5.3. Basic Principles of Subsurface Flow and Drainage Design

5.3.1. Subsurface Flow

Groundwater movement is governed by variations in piezometric head and soil hydraulic conductivity (permeability).

Indicative permeability data appropriate to soil conditions encountered in Abu Dhabi are provided in Table 5-1 and can be used as a useful starting point for drawdown estimations. The Consultant will need to demonstrate that data on actual groundwater levels and bulk permeability from site investigations has been obtained.

Permeability (m/s)	Soil Type	Drainage Characteristics
10^{0}	Clean Gravel	Good Drainage
10^{-1}		
10^{-2}		
10^{-3}	Clean Sands, Clean sand and gravel mixtures	Acceptable Drainage
10^{-4}		
10^{-5}		
10^{-6}		Acceptable Drainage
10^{-7}	Very fine sands, organic and inorganic silts,	
10^{-8}	clay, Sabkha, Stratified deposits	
10^{-9}		
10^{-10}	Homogeneous clays below zone of weathering	Practically Impervious

Table 5-1 – Typical Soil Permeability

NOTE: A wide range of values are likely to be encountered in the field, even across relatively small areas and with depth. As such, actual permeability testing or pumping testing may be essential.

5.3.2. Groundwater Levels

A critical parameter in designing a drainage system is the height of the water table midway between two consecutive rows of pipes (refer to Figure 5-3). The final height of the water table at the radius of influence or the rate of fall or rise in the water table will be affected by the hydraulic conductivity of the ground, the storage capacity of the ground and the spacing between drains wherever more than one pipe is used.

It is necessary to achieve certain critical groundwater levels to ensure successful operation of urban infrastructure.

The Consultant shall demonstrate consideration for groundwater levels to rise in the future due to urban development effects, e.g. from new areas of irrigation.

A general guide in designing for critical groundwater levels is shown in Table 5-2.