# Selwyn basin gold occurrences: Preliminary observations from the Golden Culvert, Plateau South, 3Aces, and Hyland properties


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YUKON GEOLOGICAL SURVEY

## Introduction

The Selwyn basin area is well known as a SEDEX district (Goodfellow *et al.*, 2007), and hosts several world class tungsten skarn deposits (Dick and Hodgson, 1982) and reduced intrusion-related gold deposits (Hart *et al.*, 2004). Recently, mineral exploration has started to focus on gold, and in particular, gold without a clear magmatic association.

In the summer of 2016, Yukon Geological Survey staff visited four gold properties in the Selwyn basin area. Recognizing the need for a regional understanding of possible non-magmatic gold occurrences, field observations will be combined with petrography and age dating of hydrothermal minerals to provide initial constraints on the timing and style of gold mineralization.

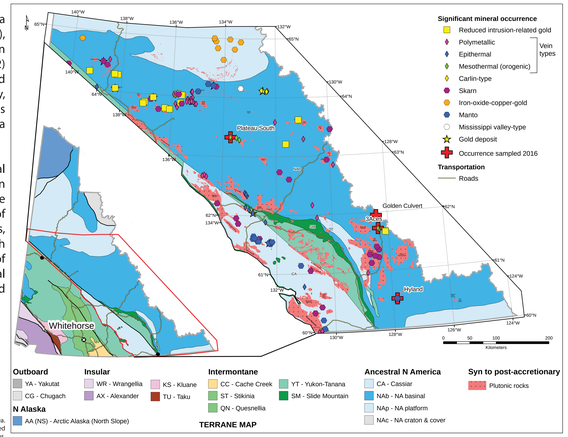



Figure 1: Significant mineral occurrences in the Selwyn basin area. Location of occurrences visited during this study are indicated by red crosses.

## Golden Culvert property

Originally staked by prospectors Bob Scott and Gary Lee in 2005, the Golden Culvert property is located approximately 25 km north of Golden Predator's 3Aces property along the Nahanni Range Road. The property was optioned to Hinterland Resources Inc. in 2010 who later performed soil sampling on the property in 2011 while operating as Stakeholder Resources. Ownership of the property was returned to Bob Scott and Gary Lee in 2011. Work performed on the property to date includes blast trenching, soil, silt and rock geochemical surveys, and VLF and magnetic ground geophysical surveys. A brief one day visit to the property by YGS personnel in July 2016 produced a schematic map of the blasted outcrop area (Figure 3).

Gold mineralization on the property is hosted in white, 1 cm to 2 m wide, arsenopyrite + quartz veins. Though current outcrop exposure on the property is limited, soil geochemical anomalies extend from exposed mineralization several km along strike (Figure 1). Golden Culvert highlights the gold exploration potential in the Selwyn basin area. Samples submitted for Ar dating of vein-hosted sericite and regional metamorphic muscovite will hopefully provide preliminary time constraints on mineralization and regional metamorphism.

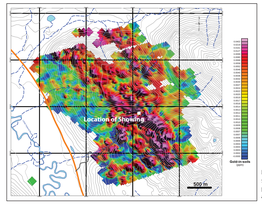



Figure 2: Countoured gold-in-soil plot for surveys conducted over the Golden Culvert property. Note SE-NW strike of soil anomalies extending for several kilometres.

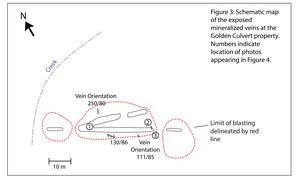



Figure 3: Schematic map of the exposed mineralized veins at the Golden Culvert property. Numbers indicate location of photos appearing in Figure 4.




Figure 4: Examples of exposed mineralization in outcrop at Golden Culvert with numbers reflecting position on map in Figure 3: (1) blasted exposure of the main gold bearing vein, (2) smaller scale view of the hailline, anastomosing aspy + qtz veins proximal to metre scale mineralized veins, (3) cross section view emphasizing the subvertical orientation of mineralized veins.

## Plateau South property

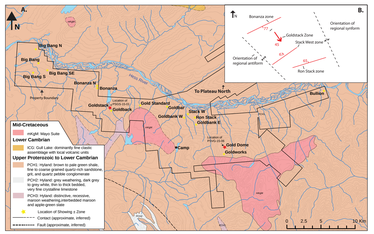



Figure 5: A) Geology of Plateau property and geographic extent of showings. Zones with drillholes observed as part of this study indicated in red. B) Orientations of mineralized structures compared to regional deformation after Roots (2003).

Located along the Hess River within Hyland Group sedimentary rocks and proximal to mid-Cretaceous Mayo suite intrusions, the Plateau South property comprises multiple gold bearing zones over a 50 km long trend. Two mineralization styles have been identified within this trend; 1) discrete quartz vein-hosted Au±Pb mineralization commonly with visible gold e.g. Gold Dome zone, and 2) quartz cemented breccia-hosted Au±Pb mineralization with disseminated gold e.g. Goldstack zone (Figure 5).

### Discrete vein showings

Mineralization across the Plateau property is similar and characterized by discrete, massive 1 cm to 2 m wide, white quartz veins striking southwest and dipping steeply northwest. The sulphide assemblage is arsenopyrite, galena and minor pyrite (Figure 9). Visible gold is common.

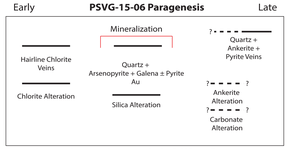



Figure 9: A proposed paragenetic sequence for the Gold Dome Zone.



Figure 7: Mineralized vein from the Ron Stack showing demonstrates the discrete, massive nature of gold bearing veins across the property.

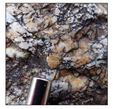


Figure 8: Example of visible gold from the Bonanza showing.

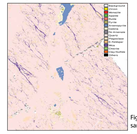


Figure 10) QEMSCAN mineral map of a sample from the Ron Stack zone.

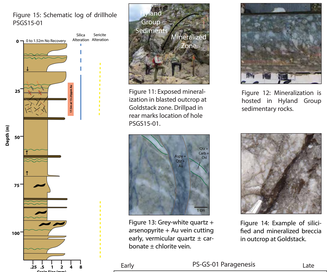



Figure 16: Proposed paragenetic sequence for the Goldstack zone.

### Goldstack zone

Gold mineralization at the Goldstack zone is hosted in a network of stockwork veins and quartz cemented breccia. Distinguishing features of Goldstack include mineralization in hairline to 5 cm wide, grey quartz + arsenopyrite + Au ± pyrite veins and breccia hosted mineralization with disseminated, fine-grained arsenopyrite and free gold in the silicified matrix of brecciated sedimentary host rocks. Mineralized body trends to the southeast plunging approximately 45°




Figure 15: Schematic log of drillhole PSGS15-01



Figure 11: Exposed mineralization in blasted outcrop at Goldstack zone. Drillpad in near marks location of hole PSGS15-01.



Figure 12: Mineralization is hosted in Hyland Group sedimentary rocks.



Figure 13: Grey-white quartz + arsenopyrite + Au vein cutting early, vermicular quartz ± carbonate ± chlorite vein.



Figure 14: Example of silicified and mineralized breccia in outcrop at Goldstack.

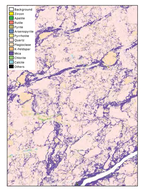



Figure 17: QEMSCAN mineral map of a sample from the Goldstack zone.

## 3Aces property

The 3Aces property is located just west of the Nahanni Range Road approximately 240 km north of Watson Lake. The property had seen discontinuous work since the late 1980s with several strong Au ± As soil anomalies discovered and drilled. When prospector Alex McMillan discovered visible gold at the Ace of Hearts in 2009, exploration successfully focused on quartz-vein hosted gold. Work to date includes nearly 12 000 m drilling, airborne and ground geophysics, stream and soil sampling, geological mapping, and prospecting.

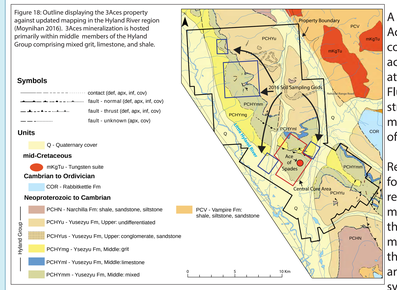



Figure 18: Outline displaying the 3Aces property against updated mapping in the Hyland River region (Moynihan 2016). 3Aces mineralization is hosted primarily within middle members of the Hyland Group comprising mixed grit, limestone, and shale.

A MSc study completed in 2014 focused on Ace of Hearts zone mineralization and concluded that low salinity, $CO_2$-rich, and acidic mineralizing fluids precipitated gold at approximately 300 °C (Whelan, 2014). Fluid inclusion, isotopic, petrographic, and structural evidence suggests that mineralization on the property is the result of regional orogenesis and metamorphism.

Recent exploration work on the property has focused on the Ace of Spades vein where a recent 700 ton bulk sample of blasted material created a longitudinal exposure of the vein (Figure 19). The vein cuts metasedimentary shale and sandstone of the Yusezyu Formation. Fault surfaces with arsenopyrite lineations suggest synmineralization normal movement on the Ace of Spades vein plunging 47° and trending 090. Later, post-mineralization faults display both sinsitral and dextral senses of motion plunging 17° and trending 180.

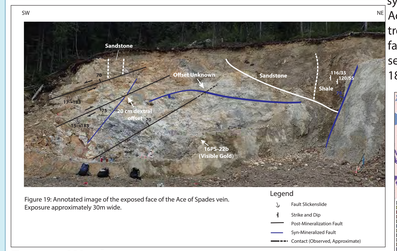



Figure 19: Annotated image of the exposed face of the Ace of Spades vein. Exposure approximately 30m wide.

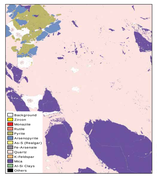



Figure 20: QEMSCAN mineral map of a sample from the Ace of spades zone.

### Future Work

The age of mineralization at 3Aces is poorly constrained. Whelan (2014) reports a lower intercept age of 151 ± 6 Ma for 18 highly discordant U-Pb analyses of hydrothermal monazite. The age of the closest plutons, 10 km to the northeast, is 98.5 Ma. Intrusive activity on the property is restricted to small dikes of unknown age. To constrain the age of mineralization, we are attempting in-situ dating of hydrothermal phosphates from Ace of Spades vein material (sample 16PS-22b in Figure 19 & 20).

## Hyland property

The Hyland property, located in southeast Yukon, is underlain by interbedded quartzite, limestone, and phyllite of the Neoproterozoic to Cambrian Hyland Group (Pigage et al. 2011). Locally, the rocks are folded about a north-trending anticline subparallel to a north-trending structural corridor referred to as the Quartz Lake lineament thought to be the major control on mineralization (Black, 2011). Mineralized samples are typically heavily silicified and brecciated, with carbonate and quartz gangue. Primary mineralization includes pyrite, arsenopyrite, chalcopyrite with minor sphalerite, tetrahedrite, and rare pyrrhotite, bismuthinite and native gold. Gold is associated with pyrite as inclusions or at pyrite-arsenopyrite grain boundaries (Black, 2011). A preliminary U-Pb rutile age of 112 ± 14 Ma overlaps with the age of the Hyland plutonic suite suggesting a possible genetic link.

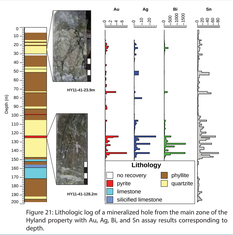



Figure 21: Lithologic log of a mineralized hole from the main zone of the Hyland property with Au, Ag, Bi, and Sn assay results corresponding to depth.

## Summary


Both previous work and preliminary investigations into the controls and metallic signatures of mineralization at the Hyland property support it having a magmatic mineralizing source. Our new mineralization age of 112 ± 14 Ma, similar to the age range of the Hyland plutonic suite suggests a possible genetic link. In contrast, work performed at the 3Aces property in the summer of 2016 supports previous conclusions that its mineralization is non-magmatic. The Golden Culvert occurrence 25 km to the north of 3Aces with has similar arsenopyrite and gold bearing veins and is also thought to be non-magmatic. There are two distinct styles of mineralization at the Plateau property though their geneses remain ambiguous. Discrete veins at Plateau South are visually similar to those at 3Aces and Golden Culvert suggesting a similar origin for all three. Mineralization at the Goldstack zone is brecciated and oriented differently possibly indicating a separate origin.

Preliminary petrography and quantitative mineral mapping (QEMSCAN) of mineralized samples from each property suggests that dating of either vein-hosted sericite or hydrothermal phosphates will be possible. In addition to dating mineralization, samples have also been selected from Hyland Group rocks distal to mineralization for regional muscovite dating to provide context for dates from Plateau and Golden Culvert. Preliminary results from these investigations are expected to be available by early 2017.


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