

Linking Geoscience Research to Orebody Knowledge at the Epizonal Fosterville Gold Deposits

Wessley Edgar¹

¹Agnico Eagle, Bendigo, Australia

The obvious economic value of the Swan Zone which evolved from within the Fosterville Gold Mine after 2015 has forever changed the international perceptions of the gold deposits in Victoria, Australia. More has been said about the mine's spectacular gold by promotional junior explorers and industry Brokers than from the mine itself which set to work mining whilst conducting in-house geoscience research. Now, with a majority of the Swan zone exhausted this orebody knowledge is successfully being applied into exploration and additional mining fronts some 5km north of Swan. A deposit that was discovered, drill-defined then mined all within a decade is Swan a singular Black Swan event or case of lightning striking twice? The deposits are an excellent place to build the knowledge to challenge traditional genesis models for orogenic systems – in an era open to novel gold mechanisms - amorphous silica fluids with colloidal metal species and nano-particle gold.

This presentation updates the geological features and in-mine observations, with research conducted since 2020 including deposit-wide multielement assay (4,495), hyperspectral alteration and detailed underground mapping with +370 samples used for +130 petrographic investigations including SEM, DSIMS, Raman Spectroscopic analyses upon a selected range of mineralization forms, host rocktypes and alteration. Sulfide separates were generated for Fission-Track geobarometry and Re-Os geochronology, plus mica Ar-Ar and SHRIMP Pb-U geochronological analysis.

This integrated data supports the Fosterville genesis model and is discussed relevant to the geological criteria which define the bonanza shear veins and sulfide halo, with some reference to other well-known Epizonal deposits in the Central Victorian goldfields. The key outcome is that lightning doesn't have to strike twice as separate hydrothermal events, but it may require progressively evolving fluids and particular local structural geometries and timing, to form the ideal large-scale versions as illustrated for the Swan shear vein.