

Structural history of the Goudreau Lake Deformation Zone and Island Gold deposit in the Superior Province, Ontario

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The Goudreau Lake Deformation Zone (GLDZ) is located within the Michipicoten Greenstone Belt of the Superior Province in northern Ontario. The greenstone belt lies to the southeast of the Hemlo gold camp and is proposed as the western extension of the Abitibi Greenstone belt. The GLDZ hosts multiple gold deposits, most notably the Island Gold deposit. The structural controls on emplacement of gold-bearing veins and the history of the deformation zone are the focus of this study. At least two generations of brittle-ductile to ductile deformation in the GLDZ have been recognized. D1 consists of regional-scale folding and the formation of the GLDZ along a parasitic synclinal fold on the northern limb of the Centre Anticline. The prevalent, approximately 60°-striking S1 foliation, as well as a camp-scale s-fold, are associated with this early folding. Stretching lineations on the S1 surface, defined by elongated feldspar, display an average plunge of 62° to the northeast and were observed to both the north and south of the deposit. Petrographic analysis will determine the shear sense of deformation during the development of this lineation. D2 deforms S1 and is defined by shallow, west-plunging folds that are locally associated with dextral shear sense indicators. The Island Gold deposit forms a mineralized corridor within the GLDZ. It is comprised of the Island Gold, Island Deep, Lochalsh, and Extension 1 and 2 Zones, which lie along strike, and the Goudreau Zone which lies to the north. The Island and Extension Zones are hosted in intermediate to felsic volcanic rocks and consist of eight subparallel ore zones of predominantly smoky grey quartz veins within a silicate and sericite alteration assemblage. The ore zones strike approximately 60° and dip approximately 80° to the south. The Goudreau Zone also consists of several ore zones and is hosted by both intermediate to felsic volcanic rocks and dioritic intrusions. Most mineralization in the Goudreau Zone is interpreted as similar to the Island and Extension Zones but another, earlier mineralization is also observed which consists of horizontal ore veins and associated moderate to nonexistent alteration package that are tightly folded with hinges plunging shallowly to the east. A preliminary sequence of deformation within the Island and Extension zones has been identified. During D1, ore veins were emplaced, folded, and underwent extension during progressive deformation, resulting in pinch-and-swell and boudinage structures. Shallow en echelon veins, associated with D2, cross-cut the ore zones.