Enhancing the understanding of the 3D architecture of the Bathurst Mining Camp, New Brunswick

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The Bathurst Mining Camp (BMC), northern New Brunswick, is host to numerous base metal deposits, including the world class Brunswick #12 Mine. However, as with other long established areas of high mineral potential, the next generation of deposits likely to be cryptic, whether buried beneath a few metres of till or hundreds of metres cover rocks. In order to find these deposits basic geological studies, combined with the application of new techniques and technologies, will be key. In the BMC the bedrock geology is reasonably well constrained at surface, but remains poorly understood at depth. Improved understanding of the 3D geological structure will enhance the ability to vector in on mineralised horizons, even in hitherto unprospective areas, e.g., beneath the Carboniferous cover. The main activities in the BMC fall into five general categories.

The first of these is a new ground-based, gravity survey based on a nominal 1 km grid (modified in relation to access constraints). Gravity measurements were made at 3539 locations. Observations were made using Lacoste and Romberg gravity meters, and were tied to the National Gravity Network. Gravity data were reduced to a sea level datum assuming a mean crustal density of 2.67 g/cm3 to produce Bouguer anomalies. Terrain corrections were determined and applied to the Bouguer anomalies. The gravity maps are based therefore on terrain corrected Bouguer anomalies, the accuracy of which is estimated to be ± 0.17 mGal. The positions of gravity stations were determined by a differential GPS with horizontal and vertical accuracies estimated at ± 1.0 m and ± 0.5 m, respectively. The shaded Bouguer gravity anomaly map (linear interval) is interpolated to a 250 m grid. The linear colour intervals are 1.5 mGal. The Bouguer gravity field was upward continued 375 m prior to computation of the vertical derivative.

Although the Bouguer gravity map illustrates many of the major geological features of the BMC such as the Nine Mile Synform, "blueschist nappe" and Pabineau Granite, it does not obviously delineate the internal structure of the main felsic pile within which the majority of the VMS mineralisation occurs. However the first vertical derivative map does illustrate a remarkable correlation between VMS prospective areas and high values. Massive sulphide horizons are too small to have been consistently registered at this resolution of survey, thus it is believed that the effect is linked to the metasomatic alteration associated with the VMS producing fluid systems.

The gravity data will be combined with existing geophysical and rock properties data to form a 3D geophysical model. In turn this will aide in the production of a series of transects across major structural and/or economically significant parts of the BMC. A 3D GIS will be developed to incorporate the geology from the transects along with inversions from the geophysical modelling to give a 3D structural model of the whole of the Bathurst Mining Camp. A preliminary phase is already underway with the development of a 3D GIS for the Heath Steele area, including the incorporation of existing geophysical data, drill-hole projections and pre-existing geological structural models.

MMI, enzyme leach and mercury geochemical techniques to analyse soil/till have proven useful for finding deeply buried deposits in various places, but have yet to be adequately tested in the BMC. Their applicability for deep exploration in the BMC is being explored by detailed sampling over mineralized control sites that are buried by till and/or by Carboniferous sedimentary rocks. In addition a trial till tracer mineral study is being conducted to see if the distribution of heavy minerals within the till can be used to vector back towards base metal deposits.

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