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## **An assessment of groundwater contamination at the Empangeni and Richards Bay landfill areas, Kwazulu-Natal, South Africa**

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Historically, landfills are the most common methods of disposal of wastes in many parts of the world. It receives mixture of various types of waste and leaching of these can lead to groundwater contamination and hence it is an environmental issue. The present study was carried out in regions around the landfills of Richards bay and Empangeni in Uthungulu district, South Africa. The active landfill site in Empangeni receives on an average 350 tonnes of waste per day. The closed inactive landfill site in Richards's bay contains 500m<sup>3</sup> of un-compacted general and garden waste. In and around these sites 16 groundwater samples and 6 surface water samples were collected as a part this study. The concentration of chemical constituents, nutrients and trace metals were analysed. The results indicate increased concentration of total dissolved solids in groundwater at the Empangeni landfill site than Richards Bay landfill site. Chloride and sodium concentration were also found to be high in both the landfill sites. Concentration of nitrate in groundwater exceeds with SANS recommended limit at both landfill sites. Lead and nickel concentration in groundwater at both landfill sites too exceeded the WHO and SANS drinking water limit which may be due to the disposal batteries, lead based paint and other nickel rich waste at the landfill sites. Manganese concentration in groundwater and surface water at the Empangeni landfill suggests that the water is in reduced condition. Majority of the physico-chemical, nutrient and trace metals concentrations found at the monitoring wells from the Empangeni landfill site, exceeded the concentrations at the Richards Bay landfill site. As the concentration of dissolved constituents decrease with the increase in distance from the landfill sites, it confirms the impact due to waste disposal. Hence, care need to be taken not to permit human activity around the landfill sites and periodical monitoring of groundwater quality is essential. It is also recommended to lining of the surface of the landfill to reduce rainfall recharge over this site.

Keywords: Landfill, leachate, Uthungulu, Richards Bay, Empangeni, groundwater contamination, heavy metal, health hazards.

