

Comparison of microbial contamination at various sites along the Plankenburg- and Diep Rivers, Western Cape, South Africa

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Abstract

This study was aimed at investigating and comparing the microbial contamination levels at various sites in the Plankenburg and Diep Rivers in the Western Cape, South Africa. Sampling of sites along the Plankenburg River started in June 2004 and continued for a period of 1 year until June 2005. Sampling of the Diep River sites started in March 2005 and continued for a period of 9 months until November 2005. Faecal coliform (FC) and *E. coli* (EC) counts were determined by means of the most probable number (MPN) technique, the number of culturable cells were determined using the heterotrophic plate count (HPC) technique and total microbial counts were evaluated by Flow cytometric analysis (FCM). The highest microbial counts for the Plankenburg River were observed at Site B where the highest MPN, FC, *E. coli* and total FCM counts of 9.2×10^6 (Week 14), 3.5×10^6 (Week 39) and 3.5×10^6 micro-organisms/100 mL (Week 39) and 2.1×10^8 micro-organisms/mL (Weeks 1 and 39) respectively, were recorded. The highest HPC recorded for the Plankenburg River was 7.9×10^6 micro-organisms/100 mL (Week 44, Site A). Site B is situated close to an informal settlement where waste effluents from stormwater drainage pipes enter the river system. In addition, other possible contamination sources included agricultural (Site A) and industrial (Site C) areas bordering the Plankenburg River. The highest total MPN, FC and *E. coli* counts in the Diep River were 5.4×10^6 (Week 23) and 1.6×10^6 micro-organisms/100 mL (FC and *E. coli*, respectively (both in Week 23)), recorded at Site B. The highest HPC and total FCM counts of 1.7×10^7 micro-organisms/100 mL (Week 14) and 2.5×10^9 micro-organisms/mL (Week 23), respectively, were also recorded at Site B. This site was identified as the most contaminated site along the Diep River and served as an accumulation point for waste effluents from the residential and industrial areas, which included paint and machine manufacturers. Other sources situated along the Diep River included storage and maintenance facilities for steel containers, a wastewater treatment plant and an oil-refinery. Most of the bacterial counts obtained for the Plankenburg and Diep Rivers exceeded the accepted maximum limit for river water for most of the sampling period.

Keywords: river water, micro-organisms, most probable number, heterotrophic plate count, flow cytometry, industrial area, residential area, informal settlement