Great Artesian Basin – SA

'The Great Artesian Basin (GAB) is the lifeline of the north as it supplies the pastoral and mining industries and communities with water in the driest zone of South Australia'

Resource Assessment

Fact Sheet 10

Department for Water Resources

Government of South Australia

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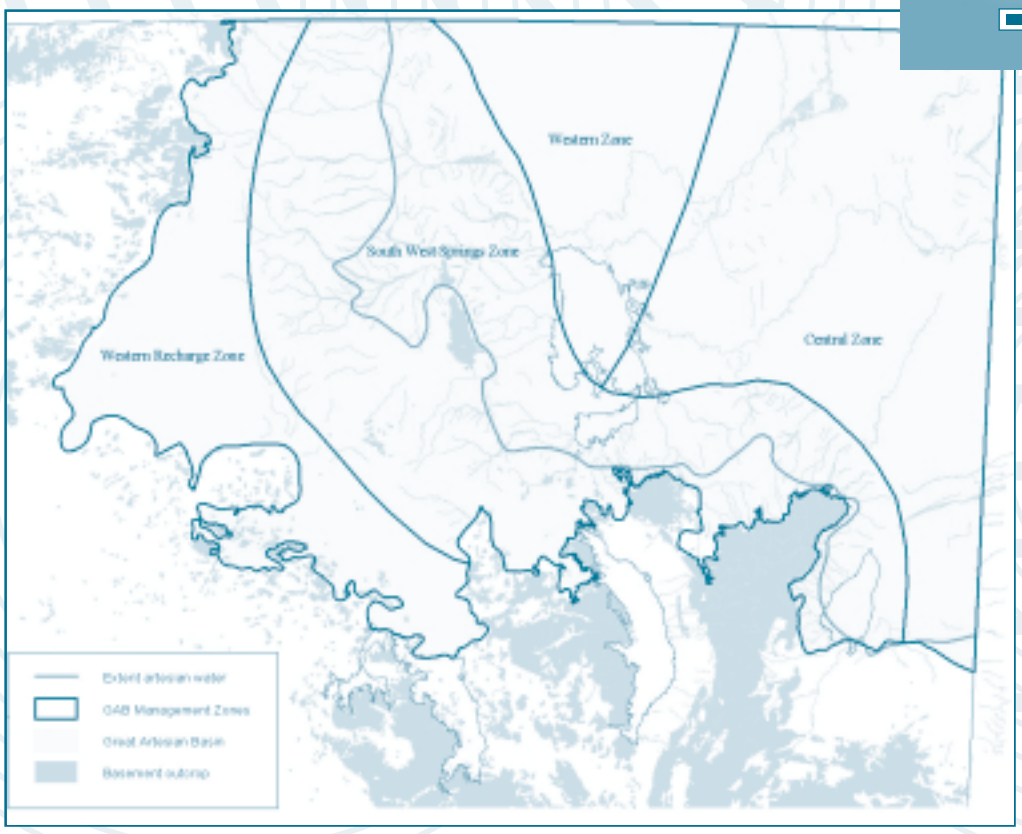
The Great Artesian Basin (GAB) is the lifeline of the north as it supplies the pastoral and mining industries and communities with water in the driest zone of South Australia.

Map of whole of GAB



Map of the South Australian portion of the GAB

Extending from Marla in the west, to Marree and Dubbo (NSW) in the south, the Great Dividing Range in the east and Cape York to the north, the GAB is one of the largest artesian basins in the world. It covers an area of 1 711 000 square kilometres or 23% of the Australian continent. The South Australian portion of the Basin covers an area of 376 000 square kilometres which is ~38% of the State.

The total volume of water stored in the GAB has been estimated at 8 700 million megalitres. A megalitre (ML) is one million litres and will fill about one half of an Olympic sized swimming pool.

A Brief History

In 1878 water from the GAB was discovered when a shallow bore was drilled near Bourke in western New South Wales. The first deep well was drilled in 1886. By 1915 over 1500 artesian bores had been drilled throughout the Basin and currently there are over 4500.

The first artesian bore in South Australia was drilled in 1883. The discovery of artesian water enabled permanent watering points to be established along the stock routes and provided reliable drinking water for pastoral properties. Currently there are ~290 artesian wells in South Australia (excluding Moomba) providing water for the pastoral and mining industries, town water supplies and monitoring purposes.

Individual bore depths in South Australia vary from less than 100 up to 1500 meters. Bores up to 2 000 meters have been drilled elsewhere in the Basin.

How was the GAB formed?

Created between 100 and 250 million years ago the GAB consists of alternating layers of water bearing (permeable) sandstone aquifers and non-water bearing (impermeable) siltstones and mudstones. The thickness of this sequence varies from less than 100 metres on the edges of the basin to over 3000 metres in the deeper parts of the basin. Some of the sandstone sequences contain oil and gas where conditions are suitable.

The main aquifer in South Australia is the Algebuckina Sandstone and Cadna-owie Formations. The Cadna-owie Formation is covered by the Bulldog Shale which forms a partly effective confining layer. An upper aquifer, the Coorikianna Sandstone, is rarely used because of its high salinity.

Basin Characteristics

The aquifers of the Basin are predominantly recharged by rainfall and stream flow along the Great Dividing Range in NSW and Qld. Recharge, to a lesser extent, also occurs in the SA / NT border region. The water seeps down through the sandstone aquifers and becomes pressurised because the overlying impermeable layer confines the water to the aquifer.

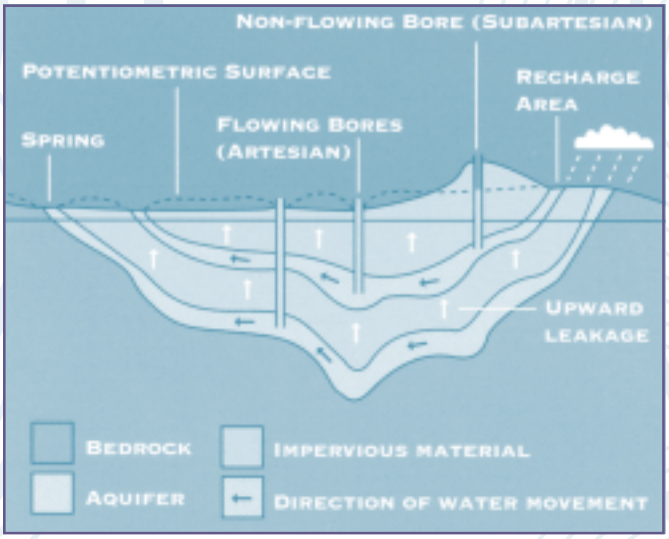
When a bore is drilled water will flow to the surface if the water pressure in the aquifer is sufficient. The water level to which the water rises is known as the potentiometric surface.

Over a large part of the South Australian portion of the GAB aquifer pressures are artesian, ie: water level rises above the ground level when the aquifer is intersected. Aquifer pressures up to 250 psi (175 metres head) have been recorded, but generally range from 1 to 200 psi (0.7 to 140 metres head). Well yields vary from < 1 L/sec up to 235 L/sec. Water temperatures vary from 25°C in shallow wells along the Basin margin, up to 100°C in deeper wells in the central part of the Basin (along the Birdsville Track). Groundwater salinities vary from 700 mg/L in the north and northeast to 40 000 mg/L in the southwest. Typically groundwater salinities lie in the range of 1 000 to 5 000 mg/L.

Dating of artesian waters has given ages of almost 2 million years for the oldest. Water of this age is found in the south western margin of the Basin, in the Lake Eyre region.

Who uses the water?

The current flow of water into South Australia through the basin has been estimated at 425 ML/day.



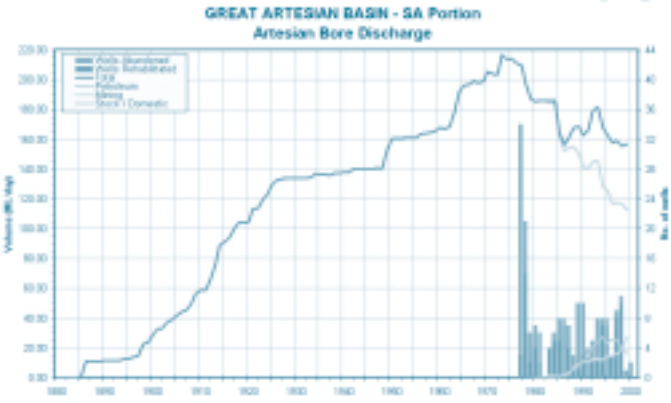
The output of this inflow is through a number of areas. The most significant loss of water is currently understood to be through vertical upward leakage, which is estimated to be 202 ML/day.

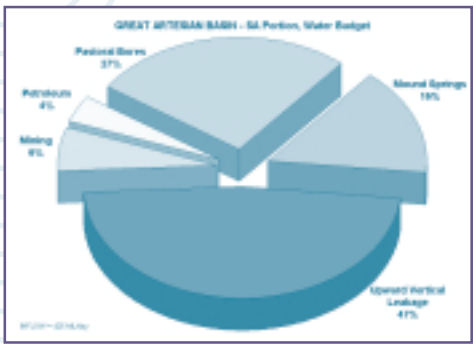
The water escapes by slow seepage through the porous sandstone and shale lying close to the surface and eventually evaporates.

Natural discharge from springs and mound springs accounts for 66 ML/day.

Water used for stock and domestic purposes from flowing bores is approximately 113 ML/day.

Mining, petroleum and industrial usage account for a further 34 ML/day.





Springs

Water in the GAB discharges to the surface naturally through mound spring. These occur where the impermeable layers confining the aquifers are thin and have been damaged by faults. Mound springs are found around the south western edge of the Basin in South Australia. These are an important phenomenon of the basin, supporting fish, other water life, grasses and bushland as well as watering wild life and stock. The water flow varies considerably due to natural causes, thus affecting the local flora and fauna.

The mound spring environment can be damaged by animals, visitors or the indiscriminate drilling of bores in close proximity to the springs. Earth movements, earthquakes, flooding or sediment build up can create change to the behaviour and location of the springs.

The current discharge from springs in South Australia has been estimated at 66 ML/day, 90% of which flows from the Dalhousie group in the north of the State.

Stopping the waste

Water from the Basin has traditionally been used inefficiently. Bores used for stock watering have been allowed to flow uncontrolled into open drains and creeks.

Water is also lost through corrosion of bore casing. The flow of water from uncontrolled wells and inefficient distribution methods is not only a waste of a valuable resource, but aquifer pressure is lowered. Maintenance of aquifer pressure is vital for the survival of mound springs and to ensure a supply for existing and future users.

In 1977 the State government commenced a systematic well rehabilitation program. Initially the program concentrated on the plugging and abandonment of seismic and exploration wells in the western region of the Basin. The program was later extended to include all uncontrolled flowing wells in South Australia. To date over 200 wells have been rehabilitated resulting in a water saving of ~105 ML/day. Similar programs were introduced in other states in the late 1980's.

GABSI

The Federal Government, through the GAB Sustainability Initiative, has committed $31.8M over 5 years to encourage bore rehabilitation and bore drain replacement over the whole of the GAB. The State government is matching the Commonwealth funding dollar for dollar, with contributions also being made by pastoral bore owners and industry.

Resource Management

The GAB is a large, but finite resource and the demand for water is anticipated to increase throughout the Basin.

Management of the Basin is vital to ensure that the demands of its current and future users are met. The Great Artesian Basin Consultative Council (GABCC), with members representing all stakeholders, is responsible for coordinating management between the States and Territory involved to ensure the sustainability of the resource. The Great Artesian Basin Strategic Management Plan was developed by the GABCC to present the views and needs of the Basin and provide direction for management of the Basin by the State and Territory jurisdictions.

Arid Areas Catchment Water Management Board SA

The Arid Areas Catchment Water Management Board (AACWMB) was established by the Minister for Water Resources under the Water Resources Act 1997. The AACWMB has responsibility for the management of all surface and groundwater resources in the northern part of the State. It also has the responsibility to inform the Minister for Water Resources and the Department for Water Resources of all community views to ensure that policies and decisions meet community needs, whilst providing the best outcomes for water resources and their dependant ecosystems. The AACWMB has commenced the preparation of a catchment water management plan for its area covering the GAB.

The Minister for Water Resources has released a notice of intention to prescribe the GAB under the Water Resources Act. If this proceeds, the AACWMB would prepare a water allocation plan which would establish water allocations and water entitlements.

For Further Information on the GAB please contact:

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Selected References and related material:

GAB Consultative Council web site: www.gabcc.org.au

GAB Resources Study (digital copy available on the GABCC web site)

GAB Strategic Management Plan (digital copy available on the GABCC web site)

Department for
Water Resources