

Ground-water Circulating Well (GCW) Technology

RCRA/CERCLA Ground-Water Forum
Technical Summary Sheet

Summary

GCW is an in-situ ground-water treatment technology where water is pumped from one interval in a well, treated within the well bore and released into another zone in the aquifer or unsaturated zone. In most cases, compressed air is injected into the lower screen of a GCW, which reduces water density causing upward flow, while air stripping volatile contaminants. Treated water is released through a screen into the upper aquifer. This technology may also be applied to non-volatile contaminants if a contaminant-specific treatment cell is installed within the well or above ground (with subsequent reinjection).

Status

GCW has been used at more than 100 sites (pilot and full scale). However, its performance has not been well-documented, and it is not clear whether the technology is ineffective or if its application has not been adequately demonstrated. Part of the problem is that many of the “success” stories do not provide enough monitoring data to verify the technology’s performance. In 1999, GCW was not recommended for general consideration at DOD sites.

Benefits

The most basic benefits of this technology are that it does not require above ground treatment and it can enhance vertical flow through a stratified system with primarily horizontal flow. The technology is most applicable to sites with one or more of the following characteristics: 1) volatile organic contaminants; 2) deep contamination; 3) thick vadose zone; 4) above ground treatment is not feasible, 5) the remedial goal is source reduction or mass removal (non-absolute), and 6) a nutrient delivery system for enhancing in-situ biodegradation is needed.

Limitations

The most significant limitation of this technology is that it does not work (induce vertical flow and recirculation) when the ratio of horizontal to vertical hydraulic conductivity is greater than 10. This low degree of anisotropy is highly unusual in most hydrogeologic environments (it can exceed 100 at many sites). A single thin (e.g. 10cm) layer of low permeability material can prevent development of a recirculation cell and cause technology failure. Other common problems include the high expense of monitoring, well clogging due to changing redox conditions within the GCW and down well equipment (e.g. packers) problems. Since this method encourages vertical mixing, it would generally be inappropriate in areas containing non-aqueous phase liquids.

Primary/Recommended Reference

Groundwater Circulating Well Technology Assessment, NRL/PU/6115-99-384 for the Environmental Security Technology Certification Program (ESTCP), 1999. Additional information on this technology may also be found at <http://www.cluin.org>.