snowyhydro
renewable energy

WATER

OPERATIONS REPORT
2011-2012

FOREWORD

This Water Operations Report describes how the Snowy Scheme operates, our water operations in the 2011–12 water year (1 May 2011 – 30 April 2012) and how Snowy Hydro met our obligations under the ***Snowy Water Licence*** during that water year.

Highlights of the 2011–12 water year included:

- The ongoing recovery of inflows into the Snowy Scheme;
- Delivery of the October 2011 Snowy River Flushing Flows;
- Management of the unprecedented March 2012 flood event;
- The March 2012 pre-release from Lake Jindabyne;
- Further amendments to the ***Snowy Water Licence.***

Snowy Hydro makes available to the public a large amount of information regarding the water operations of the Snowy Scheme – principally through this Water Operations Report and further more detailed information on our company's website: www.snowyhydro.com.au

Snowy Hydro is committed to improving stakeholder understanding and appreciation of the many responsibilities and stringent obligations that our company has to comply with in relation to the water resources of the Snowy Scheme. Through reading the information contained in this report, we trust that the community and stakeholders will be more informed of the facts about water resources and the Snowy Scheme.

On page 27 of this document you will find an independent audit report that provides verification of the data contained within this 2011–12 Water Operations Report.

Further information including terminology, calculation of data and ***Snowy Water Licence*** obligations can be found by visiting: www.snowyhydro.com.au

David Harris
Executive Officer, Production, Water and Environment
Snowy Hydro Limited

CONTENTS

Talbingo Reservoir

PURPOSE OF THIS REPORT

The purposes of this 2011–12 Water Operations Report are:

1. To provide Snowy Hydro's stakeholders with information on how our company performed in the 2011–12 water year in meeting the many obligations specified under the ***Snowy Water Licence***; and

2. To satisfy the requirement under clause 4.4 of the ***Snowy Water Licence*** for the company to prepare and publish a compliance report in respect to the 2011–12 water year.

The obligations imposed upon the company by the ***Snowy Water Licence*** essentially relate to:

1. Targeting water releases to the River Murray and Murrumbidgee River catchments, the annual volumes of which are determined according to highly prescriptive formulae set out in the ***Snowy Water Licence***;

2. Targeting water releases from Jindabyne Dam into the Snowy River for environmental purposes (Snowy River Increased Flows); and

3. Facilitating additional natural flows over nominated Snowy Scheme aqueducts and targeting releases from Tantangara Dam, both for environmental purposes (Snowy Montane Rivers Increased Flows).

Understanding this Report

- The Snowy Hydro water year commences on 1 May and concludes on 30 April each calendar year.

- Volumes in this report are quoted in gigalitres (GL). 1 gigalitre is equal to 1,000 megalitres (ML). 1 megalitre is equal to 1 million litres.

- Since the commencement of the operation of the Snowy Scheme, water release volumes have been set as targets and any minor differences between the target and actual release volumes (excess or shortfall) have been carried over to the next water year. This is done in the form of 'overs and unders' and is expressly permitted in the ***Snowy Water Licence*** in recognition of the difficulties inherent in achieving precise release volumes using infrastructure on the large scale of that comprising the Snowy Scheme.

KEY RESULTS

Snowy Hydro complied with all of the requirements imposed upon the company under the ***Snowy Water Licence*** during the 2011–12 water year.

During the 2011–12 water year, Snowy Hydro complied with each water release target relating to:

- The Required Annual Release to the River Murray catchment
- The Required Annual Release to the Murrumbidgee River catchment
- Environmental releases into the Snowy River from Jindabyne Dam
- Environmental releases from Tantangara Dam
- Environmental releases from Goodradigbee Aqueduct

The 13–year period of prolonged drought, which included the lowest inflow year on record during 2006–07, is certainly over with our second consecutive year of above average inflows. The active storage volume in Lake Eucumbene is now around long term average levels.

Jounama Dam

OVERVIEW OF SNOWY HYDRO

The shares in Snowy Hydro Limited are owned by the New South Wales Government (58%), Victorian Government (29%) and the Commonwealth Government (13%) and the company operates under an independent board.

Snowy Hydro is a growing business providing a range of price risk hedging products to participants in the competitive National Electricity Market (NEM.)

Snowy Hydro now operates the 4,000 megawatt (MW) Snowy Scheme and also owns and operates the 300MW Valley Power gas-fired power station and the 320MW Laverton North gas-fired power station, both located in Victoria.

Red Energy, an electricity and gas retailer, is a subsidiary of Snowy Hydro Limited. Red Energy currently operates in Victoria, New South Wales and South Australia and has over 320,000 electricity and gas retail customers.

Tumut 3 Power Station

THE SNOWY WATER LICENCE AND THE SNOWY HYDRO BUSINESS

To ensure that the benefits of the Snowy Scheme could be maximised for both water security and electricity generation, a set of operating principles and water accounting rules were developed by the Commonwealth, New South Wales and Victorian Governments under the 1957 Snowy Agreement.

On Corporatisation of the Snowy Mountains Hydro-electric Authority in 2002, the key elements of those operating principles and water accounting rules were codified and carried forward in the ***Snowy Water Licence*** issued by the New South Wales Government.

The ***Snowy Water Licence*** is not a freedom to act, as is the case with most licence arrangements. Rather, it is a bundle of a few rights and numerous, legally binding and enforceable obligations. The many legally binding obligations imposed on Snowy Hydro under the ***Snowy Water Licence*** include obligations with regard to targeting water releases from the Snowy Scheme.

Snowy Hydro's rights to collect, divert, store and release water under the ***Snowy Water Licence*** in no way represents any form of ownership of the water. All of the water in the Snowy Scheme is owned by the parties who have an entitlement to releases from the Snowy Scheme. This includes the States of New South Wales and Victoria, irrigators from those States and environmental entitlement holders.

To generate electricity Snowy Hydro must release water from the Snowy Scheme, and to release water from the Snowy Scheme, Snowy Hydro must generate electricity. In this way, water releases, electricity generation and their associated market impacts are inseparably linked.

To generate electricity Snowy Hydro must release water from the Snowy Scheme, and to release water from the Snowy Scheme, Snowy Hydro must generate electricity.

The mandatory nature of the obligations imposed upon Snowy Hydro by the ***Snowy Water Licence*** means that, as a practical matter, Snowy Hydro operates the Snowy Scheme to first meet its water release obligations and then to maximise electricity market opportunities within the constraints imposed by the ***Snowy Water Licence***.

Downstream water users (irrigators and environmental entitlements holders) have never been charged for the water regulation services provided to them each year by the infrastructure comprising the Snowy Scheme.

Snowy Hydro has to fund both the debt and operating costs of the Snowy Scheme through its participation in the highly competitive National Electricity Market. Those electricity revenues pay for the increasing costs of maintaining and operating the Snowy Scheme, including the costs associated with making environmental flows.

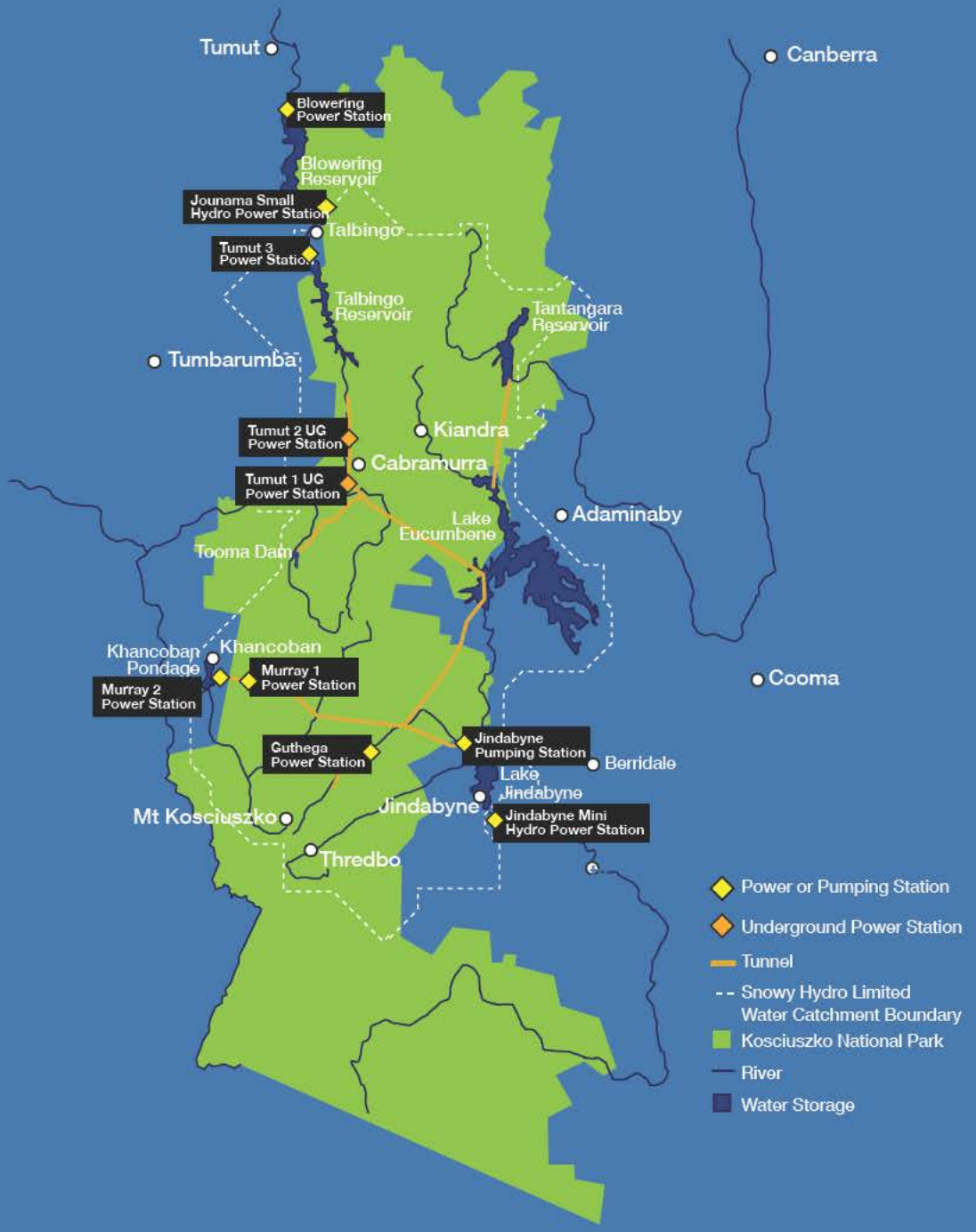
HOW THE SNOWY SCHEME WORKS

The Snowy Scheme was designed to collect and store water, including water that would otherwise flow east of the Snowy Mountains to the coast, diverting it through trans-mountain tunnels and power stations and then releasing it west of the Snowy Mountains into the catchments of the River Murray and the Murrumbidgee River, where it can be used for town water supply, extractive and environmental uses.

The Snowy Scheme includes:

- Nine power stations – Murray 1, Murray 2, Blowering, Guthega, Tumut 1 (located 366m below ground level), Tumut 2 (located 244m below ground level), Tumut 3, Jounama Small Hydro Power Station and Jindabyne Mini Hydro Power Station;
- One pumping station at Jindabyne and a pump storage facility at Tumut 3 Power Station;
- 16 major dams with a total storage capacity of 7,000GL or almost 12 times the volume of Sydney Harbour;
- 145km of inter-connected tunnels and pipelines and 80km of aqueducts; and
- 33 hydro-electric turbines with a generating capacity of 4,000MW.

The Snowy Scheme comprises two major developments: the Northern Snowy-Tumut Development and the Southern Snowy-Murray Development.



THE SNOWY-TUMUT DEVELOPMENT

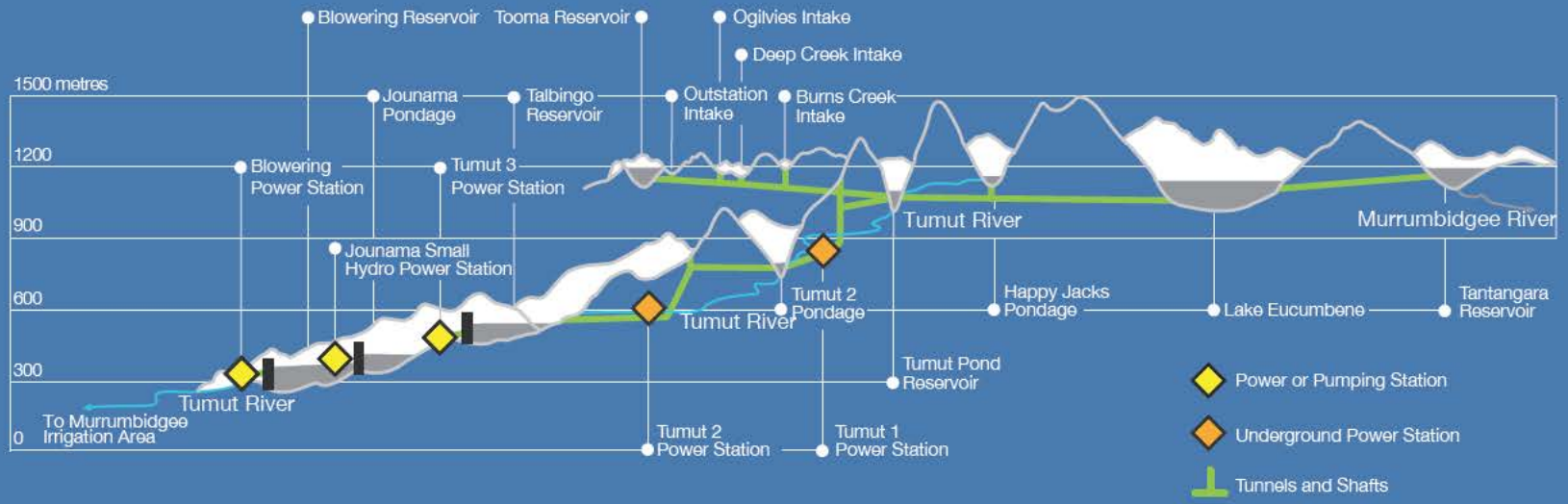
The Snowy-Tumut Development consists of five power stations and 16 generating units. It collects the headwaters of the upper Murrumbidgee, Tooma and Eucumbene Rivers. Those waters are diverted through trans-mountain tunnels to Tumut Pond Dam where they join the waters of the Tumut River and flow through Tumut 1 and Tumut 2 underground power stations, discharging into Talbingo Reservoir. Water stored in Talbingo Reservoir then passes through the Tumut 3 Power Station and into Jounama Pondage.

Three of the six generators at Tumut 3 Power Station also have large pumps fitted that can be used to pump water from Jounama Pondage back up into Talbingo Reservoir, thereby 'recycling' water. Water cannot be pumped any further uphill than Talbingo Reservoir.

Water is released from Jounama Dam into Blowering Reservoir either through the Jounama Small Hydro Power Station or through the radial release gates at Jounama Dam.

Blowering Power Station is located on Blowering Dam and is leased from NSW State Water Corporation. Water releases from Blowering Dam are controlled by State Water – a New South Wales State-Owned Corporation – to provide for downstream town water supply, extractive and environmental use requirements. Blowering Power Station is therefore a 'run of river' plant that operates as State Water releases water from Blowering Dam into the Tumut River, which joins the Murrumbidgee River near Gundagai.

On the Murrumbidgee River, as at Gundagai, the Snowy Scheme contributes inflows of around 25% during average inflow years but 60% during drought years.



THE SNOWY-MURRAY DEVELOPMENT

The Snowy-Murray Development consists of four power stations with 17 generating units and one pumping station.

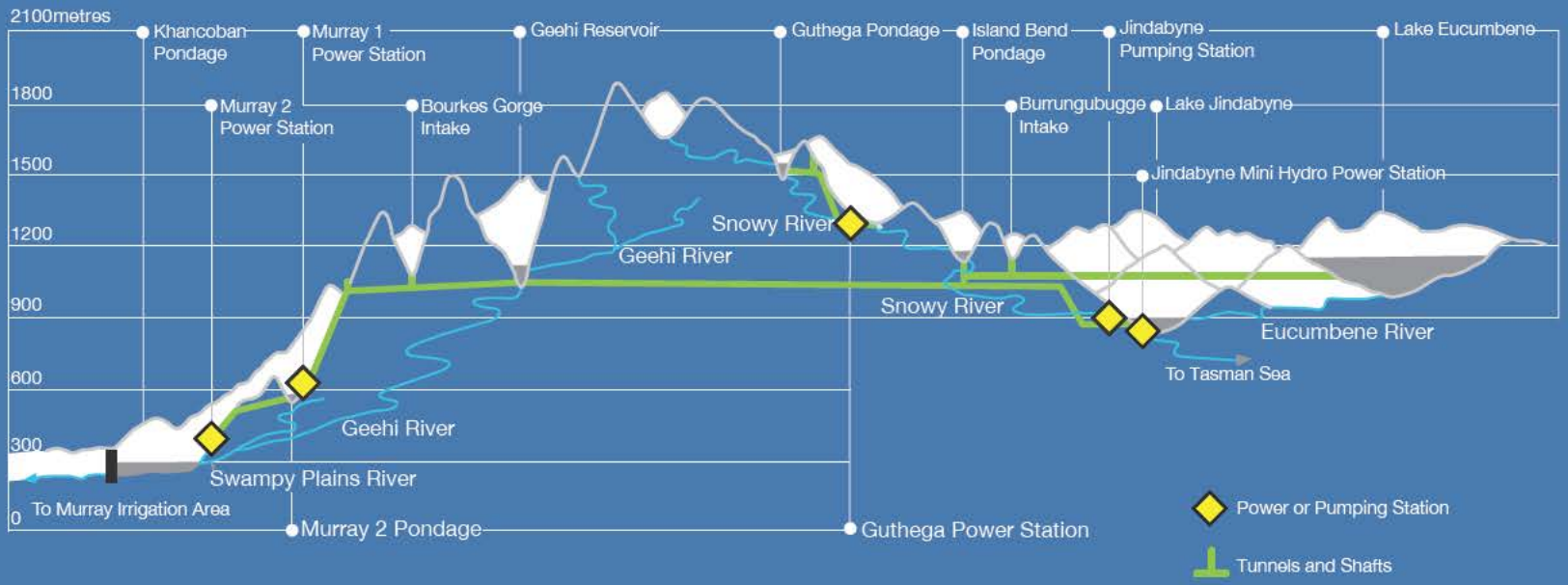
Water in the upper Snowy River is diverted at Guthega Dam through Guthega Power Station. Inflows into the relatively small Guthega Pondage are seasonal. During times of high inflows, water flowing into Island Bend Pondage is diverted to Lake Eucumbene for storage and subsequently transferred to the River Murray catchment. At times of low inflows, water from Island Bend Pondage is diverted to Geehi Reservoir through a trans-mountain tunnel, together with water which flows back from Lake Eucumbene.

The Jindabyne Pumping Station pumps water from Lake Jindabyne, normally using off-peak power, into Geehi Reservoir on the western side of the Great Dividing Range. Water from Lake Jindabyne cannot be pumped back to Lake Eucumbene.

Additionally, the Jindabyne Mini-hydro Power Station allows Snowy Hydro to recover a small amount of electricity from some of the environmental releases into the Snowy River.

From Geehi Reservoir, with additional water from the Geehi River, the water passes through Murray 1 and Murray 2 power stations. Khancoban Dam regulates water released from Murray 2 Power Station down the Swampy Plains River which is a tributary of the upper River Murray.

On the River Murray, as at the Hume Dam, the Snowy Scheme contributes inflows of around 8% during average inflow years but 33% during drought years.



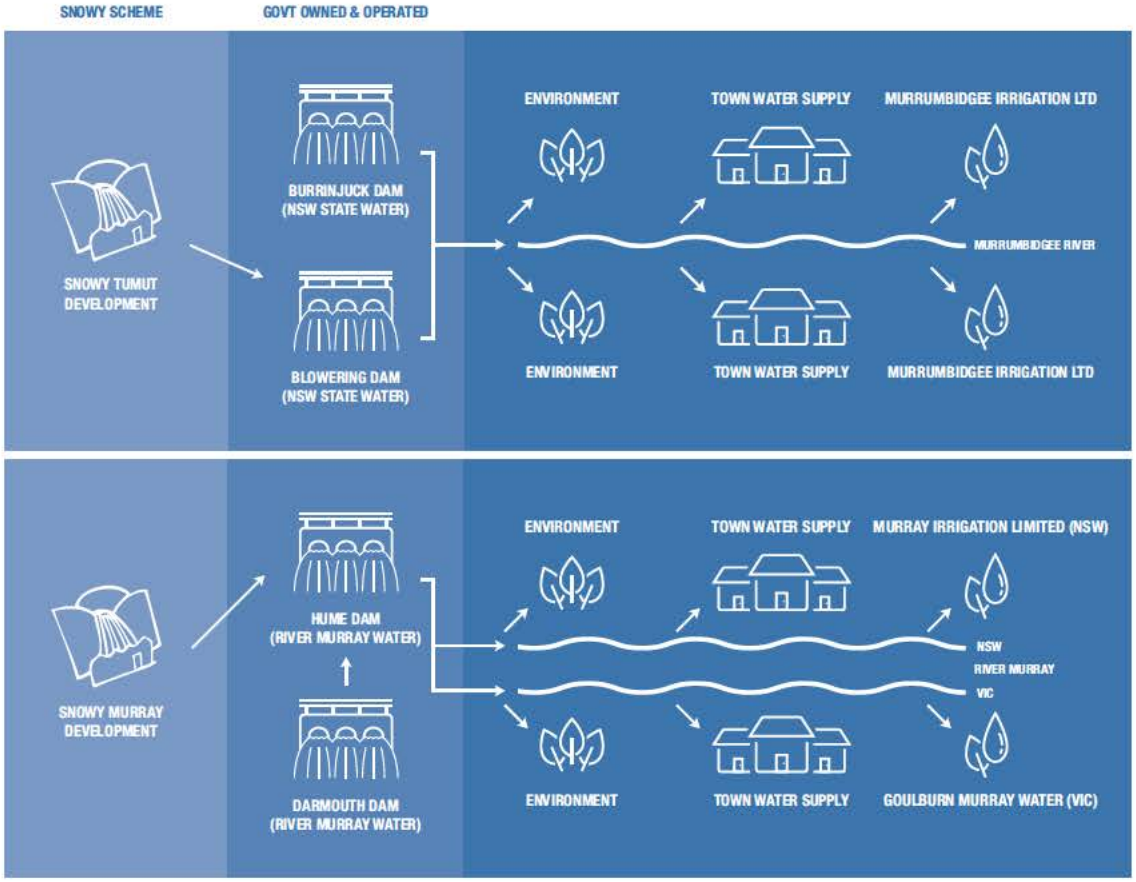
DOWNSTREAM FROM THE SNOWY SCHEME

Snowy Scheme releases and the other River Murray and Murrumbidgee River catchment inflows are re-regulated by the Hume Dam on the River Murray and Blowering Dam on the Tumut River – neither of which are owned or controlled by Snowy Hydro.

Water releases for extractive and environmental uses along the Upper River Murray are managed by the Murray-Darling Basin Authority, principally through releases from Dartmouth and Hume Dams (the Snowy Scheme does not make releases into nor has any control over the operation of Dartmouth Dam).

Snowy Hydro has no involvement or even influence in the allocation or delivery of water to downstream extractive and environmental water users.

Water releases for extractive and environmental uses along the Murrumbidgee River are managed by the NSW State Water Corporation, principally through releases from Blowering and Burrinjuck Dams (again, the Snowy Scheme does not make releases into nor has any control over the operation of Burrinjuck Dam).



DELIVERING THE FIRST 'FLUSHING FLOW' OUT OF JINDABYNE DAM INTO THE SNOWY RIVER

As an outcome of the Snowy Water Inquiry commissioned in 1998 into flows down the Snowy River, new annual targets for environmental flows were set for the Snowy River by the NSW Government. While releases have been occurring since 2002, water has been limited due to the impact of prolonged droughts and low water availability.

With improved inflows, as well as the NSW Office of Water and Victorian Department of Sustainability and the Environment securing over $400million of water entitlements, Snowy Hydro was instructed by NSW Office of Water to deliver a flushing flow to the Snowy River in October 2011.

A total of 82GL was committed and then released. This was the largest environmental water release into the Snowy River since the construction and operation of Jindabyne Dam in 1967.

It is expected that these flushing flows will improve the instream condition of the river.

The first major flushing flow commenced on Wednesday 5th October 2011 and ran for 19 days. In order to release the volume of water needed to scour the Snowy River bed and channel, water was retained in Lake Jindabyne well above the historical average levels for that time of year.

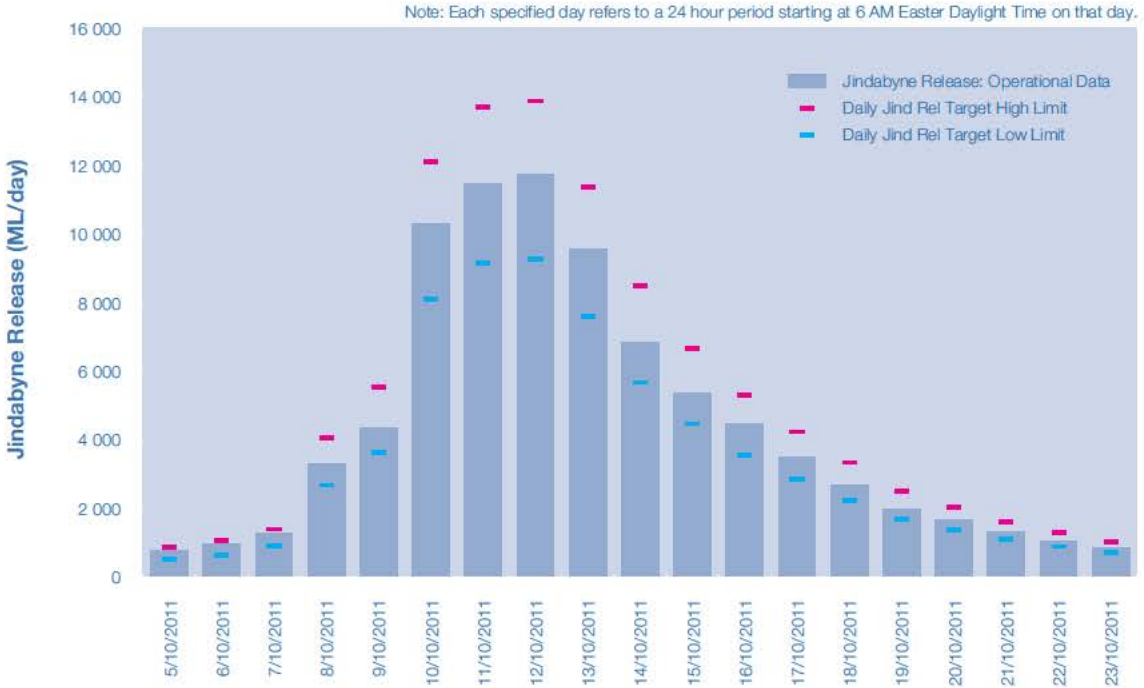
The release from Lake Jindabyne down the Snowy River peaked at almost 12GL per day and was discharged through the large radial gates as well as the cone valves. This resulted in Jindabyne lake levels dropping sharply by two and a half vertical metres over a week.

The NSW Office of Water, working with representatives across local, state and Commonwealth Government agencies, was responsible for the advice to downstream landholders and other stakeholders that would be impacted by the increased Snowy River levels. The Snowy River rose downstream of Jindabyne Dam between approximately 1.8 to 3.6 metres during this time.

Snowy Hydro Engineers, Hydrologists, Technical and Support staff spent months in the planning of the releases with the focus on safety of the public, especially on site, where a temporary public viewing area was established. The temporary public viewing area was adjacent to the spillway and included a controlled parking area so people could come and see the releases first hand.

Due to the improved inflows in the 2011–12 water year, a flushing flow will again occur in September 2012 with the dates and daily target volumes to be specified by the NSW Office of Water.

JINDABYNE DAILY RELEASES – FLUSHING FLOW OCT 2011



Snowy River Flushing Flow 2011

MANAGEMENT OF THE UNPRECEDENTED HIGH INFLOW EVENTS & FLOODING

As a result of the major rain event that occurred in late February and early March 2012, many local areas became the focus of national media attention as towns such as Cooma and Tumut experienced days of heavy rain which turned to flooding.

This significant rainfall event caused the smaller Snowy Scheme storages to fill quickly and in some cases then spill, such as Tooma Dam which has not spilled in 20 years. The inflows received in a week were almost 20% of the long term average annual inflows.

Lake Eucumbene rose two metres as a result of this single high inflow event.

The highest monthly inflow total across the Snowy Scheme recorded in the past decade is 700GL in September 2010. In March of 2012, inflows totalled 825GL which is almost a third of the annual long term average.

As a result of the flooding of the Thredbo River, combined with flooding in the smaller creeks and spilling of Island Bend Dam down the upper Snowy River, Lake Jindabyne rose more than four metres in four days. The rate at which water was flowing into Island Bend Dam exceeded the capacity of the tunnel back to Lake Eucumbene by a factor of more than five times.

With such strong inflows and localised flooding, Lake Jindabyne reached full capacity very quickly and also spilled into the Snowy River. The last time Lake Jindabyne spilled was in 1975.

During the entire event Snowy Hydro communicated extensively with local tourism operators around the lakes, stakeholders, shire councils, SES and many others as events unfolded. Additionally, we moved to daily lake level updates on our website rather than weekly to keep the public informed as much as possible.

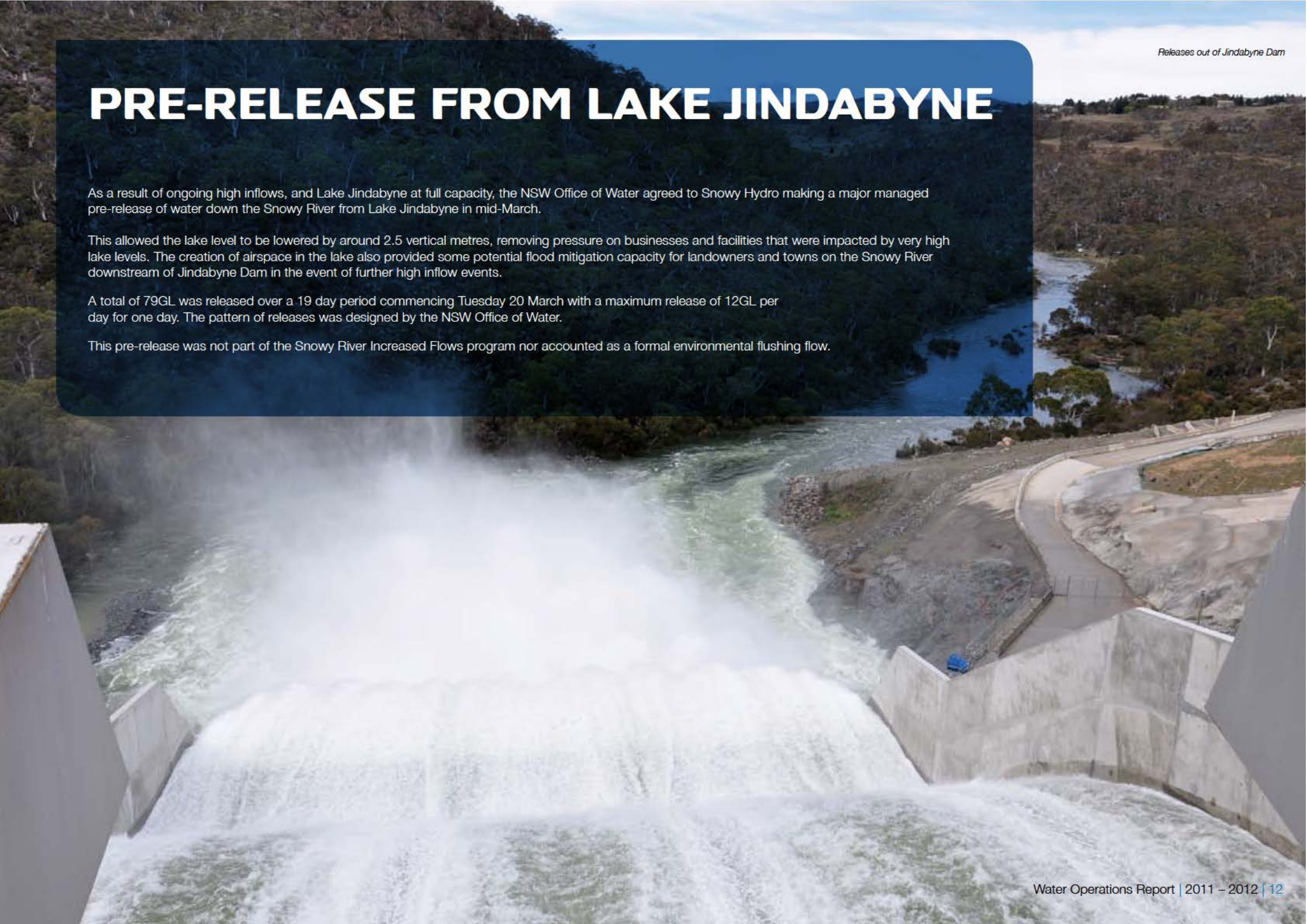
Jindabyne to Eucumbene

Despite broad communications and provision of information to the public there was still some confusion in local communities as to whether water in Lake Jindabyne could be pumped or transferred to Lake Eucumbene.

It is beyond the capability of the Jindabyne Pumping Station to pump water into Lake Eucumbene. The pumps only pump water from Lake Jindabyne to Geehi Reservoir via the Snowy-Geehi Tunnel, which is then released via the Murray 1 and then Murray 2 Power Stations and then into Khancoban Pondage and the Murray catchment.

Jindabyne Pumping Station has the capacity to pump only around 2.2GL of water per day to Geehi Reservoir. To put this into perspective, on one day alone in the first week of March 2012, Lake Jindabyne rose by 49GL of water.

Lake Jindabyne in flood, March 2012



Releases out of Jindabyne Dam

PRE-RELEASE FROM LAKE JINDABYNE

As a result of ongoing high inflows, and Lake Jindabyne at full capacity, the NSW Office of Water agreed to Snowy Hydro making a major managed pre-release of water down the Snowy River from Lake Jindabyne in mid-March.

This allowed the lake level to be lowered by around 2.5 vertical metres, removing pressure on businesses and facilities that were impacted by very high lake levels. The creation of airspace in the lake also provided some potential flood mitigation capacity for landowners and towns on the Snowy River downstream of Jindabyne Dam in the event of further high inflow events.

A total of 79GL was released over a 19 day period commencing Tuesday 20 March with a maximum release of 12GL per day for one day. The pattern of releases was designed by the NSW Office of Water.

This pre-release was not part of the Snowy River Increased Flows program nor accounted as a formal environmental flushing flow.

SNOWY WATER LICENCE VARIATIONS

In June 2011 the NSW Minister for Primary Industries, The Hon. Katrina Hodgkinson MP, announced a package of inter-related variations to the ***Snowy Water Licence*** which were formally adopted in October 2011.

After a decade of very low inflows, inflow conditions improved markedly in 2010 –11 and again in 2011–12, triggering the requirement to make increased releases above the nominal Required Annual Release. At this time, because of the widespread recovery in inflows, downstream storages were also becoming full or were near full.

The NSW Government determined that it would be preferable for all stakeholders that inflows be stored in the Snowy Scheme and be able to be called upon when drought conditions return.

Those variations were designed to allow for significant improvements to the recovery of Snowy Scheme storages and downstream water management. The variations covered four main areas:

1. Water that would have otherwise been forced out of the Snowy Scheme when inflows recover, will remain in Snowy Scheme storages for future water years to eliminate the risk that such releases might contribute to, or exacerbate, downstream flood conditions at times of inflow recovery and to ensure a more secure ongoing Required Annual releases (which will underpin future allocations);

2. "Drought Accounts" were established for both the Murray and Murrumbidgee Valleys to ensure critical human needs could be met during another severe drought. These accounts are to be credited up to 225GL and 150GL respectively in line with the recovery of inflows following the accumulation of the Dry Inflow Sequence Volume;

3. An option each year for water authorities to call out water savings held in Snowy Scheme storages for environmental flows in the Murray Valley known as River Murray Increased Flows. Previously these releases could only be made at Snowy Hydro's discretion when releases above the annual Required Annual Release are made; and

4. An option each year for Snowy Hydro to release water in excess of the Required Annual Release (RAR) and have that release treated as a pre-release of the next year's RAR. This volume is generally capped at 200GL. These releases are subject to "wet sequence protection", such that if any of these pre-releases cause additional spill from storages downstream of the Snowy Scheme, Snowy Hydro is required to make additional releases from Above Target Water to replace the lost resource.

Dry Inflow Sequence Volume and Inflow Recovery

Snowy Hydro's primary obligation under the ***Snowy Water Licence*** is to release a calculated volume of water annually to each of the River Murray and Murrumbidgee River catchments. Each of these volumes is calculated principally by reference to cumulative inflows.

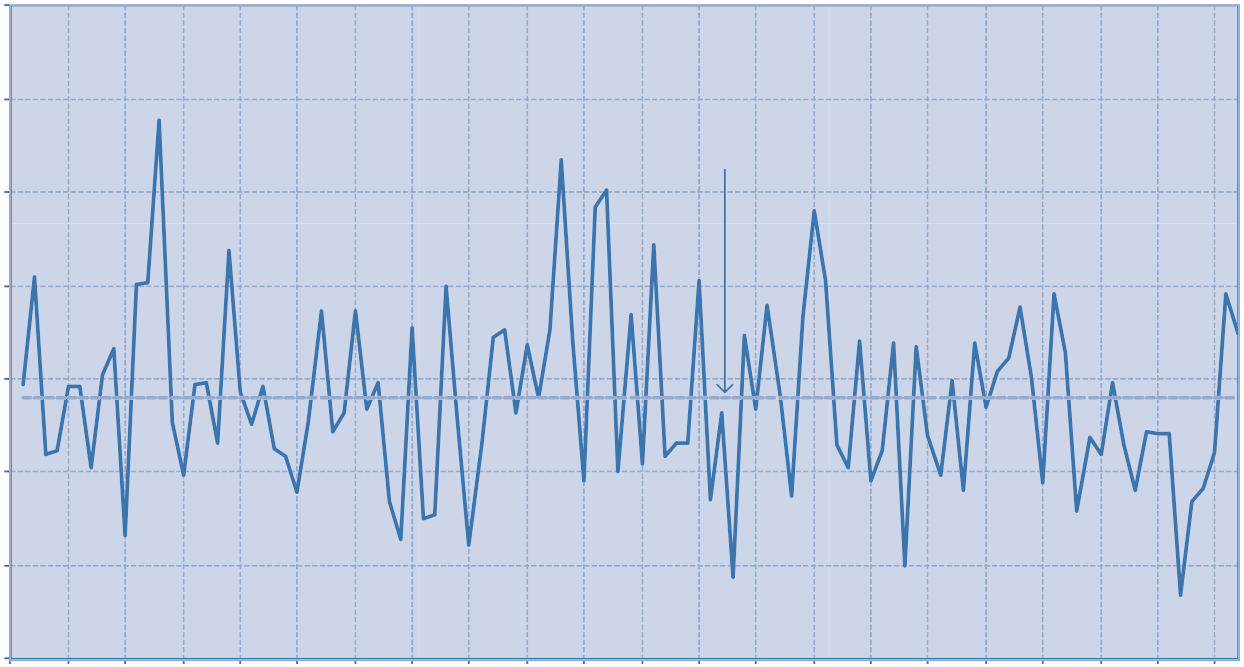
In drought years, the volume of water to be released from the Snowy Scheme is reduced under the formulae set out in the ***Snowy Water Licence***. This is known as the Dry Inflow Sequence Volume (DISV) reduction.

This reduces the releases to be made from the Snowy Scheme during dry periods but it also means that a "debt" is run up for every year that releases are reduced. Further, when inflow conditions improve, Snowy Hydro was required to release additional water over and above the nominal Required Annual Releases to essentially discharge that "debt".

INFLOWS

SNOWY SCHEME INFLOWS

The historical record of annual inflows into the Snowy Scheme is characterised by high variability with annual inflows ranging from less than 700GL to well over 5,000GL.




Critical Inflow Months
Very Wet
Actual
Average
Very Dry

WESTERN RIVER RELEASES

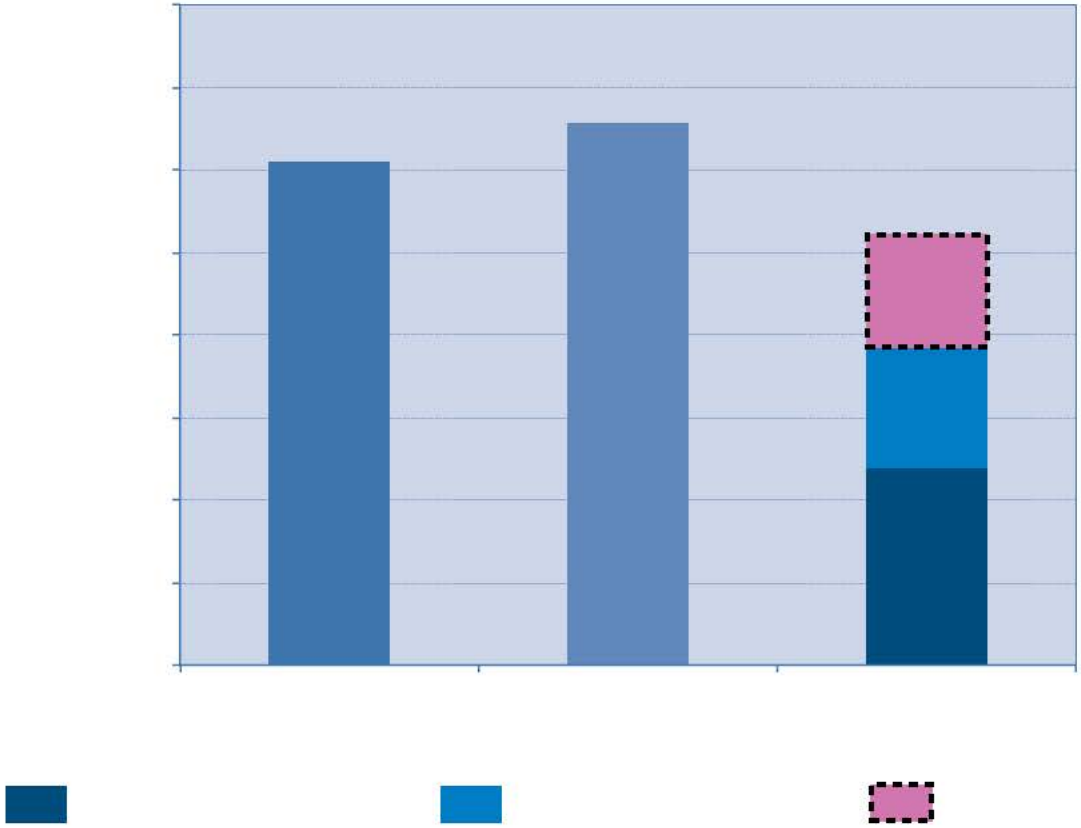
RIVER MURRAY CATCHMENT

Snowy Hydro complied with its obligation to target the Required Annual Release (RAR) from the Snowy-Murray Development to the River Murray catchment during the 2011–12 water year.

The total actual release volume was 770GL. This was made up of 477GL being the 2011–12 Required Annual Release after a Relaxation Volume Reduction (due to irrigators entitlements reaching full allocations and fullness of downstream storages) calculated under the *Snowy Water Licence*, plus 293GL of pre-release of the 2012–13 Required Annual Release as approved by the NSW Office of Water.

In the 2011–2012 water year this nominal amount was adjusted as follows:

- Increased by the difference between the previous year's DISV and the current year's DISV,
- reduced by:
  - the volume of water savings allocated to the Snowy-Murray Development to allow environmental releases to be made;
  - a pre-release made in 2010–11; and
  - the Relaxation Volume.



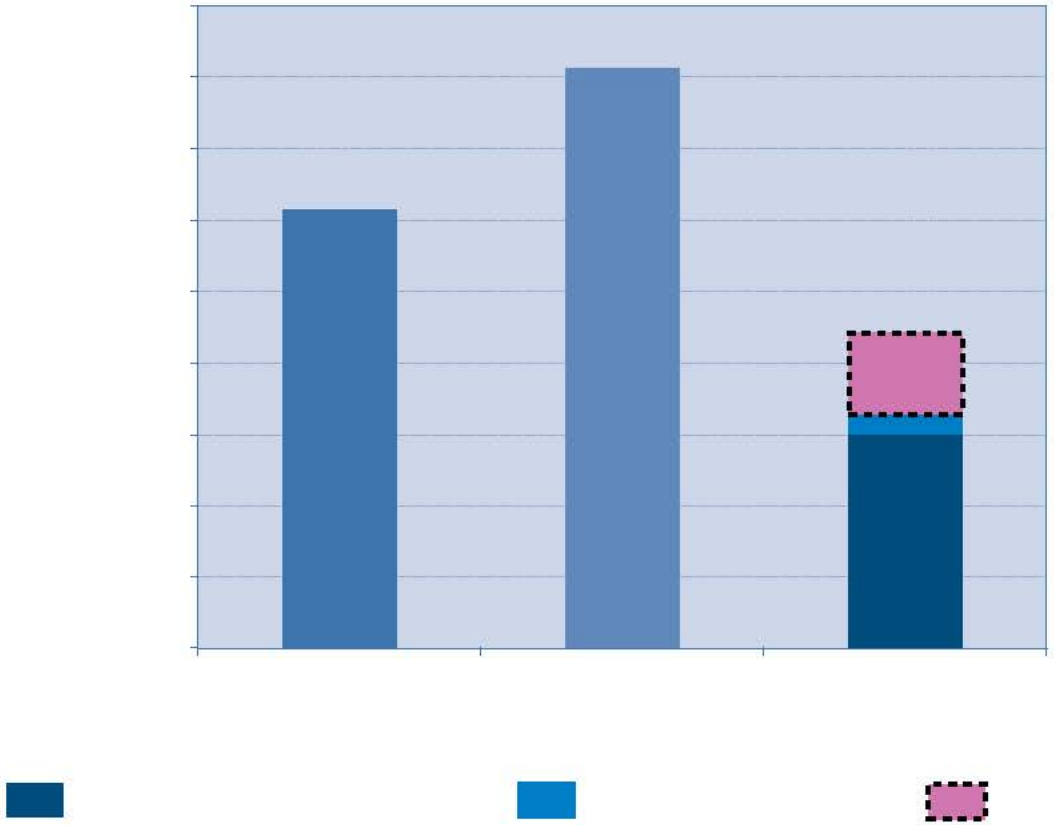
MURRUMBIDGEE RIVER CATCHMENT

Snowy Hydro complied with its obligation to target the Required Annual Release from the Snowy-Tumut Development to the Murrumbidgee River catchment during the 2011–12 water year.

The total actual release volume was 656GL. This was made up of 601GL being the 2011–12 Required Annual Release after a Relaxation Volume Reduction (due to irrigators entitlements reaching full allocations and fullness of downstream storages) calculated under the *Snowy Water Licence* plus 55GL of pre-release of the 2012–13 Required Annual Release as approved by the NSW Office of Water. This total release volume includes 57GL of montane releases.

In the 2011–12 water year this nominal amount was reduced by:

- The volume of water savings allocated to the Snowy-Tumut Development to allow environmental releases to be made;
- the relaxation volume; and
- 78GL as directed by the NSW Office of Water under clause 13.2 to facilitate a potential inter-valley transfer.



ENVIRONMENTAL RELEASES

SNOWY RIVER ENVIRONMENTAL FLOWS

The key element of the environmental flow arrangements under the ***Snowy Water Licence*** is that the total volume of environmental flows each year is determined by allocations to entitlements secured by water savings achieved by the Governments to date.

Snowy Hydro is not responsible for securing water savings or for setting the release targets.

Snowy Hydro is simply required to meet release targets notified to it by the NSW Office of Water under the ***Snowy Water Licence***.

The table on the opposite page sets out the major steps and accountabilities in the process, from securing water savings on the western rivers through to the actual release of environmental flows.

MAJOR STEP	WHO IS RESPONSIBLE
Securing verified water savings from water savings projects on the River Murray or Murrumbidgee River (or purchase of water entitlements)	Water for Rivers www.waterforrivers.org.au
Transferring verified water savings into Environmental Entitlements.	NSW Office of Water www.water.nsw.gov.au VIC Dept of Sustainability and Environment www.dse.vic.gov.au
Calculating annual allocations from the Environmental Entitlements each year (in arrears).	NSW Office of Water www.water.nsw.gov.au VIC Dept of Sustainability and Environment www.dse.vic.gov.au
Apportioning the annual allocations between the Snowy River Increased Flows, River Murray Increased Flows and the Mowamba Borrow.	NSW Office of Water www.water.nsw.gov.au
The determining of annual, monthly and daily release volumes for Snowy River Increased Flows.	NSW Office of Water www.water.nsw.gov.au
Notifying Snowy Hydro of annual, monthly and daily release volumes for Snowy River Increased Flows.	NSW Office of Water www.water.nsw.gov.au
Providing infrastructure to enable Snowy River Increased Flows from Jindabyne Dam and modifying existing infrastructure to enable Snowy Montane Rivers Increased Flows.	Snowy Hydro www.snowyhydro.com.au
Targeting releases of Snowy River Increased Flows from Jindabyne Dam and those structures nominated for Snowy Montane Rivers Increased Flows.	Snowy Hydro www.snowyhydro.com.au

SNOWY RIVER INCREASED FLOWS

Snowy Hydro complied with its obligation to target releases from Jindabyne Dam for environmental purposes during the 2011–12 water year.

The volume of Snowy River Increased Flows (SRIF) released from Jindabyne Dam during the 2011–12 water year was 149.9GL, which was 0.4GL in excess of the target volume of 149.5GL. That excess is well within the +/–10% annual tolerance around the target volumes allowed under the *Snowy Water Licence*. The 2012–13 target will be adjusted to account for this additional release.

In addition to the environmental releases, 8.5GL Base Passing Flow (BPF) was also released from Jindabyne Dam and 0.5GL riparian flow was released from the Mowamba Weir.

All monthly releases were well within the +/–20% monthly tolerance around the target volumes allowed under the *Snowy Water Licence*.

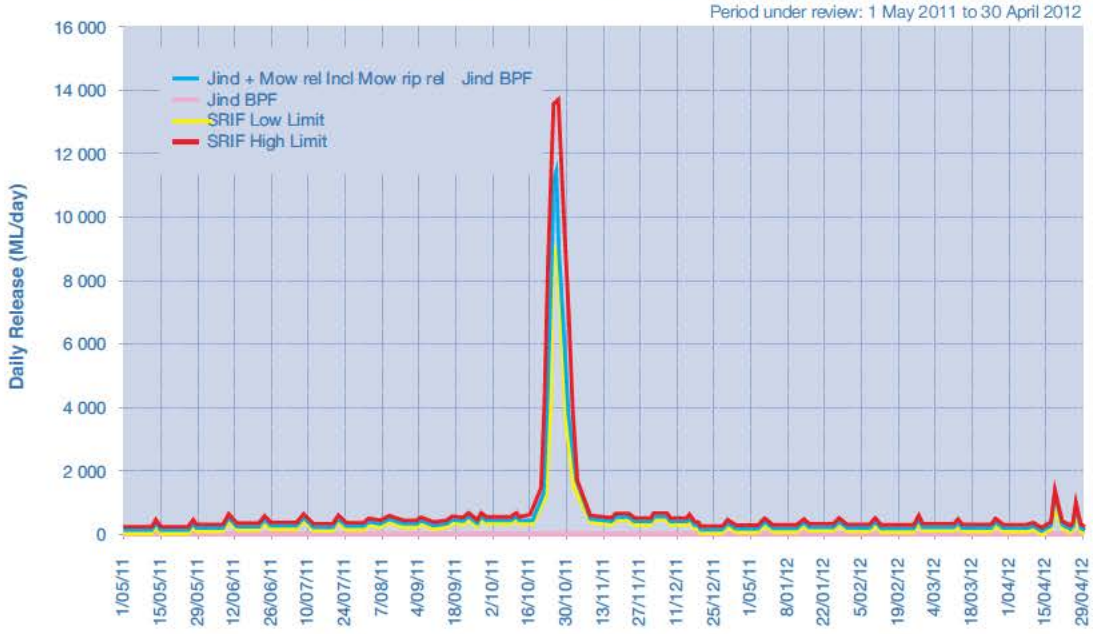
All except two of the daily release targets were well within the +/–20% daily tolerance allowed under the *Snowy Water Licence*. One occasion occurred during the ramping up of winter releases in August 2011 and the other during the ramping down of releases after the major flushing flow in October 2011.

As allocations for the 2011–12 water year exceeded 100GL for the first time since Corporatisation, the first ever flushing flow was delivered to the Snowy River as set out on page 9.

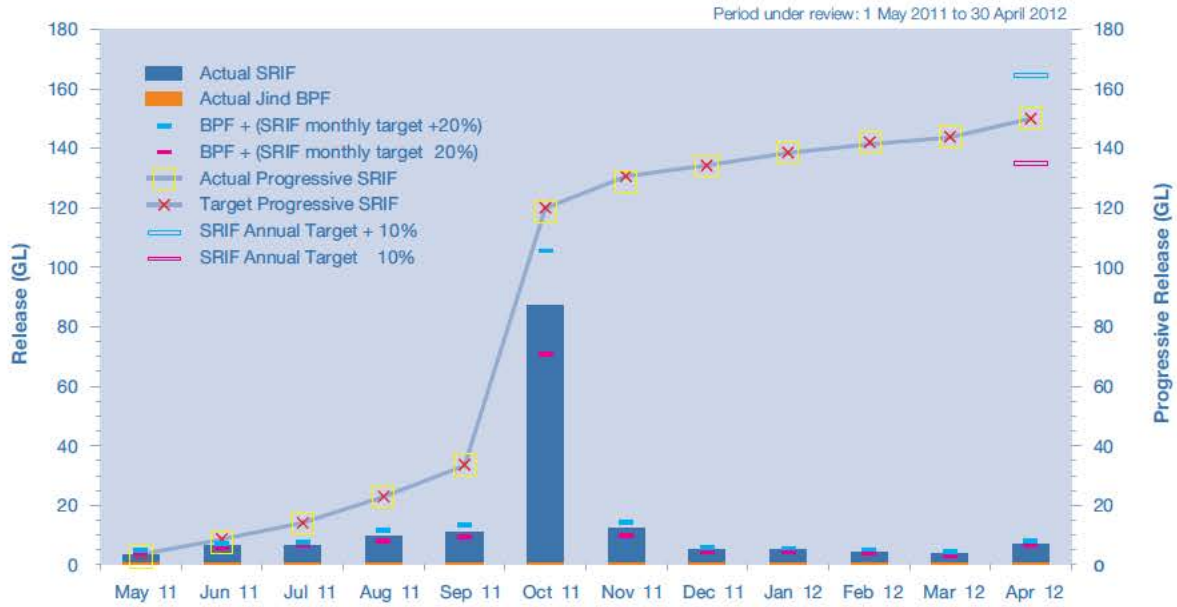
In addition to SRIF, exceptional high inflows in Jindabyne Dam in March 2012 led to Jindabyne Dam exceeding 100% storage capacity and spilling into the Snowy River automatically from 8–12th and 16–20th March 2012 inclusive, releasing a total of 16.2 GL. A pre-release was also made, for details see page 12.

The comparison of the annual, monthly and daily release targets for the Snowy River Increased Flow releases against the actual releases is shown in the following charts.

SNOWY RIVER INCREASED FLOWS AND JINDABYNE BASE PASSING FLOW RELEASES AND DAILY LIMITS. 2011 2012 WATER YEAR



SNOWY RIVER INCREASED FLOWS AND JINDABYNE BASE PASSING FLOW RELEASES INCLUDING MOWAMBA RIPARIAN RELEASES. 2011–2012 WATER YEAR.

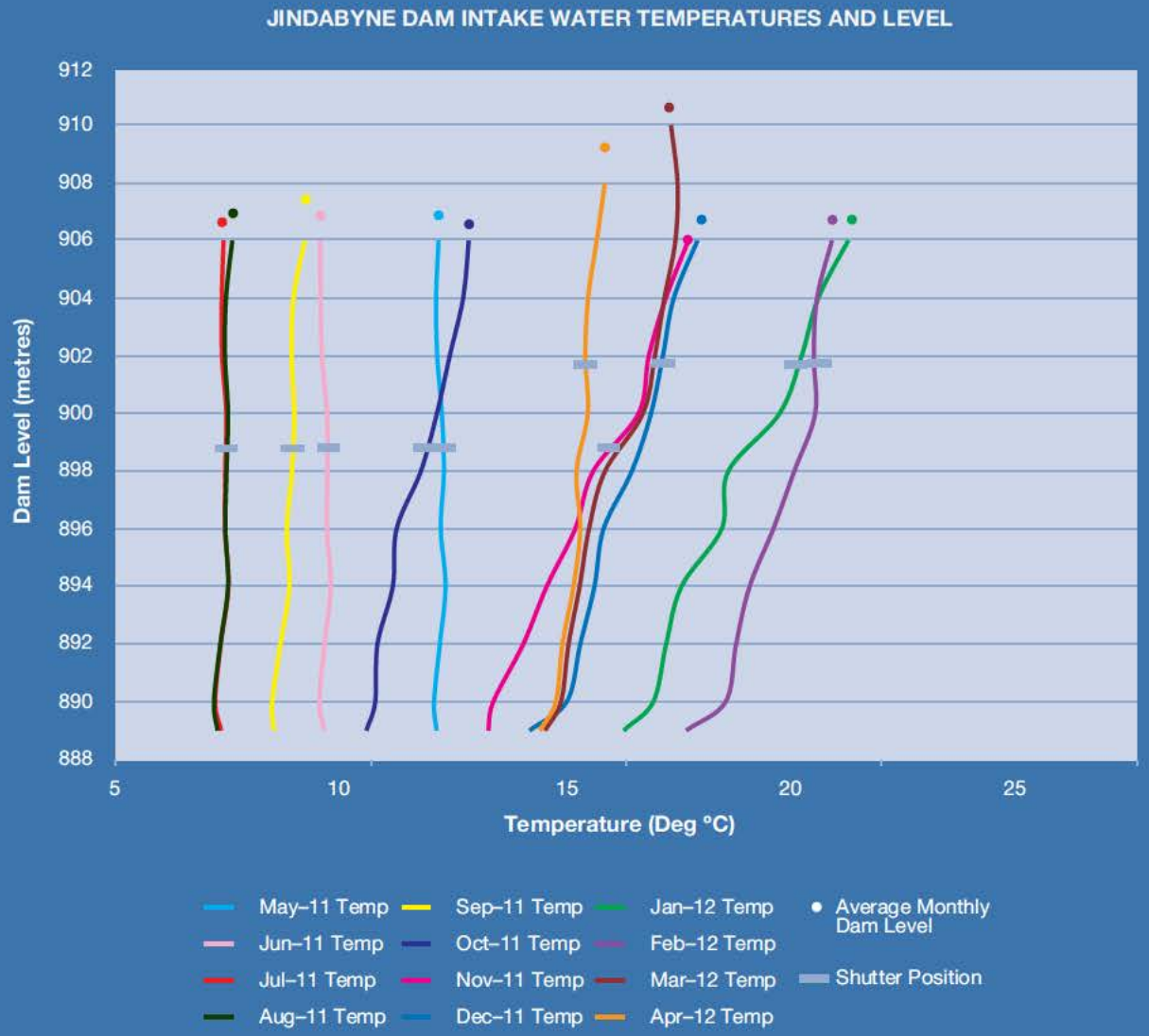


RELEASES FROM LAKE JINDABYNE

The *Snowy Water Licence* requires the outlet works at Jindabyne Dam to be capable of releasing water from above any thermocline in the reservoir. The thermocline is a thin but distinct layer in a large body of water in which temperature changes more rapidly with depth than it does in the layers above or below. Typically, as the summer progresses, the surface waters warm and the deeper waters remain cold. This causes a lack of mixing between the upper and lower layers, which can result in the lower layer having reduced oxygen levels. For these reasons the deeper waters within reservoirs are generally viewed as having undesirable water quality characteristics for releases, hence the requirement for the outlet works to be able to draw from above the thermocline.

The new intake works at Jindabyne are located at the end of a channel excavated into the bank of Lake Jindabyne. In addition to the variable level shutters in the intake tower, the level of the base of the channel means that the deeper waters of the reservoir are inaccessible. This means that the thermocline is only likely to be above the levels of the intake channel when the lake is at much higher levels.

Snowy Hydro undertakes temperature monitoring at the intake tower to detect the presence of a thermocline and adjusts shutter height as necessary. As can be seen in the chart opposite, all releases were made from above the thermocline.



SNOWY MONTANE RIVERS INCREASED FLOWS

Snowy Hydro complied with its obligation to target Snowy Montane Rivers releases for environmental purposes during the 2011–12 water year. Snowy Hydro was directed to make Snowy Montane Rivers Increased Flows (SMRIF) from Tantangara Dam and Goodradigbee Aqueduct during the 2011–12 water year.

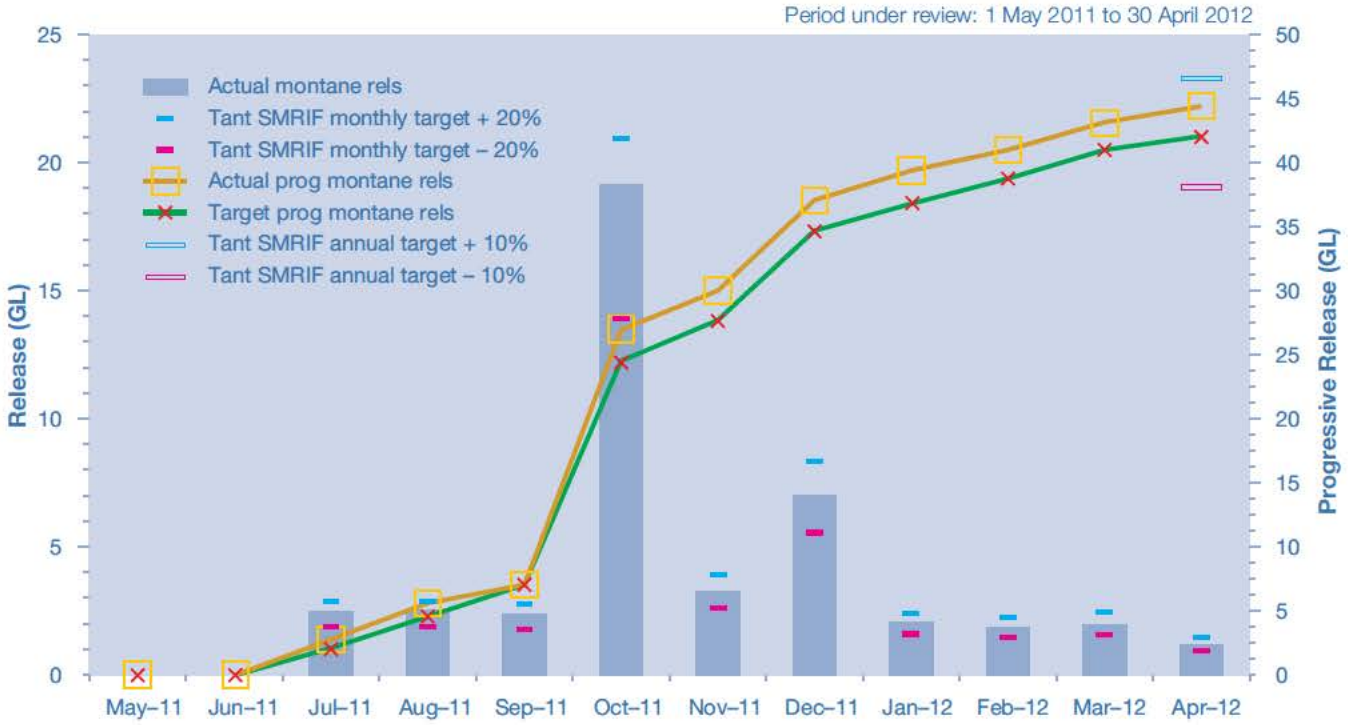
The target volume for Snowy Montane Rivers Increased Flows totalled 54.3GL, with 42.3GL from Tantangara Dam to be released during winter, spring and autumn and 12GL from Goodradigbee Aqueduct to be released over the whole water year.

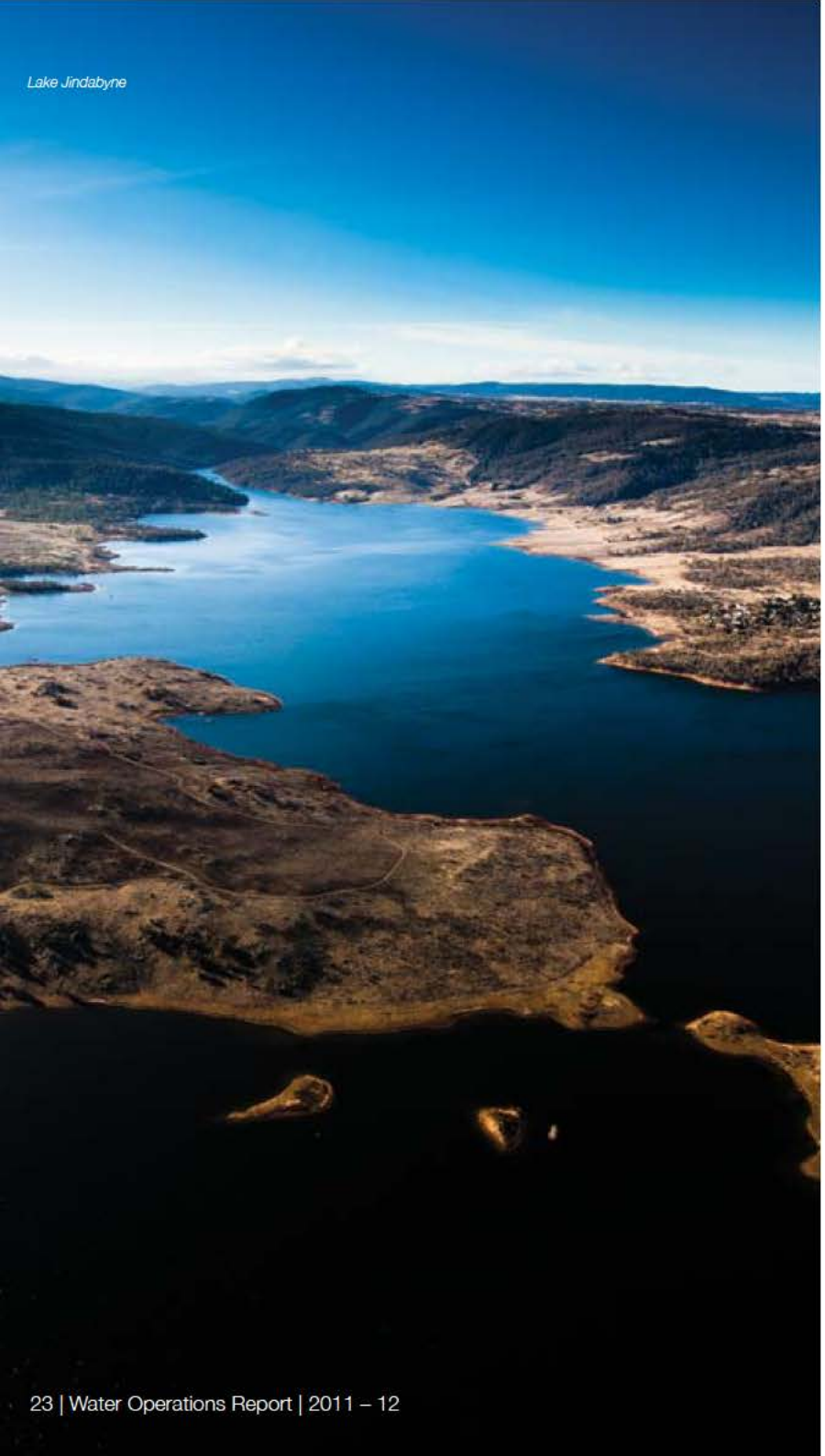
The total actual montane release volume was 56.8GL. This was made up of 44.7GL from Tantangara Dam released during winter spring and autumn and 12.1GL from Goodradigbee Aqueduct over the whole water year.

The comparison of the annual, monthly and daily release targets for the Snowy Montane Rivers Increased Flows against the actual from Tantangara Dam and monthly releases from Goodradigbee Aqueduct is set out in the graphs opposite. All except seven of the daily release targets were well within the +/–20% daily tolerance allowed under the *Snowy Water Licence*.

Daily targets for releases from Tantangara Reservoir were exceeded by more than the +/–20% daily tolerance allowed under the *Snowy Water Licence* for seven days during the ramping down of the high flows in October 2011.

SNOWY MONTANE RIVERS INCREASED FLOWS AND BASE PASSING FLOW FROM TANTANGARA DAM 2011–2012 WATER YEAR





Lake Jindabyne

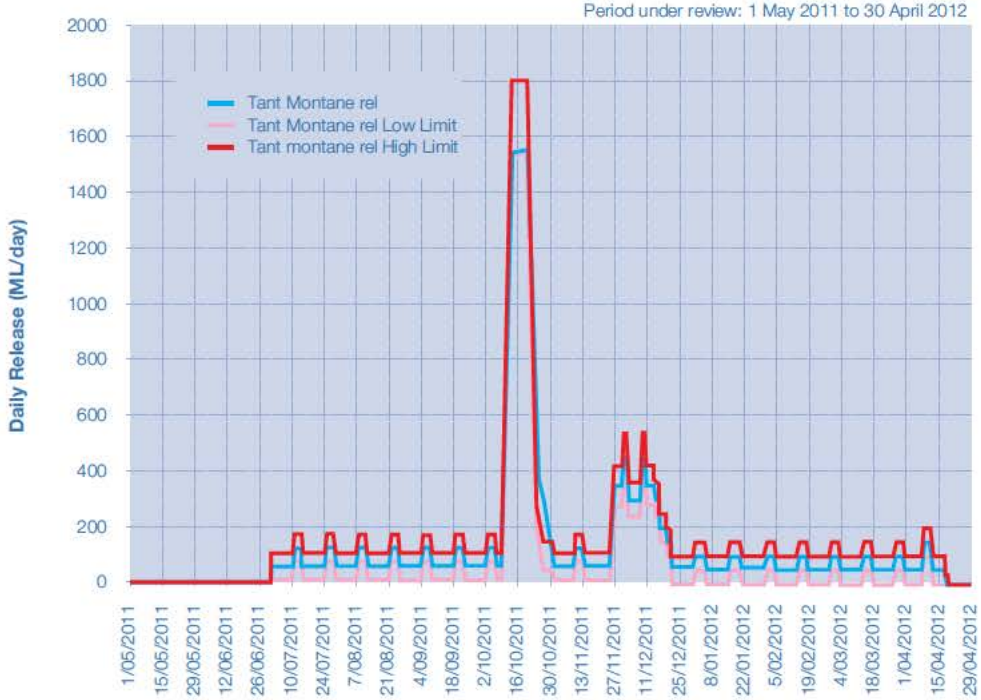
SNOWY MONTANE RIVERS INCREASED FLOWS FROM GOODRADIGBEE WEIR
2011 2012 WATER YEAR

Period under review: 1 May 2011 to 30 April 2012

Note: The annual target release for 2011–2012 Water Year is 12.0 GL.
There are no monthly or annual compliance targets for Goodradigbee.

SNOWY MONTANE RIVERS INCREASED FLOWS FROM TANTANGARA DAM AND DAILY LIMITS

Period under review: 1 May 2011 to 30 April 2012

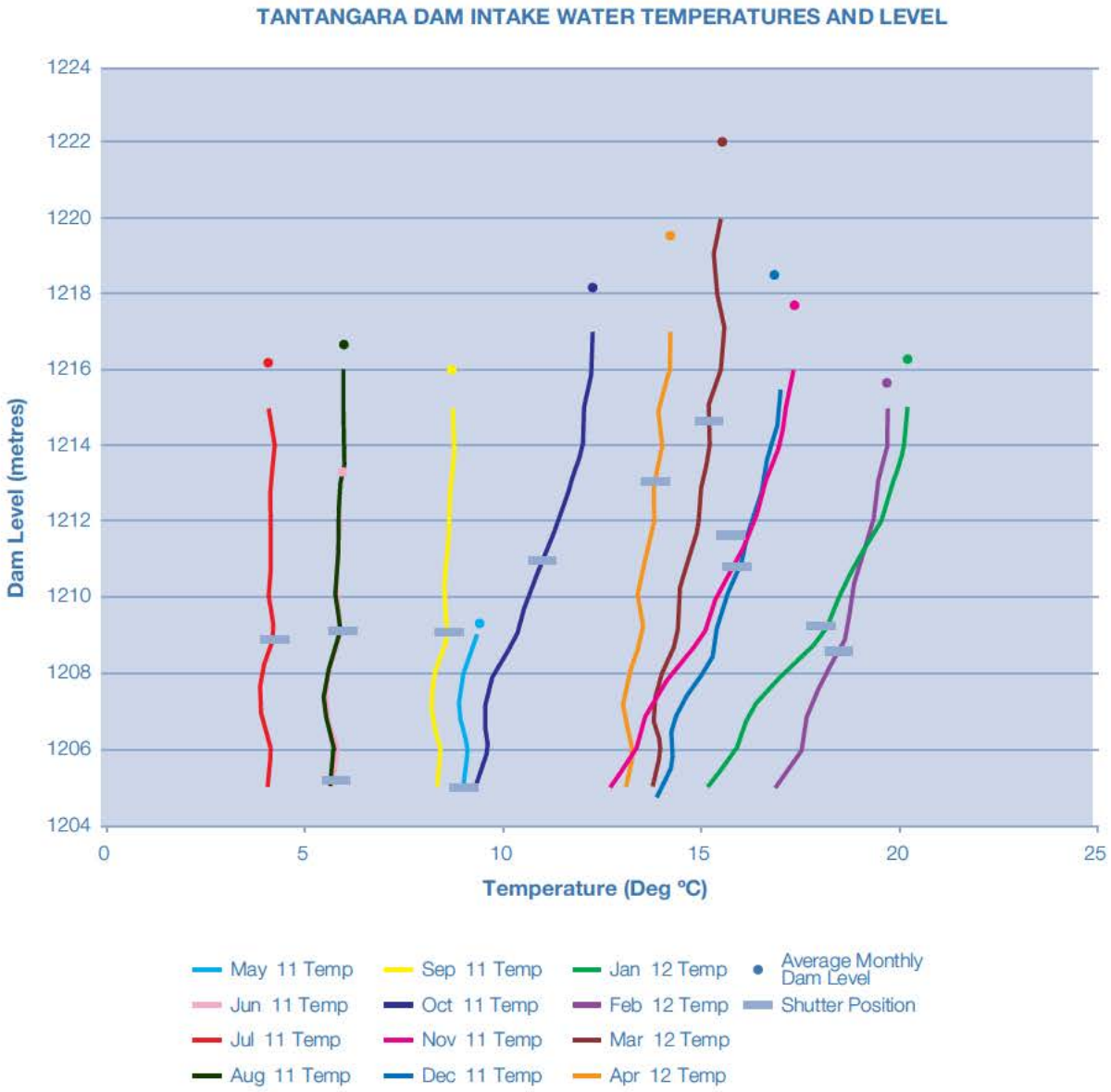


RELEASES FROM TANTANGARA RESERVOIR

The *Snowy Water Licence* requires the outlet works at Tantangara Dam to be capable of releasing water from above any thermocline in the reservoir. The thermocline is a thin but distinct layer in a large body of water in which temperature changes more rapidly with depth than it does in the layers above or below. Typically, as the summer progresses, the surface waters warm and the deeper waters remain cold. This causes a lack of mixing between the upper and lower layers, which often results in the lower layer having reduced oxygen levels. For these reasons the deeper waters within reservoirs are generally viewed as having undesirable water quality characteristics for releases, hence the requirement for the outlet works to be able to draw from above the thermocline.

The new intake works at Tantangara Dam are located on the upstream face of the dam wall. They comprise a series of 'telescoping' shutters to create a variable level off-take.

Snowy Hydro undertakes temperature monitoring at the intake tower to detect the presence of a thermocline and adjusts the shutter height as necessary. As can be seen in the chart opposite, all releases were made from above the thermocline.



STORAGES

SNOWY SCHEME STORAGE FOR 2011–12

Snowy Scheme storage levels are referred to from time to time in different measurements, they being ‘active storage’ and ‘gross storage’.

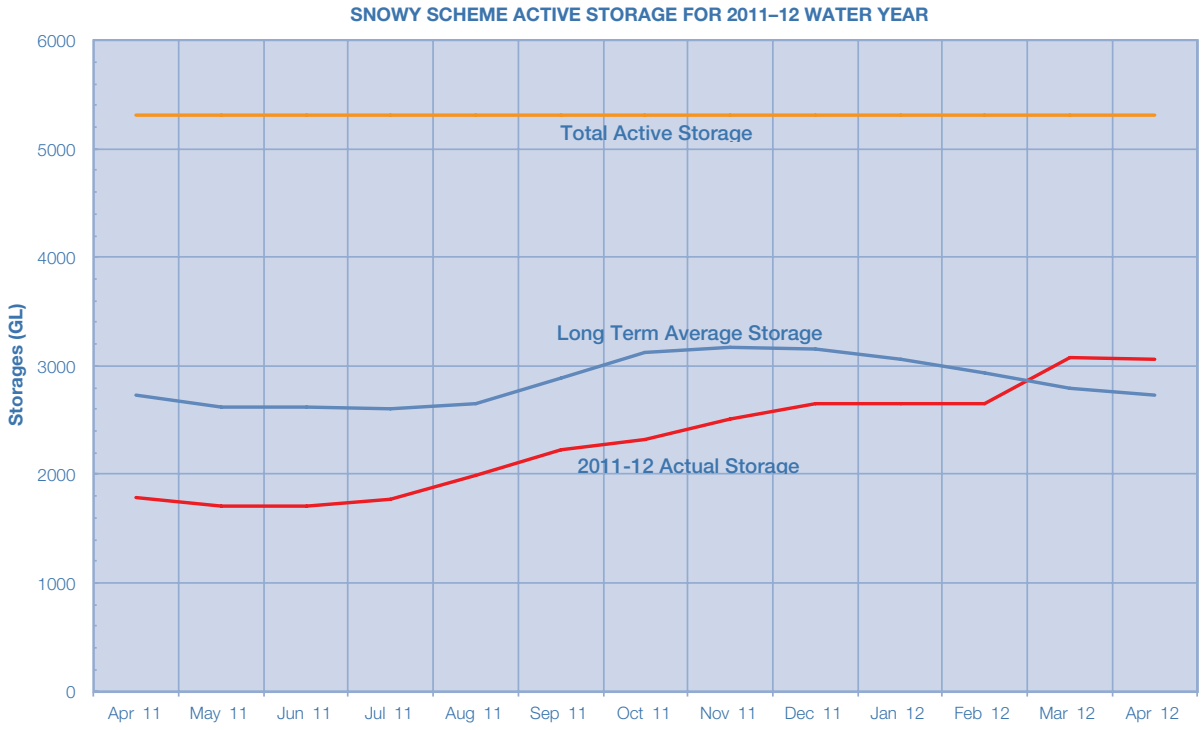
Active storage is the water that generally can be accessed by either pumping or through release via dams or through power stations.

Gross storage is the total amount of water behind the dam wall including the water than cannot ordinarily be accessed due to the design of the Snowy Scheme.

For the purposes of our business operations, active storage is used, whereas recreational users are generally more interested in and familiar with gross storage. For example, Lake Jindabyne could experience a 0% active storage level but the lake itself would be then at approximately 42% gross storage. This remaining water cannot be accessed via the pumping station due to the physical design limitations of the Snowy Scheme.

At the end of the 2010–11 water year, Snowy Scheme active storage was 1,782GL. This is equivalent to 33.6% of the Snowy Scheme active storage capacity.

During the 2011–12 water year, Snowy Scheme active storage increased by 1,272GL, with active storage totalling 3,054GL at the end of the year, which is 57.6% of the active storage capacity.



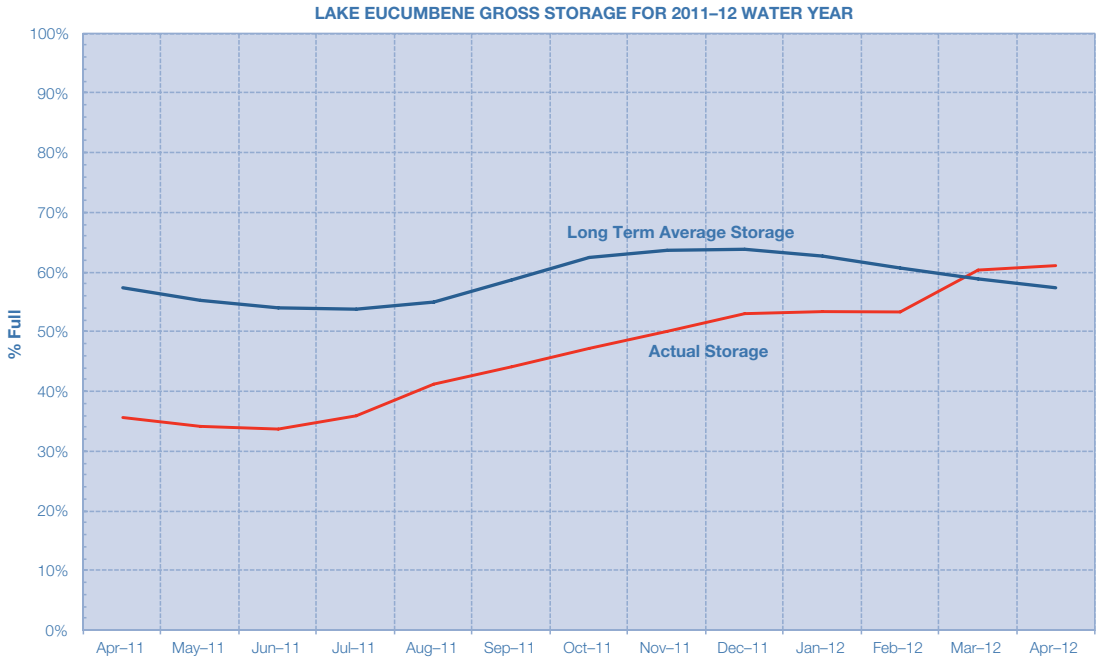
LAKE LEVELS

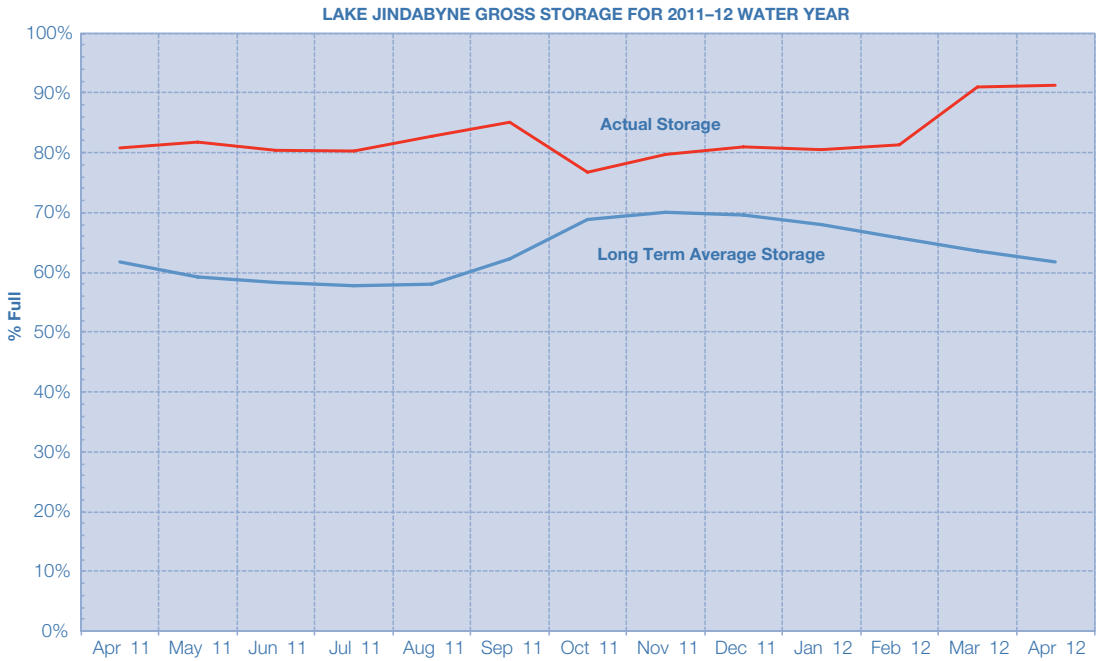
The recovery of inflows continued as the 2011–12 water year being the second consecutive year of above average inflows. Storage levels once again improved from the previous year.

The Snowy Scheme's main storage, Lake Eucumbene is higher than the previous year. Despite this, it is anticipated that another three to five above average inflow years are still required to see Lake Eucumbene storage levels return to long term average levels. It is important to appreciate that Lake Eucumbene is a massive storage.

Snowy Hydro reports gross storage levels to local tourism operators and the local community on our website. Lake Levels for our three main storages of Jindabyne, Eucumbene and Tantangara are provided weekly and are available at www.snowyhydro.com.au

Our website also includes a lake level comparison calculator where it can be seen that lake levels have improved since 2006–07 in line with improvements in annual inflows.





VERIFICATION STATEMENT

Snowy Hydro Limited
PO Box 332
Cooma NSW 2630
Tel: 1800 623 776
Email: communityfeedback@snowyhydro.com.au
Web: snowyhydro.com.au

Suite 2, Level 1
7 Leeds Street
Rhodes NSW 2138

VERIFICATION STATEMENT

Snowy Hydro Limited commissioned NCS International to verify the data from its Water Operations Report (WOR) for the 2011-2012 Water Year, in respect to the volumes of water that it was required to target and the actual releases made to meet those targets.

Responsibilities of the Verifier:

NCS International was not responsible for the preparation of any part of the WOR. The audit was carried out using recognised assessment techniques based on the ISO 19011 standard, with the WOR as the core reference document. The audit was office based and included interviews with key staff members.

Scope:

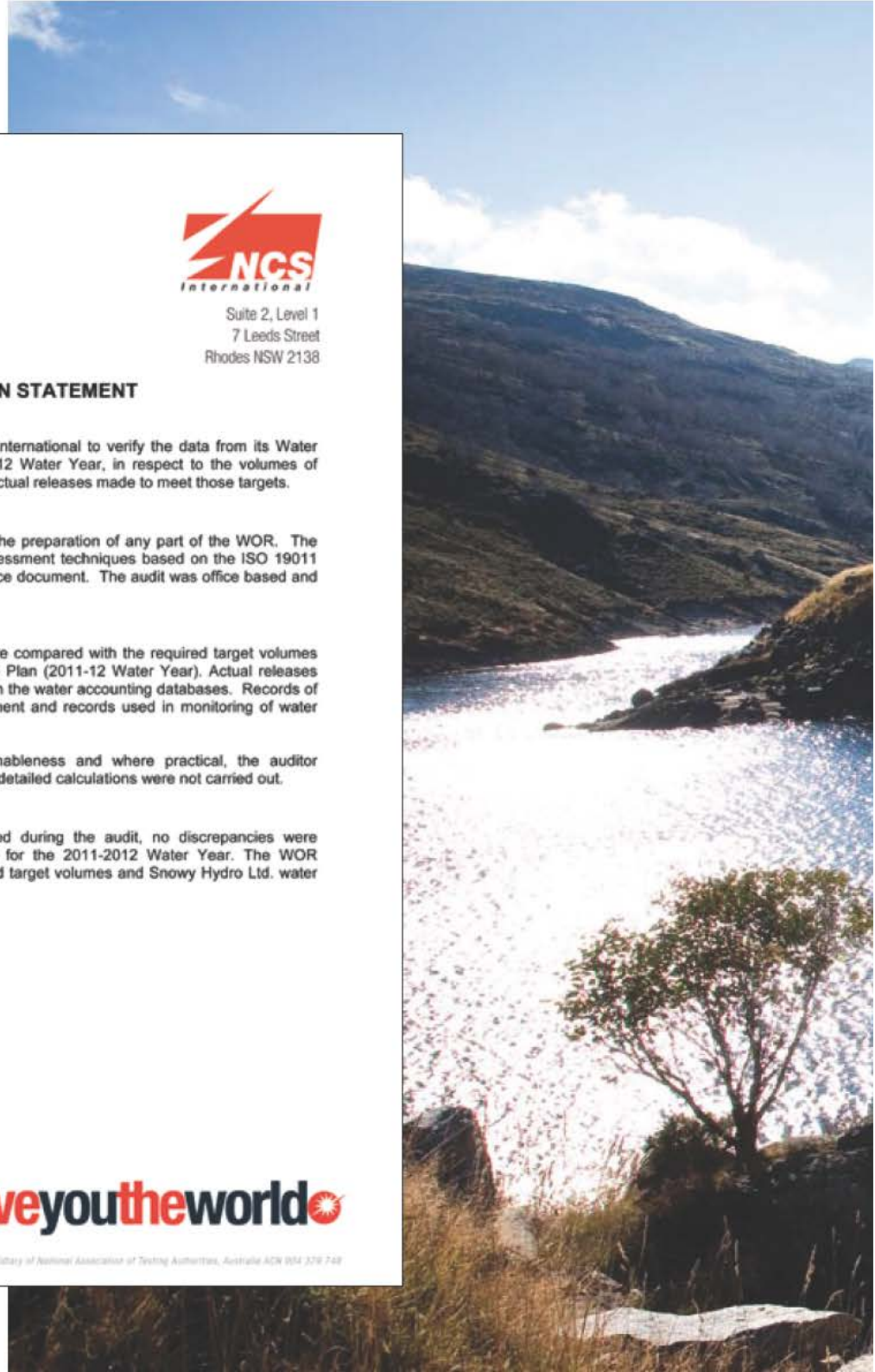
Numerical values provided in the WOR were compared with the required target volumes from the approved Annual Water Operating Plan (2011-12 Water Year). Actual releases were compared with a sample of entries from the water accounting databases. Records of maintenance and calibration of field equipment and records used in monitoring of water flows were also reviewed.

The verification reviewed data for reasonableness and where practical, the auditor checked the order of magnitude of data, but detailed calculations were not carried out.

Verification Statement:

Based on the data review process applied during the audit, no discrepancies were identified in the Water Operations Report for the 2011-2012 Water Year. The WOR provides a fair representation of the required target volumes and Snowy Hydro Ltd. water operations.

Robert Gardiner
Auditor
NCS International Pty Ltd
17 September 2012



Guthega Dam