

Alice Springs Water Resource Strategy 2005

Alice Springs Water – The Resource

“Our goal is to assist people to understand where our water comes from and how much water we have. We need to do this so people have the knowledge to have an informed say.”

In order to effectively manage our water resources we need to understand the basics.

- Where is the water?
- How much water do we have?

This fact sheet provides background information to help answer these questions.

Climate & Surface Waters

“Why don’t we use reservoirs and dams for a water supply?”

Rainfall – low and unpredictable

The low and unpredictable rainfall makes surface waters an unreliable option for water supply. Alice Springs is situated in the Central Australian arid zone where rainfall is unpredictable and can occur at any time of the year. Rainfall is low, averaging 286 mm per year however annual rainfall totals are extremely variable, ranging from a minimum of 60 mm (1928) to a maximum of 903 mm (1974). Due to the variability the median rainfall figure of 238 mm per year is probably the best measure to describe our rainfall. Importantly, evaporation rates are also very high at approximately 3,000 mm per year.

Surface Waters of Alice Springs – rare and valuable

There are no permanent surface waters within the area of the Alice Springs region considered by the strategy, this is due to inconsistent rainfalls and high evaporation rates. Despite their temporary nature the surface waters of Alice Springs have a critical role in maintaining the ecosystems, culture, and aesthetics of the region. The surface waters also feed into or recharge the groundwater reservoirs (aquifers) that we depend on. The map below shows the surface water features of Alice Springs.

Rivers – The Alice Springs region forms part of the catchments for the Todd River and Roe Creek. Because of the steep slopes, geology and sparse vegetation cover, there is a potential for large flash flooding within the catchment.

Waterholes – Temporary water bodies include: Wigley Waterhole, Junction Water Hole, Telegraph Station, and Heavitree Gap Water Hole on the Todd River; Simpsons Gap on Roe Creek; and the Emily Gap waterhole on Emily Creek, as well as a number of small stock dams. Occasional creek and river flows support streamside vegetation dominated by River Red Gums.

The [surface water map](http://www.alicewaterplan.nt.gov.au) (A3 PDF available online www.alicewaterplan.nt.gov.au), helps provide perspective about Alice Springs surface waters.



Groundwaters of Alice Springs

“Where does our drinking water come from?”

Underground waters stored within sediments or rock formations (or aquifers) provide the water supply that sustains Alice Springs. The surface waters described above are connected to the groundwater we depend upon, however scientists are still researching and finding out how surface and groundwater is connected.

There are two main sources of water in Alice Springs. The old sands and gravel sediments laid down from past Todd River channels are aquifers that contain water. The second source is from ancient rock formations associated with the Amadeus Basin laid down hundreds of millions of years ago. If you drive south from Alice Springs on the Stuart Highway you will drive over the Amadeus rock aquifers at around the place where you cross Roe Creek. The Amadeus rock aquifers run for many kilometres from east to west.

Alluvial Aquifers

The alluvial aquifers support many of the private bores of the Town Basin, Inner Farm Basin and Outer Farm Basin. In fact, if you were to dig a hole beneath the Post Office you would find water from the Town Basin. The Town Basin was the main drinking water supply for Alice Springs until 1964, when it was replaced by water supplied from the Amadeus rock aquifers. This was necessary because the Town Basin could no longer provide enough water for the growing population.

The groundwaters within the Alluvial aquifers entered the ground relatively recently and come from direct rainfall and periodic flows of the Todd River. The amount of water in the aquifers and depths to the water table vary widely in response to seasonal and annual rainfall patterns. Groundwater flows within these alluvial aquifers follow the past courses of the Todd River in a southerly direction towards and through the Heavitree and Blatherskite Ranges and across the Emily Plain floodout.

The Town Basin supplies irrigation water for the golf course and many of Alice Springs playing fields. The water quality is relatively poor by drinking water standards, but is suitable for irrigation. River Red Gum trees lining the Todd River have been tapping into the Town Basin for millennia.

“Who am I?”

I contain water. My water is not great for drinking, but good for irrigation. I’m made up of sands and gravels deposited by the Todd River. If you stand on the Todd Mall, you are standing right on top of me.



A: The Town Basin, one of the alluvial aquifers of Alice Springs.



Rock aquifers of the Amadeus Basin

The Amadeus rock aquifers provide our town's current water supply. The sedimentary rock formations that support Alice Springs are called the Mereenie Sandstone, Pacoota Sandstone, Shannon and Goyder Formations. These aquifers hold large volumes of water that is thought to have entered the ground up to 32,000 years ago, when the rainfall intensity was greater than occurs today.

The [cross-section](#) of the water bearing geological formations that support Alice Springs (roughly follows the Stuart Hwy), shows the main aquifers of Alice Springs; the Mereenie and Pacoota Sandstones, the Goyder and Shannon Formations, as well as the smaller overlying alluvial aquifers of the Town Basin, Inner Farm Basin and Outer Farm Basin.

The water quality varies in these aquifers, but is generally very good. When you turn on your tap the water that flows out was originally pumped out of the Amadeus aquifers. The bores that extract the water from these aquifers are operated by the Power and Water Corporation and are located at the Roe Creek Borefield, about 15 km south of Alice Springs.

Water levels in the Amadeus aquifers have been dropping because the rate of water being pumped out to supply Alice Springs is greater than the amount of water naturally refilling the aquifers (recharge). The [sustainability fact sheet](#) explains this in further detail.

The Alice Springs water cycle [diagram](#) shows the location of each of the alluvial aquifers and the deeper rock aquifers of the Amadeus rock aquifers. Arrows on the diagram show how water moves through the Town Basin, Inner Farm Basin and Outer Farm Basin. It also shows how the rivers recharge the deeper rock aquifers of the Amadeus Basin which are used for public water supply (Mereenie Sandstone, Pacoota Sandstone, Shannon and Goyder Formations).

- To get a 'birds-eye' perspective of where the Alice Springs aquifers occur, view the [groundwater resources map](#).
- To find out the quality of the water that occurs in each aquifer, view the [regional groundwater quality map](#).

A 'Technical' Summary of Groundwater Features of Alice Springs Alluvial Basins and Aquifers

Town Basin

The Town Basin is defined as the area of alluvial sediments of the past and present Todd River extending north from Heavitree Gap. The aquifer has an area of 7.7 km² and maximum depth of 25 meters with groundwater typically 6 meters below the surface. The alluvial sediments consist of a mixture of gravel, sand, silt and clay. Most of the Basin is filled with silt of low permeability. The best quality groundwaters are in strips of sand and gravel marking former courses of the Todd and Charles rivers. Depth to groundwater varies in response to seasonal changes, pumping regimes, the effects of runoff from paved areas and overwatering of grassed areas. Water levels since 1975 have remained unnaturally high. The dominant direction of groundwater flow is southwards, towards and through Heavitree Gap, with an estimated average annual discharge to the Inner Farm Basin in the order of 40 ML per year. It must be remembered that this amount fluctuates greatly from year to year in response to rainfall variations.

The underlying and fringing weathered bedrock of the Arunta Block contains large reservoirs of salt. This bedrock can significantly influence water quality in the Town Basin as saline water associated with this bedrock is drawn towards production bores in response to pumping.

White Gums Alluvial Basin

The White Gums alluvial basin fans outwards from Honeymoon Gap to a maximum width of 2 km, then reduces in width to 400 m at Temple Bar Gap. The thickness of the alluvium is extremely variable but averages 15 m. This basin provides water to the White Gums rural subdivision, although some bores in the area draw water from the underlying bedrock. Detailed information of recharge, storage and throughflow is not yet available and could be a priority for future investigations.

Inner Farm Basin

The Inner Farm Basin is situated immediately downstream of the Town Basin on the Todd River, straddling the area between Heavitree Gap and Mount Blatherskite to the south. The Inner Farm Basin is composed of recent Quaternary alluvial sediments (1.6 Mya to the present), older Tertiary sediments, and underlying Bitter Springs Formations consisting of dolomite, limestone and siltstone. The aquifer has an area of 0.8 km² and is formed from ancient flows of the Todd River. The sediments are up to 40 m deep with groundwater generally 6 meters below the surface. As in the Town Basin, the groundwater flow direction is generally southwards, towards and through St Mary's Gap through the Blatherskite Range, with an estimated discharge to the Outer Farm Basin of 310 ML per year.

Outer Farm Basin

The Basin extends south and southeast of Mount Blatherskite and is associated with the Emily Plains floodout. It comprises alluvial and other sediments overlying the Eastern Amadeus Basin. The sediments are relatively low yielding clays and sandy clays. In the northern parts of the western Outer Farm Basin the water table is relatively shallow (currently around 12 m) but this increases to around 60 m in the southern parts. There are large fluctuations in water levels between river recharge events particularly following successive years of high rainfall and during extended drought periods.

Eastern Portion of Amadeus Basin Rock Aquifers – Mereenie Sandstone, Pacoota Sandstone and Other Aquifers (Shannon & Goyder Formations)

Alice Springs lies on the northern shoulder of the eastern Amadeus Basin. From east to west along its axis the Amadeus Basin extends over 800 km from the edge of the Simpson Desert in the east to 150 km past the Western Australian border in the west. The Eastern Amadeus Basin is a multi aquifer system containing important aquifers including the Mereenie, Pacoota, Shannon, Goyder and Hermannsburg Sandstones. In these aquifers, groundwater flow is generally eastwards. Within the Alice Springs region the aquifers form a tilted series of thick porous layers, much like a layer cake.

In the Roe Creek area the Mereenie sandstone dips down from the surface at approximately 30° while in the Rocky Hill area the downward dip is shallower, approximately 10°. Because of the shallow dips in the Rocky Hill area, a large area of the Mereenie Sandstone aquifers occurs at economic drilling depth and provides a very large volume of available water in storage.

The depth to groundwater differs between aquifers. At Roe Creek, water levels in Mereenie sandstones now lie approximately 150 meters below the surface. Water levels in the adjacent Goyder and Upper Shannon formations are shallower. Depths to groundwater at Rocky Hill are similar to Roe Creek, except for the Mereenie Sandstones for which the levels are slightly higher at 110 meters below the surface.

Storage estimates are calculated to 300 metres below the surface at Roe Creek and 200m below the surface at Rocky Hill based on economic pumping depth. The hydraulic gradient of the Mereenie Sandstone has locally reversed because of extraction at Roe Creek. Similarly, pumping of Pacoota sandstone at Roe Creek has reduced the flow in that aquifer towards Rocky Hill. Water levels in monitoring bores show small periodic increases in response to flows in the Todd River and Roe Creek.



How much water do we have?

The table below presents a summary of estimated volumes of water within Alice Springs aquifers. To get an easy to interpret diagram of the aquifers that includes water volumes view the [Alluvial Aquifers of Alice Springs \(Current Development\)](#) diagram or the [Amadeus Rock Aquifers of Alice Springs \(Current Development\)](#) diagram.

These volumes represent our current understanding of where the water is found and how it flows within the aquifers. The volumes were calculated by NRETA scientists through extensive assessment work conducted over many years. However our scientific knowledge is not complete and there is still much more to learn, therefore they contain numerous extrapolations, approximations and many assumptions.

The volumes of water that are available can be compared to existing water demands of Alice Springs and predicted future water demands. It is important that decisions made by the community and government about how much water can be used are informed by the amount of water that is available. The water consumed today will not be available for future generations.

2005 Current Development	ALLUVIAL AQUIFERS – salinity under 1,000 mg (except Town Basin)			AMADEUS BASIN ROCK AQUIFERS – salinity under 1,000 mg/L			TOTALS
	Town Basin (<2000mg/L)	Inner Farm Basin	Outer Farm Basin	Eastern Amadeus Mereenie	Eastern Amadeus Pacoota	Eastern Amadeus other aquifers	
Total Recharge ML/yr	1200	430	810	6,200	800	80	9,520 ML/yr
Evapotranspiration ML/yr	160	50	200	4,000	0	0	4,410 ML/yr
Outflow ML/yr	40 to Inner Farm Basin	310 to Outer Farm Basin	500 to Eastern Outer Farm Basin	2,200 to Mereenie beyond strategy area	800 to Pacoota beyond strategy area	80 to Eastern Outer Farm Basin	
Current Extraction ML/yr	740	70	110	7700	1365	100	10,085 ML/yr
Current aquifer storage (ML) Under 1000 mg/L TDS	2540 ML	800 ML	100,000 ML	5,200,000 ML	400,000 ML	300,000 ML	6,003,340 ML



This diagram is called the 'Water Balance.' It shows the volumes of water moving into, out of, and between Alice Springs aquifers. The water balance can be used to estimate how much water is available for use, and what effect extraction will have on future water availability.

