

Pollution assessment in the Keiskamma River and in the impoundment downstream

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Abstract

The Keiskamma River and the impoundment, downstream were characterised over a one-year period by using standard physico-chemical methods to assess their present qualities. The pH levels are normal in the river and in the impoundment but turbidity values and the levels of electrical conductivity are high in both water systems. Also, the nutrient levels in both systems are eutrophic. The DO and BOD levels exceeded EU guideline values for the protection of the aquatic ecosystem. The Keiskammahoek Sewage Treatment Plant (KSTP) was identified as a pollution point source into the receiving river and the impoundment. Its treatment performance was investigated. Significant pollution of the river and the impoundment from the KSTP was indicated for electrical conductivity, nutrients and oxygen-demanding substances.

Keywords: Pollution point source, river impoundment

Introduction

South Africa's water resources have been under increasing threat of pollution in recent years due to rapid demographic changes, which have coincided with the establishment of human settlements lacking appropriate sanitary infrastructure. This applies especially to peri-urban areas, which surround the larger metropolitan towns in the country. Many such settlements have developed with no proper water supply and sanitation services. People living in these areas, as well as downstream users, often utilise the contaminated surface water for drinking, recreation and irrigation, which creates a situation that, poses a serious health risk to the people (Verma and Srivastava, 1990). Such is the case in the town of Keiskammahoek, the Eastern Cape that has inadequate water-borne sanitation.

The domestic water supply of the community comes from the Keiskamma River, which owing to lack of proper sanitation, is continually polluted. Problems experienced in the Transitional Local Council (TLC) with sewage discharges into the river escalated when RDP-housing units were connected to the Keiskammahoek Sewage Treatment Plant (KSTP) in 1997 without any expansion/upgrading reticulation system. Bypassing due to overflows has occurred regularly since then. The treatment works were built as an anaerobic/aerobic pond system, which means that the treatment occurs naturally without added chemicals. The problem of too high an inflow load results in a poor level of sewage purification and, as a result, pollution of the receiving Keiskamma River.

The community of Keiskammahoek uses the water from the Keiskamma River for a variety of purposes such as drinking, fishing, livestock watering and recreational purposes. The Sandile Dam is situated downstream of the town on Keiskamma River. Water from this dam is treated to supply the whole of Keiskammahoek Transitional Local Council (TLC) and the Middledrift

District. Although it is possible to renovate polluted surface waters to potable standard, the process required would be both complex and very expensive (DWAF, 1998), which may make the supply unsustainable. Moreover, several communities use water from the Keiskamma River for domestic purposes without prior treatment and it is therefore of great importance that the river remains in a "healthy" state. However, fears have been raised that due to the potential discharges from the KSTP, the river could be excessively polluted. Our initial study on the KSTP and the impact of its effluents on the receiving Keiskamma River in 1999 (Morrison et al., 2001) indicated gross pollution of the river by effluents from the sewage plant. Then recommendation was given on the need for an upgrade of the sewage plant to improve the quality of its effluents. Recently, two major modifications were made on the KSTP: a central pump station was built for the town's sewer system and an aeration pump was installed into the pond system. However, it is doubtful if these modifications would be enough to improve the quality of its effluent discharges and to reduce its impact on the river. This study focuses on the present water quality of the Keiskamma River and the impoundment, downstream (i.e. Sandile Dam) and on the quality of the effluent discharges from the KSTP after the recent modifications.

Materials and methods

Sampling sites

The location of the sampling points in the Keiskamma River, the impoundment and the KSTP is shown in Fig 1. Effluent samples were taken from the KSTP at Site S1. Site S2 was the sampling point from the river while Site S3 was the sampling point from the impoundment (i.e. Sandile Dam). Both Sites S2 and S3 were downstream of the sewage discharge point.

Before sampling for chemical analysis, sample bottles were cleaned by soaking in detergent for 24 h, followed by rinsing several times with tap water until free of detergent, rinsed with 5% nitric acid and then thoroughly with distilled-deionised water (DWAF, 1992; DWAF, 1999).

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