Case Study

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Microseismic monitoring of increased activity during shaft sinking in a deep mine in Northwestern Ontario

A previously installed microseismic monitoring system was used to observe seismicity associated with shaft sinking at the Campbell mine. Valuable information on increased seismic activity near rock unit contacts and other geological structures was communicated to workers during the shaft development to increase safety.

Fig. 1: Aerial view of the Campbell mine, part of the Red-Lake complex owned by Goldcorp Inc.

The Campbell mine is a hard rock underground gold mining operation that has been in continuous production since 1949. Acquired by Goldcorp in 2006, the Campbell mine is part of the Red Lake mine complex located on the Canadian Shield in Northwestern Ontario. The ore at Campbell mine occurs in gold-bearing quartz veins and is produced from remnant mining areas in the upper part of the mine and primarily by longhole mining in the lower part of the mine.

Background

Shaft sinking is a method of excavating vertical tunnels from the surface down, to access ore bodies located at depths where there is currently

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no access and where the option of using tunnels or adits is not feasible. Mine shaft sinking is a critical and highly technical challenge in underground mine development. Mine shafts must be completed and commissioned before construction of additional underground mine infrastructure can begin.

The Campbell mine expanded operations in the mid-1990s and decided to construct a new shaft to access ore at deeper levels than the current operation. The Reid Shaft was collared in 1996 and designed to reach a depth of 1820 meters in order to access deeper ore zones. The Reid Shaft was commissioned in 1999 and now serves as the main ore hoisting shaft.

ESG Solution

An ESG microseismic system was initially implemented at Campbell mine in the early 1990s as part of the Canadian Rockburst Research Program. This microseismic monitoring system was expanded with the addition of an ESG Hyperion microseismic monitoring system, resulting in a complete 80 channel system.

Generally, shaft sinking is performed at the early stages of mine development. As such, it is rare to have a microseismic monitoring system installed during mine shaft construction. A rare opportunity to monitor seismicity associated with shaft sinking at the Campbell mine arose when operators decided to extend a new shaft to deeper ore resources. When the Reid Shaft was created, it traversed directly through the existing ESG 80 channel microseismic sensor array. The ESG Hyperion Microseismic system successfully located blasts from the 300 level down to the its present depth (~4050ft) as well as observed increases in seismic activity near rock unit contacts and other geological structures.

Shaft sinking operations pose many risks to workers. The ability to monitor seismic activity during the shaft production provided an extra level of safety and provided a rare opportunity to gain further knowledge of seismicity associated with shaft sinking.

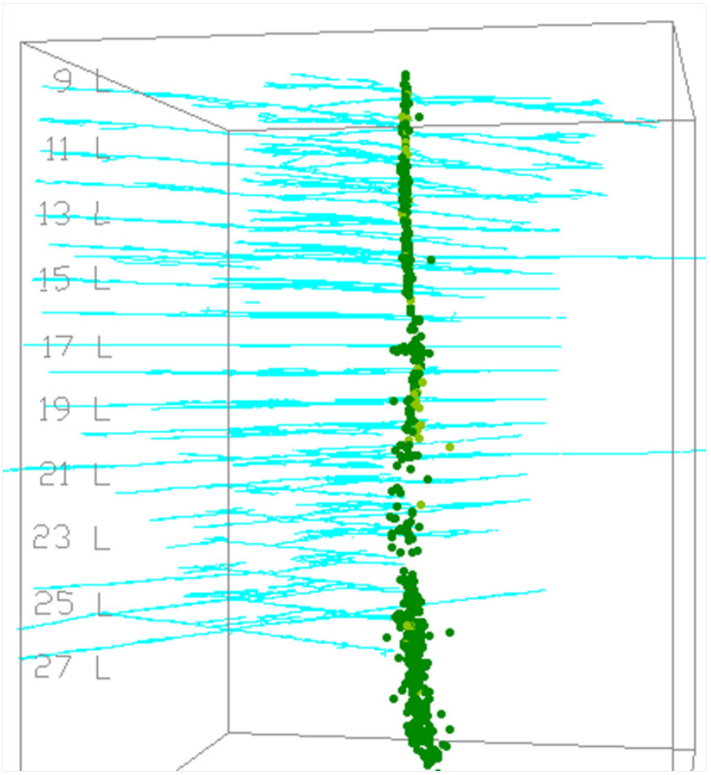

Fig. 2: Location of seismic events associated with development of the vertical Reid Shaft at Campbell mine.

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