

LEHMANN EXPLORATION MANAGEMENT, INC.
GEOLOGISTS

MEMORANDUM

TO: FILE
FROM: E. LEHMANN
CC: J. BECK
DATE: JUNE 6, 1986
PROJECT: POLARIS JOINT VENTURE
SUBJECT: HISTORY OF EXPLORATORY ACTIVITY

Questions are raised from time to time as to why the Polaris project team undertook certain activities or did not undertake certain others. In the interests of clarification, this memorandum will try to highlight some of the reasons that several such choices were made.

The Polaris Joint Venture had its origins in ELA's efforts, beginning in 1977, to obtain options and licenses to lease from the many different owners of scattered severed mineral rights in Minnesota. By the summer of 1979, ELA had acquired the mineral rights to about 1,200,000 acres in northern Minnesota, creating the Northern Minnesota Mineral Pool.

Earlier in 1979, on behalf of a client, ELA had made a study of the regional geology, the exploration opportunities, and the environmental and legal setting of exploring in Minnesota. This particular client declined to enter into an exploration program because of the timing of the proposed program with respect to the development of some geophysical techniques on which they were working.

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Therefore, in the summer of 1979, ELA approached Getty and Billiton with the idea of creating a joint venture to explore in northern Minnesota. During meetings that summer, the area of interest was outlined to include and focus on major greenstone belts and concentrations of mineral rights acquired by ELA.

One of the operating assumptions of the proposed project was that the moratorium then in force on state leasing would end in the near future and that state lands would become available for mineral leasing.

In the fall of 1979, the Polaris Joint Venture was created, and a contract was entered into with Questor for INPUT surveys. Questor was awarded the contract because Geoterrex was not available. The venture participants were cognizant of the fact the Questor had had some problems with positioning anomalies, and that Questor's interpretive capabilities perhaps left something to be desired. In view of this and at the urging of Billiton (more particularly, of George Riley, who was then stationed in The Hague), the venture entered into a contract with Patterson, Grant and Watson under which PGW was to provide geophysical consulting services. These services were to include the design and specifications of the Questor program, the interpretation of the Questor survey, and assistance with organizing ground follow-up.

The choice was made to fly two areas of potential greenstones: (1) the Sturgeon Block, in which ELA had accumulated some land on the east and west ends, and (2) the Hubbard Block, in which ELA had a considerable land position. It was known that

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the glacial cover in the Hubbard Block would be thick, but it was felt that this survey would be a worthwhile experiment.

Areas east of the Sturgeon Block, towards Ely, were not included in the flying program for two reasons. First, there was some old INPUT data in ELA's files. Second, it was believed that that area had shallow overburden and could be examined more readily by geochemical and field-prospecting methods.

Questor completed the flying in the winter of 1979-80, but the lease sale of state lands was delayed. In view of this, the venture decided to pick representative areas, which would contain varying geological environments and targets from the Questor flying, and to outline a series of blocks to be flown by the Aerodat helicopter-EM system. This system was recommended by PGW, who believed that it was superior to Dighem, partly because it included a more precise navigation system. That navigation system would allow the location of an anomaly to plus or minus five meters on the ground. Thus, most geophysical ground follow-up would be eliminated and one ground line at most would be needed for precisely the anomaly and the initial drillhole. Moreover, the use of the more precise navigation system and the elimination of the necessity of obtaining ground access would facilitate the selection of targets for eventually leasing state or private mineral rights, and thereby greatly facilitate land-acquisition activities and reduce land-acquisition costs. It was recognized that the Aerodat system would have a lesser depth of penetration than the INPUT system itself.

The locations and sizes of the Aerodat HEM blocks were chosen by geologists representing all parties to the venture,

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including the Operator, and PGW. The venture participants did not know at that time that PGW owned an interest in the Aerodat company and had not revealed this interest to the venture.

Because equipment was not immediately available, the helicopter survey was delayed from early summer until the fall of 1980. In the meantime, data from prior exploration were gathered from the files of DNR and other sources and added to the data base of the venture. This information is in the files of the venture at present. The project geologists also undertook to field-check targets from both the Questor and Aerodat surveys.

The Aerodat data were received piecemeal in the late fall of 1980 and the winter of 1980-81 and interpretations were received from PGW. Based on these interpretations, targets were selected and land information gathered on specific targets. The lease sale was further delayed and so our focus in 1980 and 1981 was totally on targets that could be acquired privately or from the Northern Minnesota Mineral Pool.

In addition, during the summers of 1980 and 1981, geo-chemical prospecting was done in the Ely area, based largely on Ned Eisenbrey's geological interpretation of that area and his selection of potentially favorable zones for base- and precious-metal mineralization.

Also during this period, approaches were made to Burlington Northern and Boise Cascade regarding possible sub-joint ventures with them in areas in which they had significant land control. The negotiations with Boise Cascade continued for some length of

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time and through several draft agreements but finally were broken off. Negotiations with Burlington Northern never proceeded beyond a very preliminary stage, though I met with Burlington Northern people on several occasions to try to persuade them to enter into serious negotiations.

Various possible courses of action were considered for the Hubbard Block to enable an interpretation of this area based on the geophysical data. This block is covered by very thick overburden and highly conductive and all practical solutions to the problems have yet to be found. Among the methods attempted on the Hubbard Block were normalization of the INPUT channels, an analysis of INPUT in relation to overburden thickness, and helicopter and ground EM surveys on selected targets. Reconnaissance drilling was considered but was rejected because of the cost.

We continued to carry on a significant lobbying effort with members of the State of Minnesota Executive Council and with several legislators, as well as in the DNR to assure that a lease sale would go forward at the earliest possible opportunity. When the lease sale was finally held, the PJV got onto a more normal footing, able to follow a more normal sequence of geophysical ground follow-up and drilling. As time went on, the concept of using just one line of ground follow-up on HEM anomalies was abandoned and full grids were cut on most anomalies.



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