Paper Number: 5518

Grade Control Efficiencies using XRF and Spectral Techniques in gold deposits

Nugus, M.J.,[1] Jenkins, A.,[2] Oliver, N.H.S.,[3 4] Peattie, R.,[1] Blenkinsop, T., Haywood, J.,[5] Hill, E.,[6] Cleverley, J.,[7]

[1.] AngloGold Ashanti. Strategic Technical Group. 76 Jeppe St. Newtown. Johannesburg, South Africa
mnugus@anglogoldashanti.com and rpeattie@anglogoldashanti.com

[2] AngloGold Ashanti Global Greenfields Exploration. Perth, Western Australia

[3] Principal, HCOV Global. www.hcovglobal.com

[4] School of Earth and Ocean Science, Cardiff University. UK

[5] AngloGold Ashanti COO International. Perth, Western Australia

[6] Principal Scientist, CSIRO. Bentley, Western Australia.

[7] JAMES CLEVERLEY

The balance between ensuring that anticipated production outputs and schedules are met and integrating technological developments into the optimisation and grade control functions is difficult to establish; as are the costs/benefits of change versus continuing inherent, subjective bias. The perceived benefits of 'risking' change continues to be outweighed by convention in many instances, even where proven technology can assist in improving efficiency, output and cost, whilst reducing the risk of subjective bias. The application of spectral and XRF data is a successful example of reconciling those interests at the Wits (MTS), Obuasi, Sunrise Dam and the La Colosa gold projects.

The work presented illustrate that the necessary data can be collected and processed semi-automated, at the appropriate time to make detailed and informed decisions about a project's potential, as well as providing the facility to be economically opportunistic and efficient. This approach reduces costs, time, project and financial risk. Additionally, it can aid improvement in safety and whilst enhancing schedules and design options and still avoiding subjective preferences and bias. Techniques such as spectral and pXRF are particularly powerful at defining and modelling high-grade, structurally controlled, mineralisation for two reasons; 1) the methods are an objective and repeatable measure of the alteration and 2) the alteration enveloping the mineralised structures is both more consistent and has a broader spatial footprint than the gold geochemistry.

At the Archaean, Sunrise Dam gold mine in Western Australia, it is spectral measures of sericite composition and abundance, carbonate composition and chlorite abundance that allow the mineralised structures to be well-defined. It can be shown that this could have provided a potential reduction of up to 25% of local, grade control drilling, have saved in excess of $4M in additional diamond drilling, whilst enabling resource hand over 3 years earlier. At the Archaean, Obuasi gold mine in Ghana, the XRF data defines discriminators for characterising ore types for ore processing and sorting with clear differentiates for refractory and free-milling material. The cost-benefit modelling indicates improvements up to NPV of between $100M-$500M for ore sorting and streaming. Additionally, the lithochemical indicators and alkali element data provides discriminators for the immediate generation of spatial, geological maps and models for targeting and mine design that correlate directly with gold mineralisation. The reclamation of tailings in the Witwatersrand (MWS) can be analysed and modelled with confidence within 72 hours of drilling with XRF sulphur and uranium integrated with gold assays.

This can provide robust and timeous data for Mineral Resource evaluation, mine design and more reliable economic evaluation for processing streams.

The use of existing and established spectral and XRF techniques are available as innovative and cost-effective options to improve margins, schedules at the Grade Control and Resource Delineation stages. However, the implications and costs associated with the ‘geologists’ subjective bias’ can now be measured against established, semi-automated and reliable data collection options.