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To: David Beilhartz, P.Geo (on behalf of Trelawney Mining and Exploration Inc.)
Subject: Gold-bearing hydrothermal breccias SW of Chester 2 Gold Trend

1. Summary

Examinations of drill core from a zone that is SW of the Chester 2 Gold Trend confirm the current hypothesis that it is a hydrothermal breccia in an intermediate composition diorite intrusion, and appropriately described as a *mill-rock breccia* by Jay Jackson. A weak scattering of disseminated sulphides (mostly pyrite, with micro-veinlets of pyrite, chalcopyrite and rare molybdenite) are dispersed throughout the brecciated mass, and low-grade gold values (including spectacular visible free gold) are pervasive over extensive drilling widths.

Gold mineralization appears to be part of a broad weak sulphidizing hydrothermal system that lacks much in the way of *mesothermal-type silica flooding* - only minor quartz and calcite veinlets are present, and alteration is more akin to a propylitic¹ "porphyry-type" setting. In short, the alteration assemblage is distinctive when compared with adjacent mesothermal mineralization types seen on other parts of Trelawney's Chester Property.

Because the mineralization is in a *wide zone of mill-rock breccia*, this appears to suggest that the initial depositional depth was not too great (an epizonal depth, above the brittle-ductile tectonic transition in the continental crust). Mesothermal gold ores are typically deposited in the brittle-ductile transition or "mesozonal part" of the continental crust and are associated with common shears. The alteration package is of a propylitic or "porphyry" type also establishing a depositional depth with less pressure confinement than that seen in typical mesothermal gold deposits. Because of these factors, the mineralized zone has the potential to be very large.

2. Brief Summary of Drill Core Examination

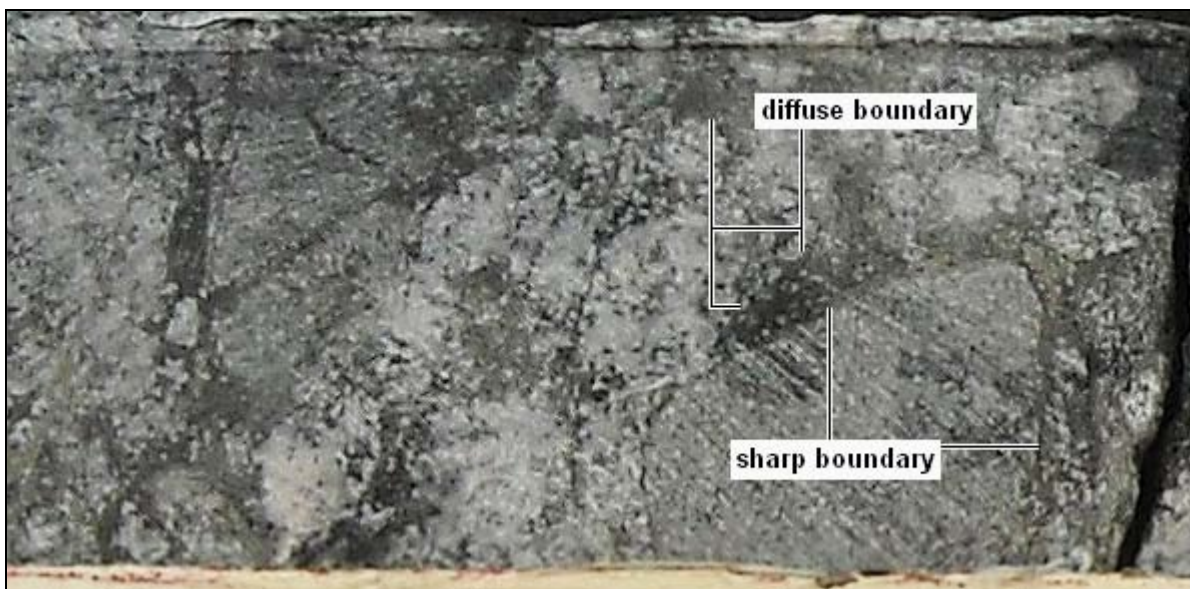
The most common alteration mineral in the drill core is chlorite. Because of its ductile nature, strongly chloritized zones may be sheared. However, stiffer fragments in the breccia matrix show no such shearing and variable degrees of alteration. Both *sharp and etched boundaries* on various breccia fragments establish that the passage of hydrothermal pulses was prolonged,

¹ *Propylitic Alteration* is typically an epidote-chlorite-pyrite alteration, often with hematite ± magnetite alteration mineral assemblages. *Albite-epidote Alteration* is caused by silica-bearing fluids rich in Na and Ca, resulting in a weak albite-silica-epidote assemblages. *Potassic Alteration* can result in the production of micaceous, potassic minerals such as biotite in iron-rich rocks, muscovite or sericite in felsic to intermediate rocks, and orthoclase (adularia) alteration, often pervasive enough to produce a weak salmon-pink alteration.

although a later weak dynamic metamorphic overprint and/or very weak hornfelsing may be present (thin sections are required for a proper detailed analysis). The lack of extensive silica flooding and carbonate (calcite-ankerite) establishes that the alteration package is not typical mesothermal. Possible salmon coloured albite might be present in some breccia fragments, but a weak potassic alteration may also be present in some fragments (K-feldspar and sericite). A variable small quantity of hematite is fairly common in some pieces but is not very extensive - magnitudes less than that seen in IOCG alteration breccia assemblages, for instance.² In the present case, the brecciated zone was used to deposit metal *on the reducing side of a redox boundary* in the hydrothermal system.

The primary rock type was an Archean intermediate composition fine to medium grained massive diorite. Under the hand lens, leucoxene is seen to have completely replaced primary ilmenite.³ The presence of uniformly dispersed leucoxene is one of the features that establishes that the original pre-breccia rock unit was a simple (possibly I-type) intrusion.⁴

Figure 1 - Both sharp and diffuse margins on fragments in the mill-rock diorite breccia that hosts gold, Trelawney Chester Property - full core width (up-down page) is shown.



² Alteration in IOCG deposits is a common mixture of sodic-calcic (albite + epidote) to potassic (commonly K-feldspar). Deeper alteration assemblages may be albite-magnetite dominant trending toward silica-K-feldspar-sericite in the upper portions. The distinctive gangue of IOCG deposits is an iron oxide mineral, usually hematite, but also magnetite may be present along with pyrite, subordinate pyrrhotite and other base metal sulphides. Other alteration includes actinolite, pyroxene, tourmaline, epidote and chlorite, along with apatite, allanite and occasional carbonate-barite assemblages. Fluid inclusions in IOCG systems commonly show a mixture of magmatic, metamorphic and meteoric waters. In short, IOCG deposits are formed at a high crustal level, as epizonal hydrothermal systems *on the oxidizing side* of a metal-precipitating *redox* boundary.

³ The reaction is probably $\text{FeTiO}_3 + 2\text{H}^+ \rightarrow \text{TiO}_2 + \text{Fe}^{2+} + \text{H}_2\text{O}$ and can even occur in beach-sand heavy mineral deposits. It is usually described as the reaction ilmenite to pseudo-rutile to leucoxene.

⁴ In outcrops near the south track leading to the present Trelawney core shack, the author has seen small gold-bearing quartz veins in thin crenulated phyllites (Te) in a base-dominated turbidite sequence (Ta Te) - the thick grit or greywacke portion (Ta) of the turbidite was previously misidentified as an intrusion. The rock type seen in the current Trelawney drill core is quite unlike that seen at the south track location.

Figure 2 - Diffuse fragment boundary shown by dark chlorite, minor quartz veining and disseminated pyrite in the alteration - two pieces of sliced drill core, full width (up-down page).



Figure 3 - Strong milled texture, extensive chloritization, full core width (up-down page).



Figure 4 - Small mafic dyke cross cutting diorite breccia - half core width (up-down page).



Figure 5 - Distribution of interpreted alteration types (grey scale) - 2 core widths (up-down page).

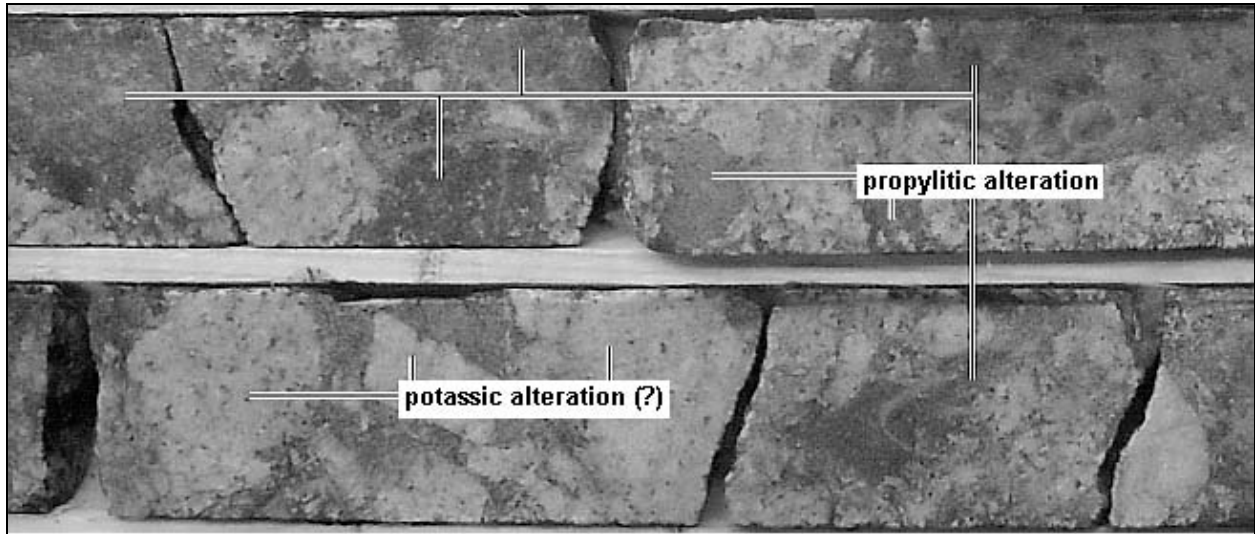


Figure 6 - Free gold in propylitic alteration - half core width (up-down page).



Figure 7 - Quartz shear veins and chalcopyrite from Chester 1 Zone - full core width (up-down page).

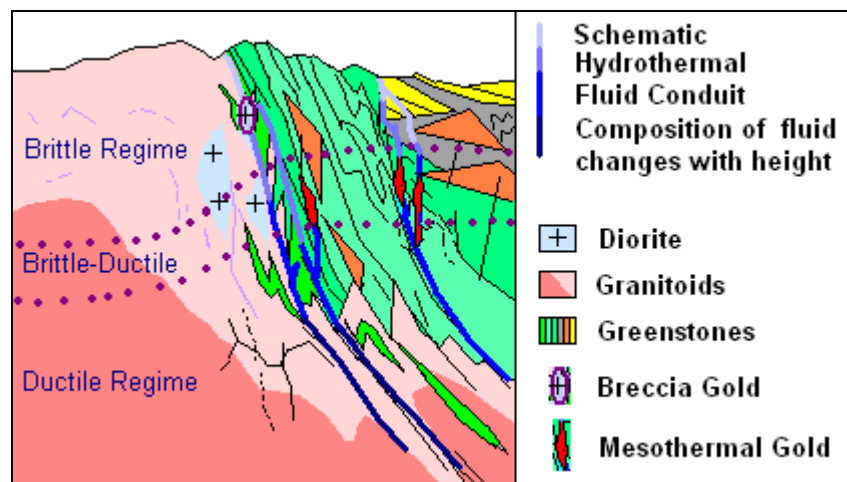


3. Model of Mineralization

The silicate alteration package associated with the low-grade dioritic breccia-hosted gold mineralization on the Trelawney Chester Property appears to be an *epizonal "porphyry" type*

although as noted earlier, a weak dynamic metamorphic or hornfelsing overprint may be present. The hydrothermal fluid responsible was probably "intrusion related," *in the sense of a dewatering pluton-hosting conduit adjacent to an Archean greenstone pile*. It is likely to have been a *remainder fluid* associated with the plutonic pile. The composition of the hydrothermal fluid was such that it created an alteration package that is *porphyry-like* yet appears to be not immediately *associated with an obvious volcanic focus* typically described for common Phanerozoic porphyry systems. An underlying intrusion may be responsible but it is too difficult to tell from the current drill core. The extensive presence of gold in this weakly sulphidized fluid suggests precipitation at a higher crustal level above that experienced in a typical mesothermal system - in a place where hydrothermal fluid composition no longer allowed significant siliceous veining and carbonate precipitation - an uncommon pH-eH and P-T regime for described *greenstone-type* gold mineralization.

Figure 8 - Schematic position of gold deposits - no scale intended.



Archean styles of mineralization generally similar to the mineralization briefly described here have been summarized by Durring, Cassidy and Hagemann (2007)⁵ *edited quote*:

"The Yilgarn Craton hosts three types of Archean granitoid-associated metallogenic systems: **orogenic gold**, **intrusion-related**, and **porphyry systems**. These systems may occur in the same terrane and share many broad characteristics, including *spatial coincidence with granitoids*, gangue silicate mineralogy, metal associations, and local structural controls. Features of Archean orogenic gold systems spatially associated with granitoids include (i) a broad range of granitoid host compositions; (ii) **gold mineralization is mostly late** with respect to Yilgarn-wide, granitoid emplacement, peak metamorphism, and deformation; (iii) orebodies are structurally controlled, and (iv) gold deposition occurs over a large range of temperatures, pressures, and crustal depths (**2 to 15 km**) from a CO₂-rich, low to moderate salinity, reduced ore fluid that was derived from a metamorphic and/or distal magmatic fluid source. These systems do not display deposit-scale vertical or lateral zonation of metals away from granitoid contacts. Host granitoid age, composition, or oxidation state are not important in controlling gold mineralization processes, **whereas structural setting and fluid flux are paramount**. Archean intrusion-related Au-Mo-W and Mo ± Au systems in the Yilgarn Craton are commonly small (< 10 t Au), and are spatially and temporally associated with felsic intrusions emplaced at < 5 to 14 km crustal depths. Orebodies are associated with pervasive alteration in

⁵ Durring, P., Cassidy, K.F. and Hagemann, S.G. (2007): Granitoid-associated orogenic, intrusion-related, and porphyry style metal deposits in the Archean Yilgarn Craton, Western Australia; *Ore Geology Reviews*, v.32, Issues 1-2, pp.157-186.

the granitoid-host and proximal supracrustal countryrock. Where available, fluid inclusion and metal association data indicate the involvement of an aqueous, CO₂-bearing, moderate to high salinity fluid during ore deposition. Archean porphyry Cu–Mo–Au, Cu–Mo, and Cu–Au systems are spatially and temporally associated with volumetrically small, pervasively altered, felsic plutons and dikes surrounded by altered and mineralized supracrustal countryrock. Lateral zonation of metals away from porphyry centers commonly includes a decrease in Cu:Ag and Ag:Cu ratios with distance from the source pluton. Microthermometry studies on fluid inclusions in gold-bearing veins suggest that early ore fluids were high-temperature and high-salinity, *and that mineralization occurred at < 5 km crustal depths*. Exploration for Archean granitoid-associated orogenic gold systems in the Yilgarn Craton lies primarily in identifying mineralized structures in granitoids or adjacent supracrustal rocks and predicting low mean stress areas where ore fluids may concentrate. In contrast, exploration strategies for Archean syn-magmatic systems hinges upon establishing temporal connections between granitoid emplacement and associated mineralization, and testing this relationship in coeval granitoids in the same terrane. Fractionation trends in granitoid composition and ore metal associations, using geochemical indices such as Rb/Sr versus Fe₂O₃/FeO, are demonstrated in Phanerozoic terranes but are presently ill-defined in the Yilgarn Craton. Crustal depth estimation is important in defining areas likely to have preserve shallow-forming, Archean porphyry systems."

Rowins (2000)⁶ argued that reduced Cu-Au porphyry systems that lack significant hematite, magnetite or sulphate (anhydrite) had hydrothermal carbonic fluids saturated with methane (CH₄) and are associated with *ilmenite-bearing* reduced I-type granitoids *possibly* like the host seen in the Trelawney drill core. The gold-bearing diorite breccia may be a variation on the giant Boddington Au-Cu deposit in Western Australia - *at least in its intrusion-related association*, but no other inference is intended. McCuaig *et al* (2001)⁷ argue that, *edited quote*,

"The Boddington deposit is interpreted as a structurally-controlled, intrusion-related Au-Cu deposit formed by two overprinting magmatic-hydrothermal systems, one at *ca.* 2700 Ma, and one at *ca.* 2612 Ma. The bulk of the mineralization appears to be associated with the later event and a K-rich post-tectonic magmatic suite. This class of intrusion-related gold deposits has recently regained attention in younger terranes [...], but this is the first well-documented occurrence of a major Archaean Au-Cu deposit associated with post-tectonic granitoids."

4. Conclusions

The diorite breccia host in the Chester claim package has the potential to have *a very large size (tonnage)*. Sulphide and associated Au-Cu mineralogy also appears to be quite simple. No arsenical minerals were seen in the drill core. Continued drilling to find the extent and probable grade of this Au-Cu system is strongly recommended, because economies of scale could make this (averaged) low-grade material economic. Thin sections should be cut to examine the silicate alteration assemblage and determine any dynamo-metamorphic and/or hornfelsing effects. If possible, outcrops should be cleaned for detailed surface mapping.

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⁶ Rowins, S.M. (2000): Reduced porphyry copper-gold deposits: A new variation on an old theme; *Geology*, v.28, No.6, pp.491-494.

⁷ McCuaig, T.C., Behn, M., Stein, H., Hagemann, S.G., McNaughton, N.J., Cassidy, K.F., Champion, D. and Wyborn, L. (2001): The Boddington gold mine: A new style of Archaean Au-Cu deposit; *Geoscience Australia*, pp.453-455.

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