Detailed Geological Mapping of Syenite-Associated Gold Mineralization Along the Lincoln–Nipissing Fault, Larder Lake, Ontario

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The main objectives of this study are to document the nature of variably gold mineralized felsic and gabbroic intrusions with a focus on their possible common petrogenesis and implications for the origin of mineralization in the gold mineralized Kirkland Lake-Larder Lake area. The linkage between the intrusions and the gold mineralization, that is passive or causative, is important to resolve as it is relevant in terms of gold deposit models and exploration programs. In northern Ontario's gold-rich Archean Abitibi terrane, such a link between intrusions of syenitic affinity often lack a causative link to mafic rocks and gold mineralization. In addition, the petrogenesis of these plausible causative intrusions also remains unclear. In order to address this problem, detailed geological mapping restricted to grid and trench methods was conducted on composite felsic-gabbroic intrusive bodies that are associated with disseminated and vein type gold prospects along the Lincoln–Nippissing shear zone in Skead Township, approximately 11 km south of Larder Lake. Mapping of the intrusions focused on assessing the presence of various compositional domains, overprinting alteration and quartz veins. The mapped intrusions, hosts both barren and gold mineralized (0.01-29.5 g/t) veins and altered rock, are dominantly medium- to coarse-grained, red-brown, amphibole bearing (<1-3%) leucosyenites and lesser homogeneous biotite granodiorite or tonalite. The leucosyenites are cut by lenses (<4 m thick) of medium- to coarse-grained diorite/gabbro which locally are pegmatitic with oriented contacts and the biotite granodiorite or tonalite is cut by abundant, randomly oriented, pale red to cloudy white aplite dikes. Some preliminary conclusions drawn from the above suggest a possible felsic-mafic petrogenetic link as well as an association between rocks of syenitic affinity, an inferred fault zone, gold-bearing fluids and alteration overprinting. Further work will assess the petrogenetic association between mafic and felsic rocks and characterize the metal- and geochemical signature of the hydrothermal gold event for comparison with intrusion-related deposits elsewhere.