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3D geological modelling and mineral resource estimate for the FE2 gold deposit, Sadiola mine, Mali

Chanderman, Lisa

2016-04-05
http://hdl.handle.net/10539/20173

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ABSTRACT

The FE2 Gold Deposit forms part of Sadiola Mine located in south-western Mali - nearby the border with Senegal - approximately 440km north-west of the capital Bamako, and 70km south of the city of Kayes.

Sadiola Mine is made up of 7 open pits (the Main Pit, FN3, FE2, FE3, FE4, Tambali and Sekokoto). Gold (Au) mineralisation is spatially associated with a complex alteration pattern, pointing to a mesothermal origin for the Au mineralisation.

The Main Pit deposit contains an Oxide portion and a deeper Sulphide zone comprised of unweathered material below the pit. In 2010, mining of the Oxide portion was concluded. Currently, Sadiola does not have the plant capability to treat Sulphides due to its hardness and most of the Oxide Mineral Reserve in the concession has been depleted. The FE2 deposit is expected to provide Oxide Ore for 7 months based on the current mine plan. The Oxide mining on the Sadiola concession has an expected life of 3 years.

Sadiola's future is thus tied to the fate of the Sadiola Sulphides Project (SSP), targeted at exploiting the Sulphide zone Ore. In the absence the SSP materialising to date, focus has shifted to the FE2 deposit to scavenge any remaining Oxide Ore, to prolong mine life.

The previous Mineral Resource model was generated in June 2014. The model was based on grade control drilling information. The current Mineral Resource Estimate (MRE), presented in this research report, was prompted by an Advanced Grade Control (AGC) drilling campaign that took place during October 2014 to identify additional Oxide Ore Mineral Resource (Indicated, Inferred and Blue Sky Potential).

The AGC drillholes (12.5m (X) by 12.5m (Y) drill spacing) have been drilled mostly as infill drilling and all holes had accompanying assay data.

The Ore and Graphite mesh modelling was conducted using the grade interpolation technique in Leapfrog® mining software. The Hardness, Redox, Laterite and Classification wireframes were created in Datamine® Studio 3 software. A lower geological cut-off of 0.32g/t Au was applied to the mineralised domains. Three domains were estimated: EZONE 1 (Laterite and Saprolite Ore); EZONE 2 (Hard Ore i.e. Sulphides) and EZONE 3 (Waste).

All estimation into the Mineral Resource model was done in Datamine® Studio 3. Ordinary Kriging (OK) was used to estimate the Au grades; Inverse Power of Distance (IPD) to estimate "hardness probabilities" for isolated hard/blastable material above the hard/soft contact; and Indicator Kriging (IK) used to estimate the distribution of the Graphitic alteration.

The Au estimation process was optimised using Quantitative Kriging Neighbourhood Analysis (QKNA). The estimates were validated visually, statistically and using swath analyses.

Uniform Conditioning (UC) was used to estimate the recoverable Mineral Resource in EZONES 1 and 2 for the reporting of the distribution of grades above various economic cut-offs. The Selective Mining Unit (SMU) size assumed for the FE2 UC process was 10m (X) x 10m (Y) x 3.33m (Z) and was based on the selectivity achievable with the current mining equipment.

Given the panel size of 25m (X) x 25m (Y) x 10m (Z), there were about 18 SMUs in each panel. A tonnage adjustment factor was applied and was based on a volume representing half the SMU size. It was expressed as a percentage of the panel size (2.7%). Any proportions smaller than this percentage were removed as they would not be practically recoverable (these volumes would be too small to mine with the selected equipment).

The Mineral Resource was classified in accordance with the South African Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC) and the Australian Joint Ore Reserves Committee (JORC) guidelines. A drill spacing of 25m (X) by 25m (Y) was considered sufficient to classify the Mineral Resource as Indicated, and 50m (X) by 50m (Y) as Inferred.

Areas covered by larger drill spacing were considered to be Blue Sky Potential (not an official Mineral Resource Category, but used for internal purposes by AngloGold Ashanti Limited (AGA) to estimate possible mineralisation potential). No Measured Mineral Resource was defined. The classification criteria are based on studies completed for other, similar Sadiola deposits (such as FE3 and FE4).

The 2014 Mineral Resource model was compared with the updated Mineral Resource model (2015) within a common volume i.e. within the Business Plan (BP) 2015 $1,600 Mineral Resource shell and the $1,200 Mineral Reserve design (below the topography

as no mining has taken place at FE2) to quantify if the Oxide Ore potential had increased as a result of the model update (**Table 1**).

The detailed Reconciliation study showed that the new estimate identified an additional 7,191 ounces of Indicated Mineral Resource – of which, 1,893 ounces was previously classified as Inferred Mineral Resource but was upgraded to the Indicated Mineral Resource category as a result of the new Mineral Resource model.

The reason for the increase is due to the new drilling results which resulted in the extension of some of the mineralised zones and showed better continuity for others.

Table 1:*Model reconciliation by broader material types: 2014 vs. 2015 MW cut-off grades*

	2014 Resource Model			2015 Resource Model			2014 minus 2012
	Tonnes	Grade	Ounces	Tonnes	Grade	Ounces	Ounce diff.
Indicated							
Soft Oxides	1,460,037	1.75	82,351	1,431,892	1.93	88,822	6,471
Hard Oxides	4,126	1.57	208	12,503	2.31	928	720
Transitional	9,188	1.86	550	28,434	2.05	1,872	1,872
Soft Sulphides	-	-	-	564	2.07	38	-512
Hard Sulphides	-	-	-	1,299	2.06	86	86
Total Indicated	**1,473,350**	**1.75**	**83,109**	**1,474,693**	**1.94**	**91,746**	**8,637**
Inferred							
Soft Oxides	53,988	1.67	2,894	18,220	1.71	1,001	-1,893
Hard Oxides	-	-	-	-	-	-	-
Transitional	-	-	-	-	-	-	-
Soft Sulphides	-	-	-	-	-	-	-
Hard Sulphides	-	-	-	-	-	-	-
Total Inferred	**53,988**	**1.67**	**2,894**	**18,220**	**1.71**	**1,1001**	**-1,893**

A checklist of assessment and reporting criteria based on the JORC code showed that no major risks to the model exist.

However, some key recommendations were made and include:

- Testing domaining and variography at various geological cut-offs
- Performing an updated Classification study to confirm the suitability of the Classification criteria used
- Soft Oxide density probe measurements reported in 2015 were significantly higher than in 2014. Further work needs to be done to confirm the validity of the density results before updating the 2015 density values
- Testing estimation software used in the estimation process against similar software in the industry to single out the one that provides the most accurate results
- Further work should be carried out to assess the effect of top cuts and top caps on the resulting Mineral Resource models

- Further work is required on boundary analysis going forward as in reality the Laterite and Saprolite are very different, despite the results of the statistics suggesting that they are similar.
- The latest LIDAR survey had not been provided at the time of Ore wireframe modelling. A new survey needs to be carried out to ensure that drillholes collar positions used in the modelling were correct
- Further work is required to understand what method is best to model the extent of the graphitic alteration and how to optimise the method