



In this practice note:

- Bores
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Groundwater extracted from bores can be an important water source for domestic use. Many urban areas occur over a suitable aquifer. Indeed, the use of groundwater in Australia for outdoor purposes is commonplace.

Groundwater quality varies from place to place, and may be unsuitable for domestic purposes. For example, groundwater can be saline or be contaminated by hu-

man activity. Where groundwater quality is unsuitable, artificial recharge of stormwater into the aquifer can often be used to produce suitable water supplies. This process is known as aquifer storage and recovery. Many authors have described successful aquifer storage and recovery projects (see references).

As well as positive benefits, groundwater utilisation schemes have the potential to cause adverse impacts on local groundwater levels and quality. Consequently, specialist advice is required from qualified personnel. In addition, approvals from relevant authorities are also required.

This WaterSmart Practice Note gives a general introduction to groundwater utilisation measures.



BORES

Covers:

- Key elements of a groundwater bore

A groundwater bore comprises a hole drilled into the ground to a depth exceeding the water table (the uppermost level of strata that is saturated by groundwater). Water-bearing strata beneath this level (such as rock or sand) is termed an aquifer. The depth of the water table and aquifers varies considerably from place to place in response to geological and climatic conditions, and can also vary seasonally.

A pump system is required to extract groundwater from the aquifer. Bores are installed by specialist drilling contractors. The principal components of a bore are shown in Figure 1.

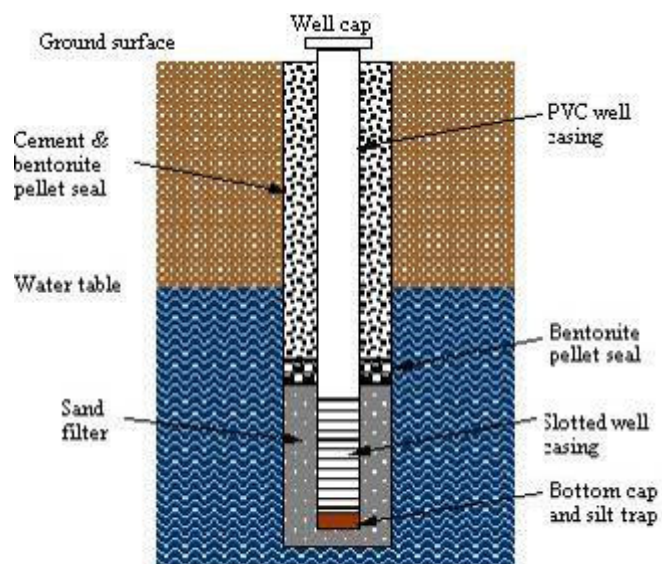


Fig 1: Components of a groundwater bore

GROUNDWATER EXTRACTION

Covers:

- Extracting groundwater for non-potable use

A conceptual groundwater extraction scheme is shown in Figure 2. Groundwater is extracted from an aquifer using a submerged pump placed in the bore. It is subsequently passed through a filter to remove sediments or contaminants. The extracted water is used for outdoor uses and toilet flushing.

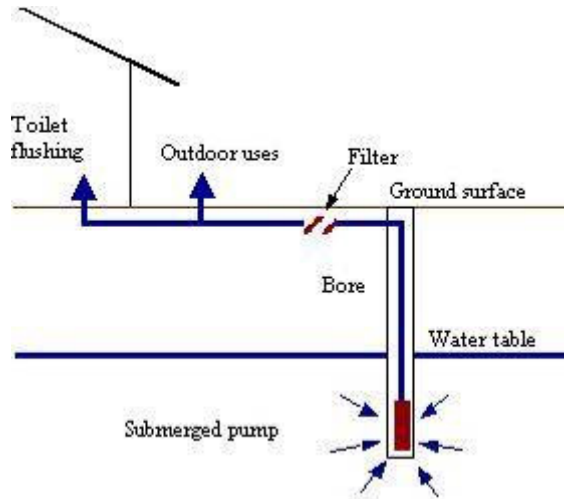


Fig 2: Conceptual groundwater extraction scheme

AQUIFER STORAGE & RECOVERY

Covers:

- Installation of a gravity rainwater tank system

Aquifer storage and recovery involves the injection of treated stormwater into a suitable aquifer. This water is stored in the aquifer for extraction and reuse at a later time. A conceptual aquifer storage and recovery scheme is shown in Figure 3.

There are three essential criteria that must be satisfied by an aquifer storage and recovery scheme.

- *Pre-treatment:* rainwater must be suitably treated prior to aquifer injection in order to prevent groundwater contamination. Domestic roof water is generally of acceptable quality provided that it is passed through a sand-gravel filter.
- *Water balance:* aquifer extraction and recharge must be balanced on an annual basis. This will ensure that long-term ground water levels are maintained.

- *Suitability for use:* the quality of water extracted from the aquifer must be suitable for the proposed use.

Satisfying each of the above requires specialist investigation, advice and management. Consequently, aquifer storage and recovery will generally only be appropriate for larger housing developments. However, where installed, it can produce significant water management benefits including:

- reduced groundwater salinity
- flood mitigation
- reduced mains water demand and costs
- restoration of groundwater levels
- improved stormwater quality.

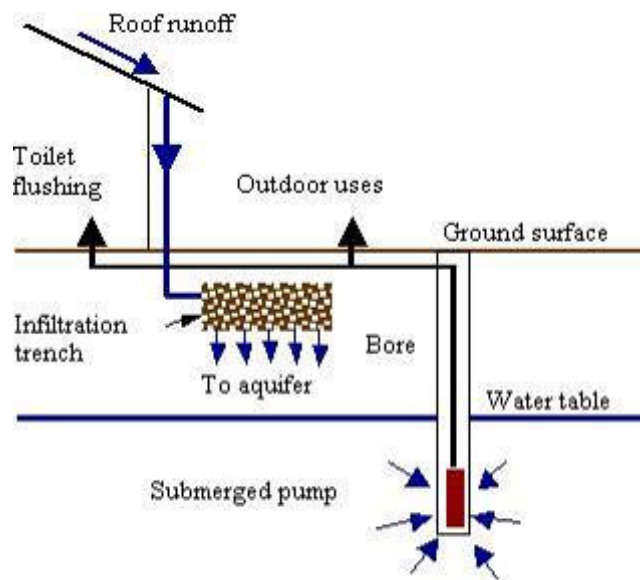


Fig 3: Conceptual aquifer storage & recovery scheme

APPROVALS

Covers:

- Licences required for groundwater extraction and injection

An access licence under the *Water Management Act 2000* is required to extract groundwater from an aquifer. Such licences are administered by the NSW Government of Natural Resources.

Because of the need for an access licence, a development application for

housing or other development involving groundwater extraction or aquifer storage and recovery is classed as 'integrated development'. This means that the application is required to be referred by the local council to the NSW Department of Natural Resources (DNR) for its 'general terms of approval' regarding the access licence.

Consultation with the Department of Environment and Conservation (DEC) is advised regarding aquifer injection and

the need for an environment protection licence under the *Protection of the Environment Operations Act 1997*.

Development applications should be supported by detailed documentation that addresses relevant hydrological, hydrogeological, soil contamination and public health issues. This must be prepared by personnel having appropriate qualifications, expertise and experience.

USEFUL WEBSITES

CSIRO Urban Water Program: www.csiro.au/csiro/channel/ich37.html

CRC for Catchment Hydrology: www.catchment.crc.org.au

Department of Environment and Conservation (NSW): Licensing under the Protection of the Environment Operation Act 1997: www.epa.nsw.gov.au/licensing/index.htm

NSW Government Department of Natural Resources: Legislation, water access, trading, approvals and licences: www.dnr.nsw.gov.au/water/licensing.shtml

Peter Coombes, University of Newcastle: www.eng.newcastle.edu.au/~cegak/Coombes

Royal Australian Institute of Architects, BDP Environment Design Guide: www.architecture.com.au/i-cms?page=60

University South Australia: www.unisa.edu.au

PRODUCT SUPPLIERS

Atlantis Corp.: www.atlantiscorp.com.au

Rocla Concrete Products: www.rocla.com.au

James Hardie Industries: www.jameshardie.com.au

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