



# IRRIGATION IN A VARIABLE LANDSCAPE : MATCHING IRRIGATION SYSTEMS AND ENTERPRISES TO SOIL HYDRAULIC CHARACTERISTICS

Final Report

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## Executive Summary

The Shepparton Irrigation Region (SIR) has detailed soil maps, which feature 6 major soil groups, made up of 148 soil types. Measurements of soil hydraulic properties were not taken during the development of the SIR soil maps, and since then there have been only a few ad-hoc measurements of soil hydraulic properties. Although broad association has often been made between soil permeability and soil groups, overall there is a poor understanding of the hydraulic properties of the soils in the region.

A two year project has been completed to collect information on soil hydraulic properties of major soils in the SIR. Such information provides a useful tool for facilitating land use changes consistent with the principles of water use efficiency and sustainability.

The project carried out study to describe the trends and variability of soil hydraulic properties in the SIR and to explore relationships between soil hydraulic properties and other variables which are less costly to measure. Existing regional soil maps were used as a reference. The study carried out measurements of soil hydraulic properties of 34 soil types at 79 sites, representing 75% of the total area of SIR. In situ measurements of saturated hydraulic conductivity were made at Horizons A, B1 and B2. Soil water capacities were determined in the laboratory on undisturbed soil cores from the field. In addition, a number of physical and chemical properties were also measured in the laboratory in order to establish indirect methods of estimation of soil hydraulic properties.

The collected soil hydraulic property data were compiled in a database. The database describes soil properties based on soil types and soil groups. The database is in the form of look-up tables of soil properties. Values of mean, median and variability measures are given. A draft booklet containing all the look-up tables is presented as an attachment to this report. The format of the booklet will be finalised and published as a reference after consultation with potential users. The database can also be directly linked with digital soil maps through GIS.

The project has built up a picture of the broad trend and variability of hydraulic properties of soils in the SIR. Although some useful trends with respect to soil groups, soil horizons and irrigation districts have been identified, overall it is found that soil hydraulic properties are highly variable. This is particularly so for soil Groups 1 and 3, each comprising highly dissimilar soil types. For this reason, it is suggested that hydraulic property values of individual soil types should be used. Group values should be used as an indication for only those soil types which have not been directly measured.

A number of soil types that cover a large area, such as Lemnos loam and Wanalta loam, show high within-soil-type variability. For these soil types, further measurements may be required to better quantify soil hydraulic properties at paddock scale. It is noted that even at a paddock scale, variability can be quite high, in some cases variability within a paddock can cover much of the within-soil-type variability.

Pedotransfer functions for predicting the soil water retention characteristic from easily measurable soil properties were successfully developed. However, consistent correlations between saturated hydraulic conductivity and easily measurable soil properties were not found.

The new information on soil hydraulic properties adds significant value to pre-existing soil maps and information, and will assist in land use planning, irrigation design, water management and irrigation related policy initiatives. In addition, the soil hydraulic property data acquired in this project will provide a knowledge link between irrigation management and impact on water tables and salinity, and between farm and catchment management. However, a framework is needed for the application of soil hydraulic property information so that irrigation systems and enterprises can be better matched with soils to achieve both farm and catchment outcomes. The development of such a framework should be the focus of future work on practical applications of the data collected in this project.

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