

Uranium pollution of the Wonderfonteinspruit, 1997-2008

Part 1: Uranium toxicity, regional background and mining-related sources of uranium pollution

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Abstract

Even though mining-related uranium (U) pollution in the Wonderfonteinspruit (WFS) has been an ongoing concern since the mid-1960s, media attention has increased considerably recently, focusing on pollution-related health risks that unsettle the general public. In view of recent findings that U might be more toxic than previously thought, such concerns need to be addressed. This even more so as South Africa has embarked on a nuclear expansion programme aimed at, amongst others, extending mining and processing of U. This is Part 1 of a series of papers aimed at the quantification of the extent of U pollution in the WFS, in order to provide a factual base for subsequent risk assessments. This paper provides an overview of recent findings on U toxicity with specific reference to drinking water, together with a critical examination of related international and South African guidelines. Based on a brief description of the study area and the impacts of mining over the past decades, the origin of U from different auriferous ore bodies (reefs) is explored. Using secondary data on historic gold and U production in the West Rand and the Far West Rand, tailings deposits in the 2 goldfields are estimated to contain well over 100 000 tons of U constituting a large reservoir for ongoing future U pollution. Apart from tailings, underground water in contact with uraniumiferous reefs constitutes another major source of waterborne U pollution. This applies to water pumped from underground mine workings as part of the active de-watering of overlying karst aquifers as well as decanting water from flooded mine voids. The discharge of U-polluted water together with largely uncontrolled outflow of uraniumiferous seepage from tailings deposits are major sources of water pollution in the WFS catchment.

Keywords: uranium, toxicity, gold mining, reefs, karst, de-watering, tailings, slimes dams, Wonderfonteinspruit