

Evaluation of factors influencing transmissivity in fractured hard-rock aquifers of the Limpopo Province

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Abstract

Geologically-complex fractured aquifers underlie large parts of the semi-arid Limpopo Province where some of the greatest groundwater needs in South Africa occur. It is important to identify potentially high-yielding zones that can be targeted for water supply. The study covered 7 distinct groundwater regions within Limpopo Province, together covering about 63 500 km². Results from over 4 000 pumping-test analyses indicated that geological setting (e.g. aureole of granitoids), proximity and orientation of dykes and lineaments and proximity of surface-water drainages may exert an influence on borehole productivity. Although dykes are poor groundwater targets, drilling dykes composed of dolerite may prove to be more successful. Lineaments striking perpendicular to the current maximum horizontal stress seem to be more favourable targets, which is inconsistent with the predicted regime. Due to the complex geological history, it is difficult to link open discontinuities to a distinct recent or past tectonic event. Regional stress-field data, as in this case, may not account for local, possibly highly significant, stress-field variations. The hydrogeological importance of several factors related to groundwater occurrence, can be used as a working reference for future groundwater-development programmes.

Keywords: Limpopo Province, groundwater, transmissivity, lineaments, borehole productivity