

Shear-Zone Hosted Gold Exploration, British Columbia: Unmanned Aerial Vehicle Photogrammetry Mapping, and EasyMineXR Application to Inaccessible Steep Terrains

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High-resolution unmanned aerial vehicle photogrammetry with survey-grade spatial accuracy, generated by Drone North in collaboration with Goliath Resources, together with SRK Consulting (Canada)'s newly developed structural mapping software (EasyMineXR) were effectively used to improve structural data coverage of the Surebet Zone discovery. A multidisciplinary approach using structural data, oriented core, and assay data, and petrography and radiometric ages in collaboration with Colorado School of Mines, was used to advance the understanding of mineralisation controls, structural geometries, and timing relationships.

Digital outcrop mapping with EasyMineXR focussed on the auriferous Surebet Shear Zone exposed along an inaccessible 1-km cliff face. Mapping included bedding orientations, form lines and fold criteria of the host Hazelton Group sedimentary succession, interpretation of the crosscutting auriferous shear zone system, dikes, and brittle faults. Regionally, mineralisation is situated on the northern margin of the Skeena arch, a zone of repeated tectonomagmatism from the Triassic to Eocene transecting the Stikine terrane. Hydrothermal activity was likely associated with Eocene deformation and calc-alkaline magmatism. Shearing was initiated as a thrust system with top-to-NE transport, subsequent to but coaxial to the NE-SW-directed contraction that produced upright to slightly inclined folds. Mineralization formed from auriferous fluids that were CO₂ rich and of comparably low salinity (3.5–5 wt % NaCl). Fluids are interpreted to be of magmatic origin. Two vein quartz types are present, early quartz formed at lithostatic pressures with a later quartz generation formed at hydrostatic conditions. Native gold and sulfide minerals including pyrrhotite, pyrite, sphalerite, galena, chalcopyrite, and tetrahedrite are paragenetically associated with the second quartz. Mineralization postdated peak metamorphism within the contact aureole andalusite zone, at mid- to upper-crustal level (>5–6 km, 350°–400°C). The Surebet discovery adds to the plethora of established mineralisation styles within this exceptional gold- and metal-rich camp.