

DATE: July 4, 1990
A TO: Samatosum J.V. Planning Committee
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DE FROM: A. J. Davidson/~~I~~. D. Pirie
SUJET Samatosum Deposit Research
SUBJECT:

824333

For some time now we have been attempting to arrange for a research program to be carried out on the Samatosum deposit. This research would be directed towards a) documenting the deposit, b) investigating specific parameters of the deposit, c) determining its genesis and paragenesis and d) defining parameters useful for further exploration. We feel that this type of research is essential at any orebody.

After some investigation we have decided that Sam is too complex a problem to be solved or researched solely by either a MSc. or PhD. candidate. We have also had discussions regarding research at Sam with U.B.C., Queen's and McGill Universities.

Dr. A. E. Williams-Jones of McGill University visited Samatosum in May, 1990 and is very excited about the research possibilities at Sam. Dr. Williams-Jones and his students have most recently been active in the Toodoggone area of B.C., at Eskay Creek, B.C. and are presently investigating stibnite veins in Guatemala. We are very impressed with Williams-Jones and we feel that he will do an excellent job of research at Sam. Work would be done by a post doctoral fellow under Williams-Jones' direct supervision.

I have attached Dr. Williams-Jones proposal and his funding requirements. As he mentions the total program at McGill will cost approximately \$90,000. This is in addition to any field work that may be necessary. The National Science and Engineering Research Council (NSERC) has a Collaborative Research and Development Program (CRD) which is prepared to support applied research by funding about 50% of the research that involves industry-university collaboration. Also, part of industry's

contribution can be "in kind" rather than a direct grant. "In kind" means salary and support for Dr. Williams-Jones' field people while at Sam, geochemical analyses, and salaries and support for our own people assisting on the research project. Thus the cash cost to the Sam JV of doing the research can be mitigated by both NSERC and "in kind" contributions. The breakdown may be as follows:

Expenditures at McGill	\$ 90,000
Expenditures at Sam	<u>\$ 30,000</u>
	\$120,000
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NSERC contribution	\$ 60,000
Sam JV "in kind" contribution	\$ 30,000
Sam JV cash contribution	<u>\$ 30,000</u>
	\$120,000

Thus we expect the research to cost the Sam JV about \$30,000 in hard \$. This money can come from a number of sources and can be split between 1990 and 1991. Sources are:

- Sam JV 1990 Exploration Budget
- Sam JV 1991 Exploration Budget
- Sam JV 1990 Mine Budget
- Sam JV 1991 Mine Budget

Please get back to me with your thoughts, comments and approval of this proposal.

**A RESEARCH PROPOSAL FOR THE SAMATOSUM DEPOSIT, SOUTH-CENTRAL
B.C.**

PRELIMINARY DRAFT

Submitted to: A.J. Davidson
Exploration Manager
Minnova Inc.
Vancouver, B.C.

By: A.E. Williams-Jones and J.R. Clark
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Montreal, Que.

Date: June 7, 1990

Objectives

The objectives of the proposed study are:

- 1) To document the nature of the precious and base metal mineralization and associated alteration of the Samatosum deposit.
- 2) To establish a detailed paragenesis for the deposit.
- 3) To determine the ages of the Samatosum and Rea deposits.
- 4) To determine the nature and source of the ore-forming fluids, and to establish the physico-chemical conditions of Samatosum mineralization.
- 5) To evaluate possible models for the formation of the deposit.
- 6) To establish effective exploration criteria for the recognition of favourable geological environments on the property, and to enhance the efficiency of exploration and development of additional deposits in the Adams Lake district.

These objectives will be achieved by the research program described below, and through collaboration with members of Minnova's exploration staff, and Dr. K. Glover, who will provide a structural framework for the study.

Methodology

The initial stage of study will involve a detailed examination of drill core and mine workings. This work will guide sample selection for detailed petrographic, mineralogical, mineral chemical and litho-geochemical studies. These will establish the nature of the mineralogy, wallrock alteration, geochemical zonations and overall paragenesis of the deposit. Petrographic and mineralogical research will involve microscopic and X-ray diffraction techniques. Mineral chemical studies will be conducted using a combination of SEM and electron microprobe techniques. The litho-geochemical analyses will involve a variety of trace, minor and major element approaches.

The ages of suitable alteration minerals in the Samatosum and Rea deposits will be determined by the stepwise-heating $^{40}\text{Ar}/^{39}\text{Ar}$ method. This method is superior to the conventional K/Ar technique, as it is able to "see through" post-depositional effects such as deformation/metamorphism.

The nature of the mineralizing fluids will be established using fluid inclusion techniques. These will include petrography and microthermometry, and if necessary, Raman spectroscopy. The microthermometric data will be used to constrain P-T conditions of formation. Some indication of the source of the fluids will be provided by the fluid inclusion studies. Oxygen and hydrogen isotope studies will be required to establish their actual origin, e.g., meteoric, marine or formational waters. Oxygen isotopic analyses will also be used to provide independent estimates of temperature and to evaluate fluid/rock interaction. Sulfur isotopic analyses will provide additional information on fluid source, and will also constrain the physico-chemical conditions of ore formation, i.e., oxygen fugacity and pH.

The data compiled during the study will be used to evaluate the various models of mineralization currently under consideration, and other such models as become apparent

during the investigation. For example, one of the models that has been favoured recently involves linking syngenetic mineralization at Rea with the apparently epigenetic mineralization at Samatosum. The model envisages a shallow basin with a marginal growth fault that provided the conduit for mineralizing fluids. In the case of the Rea deposit, these fluids debouched onto the seafloor producing a sulfide-rich sediment, whereas at Samatosum the fluids deposited mineralization within the environment of the growth fault. If this model is correct we would expect the ages of the two deposits to be essentially the same, and the mineralizing fluids to be similar (relatively saline, with a significant marine component). Utilization of such models may have major implications for the success rate of exploration both on the Sam property and elsewhere in the district.

Exploration criteria will be developed in consultation with Dr. K. Glover and members of the Minnova exploration staff. These criteria will be derived from consideration of the most plausible model for the genesis and subsequent deformational history of the Samatosum deposit.

NSERC-CRD Funding

Partial funding for the project will be sought from the National Scientific and Engineering Research Council's Collaborative Research and Development Program. The program is designed to support research of an applied nature that involves collaboration between industry and university personnel. Funding is shared between the company and NSERC, and is normally on a 50-50 basis. However, this includes non-cash "in-kind" contributions from the industrial partner. These might consist of the salaries and support of individuals who participate to any extent in the project, or the cost of data accumulated by the company for the project, or travel and field-related expenditures. These latter contributions can only be claimed for work done during the tenure of the contract. The cash contribution should be a significant portion of the overall company contribution, preferably >50 %. We will forward to you a NSERC document outlining the program with a hard copy of this proposal.

If you are in agreement that we should seek NSERC funding, we will undertake to prepare the necessary documents.

Budget

The project will have duration of 18 months. Expenditures at McGill will be distributed as follows:

materials and laboratory costs:

age determinations	5 @ 950 \$ ea.	4750 \$
thin sections	50 @ 15	750
polished thin sections	100 @ 25	2500
fluid inclusion sections	30 @ 35	1050

oxygen isotopic analyses	20 @ 120	2400
hydrogen isotopic analyses	20 @ 100	2000
sulfur isotopic analyses	20 @ 60	1200
microprobe analyses	10 days @ 200 \$ ea.	2000
X-ray diffraction	80 hrs @ 8	640
SEM analyses	80 hrs @ 20	1600
microthermometry	60 days @ 60	3600
lithochemical analyses	50 @ 60 \$ ea.	3000
salaries		
research associate	3600 \$ x 12 months	43200
	18 % benefits	7776
technician	1700 \$ x 6 months	10200
	12 % benefits	1224
miscellaneous (drafting, photography, communications, copying, etc.)		1000

		88890 \$

Assuming an NSERC-CRD funding scheme, Minnova's cash contribution would be at least 30000 \$, with an equal or greater amount "in-kind" (salaries, support, field costs, travel, etc.).