CONTROLS ON GOLD DISTRIBUTION AT THE HORNE 5 VMS DEPOSIT, ABITIBI GREENSTONE BELT, QUÉBEC

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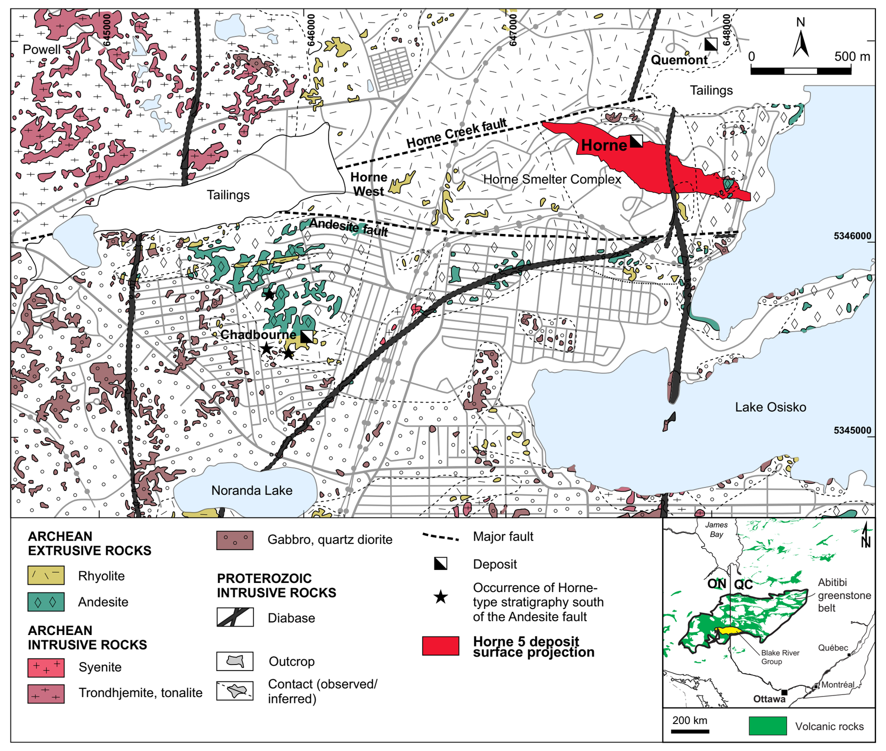


Figure 1. Geological map of the Horne Block and its surroundings within the Blake River Group (modified from Monecke et al., 2008). Surface projection of the Horne 5 deposit is shown in red between the Horne Creek and Andesite faults. Inset shows location of Blake River Group in the Abitibi greenstone belt.

INTRODUCTION

The Horne volcanogenic massive sulfide (VMS) complex is located in the Blake River Group (2704-2695 Ma) of the Abitibi greenstone belt (Fig. 1). With a total of 327.6 t Au extracted mainly from the Upper H and Lower H zones during its mine life, the Horne deposit is the world's largest gold-rich VMS. Current resources (measured, indicated and inferred) of the unexploited Horne 5 deposit, located down-plunge of the H orebodies (Fig. 2), amount to 113.4 Mt grading at 1.54 g/t Au (174.6 t Au).

The Horne 5 deposit is hosted within steeply-dipping, north-facing felsic volcaniclastic units of the Horne Block, which is bounded by the Horne Creek and Andesite faults (Fig. 1). Mineralization consists of a series of massive to semi-massive, Au-Ag-Cu-Zn-bearing (Fig. 3) sulfide lenses alternating with disseminated and stringer sulfides in coarse felsic volcaniclastic units (Fig. 4). The latter often contain massive sulfide clasts. Results from this study show: 1) alteration in the mineralized zones is of moderate intensity and consists of pervasive sericite ± quartz; 2) a well-developed foliation is present throughout most of the mineralized zone and is particularly prominent in sericitized zones; 3) sphalerite is associated with massive to disseminated pyrite, whereas chalcopyrite is locally remobilized in secondary sites within the mineralized intervals; 4) gold distribution is relatively variable, but higher gold contents are generally present in the massive to semi-massive sulfide intervals; and 5) less permeable strata within the host volcaniclastic units most likely influenced the distribution of the mineralization interpreted to have formed mostly by sub-seafloor replacement. The Horne 5 deposit represents an opportunity to better understand ore-forming processes in large Archean synvolcanic gold systems.

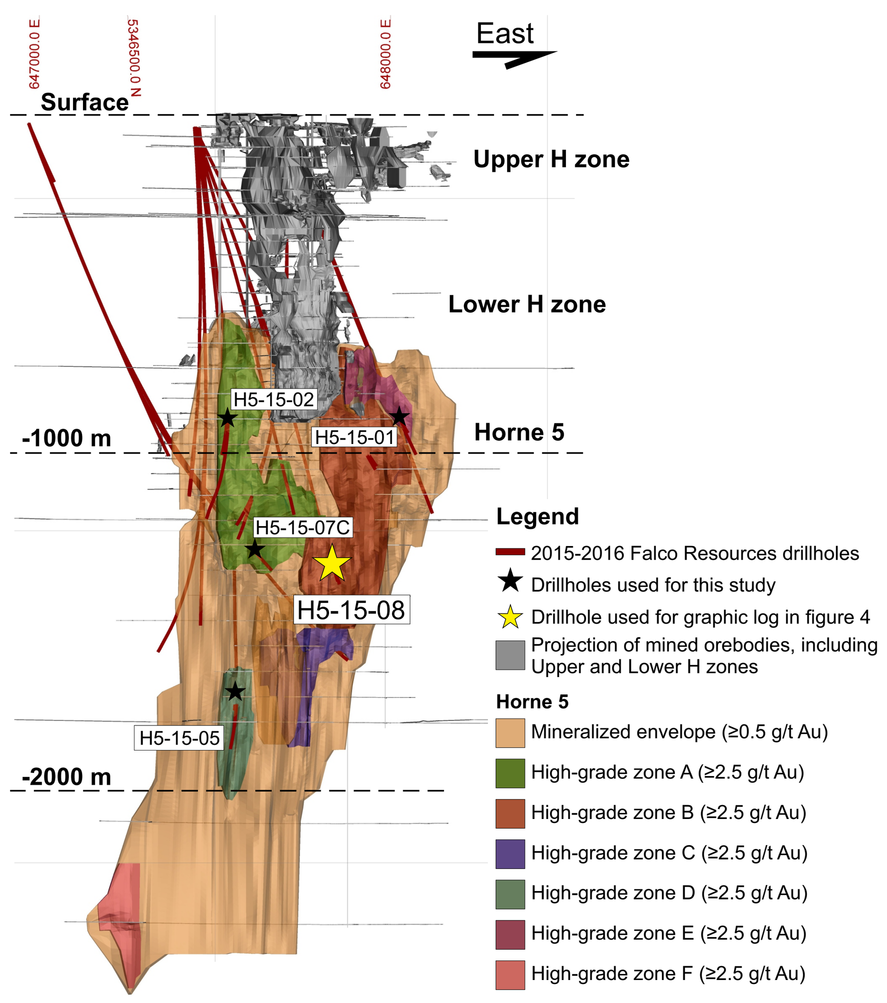


Figure 2. 3D model of the Horne 5 deposit, showing the low-grade mineralized envelope (0.5 g/t Au cut-off), high-grade gold zones (2.5 g/t Au cut-off), as well as workings of the historic Horne mine (model generated by InnovExplo for Falco Resources, 2016). Five new drillholes (DDH) belonging to Falco Resources were used to prepare detailed core logs during the summer of 2016 (see Fig. 4).

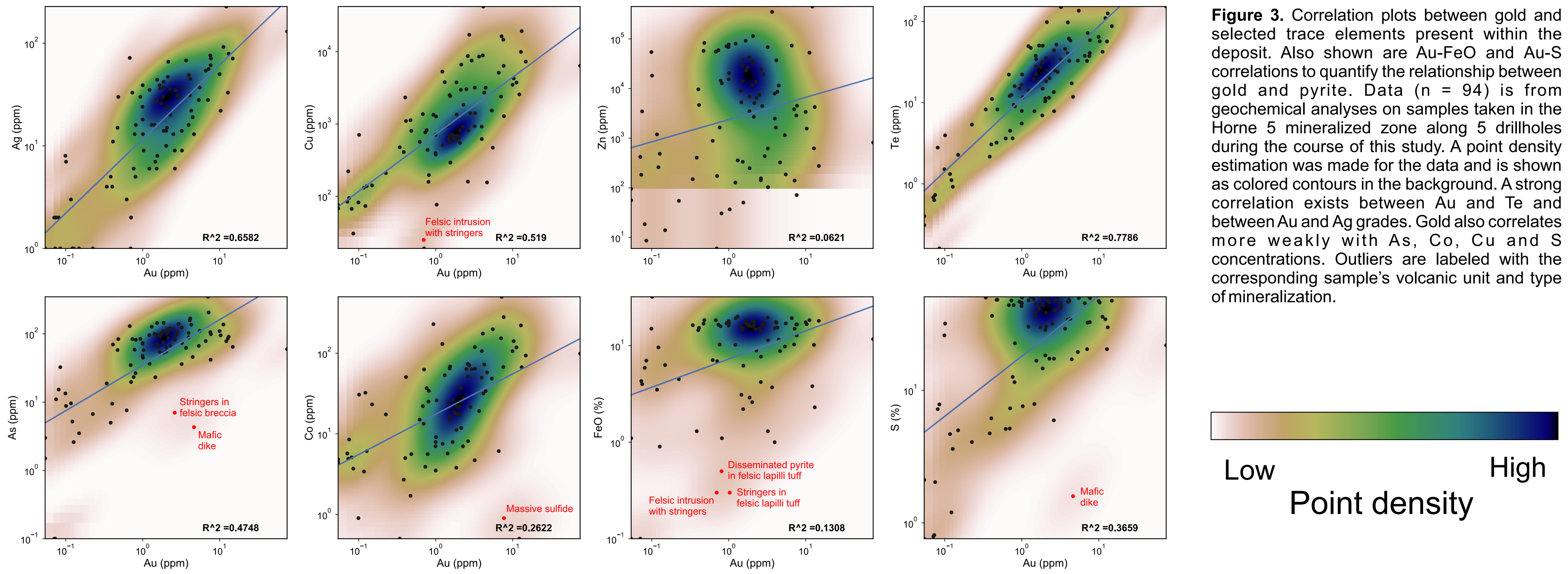
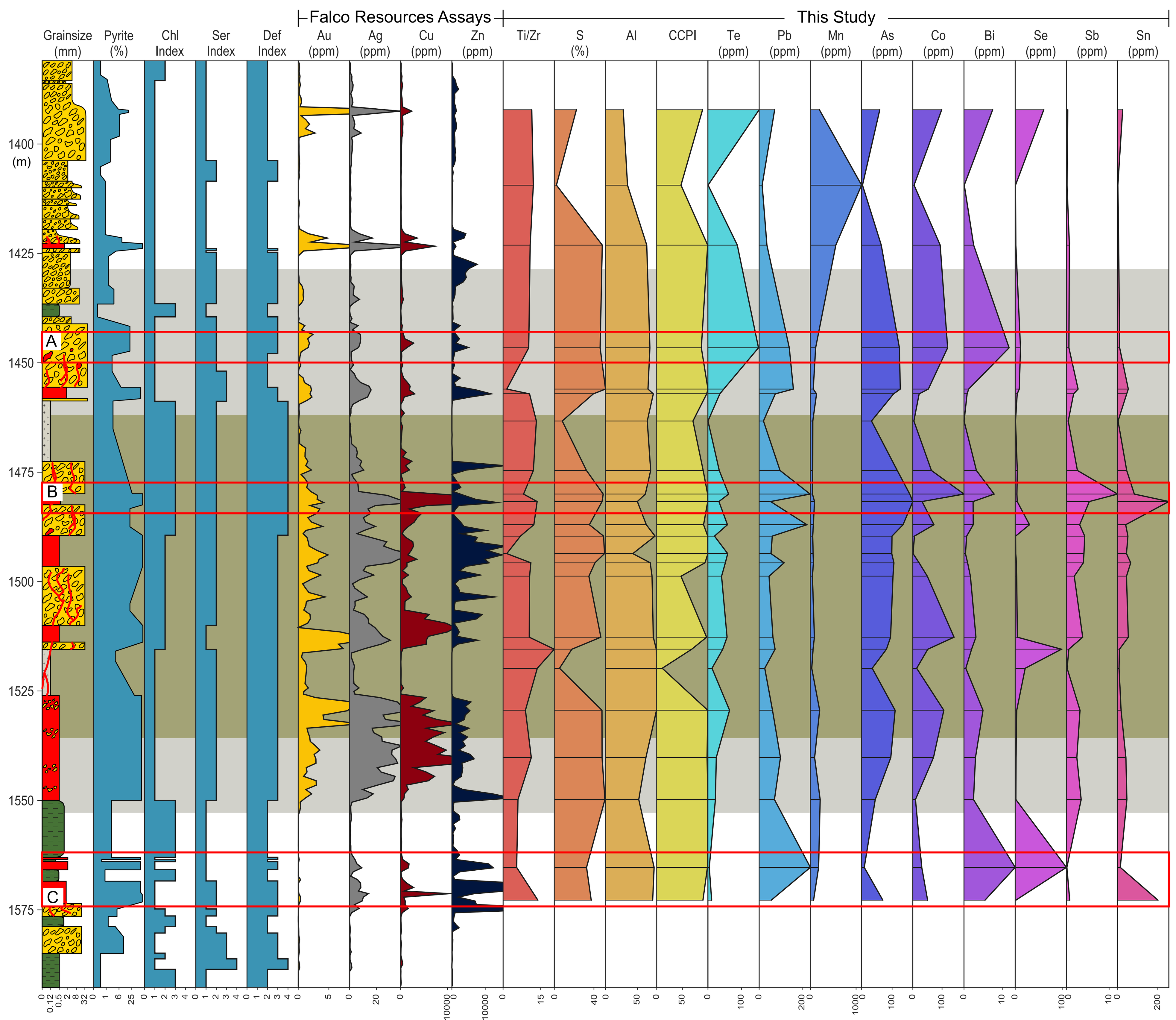


Figure 3. Correlation plots between gold and selected trace elements present within the deposit. Also shown are Au-FeO and Au-S correlations to quantify the relationship between gold and pyrite. Data (n = 94) is from geochemical analyses on samples taken in the Horne 5 mineralized zone along 5 drillholes during the course of this study. A point density estimation was made for the data and is shown as colored contours in the background. A strong correlation exists between Au and Te and between Au and Ag grades. Gold also correlates more weakly with As, Co, Cu and S concentrations. Outliers are labeled with the corresponding sample's volcanic unit and type of mineralization.



Legend

- Felsic volcaniclastics (lapilli tuffs to breccia)
- Felsic tuffs
- Coherent felsic rocks (intrusions?)
- Mafic dikes
- Massive sulfides
- Semi-massive sulfides
- Stringer + disseminated sulfides
- Massive sulfide fragments
- Gold envelope A (≥0.5 g/t Au)
- High-grade zone B (≥2.5 g/t Au)

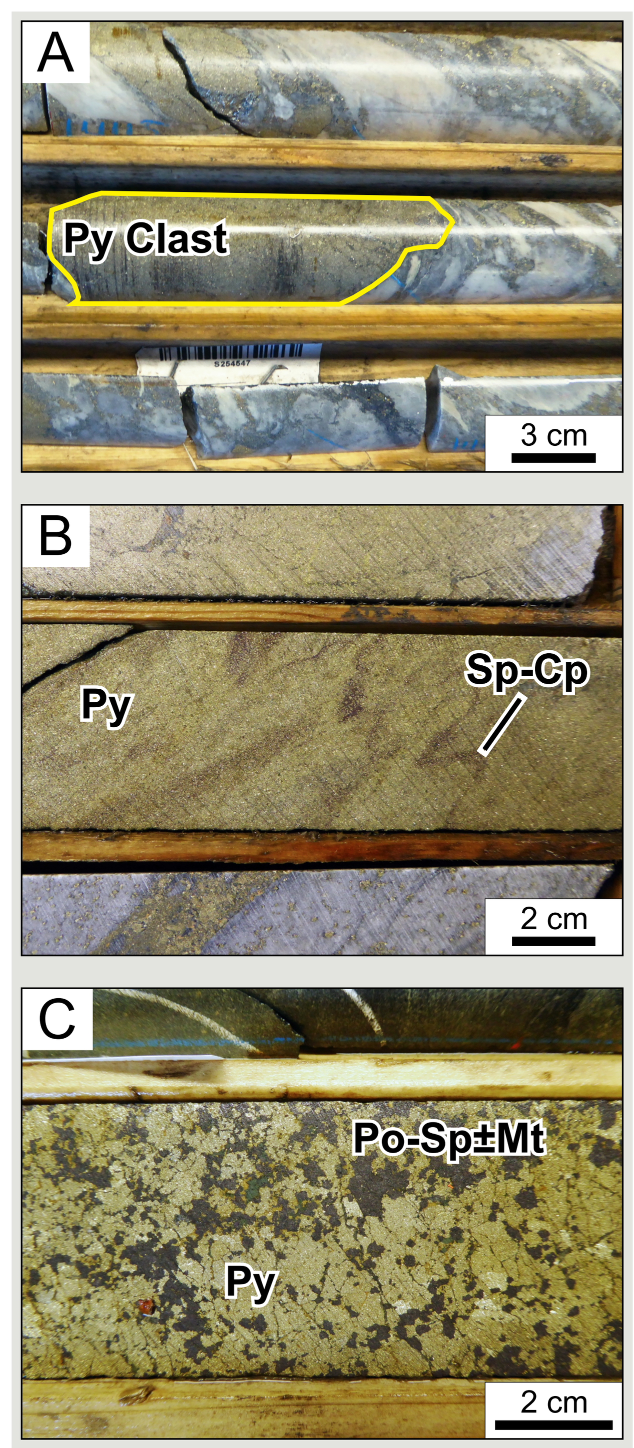
Sericite alteration intensity (visual index)
1. Non existent to weak and local
2. Weak but pervasive
3. Well developed and dominant
4. Intense, texturally destructive

Chlorite alteration intensity (visual index)
1. Weak and local (planes, fractures, diss.)
2. Patchy or pervasive along veinlets
3. Well developed and dominant
4. Chlorite schist to massive chlorite

Deformation intensity (visual index)
1. No fabric
2. Weakly developed penetrative planar fabric
3. Well developed penetrative planar fabric
4. Intensely developed planar fabric
5. Schist

Figure 4. Geochemical profile through the mineralized zone of DDH H5-15-08 with accompanying stratigraphic section and style of mineralization. Downhole plots display abundance of pyrite, intensity of chlorite and sericite alteration, intensity of deformation, gold, silver, copper and zinc assays (analyses from Falco Resources), alteration indices (Ishikawa Index, Chlorite-Carbonate-Pyrite Index and Advanced Argillic Index), and a selection of trace elements analyzed from samples collected during this study. Ti/Zr ratios indicate that the host volcaniclastic units to the Horne 5 mineralized zone are of felsic composition (rhyolite to rhyodacite). Background zones correspond to the extent of the low-grade gold envelope and high-grade gold zone B along this core. The visual index represents a series of criteria used to estimate the intensity of alteration and deformation during fieldwork. Numbered red rectangles refer to adjoining photos A, B, and C.

Core Photos



A) Massive pyrite clast (Py clast) within felsic lapilli tuff unit in the Horne 5 mineralized zone at 1446.5 m (red rectangle A in geochemical profile). This sample contains anomalous grades of Au, Ag, Cu, Zn, Te, Pb, As, Co and Bi. **B)** Massive sulfide at 1480 m (red rectangle B) composed of pyrite (Py) with fine bands of sphalerite (Sp) and chalcopyrite (Cp). The sample is characterized by anomalous values of base metals, Te, Pb, As, Co, Bi, Sb, and Sn. **C)** Coarse-grained massive sulfide at 1560 m (red rectangle C) composed of pyrite (Py), pyrrhotite (Po) and sphalerite (Sp) ± magnetite (Mt). Intrusion of surrounding mafic dikes and accompanying contact metamorphism was likely responsible for recrystallization of sulfides, formation of pyrrhotite, and gold remobilization.

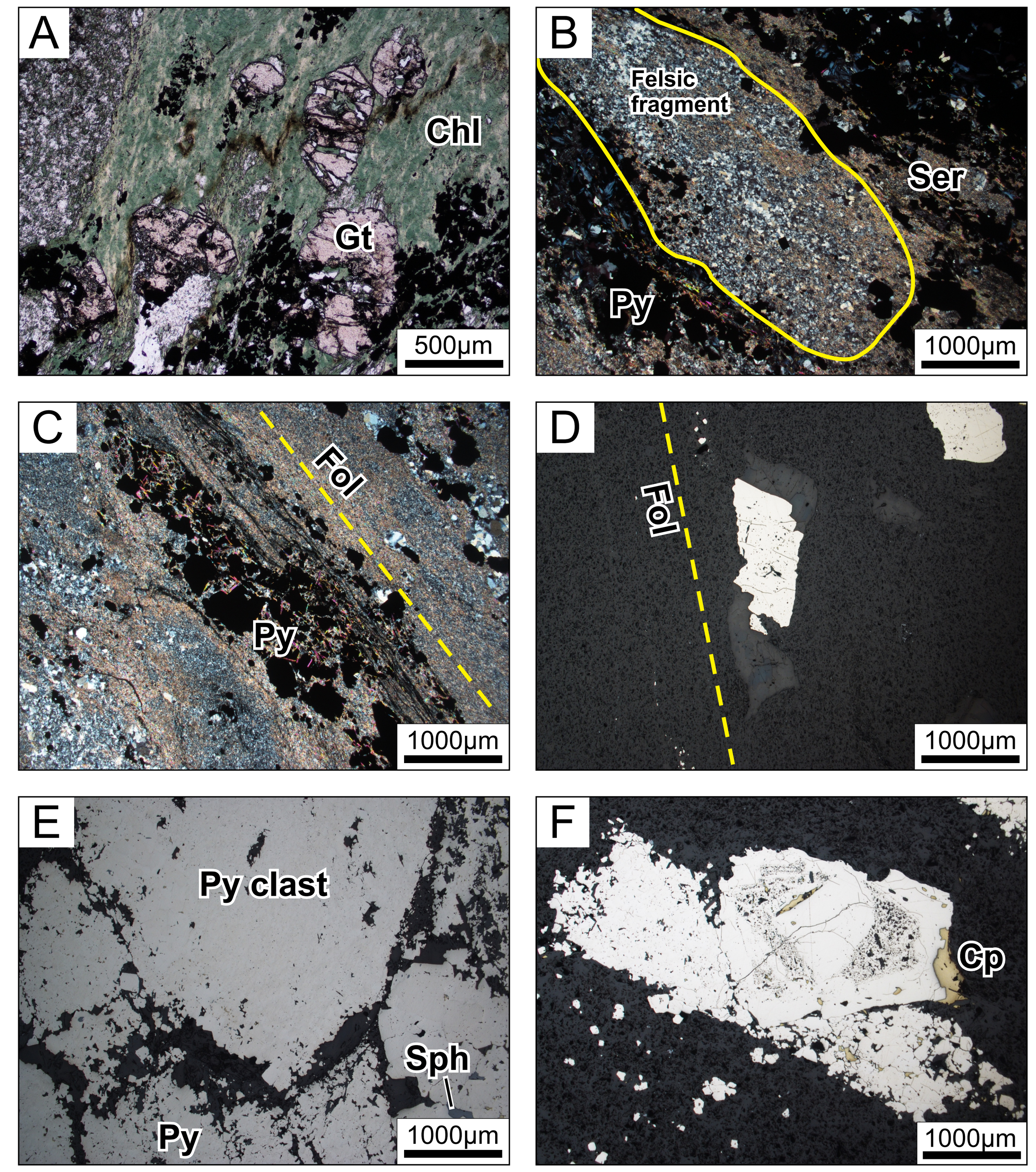


Figure 5. A) Mn-bearing pink garnets (Gt) in chlorite-rich (Chl) matrix of felsic volcaniclastic unit found in the hangingwall of the Horne 5 deposit in several studied drillholes (DDH H5-15-05). **B)** Felsic fragment in lapilli tuff unit found in the mineralized zone, composed of a finely recrystallized quartz groundmass with margins partially altered to sericite (Ser) and pyrite (Py). Surrounding sericite-rich matrix is strongly foliated (DDH H5-15-07C). **C)** Stringer of cataclastic pyrite (Py) parallel to the main foliation (Fol), as defined by the alignment of sericite in the matrix of a lapilli tuff (DDH H5-15-07C). **D)** Pyrite grain elongated along the main foliation (Fol; weak shearing?), featuring an inclusion-rich core and recrystallized borders. Coarse quartz pressure shadows are also present (DDH H5-15-07C). **E)** Finely recrystallized pyrite clast (Py Clast) within massive sulfide interval in DDH H5-15-08. The clast is clearly distinguished from the surrounding replacement-type pyrite (Py) and sphalerite (Sp). **F)** Zoned pyrite grain within massive sulphide interval featuring a ring of inclusions and recrystallized core and borders (DDH H5-15-01). Chalcopyrite (Cp) is remobilized between pyrite grains and along their margins.

Conclusions

Controls on gold distribution at the Horne 5 deposit are as follows:

- Gold distribution generally follows sulfide mineralization, since there exists a good correlation between gold and pyrite abundance and base metals;
- Mineralization is concentrated within units of high permeability to hydrothermal fluids (felsic tuff breccia to felsic breccia) capped by felsic synvolcanic intrusions and fine-grained tuffs (low permeability);
- Gold values decrease down-hole in most studied mineralized intervals, whereas Ag, Cu and Zn values do not change significantly. It remains unclear if this relationship is indicative of "zone refining" processes or if it is associated with deformation-induced gold remobilization. In DDH H5-15-08, the intrusion of mafic dikes at 1560 m likely liberated gold during recrystallization of sulfides;
- Deformation and metamorphism have affected the deposit to variable degrees, as evidenced by the moderately to well-developed foliation (stronger in sericite-rich zones), flattened felsic fragments and sulfide clasts, completely to partially recrystallized pyrite with occasional cataclastic textures, remobilized sphalerite and chalcopyrite, and formation of chlorite, epidote and Mn-bearing garnets. Their effect on gold distribution likely involves a remobilization of gold on a local scale.

Ongoing work aims at documenting the precise nature of the gold mineralization and alteration. This will include laser-ablation inductively-coupled plasma mass spectrometry analysis and scanning electron microscopy of sulfide phases, microprobe analysis of alteration phases, 3-D modeling of metal distribution and alteration, and geochronological analysis.

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