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Midway, an analysis of a new massive sulphide discovery

GREEN
104-O
MIDWAY
Pb Zn Ag.

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Several important aspects of the mineral resource business are illustrated by the Midway discovery and events leading up to it.

The Midway property straddles the British Columbia-Yukon border, about 80 km east of Whitehorse. It is comprised of some 240 claims in the Yukon and 882 units in BC. A 23 km access road links it with the Alaska Highway.

The property lies in alpine terrain with a relief up to 1000 m. Many of the prime target areas occur in broad, glacially carved valleys with overburden thicknesses of 1.0 to 20 m.

There are five companies involved in the project at this time, three juniors and two majors. The juniors are Canadian companies in the FIRA sense of the word, the majors are not.

Cordilleran Engineering, a mineral exploration management group became an entity in 1967, born of the desire by some individuals to provide exploration services to the industry and at the same time maintain a high degree of independence and to conduct basic prospecting for their own account. The group is a partnership among individuals. The partners and the employees share in the action, a fact which makes them vitally concerned with the success of the company.

Cordilleran has managed some $26 million worth of exploration in British Columbia, the Yukon and the Northwest Territories, and has been involved with or was responsible for the discovery of such major properties as Robb Lake, Goz Creek, Gayna River, Logtung and the Midway massive sulphide discovery in 1980.

Although Logtung Resources Ltd is not directly involved with the Midway discovery, it is an important stepping stone in the direction of success for Cordilleran. Logtung's roots lie in a limited partnership which funded a primary stage exploration program for $200,000 in 1976. The money was raised through investors who would be able to take advantage of the 100 per cent tax write-off under the Canadian exploration expense deduction, one of the few items not attacked by MacEachen in his recent budget.

The grassroots program resulted in the discovery of the Logtung deposit now under option to Amax Minerals Exploration. Since 1977 Amax has spent some $5 million on this property. In all, Logtung will have received $1 million in cash and retains 40 per cent equity or $2 million in cash and a 20 per cent net profits interest.

Regional Resources Ltd is a similar corporate vehicle organized to back primary stage exploration. It acquired several properties in 1979 which resulted in an underwriting to support ongoing work.

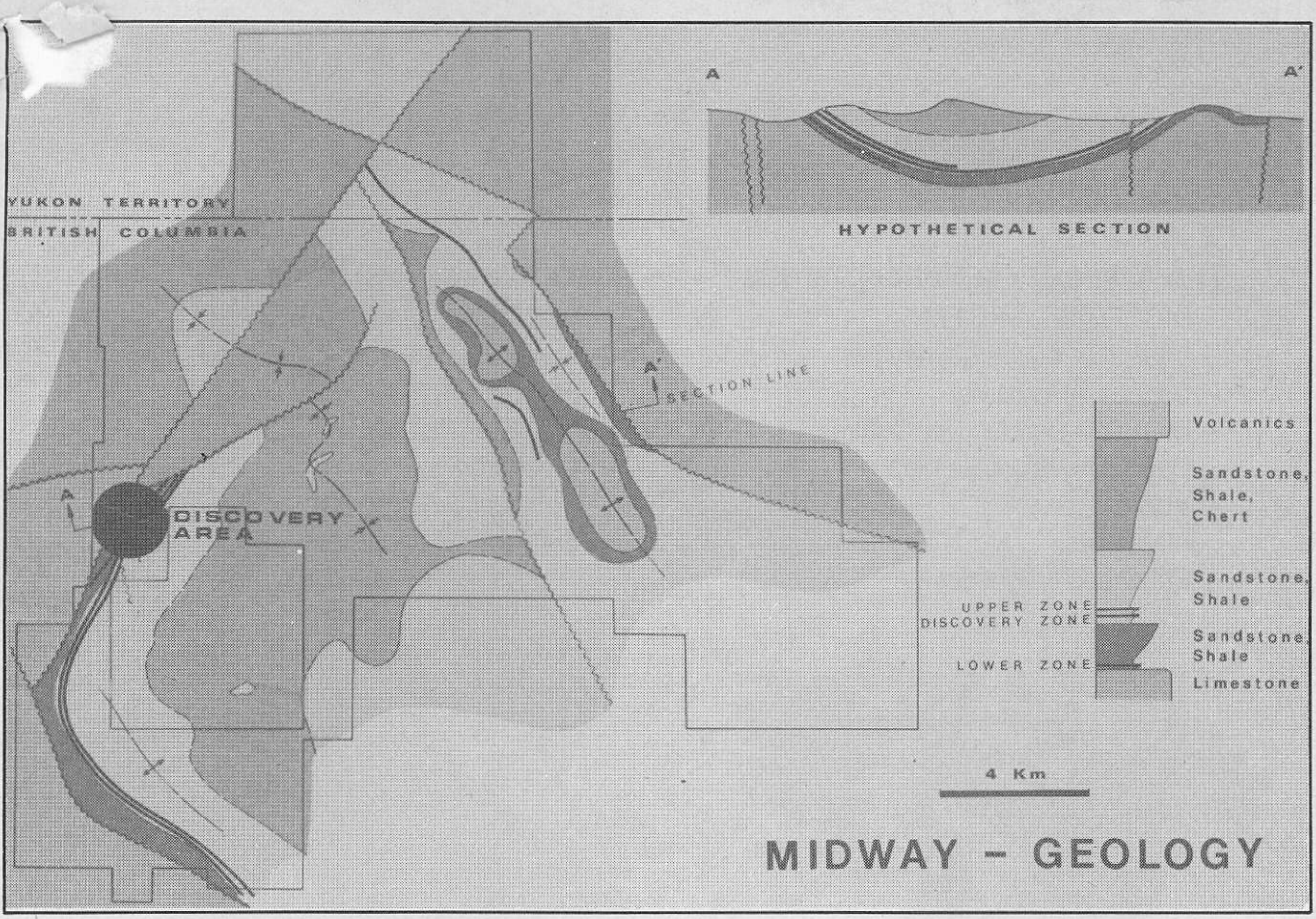
During 1980, the company funded a geological-geochemical reconnaissance program in southern Yukon and northern British Columbia. Detailed stream sediment sampling conducted over the Midway area disclosed anomalous lead, zinc, silver and barium values in several drainages. Prospecting in September led to the discovery of stratiform barite and recognition of an environment similar to that of other shale hosted base metal deposits. So the claim staking began!

The discovery

Further late season prospecting uncovered a massive sulphide horizon on the side of a trench near the old Silvertip property, a previously explored carbonate hosted silver-lead-zinc vein deposit.

That exposure is the site of the Midway discovery. Further trenching and drilling have clearly revealed it to be a sedimentary exhalative massive sulphide which will be described in more detail later on.

Amax and other major mining companies were active in the area surrounding the discovery. Amax has a tungsten prospect which adjoins the Midway claims. They were at least somewhat knowledgeable about the area and were highly interested in the



The geology of the Midway massive sulphide discovery located across the British Columbia-Yukon boundary. On the left is the general geology; at the upper right is a cross-section of the discovery area; and on the lower right is a geology of the discovery area

discovery at an early stage.

With the potential established, Amax made a deal early in 1981. Under the terms, Amax can earn a 49 per cent interest in the property through a series of exploration expenditures totalling $4 million by 1984 and cash payments of $600,000. Thereafter, Amax may elect to bring its total position to 60 per cent by paying Regional a further $2.6 million cash and granting them a four per cent smelter return. Also in 1981, because of a prior agreement, Amax assigned one-half of its position in the Midway property to Procan Exploration Company.

In June of 1981 it was decided to mount an intensive prospecting, mapping and surface exploration program followed by excavator trenching and, if time allowed, by diamond drilling. A 380 km airborne EM-mag survey using the Dighem system was flown during April and May. The resulting plan of conductivity features was a useful mapping tool. Furthermore, the best conductors were in part coincident with the discovery showing. The magnetics were generally flat and not particularly helpful. A grid of 435 km was established and 8000 soil samples were collected and analyzed for lead, zinc, silver and barium.

In late August, a Bantam 366 excavator was moved onto the property. It was used to clean up and further trace the massive sulphide discovery horizon and to expose sections of continuous stratigraphy for mapping and sampling across favorable areas. Although the steep terrain and local permafrost proved troublesome, the excavator vastly improved the exposure, extending the showing to a strike length of 110 m and revealed additional massive sulphide horizons.

By mid-September the exploration effort had outlined at least three broadly anomalous targets within the right stratigraphy and within low resistivity multiconductor areas. The discovery trench was located in one of these. It was then decided to embark upon a program of limited drilling to test the downdip extension of the discovery showing.

During late-September and part of October, a total of 860 m of NQ wireline diamond drilling was completed in six holes spaced at roughly 50 m intervals. Each hole cut at least three massive sulphide horizons.

The drill program was terminated with the completion of the sixth hole because of snow conditions. Total 1981 exploration cost was approximately $1.2 million.

Geology and mineralization

The Midway property is underlain by Devono-Mississippian sediments. The oldest unit, a thick succession of carbonate rocks is overlain by more than 1000 m of shales and sandstones which were deposited in a fault bounded basin or trough. The stratigraphic section shows that the clastic rocks can be divided into three generally coarsening upward units. Stratiform sulphide mineralization occurs at three separate levels. Favorable horizons are highly siliceous, often baritic and traceable over several kilometres in the southwest and northeast parts of the property. A hypothetical section is seen as a synclinal structure with a northwest trending axis. Strata dip approximately 30 degrees inwards and are bounded by steeply dipping faults.

Trenching in the discovery area exposed 130 m of vertical section including the upper and discovery zones. The lower zone is projected to surface from the six drill holes and from geophysical information. Bedding strikes north to northeast and dips are about 30 degrees east. Local faults with displacements of 30 to 200 m are indicated.

This section passes through holes No. 1 and No. 2 which intersected the three main mineral zones. The lower zone, located at the limestone-shale co ct consists of weakly bedded to bre ed sulphides in a shale matrix. It is from 0.9 to 2.3 m thick and generally richer in lead and silver. For example, the intersection in hole No. 3 graded 10.3 per cent lead, 4.9 per cent zinc and 14.1 oz/t silver over 2.3 m.

The discovery zone is located at a sandstone-shale contact approximately 70 m above the lower zone. It thickens substantially down dip from a maximum of 2.3 m on surface. Drill holes intersected 4.5 to 11 m of finely laminated sphalerite, pyrite, galena and silica. Its average grade in six holes is 9.3 per cent combined lead-zinc with 2.9 oz/t silver over 4.5 m.

The upper zone, approximately 20 m higher is mineralogically similar to but lower grade than the discovery zone. It is 0.5 to 2.8 m thick.

Other narrow stratiform sulphide horizons intersected in some of the drill holes could increase to economic thicknesses elsewhere.

Mineralization consists of finely interlaminated light brown to yellow sphalerite, abundant pyrite, variable amounts of galena and very fine grained quartz and sericite. Masses of coarse grained pyrite commonly cut across and obscure original textures. Minor barite is associated with the zones. Stratiform barite horizons are seen elsewhere on the property.

The unabridged text of this paper was given at the 50th anniversary Prospectors and Developers Association convention held March 7-10, 1982 in Toronto.

Applications of microcomputing devices to a field exploration environment: advantages and pitfalls

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The mining exploration and development community is, in general, no stranger to the modern digital computer and its applications. The ability of these machines to store, manipulate, process and plot large volumes of data quickly has been exploited in many phases of the mining exploration-development sequence. Most ground geological, geophysical and geochemical survey data, however, are still treated largely with paper and pencil from in-field data gathered to final plotting. Data sets have been traditionally too small, computers too large and costly, and the environment too harsh to effect any meaningful transfer.

The data gathering, recording, plotting and analysis procedures are, however, in the formative stages of undergoing change due to the introduction of advanced microprocessor electronics into the field exploration environment. This is seen on two fronts. First, manufacturers of ground geophysical equipment are building into such instruments so-called microprocessor control and memory. Second, instrument manufacturers, service companies and mining companies are involved in the application of stand alone micro (i.e. small) computers to data analysis, storage, verification and interpretation.

Our intention is to review these developments as they might be of interest to the mainstream of the mining exploration community. Those already heavily involved in computer applications may find this review overly simplistic and in some cases incomplete.

We should stress that this is an area of rapidly changing viewpoints, mining exploration instrumentation and methods, computer hardware and software. Fixed positions (including most stated herein) are quickly dated and decisions based on an inflexible or nonadaptive stance may prove costly. We hope to review the immediate future such that those anticipating changeover to more computer based systems can do so with minimum error. As a minimum, we hope to focus attention and encourage dialogue on developments that are both exciting and yet somewhat bewildering.

Computers as electronic machines which can store, manipulate and process data have found applications in most areas of the modern industrialized society. The number of people using (indebted to? dependent on?) such machines is increasing at a rate which frightens some and excites others. The trend is, regardless, irreversible. Such machines answer a need in most cases related to the machine's ability to store, process and display data at an incredibly fast speed and a marked cost advantage.

An area closely related to mining which has long made extensive use of computers is the seismic methods industry. In this case, the accelerating demand for hydrocarbons has called for increasing sophistication in exploration methods, most particularly seismic methods. The result has been a set of instruments and procedures which produce such large amounts of data that simple data verification can often only be handled by digital computers. Interpretation schemes have grown in parallel (and with the same reliance on the computer).

As the demand for nonhydrocarbon natural resources increases, mining exploration methods will develop in response. Part of this development will involve the transfer or changeover to digital data handling techniques. The changeover is, although quietly, in progress. The rate and style of the transfer will vary according to need.

In general, it may be wise to plan for a future in which exploration data (geological, geophysical, geochemical) for an area at any scale (from ERTS imagery to detailed ground surveys) will ultimately reside on a set of magnetic tapes. This data may be reconfigured, processed, displayed in any form or scale desired at any time. The basic concept is not new. The computer just allows for greater speed, flexibility and interpretive power; characteristics which should, if properly employed, contribute to better mine finding techniques.

This theme may seem remote from the ground exploration environment. It is not. The data flows from the geophysical receiver, for example, through a series of machines to the archive tape. Decisions at the front end (the receiver) and at other intermediate steps will determine the ease of data transfer and consequently the accessibility of and familiarity with the data by the explorationist.

The issue is somewhat of a puzzle with many elements and many false (or at least only short term) solutions. Any reasonable long-term solution can only be achieved with a broad view of data movements from field to office. The reader is however warned that there may be more than one solution path and such paths may vary with time and situation.

Reason for changeover

Today, probably in excess of 95 per cent of ground geophysical surveys in the mining sector are conducted with an earlier generation of instrumentation. Instruments are operated by setting a series of front panel switches. Readings are taken off analogue meters or, more recently, digital displays. Recording is done on field cards. Survey data is rough plotted in profile, contour or pseudosection form in the base camp. Merging with other data sets is done and preliminary interpretation undertaken. In the office, final drafting generates a series of maps which form the basis for further exploration-development.

The above is a tried and true method which has been and will continue to be used. It is familiar, simple (if tedious) and reassuring (one can "see" the data). There are, however, many reasons for the implementation of modern digital electronic devices in the