Geostatistical Analyses of Cone Penetration Testing Data of a Tailings Storage Facility in a Semi-Arid Setting

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ABSTRACT

Cone penetration testing with pore pressure measurements (CPTu) is an accepted investigation method being used widely in geotechnical investigation of tailings storage facilities (TSFs). The CPTu probing is a rapid and cost-effective tool in which soil properties can be almost continuously measured or derived. The data from CPTu investigation are associated with spatial and temporal phenomena. Therefore, they can be analysed by statistical techniques such as geostatistics. Geostatistics is used to analyse data as well as predict values between sampled locations. Geostatistics is widely used in mining industry for resource evaluation from initial quantification to daily mine planning to supply desired ore feed to process plant. As further information become available, the geostatistical model for the resource is updated and evolved. A similar approach can be taken for CPTu data to develop spatial patterns and interpolate values for the areas where CPTu is not conducted. Furthermore, uncertainties associated with the predicted/interpolated values can be measured in a geostatistical analysis. Multivariate mechanisms of geostatistical analysis facilitate incorporation of secondary dataset to complement a primary variable. This capability of geostatistical analysis results in development of more accurate interpolation and uncertainty models.

This paper presents the results of a geostatistical analysis of CPTu data conducted between 2004 and 2018 for an upstream-raised TSF located in the Goldfields region of Western Australia. An initial model will be developed using the 2004 and 2009 CPTu data. The model will be used to predict in situ measurements as the interested primary variables at the selected locations where 2018 CPTus were undertaken. The associated uncertainty will be also estimated.