

## **Structural orientations, architecture, and timing of auriferous quartz veins associated with mesothermal saddle reef stockwork gold mineralization, The Ovens, Lunenburg County, Nova Scotia**

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A 680 m long east-west oriented cliff section of continuous exposure along the north shore of Rose Bay, The Ovens, Nova Scotia, was measured along a reference line to determine the locations, attitudes, and timing relationships of conjugate, thrust-related, and bedding parallel (saddle reef) Au-quartz-sulphide veins within the Cunard Member of the Halifax Formation, Meguma Group. Over 5,400 veins ranging from less than 1 mm to 215 mm wide were observed, and the relationships between the veins and associated structures within the sedimentary rocks were documented. Longitudinal plots and statistical tests, performed to determine whether these veins are randomly or systematically located in space, indicate that these veins exhibit a non-random, approximately uniform distribution within structural domains, and that changes in the abundance and thickness of the veins occur at structural domain boundaries.

Stratigraphic measurements of the host sedimentary rocks reveal a monotonous sequence of fine-grained turbidites over 100 m thick. Cleavage within these sedimentary rocks exhibits distinctive refraction at fine- to coarse-grained bed contacts, and fan cleavage morphology occurs within the coarser grained beds. Geological mapping indicates that two types of

thrust faults exist. The first consists of several associated thrust planes that verge north and may have rotated earlier-formed conjugate veins above them (as documented by changes in calculated principle stress orientations). The second thrust type is represented by many smaller back-thrusts that are restricted to the south limb of the anticline and that verge steeply south. These are most abundant along the axis of The Ovens anticline, and commonly host auriferous quartz (spur) veins in orientations sub-parallel-to-slightly shallower than the north limb of the anticline.

Conjugate veins can be constrained to have formed during an extended period of folding and north vergent thrust faulting that involved significant rotation. East and west dipping conjugate veins appear to be synchronous; however, back thrusting and spur veins filling these back thrusts appear to have formed at the same time and after these conjugate veins, based on cross-cutting relationships. Because the spur veins are extensions of north-dipping saddle reef/bedding parallel veins, this suggests that saddle reef/bedding parallel vein formation generally post-dated the earlier conjugate vein formation event.