VSP IN THE PILBARA

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The construction of geotechnical models in typical Pilbara iron ore environments is vital to enable an optimized mine design while maintaining pit wall integrity. These models require the measurement of geomechanical properties, such as the modulus of elasticity, in-situ stress, unconfined compressive strength, and pressure and shear wave seismic velocities, from diamond core samples. Ideally these velocities would be measured in Reverse Circulation (RC) boreholes as their spatial density is far higher than diamond drilled holes. Unfortunately, despite its value, such data is seldom collected as a large proportion of the holes are above the water table, limiting the use of sonic-logging tools. Even if measurements are possible, damage to the borehole caused by drilling biases the resulting velocity measurements.

This paper details the results of a trial using the vertical seismic profile method to directly measure in-situ seismic velocities in RC boreholes. The method was successful in determining the velocities of the formations; which turned out to be lower than those measured directly from core samples. This has implications for the pit designs including pit walls angles and locations, which can affect the cost of mining. The data in several boreholes was of sufficient quality for more advanced processing methods, important for geological mapping and the processing and interpretation of surface seismic data.

The success of this first trial has implications for future iron-ore developments in the Pilbara. The widespread acquisition of accurate seismic velocity data will enable the creation of more accurate geotechnical models and improved development decisions.