

# Lode Mining In Yukon: An Investigation Of Quartz Deposits In The Klondike Division

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ARTICLE

## Styles of lode gold mineralization contributing to the placers of the Indian River and Black Hills Creek, Yukon Territory, Canada as deduced from microchemical characterization of placer gold grains

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**Abstract** Between 1978 and 2009, approximately 430,000 oz of placer gold were obtained from the Indian River and Black Hills Creek, which equates to roughly 20% of the production for the entire Yukon Territory during that period. The area is unglaciated, exposure is poor, and there are few known lode and occurrence present. The technique of microchemical characterization of placer gold grains has been applied to illuminate the style(s) of source mineralization and their relationship to placer gold from the Klondike gold district immediately to the north. A total of 2,613 placer gold grains from 22 localities were characterized in terms of the Au, Ag, Cu, and Hg content of their alloy and associated suite of opaque mineral inclusions. A combination of alloy and inclusion mineralogy was used to define gold signatures which augmented the previous classification of orogenic gold in the Klondike. Gold type 3b (8–25% Ag) is the main component of the placers in lower Dominion Creek but is augmented and eventually replaced by type 3a gold (10–40% Ag) in placers in the

main Indian River valley, probably through erosion of gold-bearing veins in the valley floor. Type 4 gold exhibits highly variable Ag which may contain Hg to a maximum of 11 wt.%. This gold type also hosts a distinctive inclusion assemblage of complex polymetallic sulphides, tellurides, sulfotellurides, and sulfosalts and has previously been ascribed to local low sulfidation epithermal mineralization. Placer gold in drainages radiating from Eureka Dome exhibits various proportions of types 3 and 4 gold depending on location, but type 3 gold forms the major component in Black Hills Creek and northerly flowing tributaries of the Indian River with the exception of Eureka and Montana creeks. Type 5 gold is found only in placers in the middle and lower Indian River. It is distinguished by slightly elevated (0.05–0.17%) Cu in the gold alloy, together with low (5–9%) Ag contents. Inclusions of Bi minerals, Cr-bearing magnetite and molybdenite within type 5 gold suggest derivation from an intrusion-related source. Candidates for such a source include undiscovered lode occurrences associated with Cretaceous age intrusions to the south of the Indian River, or deformed Cu–Au (–Mo) porphyry occurrences which are known to be present in the same area. This analysis of placer gold has indicated that the contribution of low sulfidation epithermal gold from Eureka Creek to the larger placers of the Indian River is minor. Consequently, the placer gold inventory of the Indian River is primarily orogenic in origin. Similarly, the characterization of placer gold in Blackhills Creek strongly suggests an orogenic source. This study has demonstrated for the first time that orogenic lode gold mineralization extends a considerable distance to the south of the southern Klondike goldfield. This information contributes to the regional models of gold mineralization in an area which is currently the focus of intensive exploration.

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