

Paper Number: 4506

Determination and delineation of hydraulic parameters of the Ohangwena Groundwater System, Cubango Megafan, Northern Namibia

Lohe, C.¹, Ananias A.², Miller, R. McG.³, Quinger, M.¹, Joseph R.³

¹Federal Institute for Geosciences and Natural Resources - BGR, Stilleweg 2, 30655 Hannover, Germany

²University of Namibia, 340 Mandume Ndemufayo Ave, Pionierspark, Windhoek, Namibia

³Consulting Geologist, PO Box 11222, Windhoek, Namibia

A Namibian-German cooperation project that has been investigating the Kalahari succession in the Owambo Basin of northern Namibia for its fresh water potential has identified a huge reserve in the Ohangwena Groundwater System (OGS) [1, 2]. The OGS forms part of the Cubango Megfan which stretches from northern Namibia to southern Angola; an area of approximately 100,000 km² [3,4]. There are three main aquifers with intervening aquitards [5]. The upper perched aquifer (KDP or KOH-0) is seasonal, temporary and generally not deeper than 11 m. Below this are the confined aquifers, KOH-I between 39-160 m in depth and KOH-II between 130-380 m in depth. The OGS consists mainly of fine-grained, well sorted, unconsolidated aquifer sands and fine-grained, unsorted, clayey to silty sands. Hydraulic parameters were determined during 39 single-well pump tests and one long-term pump test, 23 of the former in the KOH-I aquifer and 16 in the KOH-II aquifer. These enabled transmissivities and specific capacities of wells to be determined and storage coefficients to be estimated. Undisturbed aquifer and aquitard samples from a 400m cored borehole (WW203302) and two partly cored boreholes were analyzed for permeability (falling head and triaxial cell method), porosity, water absorption capacity and grain-size distribution. Maximum sampling interval was 10 metres. The KOH-I Aquifer yielded the following results: average hydraulic conductivity - 3.15 E-05 m/s, transmissivity range - 2.51-118 m²/day, specific yield - 0.92 m³/h per metre drawdown, permeability of core samples - between 1.10E-09 and 1.30E-06 m/s (vertical conductivity). Results for the KOH-II aquifer were: average hydraulic conductivity - 4.00 E-05 m/s, transmissivity range - 5.11-239 m²/day, average specific capacity - 1.85 m³/h per metre drawdown, core permeability - between 5.40E-08 and 7.60E-06 m/s (vertical conductivity). Aquitards have very low hydraulic conductivities of around 7.00 E-11 m/s. This suggests very limited connectivity between the aquifers on the Namibian side of the OGS. The results provide essential information on the geology of the OGS and permit the development of a groundwater model for future water supply schemes.

References:

- [1] Lindenmaier et al. (2014): Structure and genesis of the Cubango Megafan in northern Namibia: implications for its hydrogeology, *Hydrogeology Journal* 22: 1307–1328
- [2] Lohe et al. (2013): Drill-Log Interpretation and Evaluation of Drillings KOH I and KOH II Aquifer, Ohangwena Region, Cuvelai-Etoshia Basin. Technical Note No. 1. Technical Cooperation Project “Groundwater for the North of Namibia”, DWAF, Namibia & BGR, Germany.
- [3] Miller RMcG et al. (2010) *S Afr J Geol* 113:307-334
- [4] Miller RMcG (2008): *The Geology of Namibia: Geological Survey of Namibia, Windhoek*
- [5] Walzer et al. (2009): Hydrogeological investigation of sedimentary rocks in the central-north of Namibia; Technical Cooperation Project “Groundwater for the North of Namibia”, DWAF, Namibia & BGR, Germany. (unpubl.)

