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HYDRAULIC PROPERTIES OF FOUR SOILS FROM  
THE HERETAUNGA PLAINS AND PREDICTION OF  
THEIR SOIL WATER BEHAVIOUR DURING BORDER-  
DYKE IRRIGATION

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## ABSTRACT

An irrigation scheme has been proposed for the Ngatarawa region of the Heretaunga Plains (Hawkes Bay). The method proposed for irrigation of these soils is the border-dyke method. It was felt that this method could be inefficient in the use of water and considerable amounts of water could be lost to drainage from some of the soils in this region. Thus experiments were performed on the four major soil types of this region - Poporangi sandy loam (Typic Durochrept), Ngatarawa sandy loam (Typic Ustorthent), Takapau sandy loam (Andri Ustochrept), and Pakowhai silt loam (Aquic Ustifluent) - to determine their hydraulic properties.

The instantaneous profile method was used to measure the drainage, and water storage behaviour of these soils, and their hydraulic conductivity. Hydraulic conductivity could not be calculated for the Poporangi sandy loam, due to the duripan causing lateral flow. This invalidated the assumption that the movement of water was only vertical. For one other soil, Ngatarawa sandy loam, the hydraulic conductivity data obtained were considered to be unreliable. Reliable hydraulic conductivity data were obtained for Takapau sandy loam and Pakowhai silt loam. From data obtained from "undisturbed cores" and the field experiments, the drainage behaviour and water storage properties were determined for all four soils.

Using a numerical technique, vertical movement of water in Takapau sandy loam and Pakowhai silt loam, during and following ponded infiltration, was simulated using a CSMP computer model. These simulations indicate that the loss of water to through drainage from Takapau sandy loam would be at least 50% of that infiltrated, if the proposed residence time for ponding of water of 70 minutes is used. For Pakowhai silt loam the simulations indicate that little water is likely to

be lost to drainage if a residence time of 120 minutes is used. As hysteresis in the volumetric water content/pressure potential relationship is likely to affect the validity of these simulations, the extent of hysteresis on this relationship in these soils was investigated.

From all of these data it was concluded that only the Pakowhai silt loam would be suitable for irrigation by the border-dyke method. If this method was used on the other soils, large amounts of water could be lost to drainage. This would not only be a waste of a scarce resource, but as the Ngatarawa region lies over the unconfined part of the aquifer from which Napier and Hastings cities draw their water, it could also be a health hazard, as the drainage water from these soils could cause the nitrate level in the water in this aquifer to increase. Thus it would be better to irrigate the other three soils (Poporangi sandy loam, Ngatarawa sandy loam and Takapau sandy loam) using a sprinkler system. The application rate of the sprinkler system should be less than the saturated hydraulic conductivity of the A horizon of the soil, otherwise horizontal distribution of the amount of water infiltrating into the soil can be very uneven.

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