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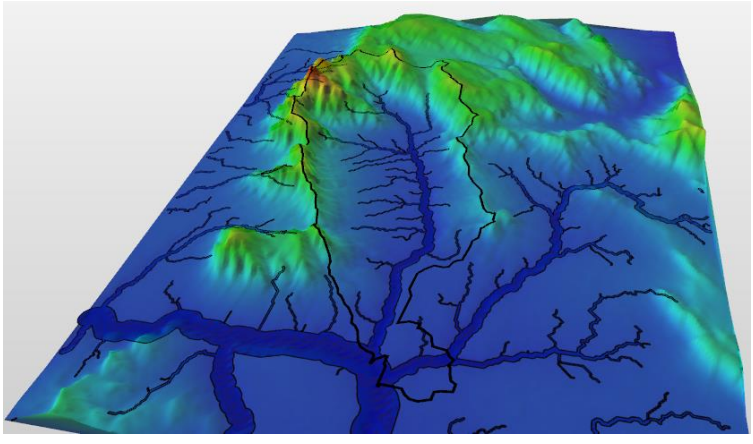
Modelling the connection between groundwater abstraction and recharge to quantify baseflow for a RAMSAR listed wetland in Western Cape, South Africa

Watson, A.W[1], Miller, J.A[1] and de Clercq, W[2].

[1] Earth Sciences, Stellenbosch University, 15661547@sun.ac.za

[2] University of Stellenbosch Water Institute

With the increased scarcity of surface water across the South-west of South Africa, abstraction of groundwater has become a more common practice. This study looks at investigating the interactions between groundwater and surface water in the Krom Antonies River, an important tributary of the Verlorenvlei estuarine lake (RAMSAR #525). The most important issue facing the long-term health of the lake is the reliability of freshwater inflow which assist in mitigating elevated salinity levels. Recharge estimations for regional primary aquifers inland in the Sandveld region are between 0.2-3.4% of rainfall. 20% of this recharge is abstracted for potato production in the Sandveld region inland of the Verlorenvlei lake catchment [1].The majority of recharge occurs in the higher lying mountainous regions further inland than the Sandveld where the fractured rock aquifers of the Table Mountain Group (TMG) dominate. The TMG is composed of various lithologies but is mostly characterised by sequences of mature sandstones. These units also underlie the Piketberg Mountains that surround the Moutonshoek catchment through which the Krom Antonies River drains. In this study a conceptual model will be constructed to depict how geology and topography impact on groundwater levels in the Moutonshoek catchment. Initial drill chip analysis suggest that in the lower lying areas of the catchment the regolith is about 25m thick where after shales of the Malmesbury Group (which underlies the TMG) are found and which act as a confining layer. The delineation of the modelling domain is important so as to include all water that might flow into the Moutonshoek catchment. The orientation of the TMG in the Piketberg Mountains influences the way in which runoff and percolation is generated from rainfall. A digital elevation model (DEM) and ArcHydro will be used to refine the modelling boundaries based on the development of an accurate cross-section through the study area and this will form the boundaries of the MODFLOW model. The MODFLOW model is being developed to determine the sustainability of groundwater abstraction taking into account possible changes in recharge volumes due to changes in regional precipitation patterns. Critical to the success of this model will be constraining the amount



of baseflow feeding the Verlorenvlei lake, especially during low flow periods. We predict that during these periods, groundwater abstraction volumes will exceed total recharge volumes and therefore have an impact on freshwater flows into the Verlorenvlei River and consequently salinity levels in the lake system.

Figure 1:Showing initial conceptual model and catchment delineation

References:

[1] Conrad J, Nel J and Wentzel J. Proceedings of the 2004 Water Institute of Southern Africa (WISA) Biennial Conference. ISBN: 1-920-01728-3