

Developing the Geological Model for Sunrise Dam Gold Mine – Insights from Exploration to Mining

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ABSTRACT

Relative to the near-surface environment, underground mineral resource development is restricted to a smaller range of exploration techniques, with data collection dominated by the information that can be extracted from drill core. The capital cost and lead time associated with drill platform development also make early drilling coverage incremental, irregular and less systematic than exploring from surface. These points highlight a significant challenge that geologists face at underground mines; the need to commit to financial and strategic decisions based on limited data. Making use of drillhole information to guide future drilling activities is an essential part of continued exploration success.

The intent of this paper is to describe the process used to generate a three dimensional geological model. The approach was driven by the need to understand the structural architecture at depth to guide target generation and optimise exploration efforts.

The workflow applied included the completion of mine scale interpretations of deposit geology in cross section and flitch, supported by targeted re-logging, to provide a sound foundation for the construction of a representative three dimensional model. Modelling was completed in Leapfrog and integrated these new interpretations with all available datasets. Modelling utilised interval selections of grouped lithologies or lithogeochemical classification to resolve inconsistency in the underlying logging data, where necessary, adopting a relatively hands-on approach that combined explicit control with implicit modelling to capture key geometries and relationships. In parallel to model development, key skills and processes have been improved, such that long term adoption and refinement of the model has become a self-sustaining team effort.

The cross sectional and flitch interpretations, modelling process and resulting three dimensional model have delivered insights relevant to exploration targeting, including new constraints on where permeability has been created for mineralising fluids. The benefits of a more representative model have also flown through the mining cycle, providing more effective inputs for geotechnical engineering.