ENGR 326
PDE Lab Assignment 1 – Elliptic PDE

A water district is planning the use of a "natural" filter for treating water from a reservoir prior to disinfection and delivery to customers. The filter consists of a 600 meter by 300 meter earthen basin of uniform properties, bound above, below, and on three sides by a impermeable barrier (Figure 1). The south boundary of the filter is maintained at a 30 meter head level from the reservoir. Two extraction wells are planned (Figure 1), each operating at the same pumping rate. Testing has shown that adequate filtration and economical pumping requires that the drawdown at each well not exceed 4 meters. Determine if a total extraction (sum of both pumps) of 1,500 m^3/day is possible given the drawdown restrictions. If extracting 1,500 m^3/day results in too great of a drawdown, determine the maximum extraction rate (to the nearest 5 m^3/day) that does not exceed the drawdown restrictions. Use a successive- over-relaxation (SOR) solution algorithm using a grid with 5 m increments in the x and y direction. Investigate the sensitivity of the solution convergence rate to the SOR factor.

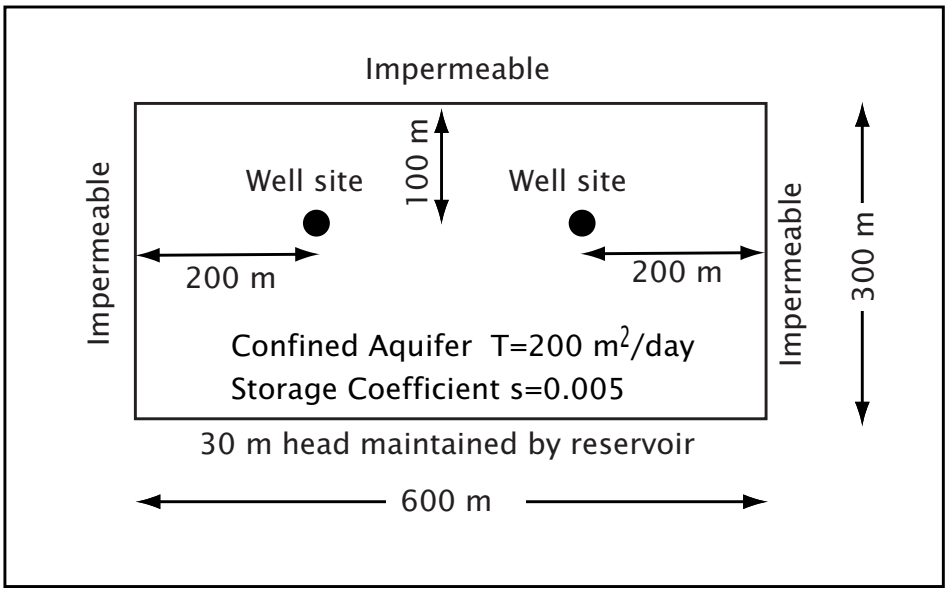

Figure 1. Aerial view of the filtration system.