

Bonnifield District

Avalon Development Corporation

Summary Report 2014

Highlights:

- At least 30 placer gold mines across the district
- Five properties with historic base metal and/or precious metal resources
- District known for VMS prospects but the newly defined Bonnifield gold trend suggests unexplored potential for mid-Cretaceous intrusive-related gold deposits
- Approximately 5,000 km² of stable State of Alaska Land open to mineral entry
- Conveniently located between two paved State of Alaska highways with numerous roads, trails and landing strips throughout

General

The Bonnifield Mining District is located in the north-central Alaska Range approximately 80 kilometers south of Fairbanks, Alaska. The paved Parks Highway runs along the western edge of the district and the West Fork of the Little Delta River defines the eastern border of the 100 kilometer E-W by 50 kilometer N-S district. The northern edge of the Bonnifield is covered by the thick Quaternary sediments that cover much of the lowlands between the district and the Fairbanks area. The southern edge of the Bonnifield District is defined by the Hines Creek Strand of the Denali Fault, two regional scale dextral strike slip faults which separate older Precambrian and Paleozoic rocks in the Bonnifield from Mesozoic and Cenozoic rocks south of the fault.

General geology of the Bonnifield district shows predominantly east-west trending units of Precambrian and Paleozoic metavolcanic and metasedimentary rocks of shallow marine origin. Cretaceous (92-93 Ma) granitic plutons and dikes occur throughout the Bonnifield and one instance of a much younger (2-4 Ma) dacite intrusion occurs at Jumbo Dome. The oldest rocks in the Bonnifield are the metasediments of the Healy Schist which are exposed in the southern half of the district in a structurally complex east-west trending antiform. The Wood River assemblage consisting of late Devonian to early Mississippian metavolcanic and metasedimentary rocks is exposed in a synform to the south of the Healy Schist. On the northern flank of the Healy Schist antiform, a synform exposes the Keevy Peak Formation (Devonian) overlain by the Totalanika Schist Formation of late Devonian to early Mississippian age. There is significant evidence that the Wood River Assemblage and Totalanika Schist Formation may be coeval, although their volcanic protoliths vary in composition. The folded structures of the Bonnifield are cut by younger northwest-southeast trending high angle faults, the largest of which is the Kansas Creek fault, as well as still younger northeast trending faults, such as the Wood River fault. Due to the limited amount of recent exploration in the district, little is known regarding the magnitude of apparent vertical displacement along northeast and northwest trending structures.

Sheep Creek Synform (VMS)

Several notable syngenetic VMS occurrences exist east of the Wood River Fault in the Sheep Creek synform which exposes several members of the Totalanika Schist. Dry Creek/Red Mountain has a 5000

foot long drill tested ore zone with high-grade zones up to 40 feet thick of 10% combined lead, zinc, and silver. An inferred resource of 3.2 million tons of 4.4 % zinc, 1.9 % lead, 0.2 % copper, 103.2 grams of silver per tonne (gpt) and 0.6 gpt gold has been calculated for the DC North horizon. To the north of Red Mountain, the WTF occurrence has stratiform massive sulfides up to 20 meters thick with massive sulfide lenses 0.3 to 2 meters thick. It has an inferred resource of 3.09 Mt grading 6.0% zinc, 2.5% lead, 0.1% copper, 196.5 gpt silver, and 1.0 gpt gold. Galleon (SMOG), Glacier Creek and Rerun have been explored to a lesser extent, but they also contain highly anomalous Zn, Pb, Cu, Ag and Au. Further exploration and drilling in this area is highly recommended to follow and further define this cluster of VMS occurrences.

Other known VMS deposits in the Bonnifield District include Anderson Mountain and Virginia Creek which are hosted in the Wood River Assemblage 25 kilometers southwest of the Sheep Creek synform. At Anderson Mountain, geophysical and geochemical surveys have defined a potential zone of volcanogenic massive sulfide mineralization stretching over a strike length of 1373 meters. There has been about 2500 meters of drilling on this prospect. The Virginia Creek prospect is also hosted in the Wood River Assemblage. In historical accounts of exploration on these prospects, the host rocks are described as part of the Totalanika Schist and recent age dating brackets the age of both the Wood River Assemblage and the Totalanika Schist as 355-375 Ma. It is very likely that other undiscovered VMS targets exist in the Bonnifield District.

Bonnifield Gold Trend

The Bonnifield District hosts one well explored gold system at Liberty Bell and a number of virtually unexplored gold-bearing prospects that are spatially and likely genetically related to Cretaceous dikes and plutons common throughout the district. Proximity to intrusions and the existence of a receptive host rock affect the geometry, grade and abundance of these occurrences. A portion of the upper Totalanika Schist, described as a black carbonaceous schist unit, is host to many of the higher gold grades found in this area. Numerous gold placer mines (many of which are currently in operation) exist throughout the Bonnifield district and appear in notable abundance west of the Wood River Fault, within the Healy Schist and Tertiary sediments overlying the Healy Schist from the Keevy Peak Formation and Totalanika Schist.

The best known mid-Cretaceous gold deposit in this district is the Liberty Bell deposit which is located at the western edge of the Bonnifield District within the lower portion of the Totalanika Schist. Gold mineralization here is thought to be the product of hydrothermal alteration resulting from an adjacent 92 Ma granitic porphyry intrusion. Mining at Liberty Bell in the 1930's produced 8,400 ounces of gold from 17,500 tons of ore (0.48 opt, 16.45 gpt recovered grade). Since this time, extensive exploration and drilling has defined five targets within the property and the Mine Zone has been determined to have a mineable resource of 1,240,000 tons with an average grade of 3.4 gpt gold. Two other gold deposits currently being explored east of the Wood River Fault occur at Kansas Creek and Glory Creek. Mineralization in both of these as-yet undrilled prospects is related to the nearby Cretaceous (92-93 Ma) Buchanan Creek granodiorite and is localized along thrust and high angle strike-slip faults. Both of these prospects lie on the south dipping limb of a large scale east-west trending antiform cored by pelitic rocks of the Healy Schist. Historic maps from the 1970s suggest the mineralization at Kansas Creek and Glory Creek are hosted within the Healy Schist and/or the same unit of the Totalanika Schist that hosts the Liberty Bell Mine, however recent mapping by the State of Alaska suggests the Keevy Peak Formation may be the preferred host at these two prospects. The numerous gold placer mines downstream of, and along the length of the Bonnifield Gold trend between Liberty Bell and the Kansas and

Glory Creek prospects suggests this 75 kilometer stretch of the trend hosts as-yet undiscovered lode gold occurrences. Although small claim holdings exist at a few prospects within the Bonnifield Gold Trend, much of the prospective ground along the trend remains virtually unexplored and open to mineral location.

While it is understood that Cretaceous intrusive activity has fostered epigenetic gold deposits in the Bonnifield, little work has been done to study the intrusive bodies themselves. They are prospective as a host for gold mineralization, much like the +10 Moz Fort Knox pluton of the same age in the Fairbanks District. The numerous placer gold deposits and regional stream sediment gold anomalies in and around these plutonic bodies suggest that the intrusive rocks in the district may also host disseminated precious metal mineralization.

West Fork Area

Additional precious and base metal prospects exist in the southeastern Bonnifield District to the south of the Healy Schist antiform on the northwest dipping limb of an isoclinal syncline. This distinctly different area of mineralization is bound to the north by the West Fork Fault and to the south by the Hines Creek Fault. Rocks here are described as the Wood River Assemblage, though are likely correlated to the Totatlanika Schist. Deposits in this area display some VMS characteristics, but differ from the VMS deposits found elsewhere in the district due to their higher Au content as well as elevated Sb, W, and Hg values. They are hosted in carbonate-bearing metamorphic rocks. There are four known occurrences along a line parallel to the West Fork Fault: Cirque, High Face, Al's and West Fork. Drilling on Cirque in 1999 intersected 5.2 meters grading 2.8 gpt gold, 74.4 gpt silver and 11.55% combined zinc-lead-copper, and a second lens intersecting 1.9 meters grading 0.9 gpt gold, 48.0 gpt silver and 11.49% combined zinc-lead-copper. West Fork was also drilled in 1999 though results for this drilling are not available. Surface samples from the massive sulfide horizon at West Fork are reported to contain 3.68% lead, 4.05% zinc, 131 gpt silver, and 0.38 gpt gold. High Face and Al's were explored in the 1970's and 1980's, but no public data are available. Further exploration in this area is needed to determine the relationship between the individual prospects and to look beyond them along strike for other similar deposits.

Additional exploration of the Bonnifield District is warranted with emphasis on phased, success dependent reconnaissance-scale stream sediment and pan concentrate sampling, geologic mapping, geochemical sampling and exploration-scale diamond core drilling. Avalon has generated a complete GIS-database of the Bonnifield District and has prepared a detailed geological report summarizing its findings. These data can be made available to interested clients.

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