SHOALHAVEN SYSTEM

DAMS OF GREATER SYDNEY AND SURROUNDS

Shoalhaven

WaterNSW

The Shoalhaven Scheme, which was built in the mid 1970s, was designed as a dual purpose water supply and hydro–electric power generation scheme. Water from Tallowa Dam, Fitzroy Falls and Wingecarribee reservoirs is used to supply local communities and supplement other Sydney storages when dam levels drop to 75 percent.

Power generation involves regular exchange of stored waters between Lake Yarrunga, Bendeela Pondage and Fitzroy Falls Reservoir.

< SHOALHAVEN CATCHMENT

Introducing WaterNSW

WaterNSW is Australia's largest water supplier. We provide two-thirds of the water used in NSW and develop infrastructure solutions for water supply security and reliability.

We operate and maintain 42 large dams and we deliver water for agriculture and drinking water supply customers. WaterNSW also protects the health of Sydney's drinking water catchment to ensure highest quality drinking water is consistently available.

Sydney's drinking water catchments

The catchments

A catchment is an area where water is collected by the natural landscape. In a catchment, all rain and run–off water eventually flows to a creek, river, lake or ocean, or into the groundwater system.

Natural and human systems, such as rivers, bushland, farms, industry, homes, plants, animals and people can exist alongside one another in a catchment.

WaterNSW helps protect five catchment areas, which provide water to greater Sydney and local communities.

They are:

- Warragamba Catchment
- Upper Nepean Catchment
- Woronora Catchment
- Shoalhaven Catchment
- Blue Mountains Catchment

The catchments occupy about 16,000 square kilometres in total. They extend from north of Lithgow and Blackheath in the upper Blue Mountains, south to the source of the Shoalhaven River near Cooma, and from Woronora in the east to the source of the Wollondilly River near Crookwell.

^ WINGECARRIBEE RESERVOIR

Shoalhaven Catchment

The Shoalhaven catchment is located in the Southern Highlands of New South Wales, and includes Tallowa Dam, Fitzroy Falls Reservoir and Bendeela Pondage.

Tallowa Dam, which forms Lake Yarrunga, is on the junction of the Shoalhaven and the Kangaroo rivers with a catchment area of 5,750 square kilometres. The Fitzroy Falls storage is in the Wildes Meadow Creek catchment covering 31 square kilometres.

The Wingecarribee River forms part of the greater Wollondilly River catchment.
The upper catchment of the Wingecarribee River feeds Wingecarribee Reservoir and includes the environmentally significant Wingecarribee Swamp.

> WINGECARRIBEE RESERVOIR

Sydney's evolving water supply system

Australia is one of the driest inhabited continents on earth. Water has been vital to the survival and prosperity of Sydney since the first days of the new colony. The need to ensure a reliable water supply through times of drought and variable seasonal rainfall has driven the development of several complex and innovative water supply schemes.

Sydney's first water supply came from the Tank Stream, named for the 'tanks' or reservoirs cut into its sides to hold water. The stream, which wound its way through the colony before emptying into Sydney Harbour at Circular Quay, degenerated into an open sewer and was abandoned in 1826.

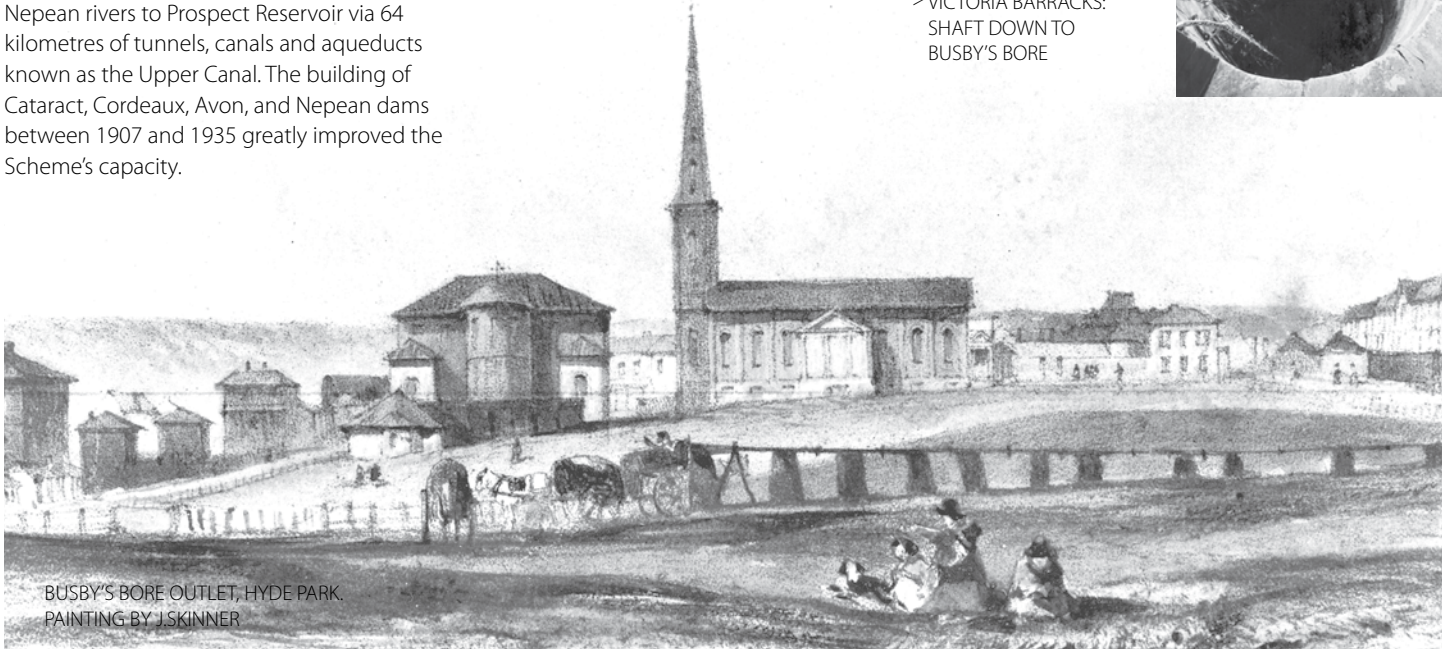
Convict labour then developed Busby's Bore, a four kilometre tunnel leading from the Lachlan Swamps, (now Centennial Park) and ending in the south–eastern corner of Hyde Park.

By 1852, drought and increasing population led to the call for a more permanent water supply for Sydney. A third water source, the Botany Swamps Scheme began operations in late 1859 but within 20 years this once copious supply of fresh water was depleted.

The Upper Nepean Scheme was Sydney's fourth source of water supply. Completed in 1888, the Scheme diverted water from a series of weirs on the Cataract, Cordeaux, Avon, and Nepean rivers to Prospect Reservoir via 64 kilometres of tunnels, canals and aqueducts known as the Upper Canal. The building of Cataract, Cordeaux, Avon, and Nepean dams between 1907 and 1935 greatly improved the Scheme's capacity.

^ TUNNEL INTERIOR UNDER OXFORD STREET

> VICTORIA BARRACKS: SHAFT DOWN TO BUSBY'S BORE



BUSBY'S BORE OUTLET, HYDE PARK. PAINTING BY J.SKINNER

Why the Shoalhaven Scheme was built

^ INFLOW CANAL TO BURRAWANG PUMPING STATION

The Shoalhaven Scheme, located in the Southern Highlands of New South Wales and built in the mid 1970s, plays a unique role in Sydney's water supply history. It was designed as a dual–purpose water transfer and hydro–electric power generation scheme.

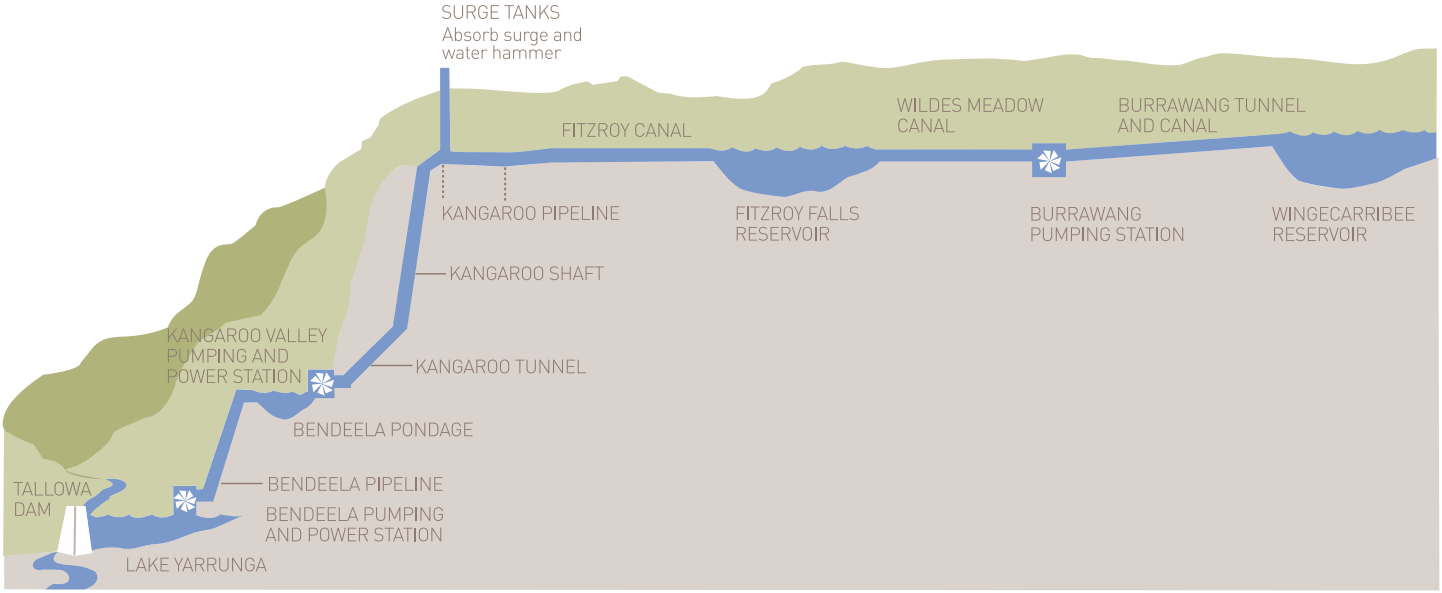
^ BURRAWANG PUMPING STATION

The plan to develop a water supply system in the Shoalhaven first rose towards the end of World War I. It was not until several decades later, in 1968, that the then Water Board consulted the Snowy Mountains Hydro–Electric Authority about the longer–term water needs of Sydney and the south coast. There was concern that Warragamba Dam, which had opened only eight years earlier, might prove inadequate to meet Sydney's water supply needs by the mid 1970s.

The advice was to proceed with the Shoalhaven Scheme – situated in the lower Shoalhaven River and Kangaroo Valley areas, on the coastal range above Fitzroy Falls and on the upper Wingecarribee River.

Construction began in 1971 and was carried out by contractors under the supervision of the Snowy Mountains Engineering Corporation. The Scheme was completed in 1977 at a final cost of $128 million.

The Shoalhaven Scheme - its features and how it works



Tallowa Dam

The centrepiece of the scheme is Tallowa Dam, a concrete dam completed in 1976. It is located immediately downstream of the junction of the Kangaroo and Shoalhaven rivers and features a central overflow spillway.

Lake Yarrunga, which is formed by Tallowa Dam, collects water from a 5,750 square kilometre catchment – extending from Kangaroo Valley in the north–east to the upper Shoalhaven River south–west of Braidwood.

Height:	43 metres
Length:	518 metres
Total capacity:	85,500 megalitres
Catchment:	5,750 square kilometres
Lake Yarrunga:	9.3 square kilometres

^ TALLOWA DAM TODAY

< NEARING COMPLETION

< KANGAROO RIVER

Kangaroo Valley – Fitzroy Falls complex

Bendeela Pumping and Power Station, located on the Kangaroo River arm of Lake Yarrunga, lifts water 127 metres to Bendeela Pondage – a 1,200 megalitre balance reservoir at the foot of the escarpment. From there, Kangaroo Valley Pumping and Power Station then lifts water a further 480 metres to Fitzroy Falls Reservoir via a tunnel, shaft, pipeline and canal. Water available for hydro–electric power generation is discharged back down the conduits, driving turbines as it returns to Lake Yarrunga.

Completed in 1972, Bendeela Pondage is an earth and rockfill embankment, circular in shape. It functions as a balance reservoir to control flow between Lake Yarrunga (formed by Tallowa Dam) and Fitzroy Falls Reservoir during water pumping or hydroelectric power generation at the Kangaroo Valley and Bendeela Pumping/ Power Stations.

Bendeela Pondage

Height:	15 metres
Length:	2,118 metres
Capacity:	1,200 megalitres

Bendeela pipeline

Connects Bendeela Pumping and Power Station with Bendeela Pondage.

Length:	740 metres
Diameter:	3,680 millimetres
Pumping capacity:	205 megalitres per hour

^ BENDEELA PONDAGE

^ BENDEELA PIPELINE

Kangaroo tunnel and shaft

Tunnel and shaft linking Kangaroo Valley Pumping and Power station (above Bendeela Pondage) with Kangaroo Pipeline.

Length:	1,480 metres (tunnel) 330 metres (shaft)

Kangaroo pipeline

Located between the head of the shaft and Fitzroy Canal.

Length:	2,494 metres
Diameter:	3,100 millimetres

Fitzroy canal

Situated on the plateau above Kangaroo Pipeline, connecting the Kangaroo Pipeline with Fitzroy Falls Reservoir.

Length:	4,070 metres

Fitzroy Falls Reservoir

Fitzroy Falls Reservoir, completed in 1974, is located on Yarrunga Creek upstream of Fitzroy Falls – about 16 kilometres south–east of Moss Vale. It consists of four separate earth and rockfill embankments.

Height:	14 metres
Length:	1,530 metres
Total capacity:	23,500 megalitres
Catchment:	31 square kilometres
Lake:	5.2 square kilometres

^ FITZROY FALLS RESERVOIR

v SPILLWAY UNDER CONSTRUCTION, FITZROY FALLS RESERVOIR

Fitzroy – Burrawang – Wingecarribee complex

From Fitzroy Falls Reservoir, water required to supplement the Sydney and Illawarra supply systems is transferred via a canal, pumping station, tunnel and a second canal to Wingecarribee Reservoir.

Wildes Meadow canal

Between Fitzroy Falls Reservoir and Burrawang Pumping Station

Length:	3,030 metres

Burrawang tunnel and canal

The tunnel connects Burrawang Pumping Station with Burrawang Canal. The canal then conveys the pumped water to Wingecarribee Reservoir.

Length:	2,830 metres (tunnel) 1,000 metres (canal)

Wingecarribee Reservoir

An earth and rockfill dam completed in 1974, Wingecarribee Reservoir is located on the Wingecarribee River about 15 kilometres south–east of Bowral. The storage capacity of Wingecarribee Reservoir was reduced by approximately 9,000 megalitres in 1998 when heavy rains resulted in the collapse of Wingecarribee Swamp, causing an inflow of peat into the Reservoir.

Height:	19 metres
Length:	1,140 metres
Total capacity:	25,900 megalitres
Catchment:	40 square kilometres
Lake:	6.3 square kilometres

Water supply

^ GLENQUARRY CUT

Water pumped from the Shoalhaven Scheme is primarily collected from the Lake Yarrunga catchment area. Wingecarribee and Fitzroy Falls reservoirs have relatively small catchment areas totalling only 71 square kilometres.

When dam levels drop to 75 percent, water from the Shoalhaven Scheme can be fed into Upper Nepean dams and Warragamba Dam to top–up the Sydney and Illawarra water supply systems.

From Wingecarribee Reservoir water can be released into the Wingecarribee River – which flows into the Wollondilly River and Lake Burragorang – feeding the main Sydney supply system via Warragamba Dam. Water can also be released from Wingecarribee Reservoir via canals and pipelines collectively known as Glenquarry Cut into Nepean River, which flows into Nepean Dam. From here it can be transferred to Sydney via the Upper Canal or to the Illawarra region via the Nepean–Avon tunnel to Avon Dam.

As well as supplementing water supply when dam levels are lower, the Shoalhaven Scheme also

^ NEPEAN DAM

supplies water to local communities. Water from Fitzroy Falls Reservoir supplies the National Parks and Wildlife Service (Office of Environment and Heritage) Visitor Centre, in Morton National Park. Wingecarribee Reservoir supplies Bowral and Mittagong via Wingecarribee Shire Council's water filtration plant located next to the reservoir. Kangaroo Valley township is supplied by treated water from Shoalhaven City Council's treatment plant, which draws water from Bendeela Pondage.

Water is also released from Tallowa Dam into the Shoalhaven River to enable the Shoalhaven City Council to extract water from the river to supply Nowra.

Electricity generation

^ KANGAROO VALLEY PUMPING AND POWER STATION

> ELECTRICITY GRID

The Shoalhaven Scheme hydro–electric power generation is managed by Eraring Energy. Water is pumped up the system between Lake Yarrunga and Fitzroy Falls Reservoir using off–peak electricity. Some of that water is then released back down the system for generation of electricity during periods of peak demand. The power is fed into the state–wide transmission grid through the Canberra–Dapto transmission line.

Ensuring dam safety

It is essential that all WaterNSW dams meet the requirements of the NSW Dams Safety Committee (DSC) under the *NSW Dams Safety Act (1978)*. The DSC, the State's regulator for dam safety, develops and implements policies and procedures for effective dam safety management in order to protect life, property and the environment from dam failures. To ensure compliance with its operating licence, WaterNSW has adopted a structured program of surveillance and monitoring that complies with the requirements of the DSC and national and international best practice.

Monitoring water quality

In Greater Sydney's drinking water catchment, WaterNSW conducts extensive routine water quality and quantity monitoring in the catchments, storages and in–flows to water filtration plants. Monitoring provides information to enable the best quality water to be drawn–off into the supply system, and to identify areas requiring special catchment management attention. WaterNSW also conducts regular testing at several locations for the presence of the protozoan parasites *Giardia* and *Cryptosporidium* in the water. Information collected from WaterNSW's monitoring programs is used for public health reporting and assessment.

Maintaining good water quality in the catchment

WaterNSW works with government, industry and the community to promote good water quality and healthy, sustainable catchments.

Extensive research is carried out by WaterNSW to help understand the catchment environment. WaterNSW also plays an important role in ensuring that proposed land use and development is compatible with preserving water quality.

Field staff undertake a range of on–ground activities in the catchments, such as pest control, fire control, erosion control and repair, regulating access, containing spills and weed control. In the Special Areas (land closest to the storages) these activities are jointly managed by the National Parks and Wildlife Service (Office of Environment and Heritage) and WaterNSW.

Many successful projects are also undertaken jointly with landholders and community groups including riverbank stabilisation, willow removal, revegetation and riverbank fencing.

Environmental flows

WaterNSW recognises that its dams and weirs affect the natural flow of water downstream. WaterNSW provides water to downstream rivers through environmental flows - water released from the storages to help restore ecological processes and biodiversity of water dependent ecosystems.

WaterNSW releases environmental flows from Tallowa Dam and Wingecarribee and Fitzroy Falls reservoirs. At Wingecarribee Reservoir, at least 3 million litres of water is sent downstream every day for environmental purposes.

At Tallowa Dam, daily variable flows for environmental purposes began in July 2009. At times of low flows, all inflows to Tallowa Dam up to 371 million litres a day (depending on the season) are released to the downstream river. At times of higher flow, an additional 20 percent of inflows to Tallowa Dam are released to the downstream river.

> ENVIRONMENTAL FLOW RELEASE FROM WINGECARRIBEE RESERVOIR

Why Special Areas are important

Parts of the Shoalhaven, Fitzroy Falls and Wingecarribee catchments close to the storages are classified as Special Areas for the protection of water quality.

In total, Special Areas cover about 3,700 square kilometres of land surrounding water storages.

The Special Areas protect our water supply because they act as a buffer zone, helping to stop nutrients and other substances that could affect the quality of water entering the storages.

WaterNSW and the NSW National Parks and Wildlife Service (Office of Environment and Heritage) jointly manage the Special Areas, in accordance with the Special Areas Strategic Plan of Management, and the Wingecarribee Swamp and Special Area Plan of Management.

This long–term plan aims to provide high quality water in the storages, ensure ecosystem integrity, and improve the environmental quality of the catchment areas.

Public access to parts of the Special Areas is restricted to protect water quality. This benefits the community by:

- ensuring we have safe, clean water
- protecting large areas of bushland and plant and animal habitats
- protecting threatened plants and animal species
- preserving evidence of Aboriginal occupation dating back many thousands of years, and
- preserving evidence of European exploration, early settlement, and phases of development such as forestry, mining and dam building.

Restrictions and controls are placed on land use, development and access within Special Areas. Activities such as swimming, fishing, boating and camping are prohibited, unless otherwise specified.

Recreation at the dams

Some fishing and canoeing is permitted at Tallowa Dam and Bendeela Picnic and Camping Grounds because Lake Yarrunga is used primarily as a backup supply for Sydney. It is not intended as a direct source of water supply. At Fitzroy Falls, land–based fishing is permitted from designated areas only. Sailing and fishing on Fitzroy Falls Reservoir is permitted only through the Southern Highlands Sailing Club and Campbelltown City Sportfishing Club respectively.

All Shoalhaven sites are open 24 hours a day, all year round and no bookings are required. Basic campsites are available at Bendeela Recreation Area. Dogs are not permitted in any of the picnic areas within the Shoalhaven Scheme as these are mostly located within proclaimed National Parks.

For educational excursions and project material, please contact our Education Office on (02) 4774 4435

There are no entry fees to any of our dams. Picnic areas cannot be reserved.

Facilities

Tallowa Dam

- Electric bbqs
- Fishing
- Boating (Non–powered)
- Camping
- Swimming
- Untreated Water

Fitzroy Falls Reservoir

- Electric bbqs
- Playground
- Fishing (Land–based)
- Toilets
- Picnic shelters

NOTE: Fishing and sailing on Fitzroy Falls Reservoir are permitted only through approved clubs.

Bendeela camping and picnic area

- Fishing
- Boating (Non–powered)
- Toilets
- Camping
- Swimming
- Drinking Water

How to get there

Fitzroy Falls Reservoir is located about 160 kilometres south–west of Sydney near Bowral.

From Sydney, head south along the Hume Highway (F5) towards Goulburn, and take the Mittagong to Bowral turnoff.

At Bowral, take the Nowra Road towards Kangaroo Valley. Fitzroy Falls Reservoir is located on the eastern side of the road, and is signposted.

Tallowa Dam and Bendeela Picnic and Camping Area are situated on the Shoalhaven River near Kangaroo Valley, about 200 kilometres south of Sydney.

From Sydney, follow the Hume Highway (F5) south towards Goulburn and take the Mittagong to Bowral turnoff. Take the Nowra Road towards Kangaroo Valley.

Turn right at Kangaroo Valley just before Hampden Bridge to Bendeela Picnic and Camping Area. For Tallowa Dam, continue across Hampden Bridge and turn right.

How you can help keep our catchments healthy

Saving water

Water is a precious resource. Each of us has a responsibility to reduce the amount of water we use – no matter where we live.

By reducing the amount of water we all use, we reduce the need to build expensive new water supply infrastructure such as dams, reservoirs and pipelines.

Reducing the amount of water we all use can also help make more water available for environmental flows, which protect the health of the rivers downstream of the dams.

WaterNSW recognises the need to adopt exemplary practices in managing our own business. Minimising leaks in pipelines and fitting water saving appliances and devices are just some of the ways WaterNSW is reducing the amount of water we use.

Water saving tips

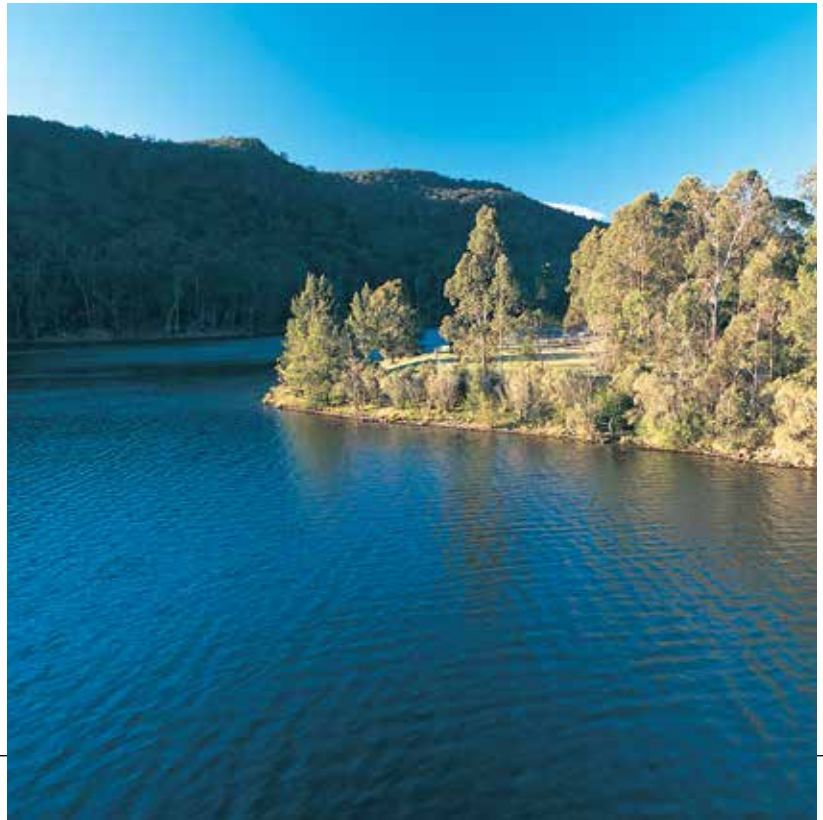
For great water savings ideas visit www.waternsw.com.au/water-quality/education/learn/using-less-water.

In the catchments

People living and working in the catchment areas play a special role in keeping our catchments healthy. Some of the ways people in the catchments help include:

- using chemicals efficiently and carefully
- controlling weeds and pests
- retaining and planting vegetation to prevent soil loss
- protecting stream bank vegetation to provide a buffer against pollution
- managing on–site sewage systems effectively
- encouraging and developing improved sewage and stormwater management systems
- preventing bushfires
- reporting spills.

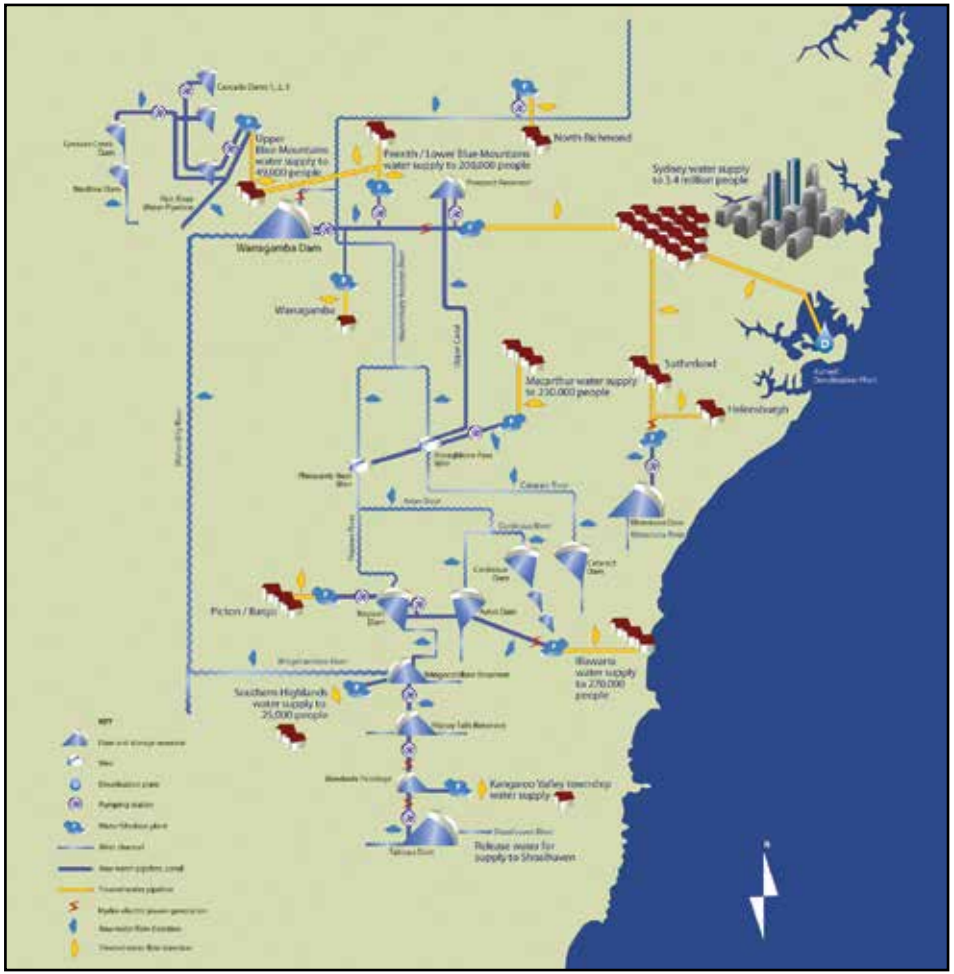
Did you know?



The **Shoalhaven River** (pictured left) is the longest river wholly within NSW.

Flash floods and storms made building work on **Tallowa Dam** very difficult. During one flood in 1974, the Kangaroo River rose 5.25 metres in four hours at Hampden Bridge.

Sydney's water supply system



Contacting WaterNSW

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Phone 1300 662 077
Office hours 8.30am to 5pm Monday to Friday
Website www.waternsw.com.au
Email customer.helpdesk@waternsw.com.au

Visitor information

Warragamba Dam Visitor Centre
Phone + 61 2 4774 4433
Hours 10am to 4pm daily
except Christmas Day and Good Friday

Other dams, reservoirs and camping grounds
Phone 1300 662 077
Hours 8.30am to 5pm Monday to Friday

Emergency reporting (24 hours)

Fires, chemical spills
Phone: 1800 061 069

Important

Information contained in this brochure may change after the date of printing. WaterNSW accepts no responsibility or liability for any loss or inconvenience incurred as a result of reliance upon information printed in this brochure. For the most up–to–date information on WaterNSW dams and recreational facilities, call 1300 662 077 or visit our website at www.waternsw.com.au

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