

VARIABILITY IN DENITRIFICATION CHARACTERISTICS OF THE VADOSE AND SATURATED ZONES IN THE MANAWATU RIVER CATCHMENT

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Investigating the denitrification characteristics of the subsurface environment is important to an understanding of the capacity of this zone to reduce nitrate contamination of groundwater and surface water. However, there are limited studies of the denitrification properties of both the vadose and saturated zones. The objective of this study is to quantify denitrification in the vadose and saturated zones at selected sites in the Tararua Groundwater Management Zone (TGWMZ) of the Manawatu River catchment.

Measurements of denitrification were conducted in the summer of 2014/2015 and the winter of 2015 at three locations in the TGWMZ namely, Pahiatua, Woodville, and Dannevirke. These sites were selected to represent areas with either oxidising or reducing shallow groundwater. The denitrification potential of the vadose zone was determined in the laboratory by assays measuring the denitrifying enzyme activity (DEA) in soil samples collected along the vertical profile (surface to 1.95 m bgl). Shallow groundwater denitrification rates were measured *in situ* using the single-well push-pull tests from two to three piezometers at each site with depths varying from 4.4 m to 7.5 m bgl.

Results of the denitrification assays show that the denitrification potential is highest in the surface soil at all sites and that this denitrification potential was similar across all of the surface soils. Denitrification potential decreased with depth, particularly at the Dannevirke site. For shallow groundwater, denitrification was clearly apparent at both test times at the Woodville site which has reduced groundwater. In contrast, there were no clear indications of denitrification at the oxidised Pahiatua site at either test time. Mixed results were obtained at the Dannevirke site where denitrification seemed to occur in the deepest piezometer during the summer test but was not evident during the winter measurements. Given that the DEA measurements for vadose zone samples involved the addition of an electron donor in the denitrification assays, results of the push-pull tests provide a better indication of the denitrification capacity of the study sites. Quantification of the denitrification potential of the study sites has important implications for nutrient management on farms.

Editor's Note: A manuscript has not yet been submitted for this presentation.