Use of alternative drilling technologies during diamond drilling activities at Ernest Henry Mine – a fractured aquifer case study

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ABSTRACT

Underground fractured aquifers in the Ernest Henry deposit are to a large extent controlled by deposit scale brittle structures. The underground mine has been sub-divided into 9 water zones based on hydrogeological characteristics, including conductivity and connectivity, within the mining areas bound by these structures. The 9 water zones and the hydrological characteristics of the associated structures are utilized for risk assessing mine development and for targeting diamond drilling dewatering activities.

Wireline and conventional underground diamond drilling techniques have been used throughout the network of underground aquifers with the aim of dewatering areas within the mining footprint. These dewatering drilling campaigns have historically been highly successful at lowering aquifer water levels throughout the underground workings. As part of recent mine expansion activities, diamond drilling has intersected high pressure (>3500kPa), high temperature (>50°C) and high flow water (>3L/sec) in as yet unconstrained underground aquifers. Groundwater is typically conducted through rubble and clay rich faults, further hampering progression of drilling.

Drilling through fractured aquifers at depth presents both mine planning as well as safety challenges. Recent drill holes have been delayed or abandoned when aquifers hosting this high pressure, high flow water have been intersected, risking mine planning deadlines.

Recent technological innovation developed to control groundwater outflows from the diamond drill hole whilst drilling has been trialed at the Ernest Henry Mine. This case study focusses on the utilization of alternative drill methodologies to allow the current drilling campaign to continue without delay, whilst also improving safety conditions encountered on the drill site.