Water facts 10

GOVERNMENT OF WESTERN AUSTRALIA

WATER AND RIVERS COMMISSION DECEMBER 1998

Groundwater pollution

It is vital to protect Western Australia's precious groundwater from contamination. This sheet explains how groundwater is managed so that we have clean water supplies for the future and protect the environment.

The importance of groundwater

Groundwater for water supplies

Groundwater is water that occupies the pores or crevices of soil or rock.

Groundwater which is fresh enough to use for water supply may contain up to 1500 milligrams per litre total dissolved salts (mg/L TDS). Groundwater in some areas is only suitable for stock (up to 14000 mg/L), or ore processing (up to 200 000 mg/L).

The amount of groundwater in Western Australia's sedimentary basins that is fresh enough to contribute to water supplies is estimated to be about 2500 gigalitres per year. However, not all of this can be used. The quantity of good quality fresh groundwater available for use for water supplies on a sustainable basis, without depleting our stores or damaging the environment, is much less — maybe one thousandth of the groundwater stored in sedimentary basins. *This means that it is very important to protect these resources from pollution (contamination).*

Salinity is the measure of total soluble (or dissolved) salt (mineral constituents) in water. For water supplies, water resources are classified as fresh, marginal, brackish or saline on the basis of salinity measured as milligrams per litre (mg/L) Total Dissolved Salts (TDS).

Fresh (good quality)	<500mg/L
Marginal	500-1500mg/L
Brackish	1500-5000mg/L
Saline	>5000mg/L

Protecting groundwater from pollution is basic to protecting and conserving our wetlands and rivers.

Groundwater and the environment

Many wetlands in south-west Western Australia are formed when the groundwater surface (watertable) is higher than the land level. Many of these lakes and swamps are of very high conservation value. Groundwater also discharges into streams and rivers. Nutrients and contaminants in the groundwater can enter wetlands and streams, feed algal blooms and cause pollution.

Groundwater pollution

Groundwater pollution occurs when waste products or other substances change the chemical or biological characteristics of the water and degrade water quality so that animals, plants or human uses of the water are affected.

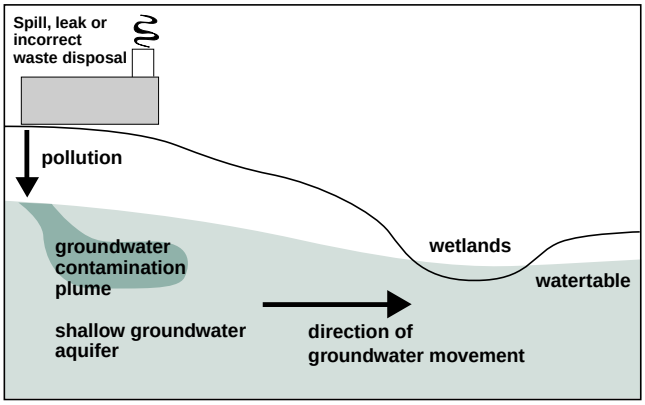
Pollutants include plant nutrients, bacteria, viruses, pesticides, herbicides, hydrocarbons (including petrol and oil), heavy metals and other toxic chemicals.

Why is groundwater prone to pollution?

Shallow groundwater is often affected by land use. Chemicals or microorganisms (bacteria and viruses) may filter through the soil to the watertable causing groundwater pollution, particularly when the watertable is shallow and soils are sandy. Groundwater in deeper (confined) aquifers beneath layers of rock or clay that do not let water through has better protection from pollution because it is not directly connected to the surface environment.

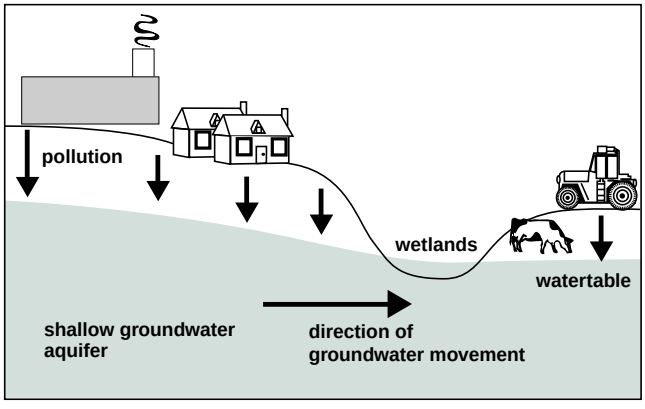
Sources of pollution

The most severe pollution often results from localised spills of chemicals, or where contaminated water is disposed of into soak wells or unlined pits. Localised sources such as these are known as *point sources* of contamination. The contaminant interacts with the moving groundwater and the soil and spreads out to form a plume moving in the same direction as the groundwater. The resulting *groundwater contamination plume* may extend several hundred metres or even further away from the source of pollution.



Point source pollution.

Groundwater can also be contaminated by *diffuse sources* over a wide area, for instance widespread use of fertilisers on gardens. Diffuse contamination may have greater environmental impacts than contamination from point sources because a much larger volume of water is affected.



Diffuse sources of pollution.

What land uses can pose a risk to groundwater?

Rural landuses generally pose a relatively low risk, but horticulture which uses large amounts of fertiliser, and intensive animal industries such as piggeries and stock holding yards, can cause pollution from nutrients, bacteria, viruses and pesticides.

Urban runoff can be highly polluted by fertilisers, animal droppings, oil, petrol, tyre rubber and pesticides.

Groundwater in areas with septic tanks could be polluted by nutrients, chemicals (e.g. fats, soaps, detergents, solvents, grease) and pathogens (bacteria and viruses).

Leachate from sanitary landfill and liquid waste disposal sites may pollute groundwater with nutrients, bacteria (especially *Salmonella*), toxic chemicals, acids and alkalis.

Leachate is material washed out of a layer of soil or dumped material by being dissolved in rainwater as it moves through the soil.

Industrial and some commercial developments present the greatest risk. Groundwater contamination can result from deliberate waste disposal, and accidental leaks or spills of hazardous chemicals during transport, storage or use.

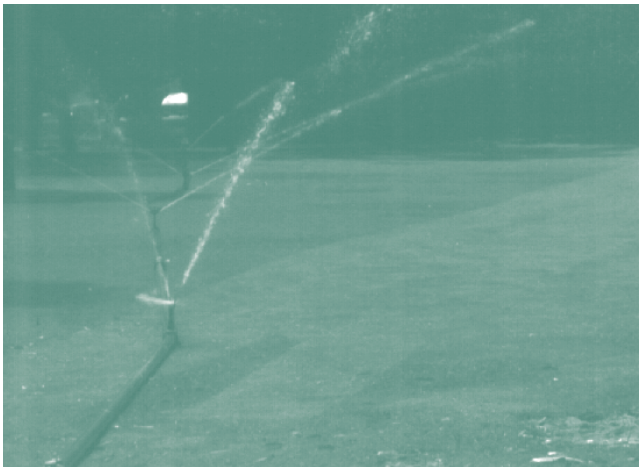
Pollutants depend on the industrial process and can include acids, alkalis, heavy metals, oils, solvents and organic chemicals. Some mining processes use toxic chemicals including cyanide which can pose a serious problem if spilled.

The impact of pollution

In Perth, where there is the highest population pressure, the water quality of the shallow groundwater is still generally very good but there are instances of localised groundwater pollution. Some wells in the Gwelup wellfield had to be shut down because of industrial contamination. Potential sources of groundwater contamination such as petrol storage tanks have been identified, and pressure for more intensive land development on the groundwater mounds is a potential threat to water quality.

Groundwater in many other parts of the State has been affected by agricultural activities, particularly in the coastal area between Geraldton and Augusta where more than 80% of the population live. Although nutrient contamination will not usually affect drinking water supplies, there are potential environmental impacts for waterways and wetlands that receive groundwater flow. The nutrients feed algae that can cause algal blooms.

Garden bores



Bores tapping shallow groundwater provide a means of watering many lawns and gardens without using high quality scheme water. In Perth, about 30% of houses have a garden bore. About 120 000 garden bores pump out around 80 million kilolitres of readily available groundwater each year.

How can you spot pollution in garden bores?

Water from private bores which tap into shallow groundwater is often coloured by peaty deposits, cloudy due to suspended sediments, contains iron and may have an odour. This water is usually suitable for watering gardens and irrigation, but unsuitable for drinking without treatment.

Bore water may be contaminated if:

- water has a strong chemical or petrol smell
- a strong smell of 'rotten eggs' suddenly appears
- water forms 'soap suds' around sprinkler outlets
- water changes colour over a period of a few weeks to months
- plants within the range of sprinklers wilt or die

How can you get bore water tested?

Samples of bore water can be tested by chemical laboratories listed under 'Analyst' in the telephone book.

Protecting groundwater quality

Preventing contamination

Once groundwater has been contaminated, it can be very expensive and often impossible to remove the pollutant. Natural dilution and dispersion may take hundreds of years. The groundwater may be unsuitable for drinking or other uses, or require expensive treatment. Groundwater can also carry the pollutants into rivers and wetlands. This means that it is vital to *protect* groundwater from pollution.

It is important to ensure that areas where groundwater is used for public or private water supply are managed to prevent groundwater contamination. This can involve:

- setting water quality standards for particular uses
- monitoring water quality to detect contamination
- declaring water source protection areas
- planning controls to limit the types of land uses permitted
- relocating potentially contaminating activities
- managing activities to minimise their impact (e.g. waste disposal, transport of hazardous chemicals)
- identifying and cleaning up contaminated sites
- changing land use to minimise the risk of contamination

You can help

- Use pesticides and fertilisers on your garden with care.
- Never tip paint, chemicals or oil into street drains.
- Store, handle and dispose of chemicals safely.
- Plant local native plants in your garden and road verge to save water and fertiliser.

Groundwater management areas

Groundwater management areas are proclaimed over areas of land overlying groundwater resources to allow controls that will protect present and future water supplies.

Declaring a 'proclaimed' area under an Act of Parliament enables control of land use in the area; for example, to prohibit activities which could cause pollution, or control the amount of water taken by licensing users.

Groundwater Area
An area proclaimed under the *Rights in Water and Irrigation Act* in which private groundwater abstraction is licensed.

Water Reserve
An area proclaimed under the *Metropolitan Water Supply Sewerage and Drainage Act* or *Country Areas Water Supply Act* to allow the protection and use of water on or under the land for public water supplies.

Underground Water Pollution Control Area (UWPCA)
An area defined under the *Metropolitan Water Supply Sewerage and Drainage Act* in which restrictions are put on activities that may pollute the groundwater.

Public Water Supply Area (PWSA)
As for UWPCA but allowing the taking of groundwater for public supplies.

The role of the Water and Rivers Commission

The Water and Rivers Commission manages Western Australia's water resources to enable sustainable development and maintain environmental and social values.

The Commission protects groundwater quality by:

- responding to pollution complaints
- cleaning up spills that threaten to pollute water resources
- assessing groundwater contamination
- monitoring water quality
- regulating land use in Public Water Source areas, including permits for businesses to operate
- guiding planning and development and catchment management to protect water resources
- preparing strategic plans for water resource protection, management and use
- assessing potential impacts of developments
- managing salinity

The Commission also has an important role in managing use of water resources (see Water Facts 9).

Further reading

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Introducing groundwater, Price, M., Allen and Unwin, 195pp, 1985.

Perth Groundwater Atlas, Water and Rivers Commission, 1997.

The water cycle, Water Facts 7, Water and Rivers Commission, 1998.

Waterwise garden bores, Water Advice 2, Water and Rivers Commission, 1997.

What is groundwater? Water Facts 8, Water and Rivers Commission, 1998.

Western Australia's groundwater resources, Water Facts 9, Water and Rivers Commission, 1998.

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This Water Facts sheet is one in a series providing information on water issues of interest to the community.

Printed on recycled paper December 1998
ISSN 1328-2042 ISBN 0 7309 7408 1