MECHANICS OF FLUIDS IN LAYERED SOILS

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MECHANICS OF FLUIDS IN LAYERED SOILS

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ABSTRACT

In this chapter the mechanical behaviour of layered porous, saturated soils, typically consisting of strata of clay and sand is discussed, from the viewpoint of phenomena such as subsidence due to the extraction of fluids from the aquifer. Special attention is paid to the influence of permeability contrasts such as occurring in a soil system consisting of layers of clay and sand, and the relative importance of the compressibilities of the various layers. In many existing models the deformations of the clay layers are disregarded, so that all surface settlements are due to deformations of the sandy aquifers. This may be acceptable for relatively thin layers of stiff clay. In many circumstances, however, such as may occur in delta's of large river systems, it may be necessary to take into account the deformation of the clay layers. For such situations two possible approximate models are presented. The models are compared to a full numerical solution, which can be considered to represent the true solution of the coupled problem.

1. INTRODUCTION

Natural soils often consist of layers of different properties, with layers of high permeability (sand layers) interspersed with layers of low permeability (e.g. clay). For the prediction of the subsidence of such a system due to the withdrawal of groundwater, or due to an external loading of the soil, the compression of all strata must be taken into account.

The problem is of a transient nature, with the propagation of pore water pressure differences being retarded by the combined