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Bore water use in Perth gardens

People in most areas of Perth are able to draw on shallow groundwater by sinking private bores.

Each year in Perth, about 70 million kilolitres of high-quality household scheme water is used on Perth's gardens. This is more than the entire contents of Mundaring weir. Instead of using scheme water, many people use shallow groundwater pumped from their own bores to water their gardens.

Perth's groundwater resources

The Swan Coastal Plain, upon which Perth is situated, is covered by a veneer of sediments, particularly sand and limestone. These sediments have been deposited over thousands of years by water and wind. The superficial sediments extend to a depth of about 100 metres (average 50 metres) over the top of older and often less permeable sediments. Rainwater percolates into the superficial sediments and accumulates as groundwater.

Shallow groundwater is an important source of water for Perth's scheme supply and is also extracted through bores for watering private gardens, parks, sporting areas and market gardens.

A distinguishing characteristic of the shallow groundwater that we draw upon for garden watering is that it is generally at the same pressure as the atmosphere. This means that most householders can dig down several metres into the sand to reach the top of the saturated soil, called the watertable, but then must lift the water up to the surface for use. Perth's early settlers lowered a bucket on a rope but most people now have electric pumps to draw the water up. In contrast, deeper sources of groundwater, sometimes called artesian aquifers, hold groundwater under pressure. When a drill is used to bore down through the confining rock, the groundwater may rise to the surface.

Who has bores?

There are estimated to be 130 000 private bores in Perth. The number of private bores increased rapidly when water restrictions were imposed in the late 1970s due to a long dry spell of weather.

The number of bores in an area depends on:

- depth to the watertable — installation costs can be discouraging where the watertable is more than 10 metres deep;
- difficulty — coastal areas have fewer bores possibly because of the high cost of drilling into limestone;
- chance of success — bores are fewer in some eastern suburbs particularly in areas of clay or granite where bore yields are generally low.

Activities removing large volumes of groundwater require an abstraction licence from the Water and Rivers Commission. However, household bores in the Perth metropolitan area do not need a licence mainly due to the relatively minor amounts of water they remove. If you are unsure if a licence is required for your property, please contact the Commission on the phone numbers provided.



Perth's garden bore strategy

In 1997 the Minister for Water Resources launched a campaign to promote the use of garden bores. Currently almost a third of Perth's scheme water supply is used on gardens. Instead of using this high quality water, garden bore owners use shallow groundwater.

Where clean and accessible groundwater exists in areas suitable for garden bores, they are a good way of utilising this resource.

The Commission recently released the 'Perth Groundwater Atlas' to provide information on the areas suitable for garden bores. The Groundwater Atlas is a source of easily accessible groundwater information to assist drillers, irrigators and the public. This publication is available at many libraries, and through the Commission.

Although groundwater may be readily available, it should still be considered a precious resource. Groundwater is very important to the environment and should be used in a responsible manner.

Given that in many areas gardens are not as large as they used to be, consideration should be given to sharing a bore between neighbours. This will provide all the benefits of owning a bore while allowing the cost of installation to be shared.

Groundwater prior to urbanisation

Groundwater is part of a dynamic water cycle. Where the Swan Coastal Plain is still covered in native vegetation, an average of about 10% to 20% of rainwater percolates down into the shallow aquifer to become groundwater. The groundwater then moves very slowly under the force of gravity until it discharges into rivers and the ocean. However, much is returned to the atmosphere along the way via evaporation from wetlands and transpiration by vegetation.

Groundwater is important to the health of the coastal plain environments. The Swan Coastal Plain was once a patchwork of wetlands (lakes and swamps) and many still remain despite draining for agriculture and urban development. These wetlands depend on the groundwater level being at or near the surface. The natural vegetation also relies on groundwater. In many areas, the plants are able to survive and even continue to grow through the summer by reaching down to the watertable.

Groundwater levels have a seasonal cycle. The watertable of the Swan Coastal Plain rises in winter with rainfall recharging the groundwater, and then gradually drops over the summer months. The wetland and woodland vegetation and animals have adapted to this cycle.

Changes with clearing and urbanisation

Since European settlement, the groundwater balance has been altered in three ways:

- Clearing — the natural vegetation, which removed much of the groundwater through transpiration, has been cleared in many areas, causing the watertable to rise.

- Drainage — the watertable has been lowered in low-lying land in and around wetlands, often for agriculture and housing. The excess water is drained to the river, ocean and a few wetlands which have been set aside as permanently inundated collection points, such as Lake Monger.
- Sealing of surfaces — covering the ground with houses, roads and paving increases the amount of water runoff from rainfall. Through much of Perth, these large volumes of runoff are concentrated into compensation basins and into the ground, adding to high watertable problems.

Raised watertables have meant that many suburbs need to be drained to keep houses dry in winter — 520 million cubic metres (twice the scheme water supply) is drained annually from an area of 84 000 hectares in northern, central and southern Perth. Some reduction in watertable levels back toward the natural balance has occurred in the older suburbs where gardens and parklands are well established. However, the current tendency to increase housing density, with increased roof and pavement runoff, is likely to reverse this trend.

The permanently higher watertable and need for drainage has upset the natural balance. In particular, some of the wetlands that have not been drained have grown broader and deeper. Many previously seasonal wetlands are now permanently inundated. The higher watertables have killed trees in and around the water and lakes have lost birds that rely on seasonally receding mudflats.

Private bores can be a good thing

There are many parts of Perth where bores should be encouraged for garden irrigation. In areas where the watertable is close to the surface, a drainage system exists to prevent further groundwater level rises. Using groundwater for irrigating gardens in these areas will reduce the amount that has to be drained to wetlands, rivers or the ocean. The combined effect of many bores can be to draw the watertable down more in summer than at present, but this can help to restore a seasonal cycle.

The benefits are several:

- scheme water savings — use of groundwater for irrigation purposes reduces draw on scheme water supplies, delaying the time when new resources (dams and wellfields) are needed;
- recycling of local water — using the excess groundwater brought about by urbanisation for irrigating gardens is a good idea whereas 'importing' scheme water for garden irrigation adds to the already high groundwater levels.



Waterwise garden bore use

Groundwater bores should be used efficiently. Even though groundwater is readily available in most areas, watering your garden with bore water should still be undertaken responsibly and in a Waterwise manner.

You can be Waterwise by:

- only watering enough to meet the garden's needs
- using plants that require less water (e.g. native species)
- not watering during the daylight hours

While bores offer a range of benefits, their excessive use can contribute to a number of environmental problems:

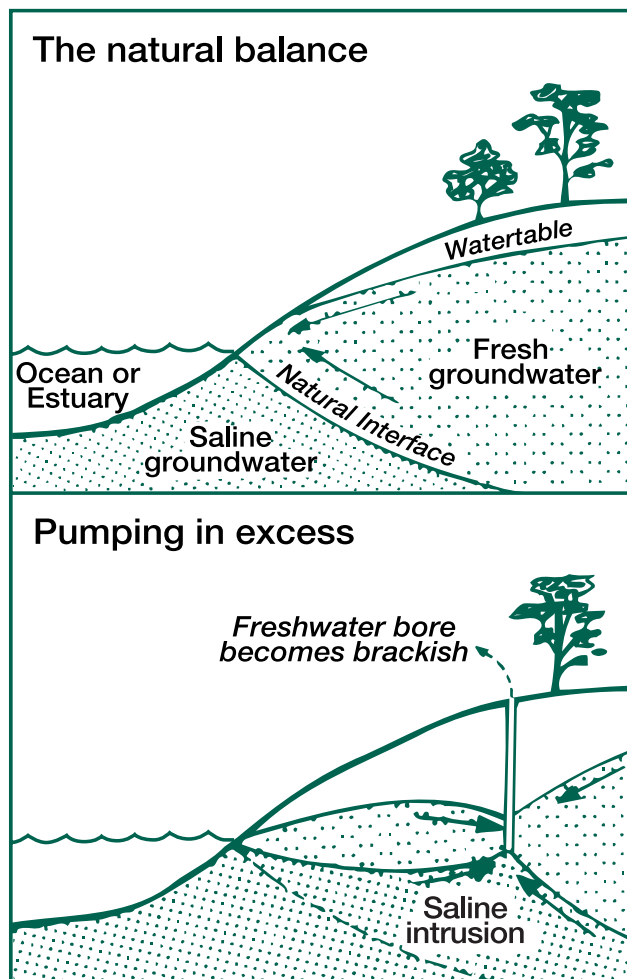
- Groundwater draw-down — overpumping can lower the watertable to undesirable levels in about 10% of suburban areas and be detrimental to the environment.
- Nutrient loss — most of Perth soils are very poor in nutrients and do not readily bind fertiliser. Over-watering will leach out the fertilisers that gardeners need to add to their lawns and flower-beds. This is an unnecessary cost to the gardener and risks polluting the groundwater and local wetlands with nutrients (nitrogen and phosphorus).
- Saltwater intrusion — in areas prone to saltwater intrusion (close to the coast or Swan River estuary) excessive bore use is a major contributing factor to the influx of saline water.

Possible constraints on bores

Bores are an excellent water supply for garden use in much of Perth. However, not all areas of Perth are suitable for bores.

- In some places, the watertable is deep beneath the ground surface or the rock type encountered makes drilling for water difficult and expensive.
- Near the foothills and in places where there are clay soils, groundwater supplies may be limited and bore yields may be low.
- Other areas are environmentally sensitive. Wetlands, and the plants and animals that depend on them, need groundwater to maintain water levels. Pumping out too much water near wetlands could disrupt the natural water cycle and cause environmental damage. Wetlands of conservation value are depicted in the 'Perth Groundwater Atlas'. If you plan on installing a bore near such a wetland (within 500 metres), please contact the Commission.
- In areas near the Swan River estuary or the ocean, saltwater may be drawn into the bores if they are excessively pumped. Because the water within the

ocean and estuaries is saline, a wedge-shaped boundary (or interface) is formed between this saline groundwater and the fresh groundwater below the land. This saltwater wedge may extend more than a kilometre inland. For example, all of the Cottesloe peninsula is underlain by saline groundwater.



Saltwater intrusion into bores

- Where there is or has been industrial activity, and in areas near old waste disposal sites, the groundwater may be contaminated. The Perth Groundwater Atlas shows the location of known and inferred contaminated sites in the metropolitan area.

Areas suitable for bores

Throughout the Perth area the Commission's 'Perth Groundwater Atlas' provides information such as the depth to groundwater, groundwater salinity and identifies areas unsuitable for garden bores. The areas which are generally suitable for drilling garden bores include:

- the northwestern urban corridor;
- the central sandy areas north and south of the Swan River;
- the northeastern urban corridor in areas without clay;
- suburbs west of Jandakot;
- suburbs around Winthrop.



Areas not suitable for bores

Areas generally unsuitable for drilling more garden bores include:

- the Cottesloe peninsula (saltwater intrusion)
- suburbs around Secret Harbour and Port Kennedy (limited groundwater resources)
- within 200 metres of the ocean or the Swan River estuary (saltwater intrusion)
- areas in and around the foothills (groundwater is limited)
- near wetlands (possible excessive lowering of groundwater if bores are overpumped)
- near contaminated areas (groundwater may be polluted)

Groundwater contamination

Groundwater contamination occurs in some Perth suburbs, but is generally of little concern provided that water from household bores is only used for watering gardens and is not used for drinking. Groundwater contamination is most likely to be detected in bores near existing or old commercial or industrial areas.

Pumping from bores can affect groundwater flow and alter the movement of a contaminant plume towards the bore. Garden bores that are located in areas of groundwater contamination may pump contaminated water. While this may or may not harm plants, the contaminated groundwater may be harmful to humans, if consumed. The Water and Rivers Commission strongly recommends that the water from garden bores is not used for drinking unless analysed and certified safe by the Health Department of Western Australia.

The Water and Rivers Commission advises that bores should not be located in areas of groundwater contamination. If in doubt, please contact the Water and Rivers Commission. For more information on groundwater contamination, see Water Facts 10, Groundwater Pollution.

For more information

Copies of the Commission's 'Perth Groundwater Atlas' are available for sale from the Water and Rivers Commission and for viewing in a number of local libraries. The atlas provides easy access to groundwater information for assist drillers, irrigators and the public.

Groundwater and bores: If you wish to find out more about the groundwater resources of Perth and the wise use and management of these resources, contact the Commission on (08) 9278 0300.

Information on Waterwise gardening is also available from the Water Corporation on (08) 9420 2420.

Sinking a bore: Irrigation and reticulation installation companies that are members of the Irrigation Association of Australia can advise on practical aspects of sinking bores. If you are interested in sharing a bore with your neighbours, then some corporate members of the Irrigation Association are able to provide information on agreements that may be used to confirm the arrangement.

To ensure consumer protection, the Australian Drilling Industry Association recommends the use of drillers certified by the ADIA (or suitably equivalent qualifications). The ADIA can provide information on suitably qualified drillers in your area. Phone: (08) 9354 8436.

Limitations of information

While particular areas are considered suitable for bores, the actual yield and quality of groundwater cannot be guaranteed. Both are highly variable and depend on a number of factors including the precise location and depth of the bore.

For more information contact



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