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Title: THE EAGLE NICKEL-COPPER DEPOSIT: MARQUETTE COUNTY, MICHIGAN

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Abstract: Kennecott's discovery of the Eagle nickel-copper deposit in 2002 marked the culmination of more than a decade of exploration work by Kennecott in the Paleoproterozoic Baraga sedimentary basin. The discovery hole, YD02-02 completed in July 2002, intersected 84.2m of massive sulfide mineralization averaging 6.3% Ni and 4.0% Cu. The resource estimate for the Eagle deposit at the end of 2005 was 4.12 million tonnes at 3.59% Ni, 2.89%Cu and 0.1% Co.

The Eagle deposit is hosted in the westernmost of two small peridotite bodies historically referred to as the Yellow Dog Peridotite. The Yellow Dog intrusions, which lack penetrative foliations and truncate Penokean tectonic fabrics in the surrounding meta-sediments, are believed to be Keweenawan in age (Klasner, et. al., 1979). The intrusions are mainly comprised of coarse-grained, variably serpentized peridotite and feldspathic peridotite. A fine-grained, olivine poor phase is found along the margins of the intrusions and as xenoliths within the peridotite. Possible amygdules in the olivine poor phase(s) suggest a shallow level of intrusion.

Three principal types of sulfide mineralization are recognized in the Eagle deposit: disseminated (blebby), semi-massive (matrix) and massive. Although the nickel contents of semi-massive and massive sulfides are relatively uniform through out the deposit, copper contents vary significantly. Platinum group metals (PGM) and gold values are significantly higher in the copper rich massive sulfides. Copper rich veins and disseminations, with significant PGM and gold, in the surrounding meta-sediments may constitute a fourth type of ore.

Massive and semi-massive sulfide ore types in the Eagle deposit are irregularly distributed. The contacts between different ore types are sharp and show little evidence of the gradation or layering that might be expected if gravity driven accumulation of sulfides from an overlying, sulfide saturated, silicate magma was the principle mechanism of ore formation. Sequential emplacement of various mixtures of silicate and sulfide magma and cumulus minerals, derived from a lower stratified magma chamber, may provide a better model.

Klasner, J.S., Snider, D.W., Cannon, W.F., and Slack, J.F., 1979. The Yellow Dog Peridotite and a possible buried igneous complex of lower Keweenawan age in the northern peninsula of Michigan. Geologic Survey of Michigan DNR report of investigation 24, 31 pp.