

Meeting EU Water Framework Directive groundwater quality objectives: the challenge posed by phosphorus in western Irish karst aquifers

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Groundwater can be a significant pathway for phosphorus transfer to surface waters in some circumstances; transfer of ecologically significant quantities of phosphorus has been established in the western Irish limestone lowlands, where thin, or absent, soils and subsoils overlie conduit dominated karst aquifers, providing little opportunity for phosphorus attenuation (Kilroy & Coxon, 2005). In addition, in this karst region, groundwater often provides the majority of surface water flow, and therefore the contribution of phosphorus to surface water bodies can be important.

The E.U. Water Framework Directive (2000/60/EC) required an evaluation of the status of all water bodies, prior to establishing management plans to achieve good status by 2015. The environmental quality standard (EQS) for molybdate reactive phosphorus set for rivers in the Republic of Ireland is 35 µg/l P (as an annual mean). Rivers failing to meet this standard are deemed to be at less than good status. In the Irish Western River Basin District, this includes a large proportion of river channel, much of which lies within the karst lowlands, and this has implications for groundwater body status. The classification of Ireland's groundwater bodies was undertaken in 2008 by the EPA using data from the national groundwater monitoring programme. One of the Water Framework Directive status assessments includes a determination of whether the contribution from groundwater is sufficient to threaten the Water Framework Directive objectives for associated surface water bodies. In the case of phosphorus, the test requires consideration of both groundwater phosphorus concentrations and groundwater flow contributions to surface water. The criteria for poor groundwater status are met if an associated surface water body does not meet its objectives, groundwater threshold values are exceeded and groundwater contributes more than 50% of the pollutant load required to cause the environmental quality standard of 35 µg/l P to be exceeded. The results of this assessment were that 101 groundwater bodies (13.3% of area) in the Republic of Ireland were at poor status due to the contribution of phosphorus from groundwater bodies to associated surface water bodies (Daly, 2009). The vast majority of these groundwater bodies are in karst aquifers.

This situation presents a challenge for those working to attain the required Water Framework Directive objectives of good status by 2015. Further research is required on phosphorus sources and transfer pathways within poor status groundwater bodies, and on the implications for river basin management plans.

Daly, D. 2009. Groundwater—the 'hidden resource'. *Biology and Environment: Proceedings of the Royal Irish Academy* 109B: 221–36. DOI: 10.3318/BIOE.2009.109.3.221

Kilroy, G. and Coxon, C. 2005. Temporal variability of phosphorus fractions in Irish karst springs. *Environmental Geology*, 47 (3): 421-430.