Investigation of heuweltjie structure and soil chemistry in the Buffels River valley and implications for transfer of salts to groundwater

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Heuweltjies, which are considered to be paleo-termite mounds, form distinct landscape 'spots' across large areas of the Northern Cape Province of South Africa [1]. The Buffels River catchment, where heuweltjies are particularly abundant, suffers from variably saline groundwater. The heuweltjies record higher electrical conductivity (EC) than the surrounding soils [2,3], and it has been hypothesized that heuweltjies could be contributing salt to the groundwater system.

One of the keys to resolving the contribution of heuweltjie salts to groundwater is to fully understand the nature of the soil making up the heuweltjies, as well as where and how the salts are hosted within the heuweltjies. Analysis of these distribution patterns can aid in determining if these ions or salts are stationary in the heuweltjies and related to heuweltjie formation, or if they are mobilised and migrating to the groundwater system.

In this study, 58m long cross sections were excavated, to a maximum depth of 3 m, through two heuweltjies at different slope positions in the Buffels River valley. Soil profiles were sampled at 1 m intervals laterally throughout the cross sections (1 - 58 m) from the surface down to the underlying alluvial sediments. Samples were analysed for texture, EC, pH, anions, cations, and mineralogy.

pH values for both heuweltjies were highest in the surface soils due to their calcareous nature. The subsoils were enriched in gypsum. EC increases with depth in both heuweltjies, suggesting the possibility that heuweltjie salts are moving into the groundwater aquifer, with elevation (i.e. distance to the riverbed) also playing a role. It is therefore important to determine the distribution of individual salts within the heuweltjies in order to evaluate transport mechanisms and flow paths of salts through the heuweltjies and into the aquifer.

[1] McAuliffe *et al.* (2019) *J. Arid Environ* **163,** 26-33. [2] Kunz *et al*. (2012) *J. Arid Environ.* **87**, 198-205. [3] McAuliffe *et al.* (2014) *Earth Surf. Proc. & Landforms* **39**, 1900-1912.