

## **Distinguishing between biogenic and volcanogenic mineralization in the metalliferous black shale Quock Formation, British Columbia**

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The Iskut area of northwestern British Columbia contains numerous base and precious metal-rich deposits. The Eskay Creek mine, which closed in 2008, exploited an unusual Au-Ag-rich VMS deposit. The major mineralized lenses comprised of sulfosalt-rich clastic beds in the upper part of the Early Jurassic Hazleton arc stratigraphy. Overlying units are dominated by shales with increasing coarse clastic components upwards into the Middle Jurassic Bowser Basin sequence. The Quock Formation, which occurs above the basal shale of the Salmon River Formation, consists of black shale interbedded with white volcanic sediments or tuffs, resulting in a striped appearance. The Quock Formation is pyrite-rich, and contains elevated Zn, Pb, Ag, Ni, Cu, Co, Mo and As. The metal suite may represent biogenic concentration of metals, but the proximity to Eskay Creek, spatially and stratigraphically, suggests potential for a hydrothermal component that could be significant for exploration. Pyrite in the Quock Formation occurs in framboids and as euhedral grains. The variation of pyrite concentration and metal enrichment have been compared between the shale and volcanic sediment bands using bulk and selected geochemistry, and high energy synchrotron scans that produced individual element maps visually depicting metal concentration. These data are supported by analyses of total organic carbon and sulfur isotope compositions. In addition, the geochemistry of the Salmon River Formation, the Quock Formation, and the shales of the overlying Bowser Basin sequence, are compared to evaluate changes in metal concentration between these units, and progressive changes upwards into the developing clastic basin. The results of this study suggest that biogenic processes were likely important in the concentration of metals in the shale and volcanic sediment beds of the Quock Formation, and in the overlying shales, but a volcanogenic contribution may be present with potential relationships to Eskay-style mineralization.