Hydraulic structures with water level differences upstream and downstream are subjected to seepage in foundation soils. Two sources of weakness are to be guarded against: (1) percolation or seepage may cause under-mining, resulting in the collapse of the whole structure, and (2) the floor of the apron may be forced upwards, owing to the upward pressure of water seeping through pervious soil under the structure. Many earlier failures of hydraulic structures have been reported due to these two reasons.

Closed form theoretical solutions for the case of finite depth seepage below weir aprons with end cutoffs, with a step at the downstream side are obtained in this research. The resulting implicit equations, containing elliptic integrals of first and third kind, have been used to obtain various seepage characteristics. The results have been compared with existing solutions of some known boundary conditions. Design curves for uplift pressure at key points, exit gradient factor and seepage discharge factor have been presented in terms of non-dimensional floor profile ratios.