

# Making better use of water resources

## Using groundwater storage to manage supplies

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**F**resh water resources in rivers, lakes and aquifers are finite and often poorly distributed. Sustainable use of water resources involves, not only meeting the demands for potable water but also demands from industry, agriculture, recreation and the environment. In humid countries maintenance of a minimum river flow may be demanded for effluent dilution, navigation and habitat preservation.

The sources of water selected to meet demands are dependent on availability and cost and often a combination of surface and groundwater is used. The supply of water from precipitation is variable on an annual or longer cycle so storage is a key component of many schemes. Storage of water is most visible in lakes and man-made reservoirs but by far the largest store is natural, as groundwater in aquifers. In the UK, groundwater provides about one third of potable supplies. Dependence on groundwater increases in south-east England where low topography, low rainfall and high population density frequently make groundwater the most economically and environmentally attractive source of water.

The store of water in aquifers, is constantly being depleted by natural seepage to wetlands and streams – the baseflow component of river flow. Total discharge from aquifers is increased by abstraction. This can intercept groundwater flow towards natural discharge points and hence reduce baseflow in streams and rivers. However, much of the groundwater taken for public supply and some

industrial uses is returned to the surface water system as treated waste-water. Careful management of the timing and location of the abstraction and the location of discharge of return waters can minimise the impacts.

Conjunctive use of surface and groundwater can reduce abstraction from rivers during periods of low flow by using groundwater storage. River augmentation schemes pump groundwater into streams to maintain flow in the dry summer months, the aquifers being recharged in the wet winter months. Artificial recharge of aquifers through spreading basins or injection into boreholes is another technique that is increasingly being used to enhance water storage capacity.

Seasonal surplus water can be injected into aquifers when supply exceeds demand; it is then available for abstraction at times of high demand. Aquifer Storage Recovery (ASR) schemes usually use the same borehole to inject and recover the water and can store large volumes with minimal environmental impact. Capital investment can be spread through phased development and major water transfer schemes or reservoir construction can be delayed or even avoided. Often the ASR option is considerably cheaper than other solutions to water supply problems. Despite the obvious benefits of ASR, it is a relatively untried technology in the UK. It is considered to be a high risk option because of lack of understanding of the science. Research and trial investigations are being undertaken to improve our understanding.

### ASR in Britain

- The BGS, UKWIR and the Environment Agency undertook a study of the potential for ASR in Britain as well as the regulatory issues involved in development (1997/98).
- Thames Water, Wessex Water, Yorkshire Water, Anglian Water, Southern Water and several of the water supply companies are actively involved in investigating the potential of, ASR.
- A two-year research project to investigate the hydraulic and geochemical performance of ASR schemes is to start at the end of 1998. The project is funded by an OST Foresight LINK award and UKWIR Ltd., and will be carried out by the BGS.

*Investigating an artesian borehole in a potential ASR scheme in Dorset.*

