This abstract is part of the session of 10-minute talks

Managing an abandoned mine as a future resource: Ellendale diamond mine

by

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Mining for internationally acclaimed high-quality (fancy) yellow diamonds occurred at Ellendale diamond mine from 2002 to 2015, ceasing in July 2015 when Kimberley Diamond Company NL entered into administration, and subsequently into liquidation. Following the site being disclaimed under the *Corporations Act 2001 (Cth)*, Ellendale was formally declared an abandoned mine site on 4 December 2015. As the remaining diamond resource at Ellendale is of significant value to the State, it is the objective of the Department of Mines, Industry Regulation and Safety to ensure the site remains viable for future responsible resource development.

Ellendale is located on the Lennard Shelf in the northeastern portion of the Canning Basin. The geology is dominated by the Devonian marine sediments (siltstones, shales, limestones) of the Fairfield Group, which are unconformably overlain by Permian-age fluvial sandstones (Grant Group). During the Tertiary Period, the Canning Basin was intruded by lamproitic plugs and subsequent eruptions have filled the volcanic vent with lamproitic pyroclastic tuffs.

Waste rock generated following the removal of the target diamond-bearing material within the plug has been used to construct both waste-rock landforms and tailings storage facilities (Fig. 1). These constructed landforms show varying degrees of erosion across the landform surfaces; on some structures the significant level of erosion has the potential to lead to wall instability and, under extreme conditions, wall failure if no remediation action is taken.

Studies undertaken on the main waste materials confirmed the cohesiveness of the material types as being too low to resist the erosive force of surface water flows across current batter designs. The weathering rate of the waste materials is a major contributing factor affecting erosional stability, with both siltstone and magmatic wastes breaking down from blocky waste rock to very fine-grained particles after being blasted, excavated, transported and exposed to the elements.

Landform remediation options include the use of rock armouring utilizing the blocky sandstone material and adoption of modifications to the current batter design to reduce run-off potential. This will result in a more stable landform into the long term, reducing the potential for environmental impacts, and will preserve the Ellendale site for future use.

Figure 1. **Ellendale 9 TSF-1D Cell 3 western wall, indicating significant gullying and sediment deposition. Gullies are greater than 2 m deep and extend from crest to toe. Remediation options will include rock armouring and modifications to the outer batter slope angle**