An assessment of the rate of construction of an upstream raised tailings dam

P Garvey1, JJ Moreno2, J Willis3 and S Premananda4

1.Consultant (Civil Engineer), SRK Consulting (Australasia) Pty Ltd, West Perth WA 6000. Email: pgarvey@srk.com.au
2.Principal Consultant (Civil Engineer), SRK Consulting (Australasia) Pty Ltd, West Perth WA 6005. Email: jmoreno@srk.com.au
3.Superintendent Dams, BHP Olympic Dam, Roxby Downs SA 5725. Email: justin.willis1@bhp.com
4.Senior Engineer TRS, BHP Olympic Dam, Roxby Downs SA 5725. Email: sajith.premananda@bhp.com

ABSTRACT

Many of the tailings storage facilities (TSFs) in Australia are upstream raised facilities for which the consolidation of the hydraulically deposited tailings is essential to the stability of the TSF. While much operational consideration is given to limiting the rate of rise of TSFs through careful management of deposition rates to achieve desired consolidation, the rate of wall raise construction (RoC) is often not given the same level of consideration. Loading the tailings at too high a rate during construction could lead to upstream and potentially downstream failure of the embankment. The Tailings Retention System (TRS) at the BHP Olympic Dam Mine comprises upstream raised TSFs that are continually raised with a zoned embankment. Despite over 20 years of successful wall raising, there was a desire to improve the understanding of the RoC and identify upper construction limits to ensure wall raising continued safely.

In order to understand the RoC, trial wall raise construction pads were constructed at different rates and the pore pressure response of the underlying tailings material was monitored. The pore pressure data were used to calibrate the permeability and consolidation characteristics in a finite element model (FEM) that replicated a typical wall raise. The rate of material placement, location of the phreatic surface and construction load were varied in the FEM until failure was initiated. Results were presented as a period, in days, over which the various zones for the wall raise could be safely constructed. The results indicated sensitivity to the location of the phreatic surface prior to the wall raise as well as the application of construction traffic loads. This paper presents the study approach, challenges experienced in modelling the construction methodology, the study results and their relevance in the improvement of understanding of RoC at the BHP Olympic Dam TRS.