

The Great Artesian Basin

The Great Artesian Basin (GAB) is one of the largest artesian groundwater basins in the world. It extends 2400 kilometres (km) from Cape York in the north to Dubbo in the south. At its widest it is 1800 km from the Darling Downs to west of Coober Pedy. With an area of over 1.7 million square kilometres the basin underlies approximately one-fifth of the Australian continent. (See Figure 1).

The GAB stores a huge volume of water that is estimated to be 64 900 million megalitres. It is enough water to fill Sydney Harbour 130 000 times.

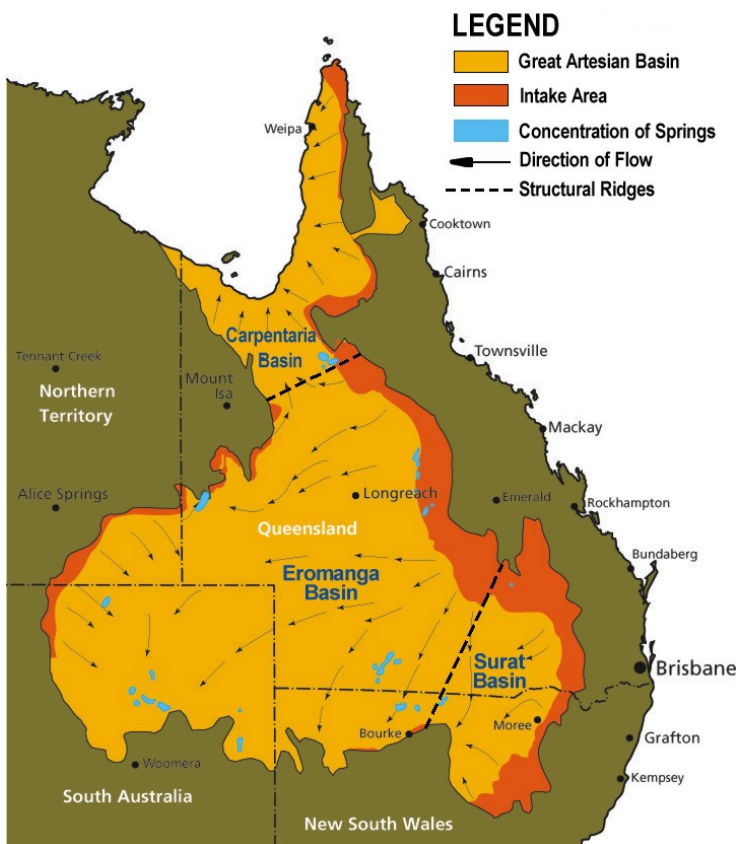


Figure 1—The Great Artesian Basin

How the basin was formed

Over many millions of years, the GAB was created by the deposition of sediments that eventually formed alternating layers of permeable sandstone and impermeable siltstones and mudstones. The deposits occurred in three major depressions; the Carpentaria, Eromanga and Surat basins which together form the GAB.

At the end of the Triassic period, uplift on the margins of these basins occurred and erosion of these areas led to sedimentation. Throughout the period, sand and gravel was deposited by streams and rivers and clays and clayey sands were laid down by floodplains and lakes. This process produced a profile of alternating layers.

As rivers eroded the steeper slopes, the land began to flatten, and deposition in lakes and large floodplains became more dominant. The sandy sediments consolidated to form the permeable sandstone from which the artesian water is now tapped and the clayey sediments became the impermeable layers. Thickness of the combined layers varies from less than 100 metres on the basin extremities to over 3000 metres in the deeper parts. (See Figure 2).

During the Cretaceous period (about 100 million years ago), down warping and high sea levels created a shallow sea over much of inland Australia. This sea deposited mainly muddy sediments, which later consolidated, forming the rolling downs that can be seen today.

As the Cretaceous period ended, about 65 million years ago, uplift ended sedimentation in the region of the GAB. Further uplifting and erosion resulted in the exposure of the permeable sandstones in the marginal areas of the Basin. This occurred mainly along the western edge of the present day Great Dividing Range. Rainfall began to infiltrate into the sandstones that led to the accumulation of the vast groundwater reserve.

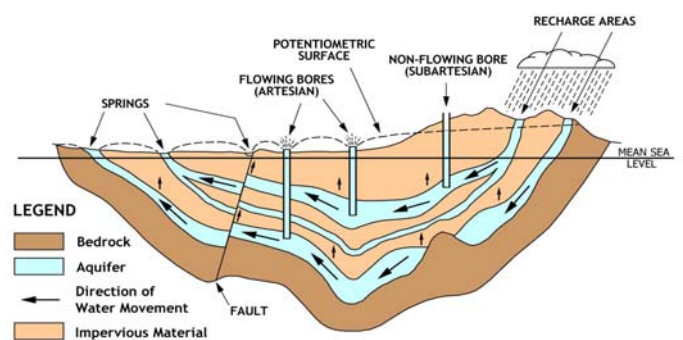


Figure 2—Generalised cross-section of the Great Artesian Basin

Artesian water

Artesian water is underground water confined and pressurised within a porous and permeable geological formation. Formations that store and transmit water are referred to as aquifers. When one of these aquifers is tapped by a bore, artesian water may flow naturally to the surface.

In the GAB, these aquifers are sandstones and are recharged by rainfall and streamflow infiltrating into the exposed sandstones on the edges of the basin. The water moves slowly down through the sandstone, filling the aquifer to the level of the intake area. (See figures 1 and 2).

Why an artesian bore flows

As the aquifer is confined by an impermeable overlying layer, the water becomes pressurised.

When a bore is drilled into one of the aquifers, the water will rise due to the pressure. The level to which it rises is called the potentiometric surface. If this surface is above ground level, then the bore will flow. In a subartesian bore the water does not rise above ground level. (See Figure 2).

Maximum pressure recorded at ground level in the GAB is 1300 kilopascals (about 130 metres head).

Other facts

Across the GAB, the average depth of bores is 500 metres, but some bores have been drilled to 2000 metres depth.

Dating of the artesian water has given ages of almost two million years for the oldest water. This water is found in the south-west of the GAB.

Water quality in the main aquifers is generally good for watering livestock but because of high levels of certain ions, is not suitable for irrigation. Measured in total dissolved solids (TDS), water quality varies between 500 and 1500 milligrams per litre. It is used for domestic purposes throughout the GAB.

Water temperatures range from 30°C in shallow areas to 100°C at the surface in the deeper regions.

Water use in the GAB

Before European settlement

Prior to European settlement, Indigenous Australians used the natural springs of the GAB and regarded them as significant to their traditional cultures. The springs are natural outlets of the artesian aquifers from which groundwater flows to the surface. (See Figure 2). They were a reliable source of water in times of drought when other water sources were scarce. The springs were and still are valuable for the support of wildlife.

Many stories of Indigenous Australian's ancestors involve GAB springs and their placement along travel routes. Some of these springs feature in Aboriginal myths and hold significant spiritual and cultural beliefs of Indigenous communities.

Recent history and development

European settlers first discovered artesian water from the GAB in 1878 when a shallow bore sunk near Bourke in New South Wales produced flowing water. Many bores were soon drilled, and by 1915 over 1500 flowing artesian bores had been drilled throughout the basin. The assurance of a reliable water supply for settlers and their stock meant the development of a valuable sheep and cattle industry.

Thousands of kilometres of bore drains were excavated to distribute the water around properties, thus allowing sheep and cattle to be raised on the vast Mitchell grass, Mulga and Spinifex plains.

Prior to development in the GAB, it is estimated that, excluding the Carpentaria Basin, 1040 megalitres of water entered the aquifers of the basin in Queensland each day. All of this, together with the volume of recharge from other states, discharged as surface springs and a natural equilibrium of inflow to outflow was maintained.

Many bores initially flowed at rates of over 10 megalitres per day (ML/d), however, the majority now flow between 0.01 and 6 ML/d. Total outflow from the GAB reached a peak of over 2000 ML/d around 1915. Since then, artesian pressure and flow rates have declined, while the number of bores has increased. The current total outflow from the basin is about 1500 ML/d.

Also, about one-third of all artesian bores which flowed when drilled have now ceased to flow and require pumps to bring the water to the surface.

Management of the GAB

The GAB is a vast resource that has allowed a major part of arid Australia to be turned into productive grazing country. The careful and sustainable management of this valuable natural resource is vital for future generations.

A collaborative 15 year strategic management plan is used by Queensland, New South Wales, South Australia, Northern Territory and the Commonwealth governments to achieve sustainability of the basin and its resources. The Great Artesian Basin Coordinating Committee (GABCC) is responsible for coordinating management of the GAB between the jurisdictions involved.

More information

Visit the Department of Environment and Resource Management's website at <www.derm.qld.gov.au> or the GABCC website at <www.gabcc.org.au>.

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**For general enquiries contact the
Queensland Government call centre 13 74 68 (13 QGOV)
or visit www.derm.qld.gov.au**