Case Study

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Use of a destress slot for underground gold mining in Northern Ontario

A high-resolution microseismic monitoring system was implemented at the Golden Giant mine to observe conditions during the excavation of a destress slot designed to create a stress shadow to protect the production shaft from mine induced stresses during ore extraction.

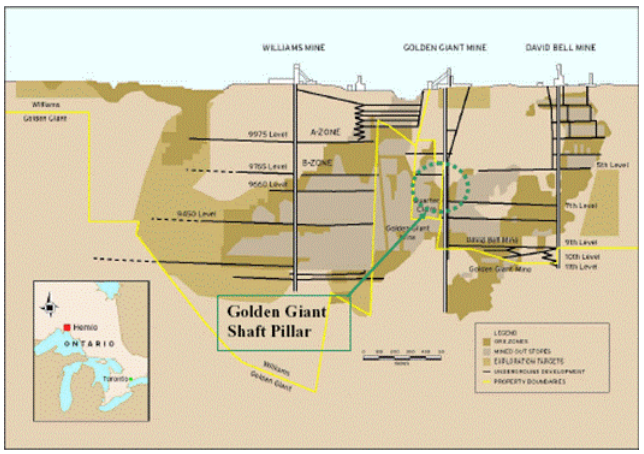

Fig 1: Schematic of the Golden Giant mine, located between the Williams and David Bell mines near Marathon, Ontario

Operated by the Newmont Mining Corporation until 2006, the Golden Giant gold mine was located in the Hemlo gold deposit approximately 40 km east of Marathon Ontario. Situated between the Williams and David Bell mines, the Golden Giant mine produced over 6 million ounces of gold over 21 years of operation.

Background

During peak production in the 1990s, the Golden Giant mine experienced high levels of microseismic activity near the main production shaft. A large shaft pillar was maintained to protect the production shaft from mine induced stresses and blasting from the nearby David Bell mine. Modeling studies suggested

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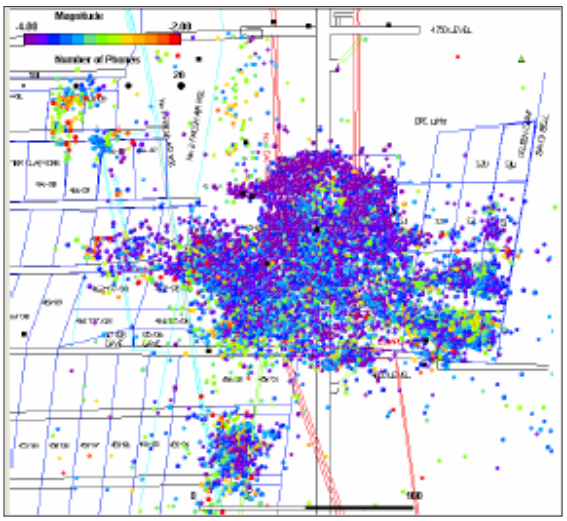

Fig. 2: 15,000 events were processed between April 2002-June 2003

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An ESG microseismic monitoring array consisting of 22 uniaxial and 3 triaxial sensors were installed around the shaft pillar, to assess the seismicity in the shaft during mining of the destress slot and extraction of the shaft pillar ore. The high-resolution system exhibited location accuracy better than 4m, therefore events occurring on the destress slot could be differentiated from those occurring in the shaft. Adding to this challenge was the fact that at times, only 8m separated these two excavations.

Destress slot mining began in early 2002 and involved removal of a central stope followed by stopes on either side. During this time, a large number of microseismic events were recorded, however, few of these events occurred near the production shaft and only one event had a moment magnitude greater than -1.0.

The accuracy of source locations provided by the ESG microseismic system helped to validate the destress slot design and monitor its implementation, allowing the mine to extract high grade ore from the shaft pillar while keeping the production shaft in full operation.

that over the life of the mine, the main shaft and nearby shaft pillar would be exposed to high stresses that would negatively affect the stability of the shaft walls.

Original mine plans were revised when it became apparent that a significant amount of ore would be left behind if this shaft pillar could not be extracted simultaneously with the deep ore in the shaft. In order to remove the ore in the shaft pillar, the extraction of a destress slot was required to create a stress shadow re-direct stresses away from the shaft walls.

3D modeling was used to design a destress slot approximately 90m high and 50m wide consisting of three stopes positioned north of the shaft.

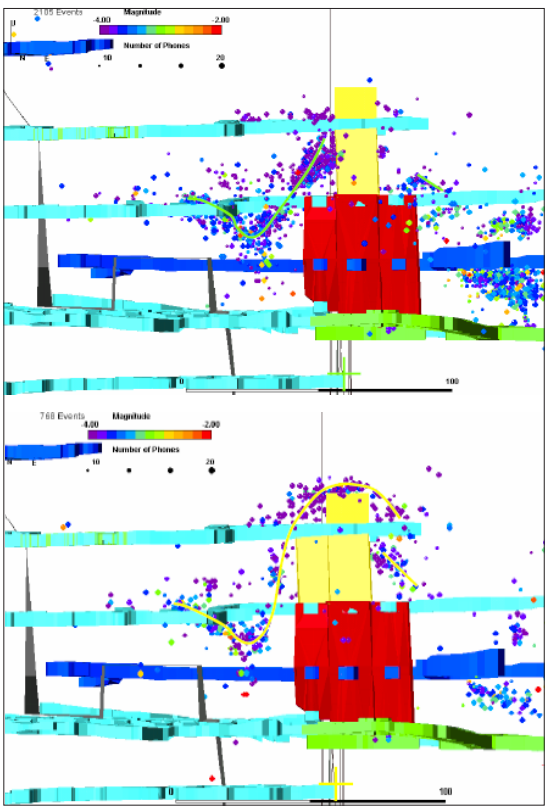

Fig. 3: Microseismic events from two time periods associated with excavation of the destress slot (rectangular areas)

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