Document Title: Description, AN, Effects of disturbance on soil WP readings		Part # and Rev. 13384	
		Release Date: 1-12-07	
Rev.	Description	Revision By	Date
-01	Updated to WP4C	DDH	11/12/10
-02	Figure 1 updated, Text updated for compatibility with WP4C	DC	5/16/11

Production Filename: 13384 (In Product Library)

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

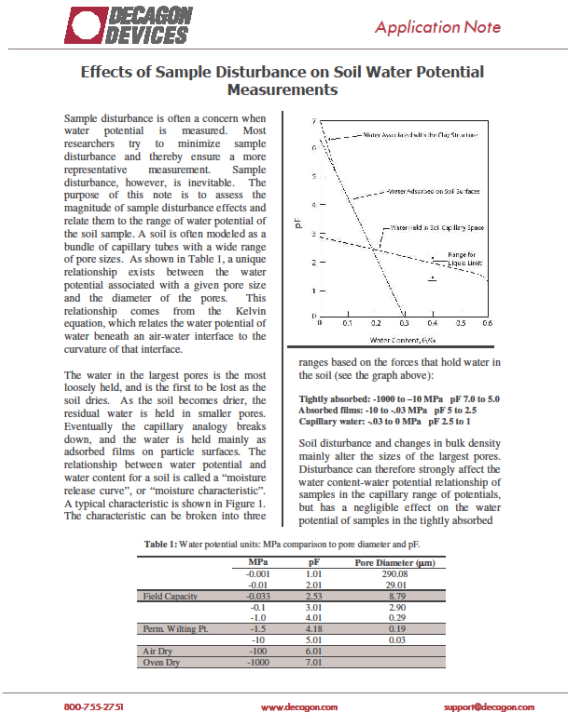
Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Page 1 of 2)



DECAGON DEVICES Application Note

Effects of Sample Disturbance on Soil Water Potential Measurements

Sample disturbance is often a concern when water potential is measured. Most researchers try to minimize sample disturbance and thereby ensure a more representative measurement. Sample disturbance, however, is inevitable. The purpose of this note is to assess the magnitude of sample disturbance effects and relate them to the range of water potential of the soil sample. A soil is often modeled as a bundle of capillary tubes with a wide range of pore sizes. As shown in Table 1, a unique relationship exists between the water potential associated with a given pore size and the diameter of the pores. This relationship comes from the Kelvin equation, which relates the water potential of water beneath an air-water interface to the curvature of that interface.

The water in the largest pores is the most loosely held, and is the first to be lost as the soil dries. As the soil becomes drier, the residual water is held in smaller pores. Eventually the capillary analogy breaks down, and the water is held mainly as adsorbed films on particle surfaces. The relationship between water potential and water content for a soil is called a "moisture release curve", or "moisture characteristic". A typical characteristic is shown in Figure 1. The characteristic can be broken into three

ranges based on the forces that hold water in the soil (see the graph above):

Tightly absorbed: -1000 to ~10 MPa pF 7.0 to 5.0
Absorbed films: -10 to ~.03 MPa pF 5 to 2.5
Capillary water: ~.03 to 0 MPa pF 2.5 to 1

Soil disturbance and changes in bulk density mainly alter the sizes of the largest pores. Disturbance can therefore strongly affect the water content-water potential relationship of samples in the capillary range of potentials, but has a negligible effect on the water potential of samples in the tightly absorbed

Table 1: Water potential units: MPa comparison to pore diameter and pF.

	MPa	pF	Pore Diameter (μm)
	-0.001	1.01	290.08
	-0.01	2.01	29.01
Field Capacity	-0.033	2.53	8.79
	-0.1	3.01	2.90
	-1.0	4.01	0.29
Perm. Wilting Pt.	-1.5	4.18	0.19
	-10	5.01	0.03
Air Dry	-100	6.01	
Oven Dry	-1000	7.01	

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