

Groundwater is our priceless natural resource and it is our duty to protect it and to take care of its quality. That is the reason why several techniques of pollution removal have been developed; the Groundwater Circulation Well technique (GCW) is one of them. This system enables us to clean contaminated groundwater effectively and in-situ (it means that there is no need to extract groundwater to the surface).

This thesis is aimed at collecting and presenting our actual knowledge of the most common GCW systems.

In the first part of the thesis the basic kinds of the GCW are introduced and their principles are presented. The remediation mechanisms are further described with respect to the character of the particular contamination. The chemical and biological processes controlling the contaminant degradation are described. Several experiments that were carried out and monitored in order to study the efficiency of GCWs are presented.

In the last part of the thesis the mathematical modelling of GCWs is introduced. The partial differential equations governing the processes of flow and mass transport in the well surrounding parts of aquifers are presented and the corresponding initial and boundary conditions are formulated. The obtained numerical results and conclusions of their comparison with measured data are discussed.