

### Response to Anonymous Referee # 3

The following references have been included:-

Lines 40-43           Aslan et al., 2007; Craun et al., 1981; Shuval et al., 1977.  
Lines:-71-73        Mohseni-Bandpi et al., 2013  
Lines: -107-11      Stouthamer, 1992; Cherchi et al., 2009; Jensen et al, 2012  
Lines:-87-89        Mahlangu et al., 2011

Line 87-89: Comment acknowledged and statement revised as follows:

On certain occasions, the effluent concentration of NO<sub>3</sub>-N was even higher than the unfiltered water and possibly due to desorption of previously adsorbed nitrates and nitrification. Also research has revealed heterotrophic nitrifying microorganisms are key players in the nitrogen cycle and hence can also increase the effluent concentration of NO<sub>3</sub>-N through cell-lysis (Masahito et al., 2007).

Aslo asked by reviewer 1 and was addressed as follows in the reply-

A C/N ratio of 1.8 was selected based on studies conducted by Aslan et al (2007), Gomez et al (2000) and Callado (2001). The following statement was added:-

“These two ratios were selected based on the optimum range of carbon to nitrogen ratio which was established by Aslan et al (2007), Gomez et al (2000) and Callado (2001) for de-nitrification in slow sand filtration, which ranged from 1.08 to 2.5”

Line 132-135

The filter diameter is 300mm as shown in Fig 1 and the diameter of the filter media as described in lines 134-135.

Nature of raw water

The COD of the raw river water was very low to be effective as a carbon source and was 24mg/l and hence the spiking. The average pH of the raw water was 8.6 (Line 228) and a nitrate concentration ranging from 0.39mg/l to 1.15mg/l.

Lines 228-229 (asked also by Reviewer # 2 and was addressed as follows in the reply:-

This phenomenon is explained in lines 232 to 237. Also other researchers have noted insignificant pH changes in similar filters (Baba et al., 2015). Another reason could be the short resting period of 24hrs because significant changes of pH are noted after 5 days (Rust et al., 2000). Also, a higher concentration of the carbon source can result in an increase in pH.

Furthermore, It should be noted that in a biosand filter, the process is not purely de-nitrification. There is also nitrification and aerobic respiration at the top due to availability of oxygen and this phenomenon has been explained in lines Lines 30; 32); 75-78; 246-252 and also confirmed by Heather et al. (2010) and Willian et al. (1986). Nitrification is obligatorily coupled to oxygen consumption and has an effect on the decrease in alkalinity. Such a decrease in alkalinity might cause a decrease in pH (Habboub, 2007). Acidic nitrite formation results in a drop in pH, thus if the buffer capacity of the system is weak, the pH might drop well below 6.7