that others exist. Within these zones individual deposits will have their own structural characteristics influenced by the nature of the wall rocks and their position in relation to other Tertiary structures. Most of the fracture systems will be above the Phoenix detachment fault but some may be below it and others may be sub parallel to or within it. The detachment zone itself is complex with various strands and at places it is strongly curved. It has had a progressive structural history; ie. it changed through a short interval of the Tertiary as did the associated vulcanism and hydrothermal regime. Mineralization will be found in all the rock units possibly including some of the Tertiary.

We can conclude that the copper skarn mineralization outlined by Granby in the Snowshoe-Monarch area and as remnants in the main pit will maintain the historic grades in gold but may be enhanced locally by the presence of fracture controlled and redistributed Tertiary gold mineralization.

RECOMMENDATIONS

This review strongly suggests to me that the data bank which has been so well assembled by BMCI should be re-evaluated with the objective of finding fracture controlled epithermal, probably Tertiary mineralization. This evaluation should make use of all the data now available. The complexities of the Tertiary fracture system and possible relationships to copper-gold skarn zones must be considered.

If new target areas are identified, modifications and reinterpretations of old surveys might be made. New programs should be designed to specifically test these types of mineralized zones.

REFERENCES

Caron, M.E., Deighton, J.R., Howell, W.A., and Hoffman, S.J.; (1991), Geological, Geophysical and Geochemical Report for the Phoenix Property, Kettle River Resources Report No.659A. (1 report and two folders of maps)

Caron, M.E.; (1992), Diamond Drilling Report for the Snowshoe Group of Claims, Phoenix Property; Kettle River Resources Report No.694.

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November 12 1992.