Development of Geocapillary Barrier System for Water Retention in Highway Landscaping

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Abstract

This study investigates the potential use of geosynthetic materials as capillary barriers to enhance water retention in landscaping soils. Soil was first classified using Unified Soil Classification System (USCS), then Van Genuchten model was used to model and compare unsaturated hydraulic characteristics of the soil and geosynthetic materials. Five different materials; gravel, sand, Needle Punched 50 (NP 50) geotextile, Thermally Bonded (TB) 9 and (TB) 21 geotextiles were used together with silty clay to create capillary barriers in five different 500mm deep soil columns to determine how each of the materials influences the amount of water stored. Water infiltration was allowed into each of the columns constructed as capacitive moisture sensors tracked change in moisture content in the soil. The air entry pressure and residual matric suction for the materials was determined from Water Retention Curves (WRCs) and compared to water content retained in each column. This study concluded that properly designed capillary barrier can be used to increase water retention in landscape soils. It was also demonstrated that geosynthetic materials with the higher residual matric suction (NP 50 and sand) stored more water compared to the ones with the least (TB 21 and TB 9).