



Department of
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Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources

Background document for amended plan 2016

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Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources – Background document for amended plan 2016

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More information

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Introduction

Water sharing plans are being progressively developed for rivers and groundwater systems across New South Wales following the introduction of the *Water Management Act 2000* (WMA 2000). These plans protect the health of our rivers and groundwater while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

The first round of water sharing plans commenced on 1 July 2004. The development of these plans resulted in around 80 per cent of the water use in NSW being managed under the WMA 2000. By the end of 2012, over 95 per cent of all water extracted in NSW was covered by a water sharing plan. By the end of 2016 it is anticipated that all extraction in NSW will be covered by a water sharing plan.

Water sharing plans for the unregulated¹ rivers and groundwater systems have been completed using a broad scale 'macro' approach based on whole river catchment or aquifer systems. Each macro plan covers a large river basin rather than a single subcatchment, or in the case of groundwater systems, cover a particular type of aquifer (for example fractured rock). These river basin or aquifer macro plans will generally apply to catchments or aquifers where there is less intensive water use.

The *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* (the Lachlan Unregulated Plan) covers 22 unregulated surface water sources that are grouped into one extraction management unit (EMU) and two alluvial groundwater sources (refer Appendix 1).

This document provides background to the development of the rules in the plan and includes:

- the purpose of the statutory plan
- a physical description of the Lachlan catchment including land and water use
- the process of plan development including scope, history and basis for decisions
- the activities associated with implementation, monitoring and review of the plan

This document is part of a range of material available specifically on the plan including:

- the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* - a legal instrument written in its required statutory format
- *Water sharing plans – Inland unregulated and alluvial water sources – Overview* – a plain English version of the plan explaining the key sections and rules
- rules summary sheets for each water source detailing the proposed management rules.

In addition, general information on the macro planning process is available in the water sharing plans section of the DPI Water website www.water.nsw.gov.au. Information available for download or viewing includes:

- *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation* – explains the method used to classify and set water sharing rules for unregulated streams across the state
- *Macro water sharing plans – the approach for unregulated rivers. Setting access and trading rules for pools* – explains the method used to set water sharing rules for pools in unregulated water sources across the state

¹ The supply of water in unregulated rivers is typically not controlled by releases of water from dams but rather is dependent solely on rainfall and natural river flows.

- *Macro water sharing plans – the approach for groundwater. A report to assist community consultation* – explains the method used to classify and set water sharing rules for groundwater across the state
- *Setting rules for water sharing plans* – information outlining the key steps for developing the rules.

An amended plan for the unregulated Lachlan catchment

The *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* commenced on 14 September 2012. Until now, water sharing arrangements for the Mandagery Creek Water Source have been covered under a separate water sharing plan that commenced in 2004. This plan was amongst the first plans to commence in NSW and was due to expire in 2016.

In 2013 the Minister approved the replacement of this plan based on reports from the Natural Resources Commission and the former Office of Water (NRC 2013 and Office of Water 2013). The Minister directed that any changes to inland plans should be limited due to the impending development of water resource plans under the Murray-Darling Basin Plan. Any proposed changes to this plan must be permitted under the WMA 2000 and need to consider the significant amount of consultation which was undertaken in the plan's initial development.

The merging of the Mandagery Creek plan with the more recent Lachlan Unregulated water sharing plan will bring it into line with the current legislative and policy framework for water sharing in NSW. All unregulated water in the Lachlan will now be governed by the one plan.

Changes to the provisions of the Mandagery replacement plan have occurred for a number of reasons including: changes to policy, updates to legislation, updated data, outcomes of audits, and to open up restrictive trading provisions. As the provisions in this plan have been operating for over a decade, and the initial plan was developed in close consultation with stakeholder groups, DPI Water has aimed to avoid unnecessary changes and focus on improving provisions based on the information sources mentioned above.

The amended *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* (hereafter referred to as the Lachlan Unregulated water sharing plan) covers 23 surface water sources and two groundwater sources. The surface water sources are grouped into one extraction management unit.

Purpose of the Plan

Why are water sharing plans being prepared?

Expansion of water extraction across NSW in the 20th century has placed most valleys at, or close to, the limit of sustainable water extraction. This has seen increasing competition between water users (towns, farmers, industries and irrigators) for access to water. This has also placed pressure on the health and biological diversity of our rivers and aquifers.

In December 2000, the NSW parliament passed the *Water Management Act 2000* (WMA 2000) which sets the overall objective of “sustainable and integrated management of the State’s water” (DLWC, 2001a). Water sharing plans play a major role in achieving this objective.

Under the WMA 2000, water sharing plans must:

- protect water sources and their dependent ecosystems
- protect the basic rights of landholders to extract water.

In effect, environmental water and basic landholder rights are afforded priority over licensed water extractions.

Amongst licensed water users, access to town water supplies and stock and domestic water is given priority over extractions for commercial purposes such as irrigation and other industries. Water sharing plans provide the legal basis for sharing water between the environment and consumptive purposes.

Water sharing plans also recognise the economic benefits that commercial users such as irrigation and industry can bring to a region. Upon commencement, access licences held under the *Water Act 1912* are converted to access licences under the *Water Management Act 2000*; a process which separates water licences from land tenure. This facilitates the trade of access licences and can encourage more efficient use of water resources. It also allows new industries to develop as water can move to its highest value use.

In conjunction with the WMA 2000, water sharing plans also set rules so that commercial users can continue to operate productively. In general, commercial licences under the WMA 2000 are granted in perpetuity, providing greater commercial security of water access entitlements. Water sharing plans also define the access rules for commercial users for 10 years providing all users with greater certainty regarding sharing arrangements.

Benefits for water users

With the introduction of water sharing plans, a number of benefits will flow to water users including:

- greater certainty – water sharing plans set out the water sharing arrangements for a 10 year period
- clear trading and access rules which will help foster trading
- greater security – *Water Act 1912* licences are converted to perpetual water access licences under the *Water Management Act 2000*.

Environmental considerations

Water sharing plans are required to reserve water for the overall health of the river and to protect specific ecosystems that depend on river flows, such as wetlands, lakes, estuaries and floodplains. This share of water reserved for the environment is also intended to sustain the river system’s aquatic fauna and flora.

Unregulated streams

Rivers naturally experience a range of flows. These various flows are necessary for different hydrologic, geomorphic, biological and chemical processes to occur. Flood flows are required to scour channels, rework sediments, and inundate floodplains; medium flows oxygenate water and allow fish passage; and low flows maintain connectivity and assist the survival of aquatic and riparian fauna and flora. To preserve a healthy river ecosystem, this range of stream flows must be maintained.

Unregulated streams in western NSW experience long periods of no flow interspersed with rare flows of varying magnitude. Fauna and flora have evolved with these conditions and depend heavily on river pools and lagoons which provide refuge during the extended periods of low rainfall and runoff.

In order to protect some water for the benefit of the environment, the Lachlan Unregulated water sharing plan imposes new access restrictions on days when flows are low. This is achieved by establishing 'cease-to-pump' rules that require users to stop taking water when flow declines below a set level. When the plan commences, surface water licences in all unregulated water sources will be subject to cease-to-pump rules (excluding licences held by town water suppliers, local water utilities, licensed stock and domestic users, and licences used for food safety and essential dairy care²).

In addition, 'commence-to-pump' rules applied in some water sources ensure that freshes are available to the environment by requiring users to only recommence taking water once flow has increased above a specified level.

Alluvial aquifers

The Lachlan Unregulated water sharing plan sets rules for alluvial aquifers in the plan area. Water sharing rules for extractions from fractured rock and porous rock aquifers are dealt with in other plans.

Aquifers can store large volumes of water, often accumulated over thousands, or even tens of thousands of years. Water enters (or "recharges") aquifers via rainfall, surface flows from rivers or lakes, or flow from adjacent aquifers. Water sharing plans aim to achieve sustainable groundwater extraction by limiting extractions to a proportion of aquifer recharge. The remainder of recharge is reserved for the environment.

Some aquifers are highly connected to surface water, so that taking water from one source affects the other. In groundwater systems defined as 'highly connected', environmental water may also be protected from extraction through linked cease-to-pump rules to ensure taking groundwater does not adversely affect surface water flows.

The plan also includes rules on the location of new works and extraction from existing works to protect high priority groundwater dependent ecosystems, high priority karst systems and other environmentally sensitive areas such as rivers or streams.

² There are limited exemptions for licensed stock and domestic and town water supply purposes which allow access to very low flows. See section "Access to very low flow"

Scope of the plan

The Lachlan Unregulated water sharing plan covers two separate water resources, within the Lachlan Water Management Area:

- the unregulated rivers – all of the unregulated rivers in the Lachlan River catchment
- the Upper Lachlan and Belubula Valley alluvial groundwater sources which contains those major alluvial aquifers not already covered by a water sharing plan.

Incorporating the unregulated rivers and the alluvial aquifers into the one plan recognises the connectivity of these water resources, and allows for the development of water sharing rules that are linked and are equitable across these resources.

This plan does not cover the regulated reaches of the Lachlan River, which are already covered by the *Water Sharing Plan for the Lachlan Regulated River Water Source 2004*. Similarly, water sharing from fractured rock aquifers, porous rock aquifers and the alluvial aquifers of the lower Lachlan catchment are addressed in other water sharing plans:

- the *Water Sharing Plan for the Lower Lachlan Groundwater Source 2003*
- the *Water Sharing Plan for the NSW Murray-Darling Basin Porous Rock Groundwater Sources 2011*
- the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2011*.

Water management units

Water sharing plans are developed using various water management units: water sources, management zones and extraction management units.

The area covered by water sharing plans is divided into **water sources**, which often coincide with sub-catchment boundaries. It is at the water source level that water sharing rules are developed. The Lachlan Unregulated water sharing plan defines 25 water sources; 23 unregulated water sources and two alluvial groundwater sources.

Water sources can be further subdivided into **management zones** where finer resolution of rules is required. Within this plan there are eight management zones in one of the alluvial groundwater sources and six management zones in the Mandagery Creek water source.

For more information about water management units refer to 'Water Sharing Rules' section of this document.

Where appropriate, **extraction management units** (EMUs), consisting of one or several water sources, may be specified for the purpose of establishing a geographic area over which the long term average annual extraction limit (LTAAEL) applies.

This plan contains one EMU which covers all 23 unregulated surface water sources. There are also two separate alluvial groundwater sources included in the plan area which each have their own LTAAEL.

Objectives of the plan

The objectives of the Lachlan Unregulated water sharing plan are to:

- protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources
- protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources
- protect basic landholder rights
- manage these water sources to ensure equitable sharing between users

- provide opportunities for enhanced market based trading of access licences and water allocations within environmental and system constraints
- provide water allocation account management rules which allow sufficient flexibility in water use
- contribute to the maintenance of water quality
- provide recognition of the connectivity between surface water and groundwater
- adaptively manage these water sources
- contribute to the “*environmental and other public benefit outcomes*” identified under the “*Water Access Entitlements and Planning Framework*” in the Intergovernmental Agreement on a National Water Initiative (2004).

Description of the plan area

The Lachlan River catchment covers an approximate area of 90,000 km². The plan area is located in the central west of NSW and includes the major towns of Cowra, Young, Parkes, Forbes, Hillston and Condobolin. The Lachlan River catchment is bounded by the Murrumbidgee catchment to the south, the Murray catchment to the west, the slopes of the Great Dividing Range to the east and the catchments of the Macquarie and Barwon-Darling to the north and northwest respectively. The Lachlan River is a terminal river which flows into the Great Cumbung Swamp near Oxley. Only during times of very high floods do river flows reach the Murrumbidgee River.

The Lachlan River catchment is made up of several main tributaries including the Abercrombie River, the Boorowa River, the Belubula regulated river, the Crookwell River and Western Bland Creek. The Lachlan River for the main part is regulated but diverges into a number of effluent creeks at the downstream end of the catchment. These creeks are not regulated unlike the main branch of the river.

Major instream structures within the unregulated part of the Lachlan River catchment include: Lake Rowlands (3,150 ML) currently used for town water supply purposes; Water Supply Dam on Kentgrove Creek (400 ML) used for town water supply purposes, Darbys Weir and Boorowa Weir. Harvestable rights dams are present throughout the Lachlan River catchment and capture runoff preventing it from flowing into the creeks and streams.

High environmental value areas

The Lachlan catchment has significant aquatic ecological value, including:

- 471,011 ha of wetlands in the lower floodplain
- nine wetlands with particular values for water bird and migratory bird habitat, listed in the Directory of Important Wetlands in Australia (Environment Australia 2001)
- native fish species including the Australian smelt, freshwater catfish, silver perch, golden perch, big-headed gudgeon and western carp gudgeon
- habitat for threatened species, such as Sloane's froglet, Australian painted snipe, osprey, blue-billed duck and the fishing bat
- areas of river red gum forest and woodland, black box woodland and lignum (Commonwealth Environmental Water Office 2012).

The nine nationally important wetlands include the Booligal Wetlands, Murrumbidgee Swamp/Lake Merrimajeel, Cuba Dam, Merrowie Creek, Great Cumbung Swamp, Lachlan Swamp, Lake Brewster, Lower Mirrool Creek Floodplain, and Lake Cowal/Wilbertroy wetlands (Commonwealth Environmental Water Office 2012).

The Booligal Wetlands and the Great Cumbung Swamp are notable sites as both wetlands are well known for providing habitat for both large numbers and species of waterbirds, particularly straw-necked, white and glossy ibis when the area is flooded. The catchment has been recorded to support 80,000 breeding pairs of ibis. The Great Cumbung Swamp also contains one of the largest stands of river red gums in NSW (Commonwealth Environmental Water Office 2012).

The Lachlan riverine system supports a diverse assemblage of species, including over 23 native freshwater finfish species. Of the species recorded in the Lachlan seven are listed as threatened in NSW waters. Over 40 species of water birds including some that are listed under international conservation agreements are found in the lower catchment. This area is also important refuge for waterbirds listed as vulnerable including the freckled and blue-billed duck. In recognition of this the aquatic ecological community in the lowland catchment of the

Lachlan River has been listed as an Endangered Ecological Community (EEC) under the *Fisheries Management Act 1994* (Lachlan CMA, 2012).

Sixteen of the 23 unregulated surface water sources within the plan area are identified as having high instream values. This includes Mandagery Creek where the instream value assessment was updated in 2015 with new data.

Land use history

Prior to European settlement in the 1800s, the Wiradjuri people predominately occupied the Lachlan catchment however the area was also shared with nine other nations including Dhurug, Ngunawal, Gundungurra, Wongaibon, Barindji, Yitha Yitha, Muthi Muthi and Nari Nari (Lachlan CMA, 2006).

During the 1830s, with European settlement moving west from the coast and following fertile land along the inland rivers, the Wiradjuri people began clashing with European settlers due to the dispossession of land and the destruction of their traditional fishing areas (AboutNSW, 2008).

In 1815 a road was built over the Blue Mountains from Sydney by William Cox on route to Bathurst which became an important base for further exploration (LPMA, 2011). In the same year surveyor George Evans explored further west into the Eugowra district and the Lachlan River area, to almost as far west as the site of Forbes (LPMA, 2011).

In 1817, surveyor-general John Oxley explored the Lachlan River and the surrounding districts almost to the downstream end but was hindered by the 'immense marshes of [the] desolate and barren country' (LPMA, 2011). Although European settlement began around 1815, the population increased substantially following the discovery of gold in the 1850s (Lachlan CMA, 2006). During this time, inland NSW held some of the most densely populated areas in the state. Native vegetation in the Lachlan catchment was largely altered by the development of land for the purposes of timber, agriculture, mining and housing as well as the introduction of weeds and pest species (CSIRO, 2008).

Since the 1900s agriculture has been the predominant industry throughout the catchment (Lachlan CMA, 2006). Currently land is primarily used for livestock grazing and dryland cropping. Livestock grazing occurs throughout the catchment with dryland cropping mainly occurring downstream of Wyangala Dam and through the middle reaches of the catchment where moderate winter rainfalls occur.

While economically important within the catchment, irrigated crops cover only 1.4% of the catchment area (Green et al, 2011). Irrigated crops include pasture, cereals and oilseeds grown on the alluvial soils of the riverine plain; and vegetables, wine grapes and stone fruit grown on the riverine plains and tableland region. Pasture (summer and winter) and lucerne are the predominant irrigated crops followed by cereals (Green et al, 2011). Smaller irrigation areas of cherries and other stone fruit are grown around Young with wine grapes grown around Cowra and Canowindra. Cotton was grown around the Hillston area prior to the recent drought. The primary water supply for irrigation in the Lachlan catchment is the Lachlan regulated river, followed by the alluvial groundwater sources. The level of irrigation associated with the unregulated river and tributaries is significantly less and the key growing crops and areas being cherries and stone fruit around Young and potatoes around Crookwell (Green et al, 2011).

Mining is the other key landuse in the catchment, with three major mines (two gold and one copper) located within the Plan area. These mines have significant water requirements for processing and between them extract water from the Lachlan regulated river water source, the unregulated Belubula tributaries below Carcoar Dam water source, the Belubula regulated river water source and the Upper Lachlan alluvial groundwater source. These mines are relatively large producers and provide a significant socioeconomic contribution to the region.

Today in excess of 90,000 people live in the Lachlan River catchment, primarily in the towns of Cowra, Young, Parkes, Forbes, Wyalong and Condobolin (CSIRO, 2008).

Within the catchment area, 40% remains covered in native vegetation (DEC, 2006). These areas are primarily located in the upper catchment in the Abercrombie and Upper Lachlan rivers, south of Lake Cargelligo and throughout the western end of the Lachlan Catchment.

Over 3,800 km² of land within the catchment is conserved in national parks and other conservation reserves. The majority of these are located in the upper catchment whereas the more extensive reserves are located in the lower catchment.

The Lachlan catchment contains a significant number of wetlands most of which are located downstream of Forbes where the floodplain broadens and contains a web of anabranches, effluents billabongs and lakes (Green et al, 2011). The Lachlan River terminates at the Cumbung Swamp which, along with a number of other wetlands that receive flows from the Lachlan, is included in the Directory of Important Wetlands in Australia (Environment Australia, 2001).

Climate

Summer in the Lachlan catchment is hot, with average maximum temperatures in January at Forbes, Ivanhoe and West Wyalong ranging from 32^oC to 35^oC (CSIRO, 2007). In the east of the catchment the climate is milder due to the higher elevation (up to 1,216 m at Mount Werong in the Blue Mountains). The average maximum temperature in Crookwell is 27^oC in January (CSIRO, 2007). Winters in the catchment are cool to mild with average maximum temperatures in July at Ivanhoe and Forbes ranging from 14^oC to 16^oC and 10^oC at Crookwell (CSIRO, 2007). Frosts are also common in winter.

Annual rainfall throughout the catchment ranges from 200 mm in the west to 1000 mm in the east. The mean average rainfall for the catchment is around 461 mm. Although rain generally falls throughout the year, rainfall is summer dominant in the north of the catchment and winter dominant in the south.

Groundwater

The groundwater sources that fall within the plan area include the alluvial aquifers of the Upper and Lower Lachlan valley and the alluvial aquifers of the Belubula regulated river. The *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* addresses water sharing in two groundwater sources: the Upper Lachlan Alluvial and the Belubula Valley Alluvial Groundwater Sources.

Upper Lachlan Alluvial Groundwater Source

The alluvial deposits of the Upper Lachlan valley extend along the Lachlan River from Cowra to Lake Cargelligo increasing in depth from 70 m at Cowra to 150 m at Condobolin (WRC, 1984). Significant alluvial deposits are also located in the catchment of the Bland Creek. There are two major formations in the aquifer, the deeper Lachlan Formation which fills palaeochannels of the Lachlan River and the overlying thinner Cowra Formation. The Cowra Formation is primarily used for stock and domestic supplies as bore yields are lower than the Lachlan Formation which is the more productive aquifer (O'Rourke, 2010).

Water quality throughout the aquifer east of Condobolin is fresh to marginal, whereas between Condobolin and Lake Cargelligo most of the groundwater is brackish or saline and only suitable for stock watering purposes.

Although the Lower Lachlan alluvial groundwater source is the more developed aquifer within the catchment, the Upper Lachlan alluvial groundwater source is also significantly developed (CSIRO, 2008) due to the high yielding characteristics of the aquifer (DECCW, 2010).

Currently the Upper Lachlan alluvial groundwater management area is split into eight zones for the purposes of management. These zones are based on hydrogeological differences and discrete geographical areas.

There are currently 148 monitoring sites in the Upper Lachlan Alluvial Groundwater Source and usage data has been collected in some areas since 1970. Monitoring of the groundwater source has shown that as a result of groundwater development there have been changes to storage levels and consequently changes in some flow directions (O'Rourke, 2010).

Numerous groundwater studies of the Upper Lachlan alluvium have been undertaken, including Williamson (1986), Water Resources Commission (1986), Ross (1982), DLWC (2001b), Habermehl, Baskaran and Budd (2003), Bish and Williams (2004) and CSIRO (2008). These studies report and review the status of the groundwater resources in the Upper Lachlan catchment.

The alluvial aquifer is recharged primarily through rainfall and river leakage with flooding and irrigation also contributing but to a lesser degree (Bilge 2012, CSIRO 2008, O'Rourke 2010). The aquifer system receives no lateral flow through the northern, eastern and southern boundaries. Regional flow is from east to west and groundwater flow out of the system is westward into the Lower Lachlan valley.

Analysis of river cross sections and groundwater levels reveals that the Upper Lachlan Alluvial aquifer is linked to the Lachlan regulated river and its major unregulated tributaries. Due to the local characteristics of the alluvial aquifer the degree of connectivity varies along the river system. The aquifer may be gaining in one location, losing in another and disconnected in another (CSIRO, 2008). A small part of the alluvial aquifer just upstream of Cowra has been identified as 'highly connected' (Broadstock and Barrett, 2010), where at least 70% of the volume of groundwater pumped during one irrigation season is derived from the surface water source. That part of the alluvial aquifer located in the Bland creek catchment (management zone seven), is confined such that groundwater responds rapidly to pumping but not to climatic conditions (O'Rourke, 2010).

A groundwater flow model was recently developed for the alluvium covering the Upper Lachlan Valley, which includes the Upper Lachlan Alluvial and Belubula Valley Alluvial groundwater sources. The model was developed in order to aid understanding of the system by identifying key recharge sources and their contribution, flows within the aquifer, the nature of groundwater/surface water interchange, the impacts of development on the system and those parts of the aquifer under stress (Bilge, 2012).

Prior to the mid 1990s groundwater extraction in the Upper Lachlan alluvium was limited mainly to stock and domestic use and town water supply and irrigation needs were met primarily by surface water. Since the mid 1990s there has been a considerable increase in groundwater usage volumes and areas irrigated by groundwater which is thought to be related to the implementation of the Murray-Darling Basin surface water cap (Bilge, 2012).

Belubula Valley Alluvial Groundwater Source

The Belubula Valley Alluvial Groundwater Source is located along the lower section of the Belubula River, extending approximately 10 km upstream and downstream of Canowindra. The alluvial sediments occupy the river trench, ranging from one to two kilometres in width and up to 20 m deep at Canowindra. The Belubula Valley alluvium adjoins the Upper Lachlan Valley alluvium around the junction of the Belubula River with the Lachlan River (SKM, 2010).

The aquifers of the Belubula Valley alluvium include the basal Lachlan Formation and the overlying Cowra Formation. The Lachlan Formation is comprised of alluvial sands and gravels whereas the Cowra Formation is generally finer grained and composed of alluvial channel sands and floodplain clays. The fine grained nature generally results in low bore yields (SKM, 2012).

There are currently eight monitoring sites in the Belubula Valley Alluvial Groundwater Source. Limited studies on the Belubula Valley alluvium have been undertaken. The most recent and most thorough study looked at groundwater surface water interactions in the Belubula Valley alluvium (SKM, 2010). This study was undertaken by Sinclair Knight Mertz as part of a larger study. Previous studies have shown that the Belubula Valley alluvium is highly connected to the Belubula Regulated River where pulses in river flows correspond with peaks in the alluvial groundwater level (Kolstad, 2009). As a result, for the purposes of water management DPI Water has classified this alluvial aquifer as highly connected (Broadstock and Barrett, 2010). The most recent study undertaken suggests that this connectivity could be as great as 90% (SKM, 2012).

The rate of stream flow depletion due to pumping from individual bores has been estimated and it has demonstrated that stream flow depletion began when groundwater extraction commenced in the early 1960s (SKM, 2010).

Observation of stream flow measurements along the Belubula River indicates an overall relative gain in flow (gaining stream) upstream of Canowindra and a loss in flow (losing stream) downstream of Canowindra (Kolstad, 2009). Some fluctuation in flow rates were also observed to occur between the Needles and Bells stream flow gauges, it is thought this is due to local tributary water additions (Kolstad, 2009).

Entitlement and use

There are approximately 6,468 water licences (unregulated and aquifer) in the plan area, totalling approximately 232,958 ML of entitlement (Table 1). The majority of licences are used for irrigation, with a significant proportion used for mining and stock water. Water is also extracted from watercourses and aquifers within the plan area through basic landholder rights (not requiring a licence).

Changes to plan entitlement in Mandagery Creek

Entitlements in Mandagery Creek were reviewed during the replacement of the plan to reflect the current licensed entitlement. This resulted in the plan entitlement of 7,748 ML being revised to 8,148ML from the issue of new licences during the life of the plan.

Table 1: Total entitlement (approximate) and number of licences for each water source (excluding town water supply entitlement)

Water source	Entitlement (shares)	Number of licences
Unregulated water sources		
Abercrombie River above Wyangala	789	37
Belubula Tributaries below Carcoar Dam	6,807	67
Belubula River above Carcoar Dam	5	2
Bogandillon and Manna Creeks	2,772	13
Boorowa River and Hovells Creek	1,476	51
Burrangong Creek	2,658	68
Crookwell River	1,153	43
Crowther Creek	1,475	36
Unregulated Effluent Creeks	2,424	41
Goobang and Billabong Creeks	1,662	32
Goonigal and Kangaroo Creeks	1,035	6

Water source	Entitlement (shares)	Number of licences
Gunningbland and Yarrabandai	517	14
Humbug Creek	9	8
Lachlan River above Reids Flat	724	34
Mandagery Creek	8148	114
Mt Hope Area	9	1
Mid Lachlan Unregulated	12,823	24
Naradhan Area	0	0
Tyagong Creek	169	8
Lake Forbes and Back Yamma Creek	239	11
Ooma Creek and Tributaries	121	9
Waugoola Creek	271	19
Western Bland Creek	2,177	56
Alluvial groundwater sources		
Upper Lachlan Alluvial	177,277	5,595
Belubula Valley Alluvial	8,223	179
TOTAL (unregulated and alluvial water sources)	232,958	6,468

Water extraction in the unregulated water sources

The majority of the unregulated surface water licences are located:

- around the town of Young, in the headwaters of Burrangong Creek
- around the town of Crookwell, within the headwaters of the Crookwell River
- within the Belubula tributaries below Carcoar Dam water source along Cadiagullong Creek, Flyers Creek, Cowriga Creek and Swallows Creek
- along Mandagery Creek below Eugowra.

There are considerably fewer licences in the north and south-western part of the plan area where streams are generally intermittent or ephemeral.

Three of the 23 unregulated water sources covered by the Lachlan Unregulated water sharing plan were classified as having a high level of economic dependence, based on the economic value of goods and services generated from activities such as irrigated agriculture and mining (Table 2).

Water extraction in the Lachlan unregulated catchment is utilised for a range of agricultural uses which include: dryland pasture (62.6% of the catchment area) and dryland crops (15.5%) (CSIRO, 2008). Irrigated crops utilise 0.6% of the catchment area and includes cereals, cotton, horticulture, orchards, pasture, hay and vine fruits (CSIRO, 2008).

Table 2: Water sources with a high level of economic dependence

Water source	Description
Belubula Tributaries below Carcoar Dam	Relatively high value of irrigated agricultural production associated with mining.
Burrangong Creek	Relatively high value of irrigated agricultural production associated with horticulture, particularly cherries and grapes
Crookwell River	Relatively high value of irrigated agricultural production associated with potato growing

Mining is becoming a larger contributor to the economy of the Lachlan catchment in addition to agriculture. Mines are currently operating at North Parkes, Lake Cowal and Cadia (Lachlan CMA, 2006).

Detailed long term water use data is not available in the unregulated rivers because there is not yet broad scale metering in these water sources. Some metering has been rolled out over the last few years through the Water Use Monitoring Program.

Water extraction in the alluvial groundwater sources

The alluvial groundwater licences are located mainly in management zones 1, 2 and 3 along the main trunk of the Lachlan regulated river. Management zones four and eight have the least number of aquifer licences. The Belubula Valley alluvium contains 76 aquifer access licences, less than most management zones in the Upper Lachlan. Alluvial aquifers were embargoed in 2008 for both the Upper Lachlan and Belubula Valley alluvials.

Of the total groundwater usage in the Upper Lachlan, 86% is for irrigation purposes, 7% for mining purposes and 5% is for town water supplies. In the Belubula Valley alluvium 97% of usage is for irrigation purposes and 3% is used for rural purposes (DSEWPC, 2009).

Detailed water use data is not available in the alluvial groundwater sources because there is not yet broad scale metering in these water sources. However, some works do have meters. All irrigation, industrial, commercial and mining bores classed as 'high yield' have meters installed in the Upper Lachlan and Belubula alluvials.

Local water utility requirements

A number of town water supply systems are located within the plan area ranging from large storages to small direct river extractions (Table 3). These systems are managed by various authorities with Parkes Shire Council supplying the largest amount of water from both unregulated and alluvial water sources combined. These systems provide water for towns including Parkes, Peak Hill, Alectown, Cookamidgera, Bogan Gate, Trundle and Tullamore (Parkes Shire Council, 2010).

Central Tablelands Water also supply water to a number of townships, including Blayney, Millthorpe, Carcoar, Mandurama, Lyndhurst, Cargo, Cudal, Manildra, Canowindra, Eugowra, Grenfell, Woodstock, Gooloogong and Quandialla (CTW, 2006). The main water source of Central Tablelands Water is Lake Rowlands, a 4,500 ML dam which was built in 1953 across a tributary of the Belubula River (CTW, 2006). During summer, groundwater bores near Gooloogong are used to supplement the dam, due to their good water quality and during more extreme times various other groundwater sources are utilised by Central Tablelands Water (CTW, 2006).

In some of the unregulated water sources where water is extracted for town water supply, competition for water during low flows can become an issue between agricultural users and the local water utility.

To partly address this competition, the Lachlan Unregulated water sharing plan allows water utilities to extract during periods of very low flow, whilst all other licensed holders are prohibited from extracting.

Table 3 Town water supplies, location and entitlement volume

Water source	Water supply	Council / other	Entitlement (ML/ year)
Boorowa River and Hovells Creek	Boorowa	Boorowa Shire	340
Unregulated Effluent Creeks	Ivanhoe	Central Darling Shire Council	304
Belubula Tributaries below Carcoar Dam	Blayney, Carcoar, Mandurama, Lyndhurst, Canowindra, Quandialla, Manildra, Grenfell, Eugowra, Woodstock, Cudal, Gooloogong, Cargo, Millthorpe	Central Tablelands Water	3150
Ooma Creek and Tributaries	Grenfell	Central Tablelands Water	100
Goobang and Billabong Creeks	Parkes, Peak Hill, Alectown, Cookamidgera	Parkes Shire Council	1500
Lachlan River above Reids Flat	Gunning	Upper Lachlan Shire Council	110
Crookwell River	Crookwell	Upper Lachlan Shire Council	400
Upper Lachlan Alluvial	Blayney, Carcoar, Mandurama, Lyndhurst, Canowindra, Quandialla, Manildra, Eugowra, Woodstock, Cudal, Grenfell, Gooloogong, Cargo, Millthorpe, Quandialla	Central Tablelands Water	1138
	Parkes, Peak Hill	Parkes Shire Council	4350
	Forbes, Ootha	Forbes Shire Council	1260
	Condobolin	Lachlan Shire Council	800
	Cowra	Cowra Shire Council	250

Interagency panels

DPI Water is responsible for implementing the *Water Management Act 2000*, including developing water sharing plans for the state's water resources. DPI Water has established several interagency panels to assist with the development of water planning policies and the preparation of water sharing plans: the State Interagency Panel, the State Groundwater Panel, and Interagency Regional Panels.

State Interagency Panel

The State Interagency Panel (SIP) has overall responsibility for the statewide strategic direction of water sharing planning, to ensure that adequate resources are available from each agency and that the varying policy and statutory requirements of the relevant NSW Government agencies are met. The SIP also has the role of making water sharing decisions in cases where the Interagency Regional Panel cannot reach agreement or where the issue has statewide significance.

The SIP is chaired by DPI Water and comprises representatives from DPI Water, the NSW Office of Environment and Heritage (OEH), local land services (LLS), and agriculture, fisheries and aquaculture specialists from the NSW Department of Primary Industries (NSW DPI). DPI Water is responsible for the overall project management.

State Groundwater Panel

The State Groundwater Panel (SGP) was established to oversee the development of policy for the macro water sharing planning process for groundwater. The Panel has members from DPI Water, OEH, and from NSW DPI Agriculture. LLS are also represented.

The SGP provides a senior level forum for discussing and resolving a wide range of water planning and policy issues specific to groundwater. In particular the SGP developed statewide distance criteria which Interagency Regional Panels use as a starting point when considering distance rules for groundwater sources.

The SGP is a subcommittee of the SIP.

Interagency Regional Panels

Interagency Regional Panels (IRPs) were established to develop water sharing plans. IRPs consist of two representatives from NSW DPI (one from DPI Water and another covering both agricultural and fisheries interests) and one representative from OEH.

A representative from LLS attends meetings as an observer to provide advice on consultation issues and other matters within their areas of expertise.

Appendix 3 lists the names of the Lachlan IRP representatives and their areas of expertise, and also lists their colleagues who they had access to for specific technical and scientific information.

The key responsibilities of the IRP are to:

- consider relevant policy matters and ensure water sharing rules are consistent with state policy;
- review the hydrological (water management) units provided by DPI Water;
- assign economic, social and environmental values and undertake risk and value assessments to classify each unregulated water source;
- review existing and generic water sharing rules as to their applicability;
- make recommendations on the water access and dealing (trading) rules for each water source;

- assist with consultation on the proposed rules; and
- review submissions from targeted consultation and public exhibition, and make changes where necessary to the water sharing rules.

IRPs used local knowledge and expertise in developing and recommending the water sharing rules through a consensus decision making approach.

Policy and planning framework

There are a number of legislative and policy documents that impact on and direct the development of plans. These include:

- National Water Initiative;
- *Water Management Act 2000*;
- *Access Licence Dealing Principles Order 2004*;
- Murray-Darling Basin Cap Agreement;
- The Basin Plan (*Commonwealth Water Act 2007*);
- Natural Resource Commission's statewide targets; and
- Central West Catchment Action Plan.

National Water Initiative

The National Water Initiative (NWI) was signed by the Council of Australian Governments (COAG) in June 2004. Through the NWI, governments across Australia, including NSW, have agreed on actions to achieve a more cohesive national approach to managing, measuring, planning, pricing and trading water. The NWI recognises the continuing need to increase the productivity and efficiency of Australia's water use, whilst servicing rural and urban communities, and ensuring the health of river and groundwater systems.

Until the end of 2014 the NWI was implemented and monitored by the National Water Commission. Its responsibility for assessing each state's progress with the NWI and providing independent advice to the Commonwealth Government has now been taken over by the Commonwealth Productivity Commission.

Water Management Act 2000

The object of the *Water Management Act 2000* (WMA 2000) is the sustainable and integrated management of the state's water for the benefit of both present and future generations.

The WMA 2000 was passed by the NSW Parliament in December 2000, establishing a complete new statutory framework for managing water in NSW. For the first time, NSW had comprehensive water legislation to guide our water management activities.

The WMA 2000 is based on the concept of ecologically sustainable development – development today that will not threaten the ability of future generations to meet their needs.

The WMA 2000 was driven by the need for NSW to secure a sustainable basis for water management for several reasons.

During the 1990s NSW was at the limits of its available water resources – new licences for commercial purposes could no longer be issued across most of NSW and a limit had been placed on the total volume of water that can be extracted across the inland of NSW under the Murray-Darling Basin Cap

The decline in the health of our rivers, groundwater, floodplains and estuaries was being seen through increasing water quality problems, loss of species, wetland decline and habitat

loss. As a result, the WMA 2000 recognises the need to allocate and provide water for the environmental health of our rivers and groundwater systems, while also providing licence holders with more secure access to water and greater opportunities to trade water through the separation of water licences from land. The main tool the Act provides for managing the State's water resources are water sharing plans. These are used to set out the rules for the sharing of water in a particular water source between water users and the environment and rules for the trading of water in a particular water source.

Because of the major changes required by the legislation, the WMA 2000 has been progressively implemented. Since 1 July 2004 the new licensing and approvals system has been in effect in those areas of NSW covered by operational water sharing plans. These areas cover most of the state's major regulated river systems and therefore the largest areas of water extraction. As water sharing plans are finalised and commenced for the rest of the state, the licensing provisions of the WMA 2000 are introduced extending the benefits for the environment of defined environmental rules and for licence holders of perpetual water licences and greater opportunities for water trading.

The latest copy of the [Water Management Act 2000](#) is available from the NSW government legislation site.

Access Licence Dealing Principles Order 2004

The *Access Licence Dealing Principles Order 2004* (commonly referred to as the Ministers Dealing Principles) commenced in 2004. It draws on the objects and water management principles of the *Water Management Act 2000* and provides statewide guidance and rules for applications to undertake water dealings including trade.

The Minister's Dealing Principles specify that dealings must consider:

- the impacts on other water users;
- the impacts on the water source;
- the impacts on indigenous, cultural, heritage and spiritual matters; and
- maximising social and economic benefits.

Rules for specific types of access licence dealings (such as conversion to a new category, subdivision, consolidation, assignment or rights or allocation, changing water sources, amending extraction components and interstate dealings) are also included. The Minister's Dealing Principles specify when a dealing is prohibited and what requirements must be met in order for a dealing to be permitted.

Water sharing plans must be consistent to the Minister's Dealing Principles. Water sharing plans can also put additional restrictions in place such as restricting trade into a particular area due to its environmental value or hydrological stress.

Murray-Darling Basin Cap Agreement

The Lachlan catchment covers 8% of the total area of the Murray-Darling Basin and is subject to agreements and statutes which cover water management within the Basin. The Lachlan Unregulated Plan therefore has to be developed within the context of the Basin and existing commitments to water sharing.

In 1994, the Murray-Darling Basin Ministerial Council (MDBMC) undertook an assessment of water diversions across the Basin. This found that the levels of diversions at that time were placing stress on both the environmental health of our river systems and the reliability of supply to water users; and that diversions were continuing to increase. In response, the MDBMC introduced a diversion limit – the Cap, in 1995.

Schedule F of the *Murray-Darling Basin Agreement* (the Agreement) was then introduced in 1996 and set the operating framework for the Cap. In NSW, the Cap is defined as the average yearly volume of water that would have been diverted under 1993–94 levels of development and management rules. There is no MDBMC Cap on groundwater diversions.

Under the Agreement, plans are required to be developed to ensure consistency with the Cap. This means that the long term average annual extraction limit (LTAAEL) for regulated and unregulated water sources must be equal to or less than the Cap. NSW has chosen to divide the Cap into unregulated and regulated components.

In regulated water sources, licences are volume based, and therefore require the metering of water extractions, which has provided a good basis for establishing the Cap. However, in unregulated water sources, irrigation licences were previously issued on the basis of the area of land to be irrigated, rather than a specific volume of water. The volumes of extractions from unregulated water sources have therefore not been monitored, which makes the establishment of a Cap problematic. In response, a volumetric conversion process was developed. As part of this process, irrigation licence holders were surveyed as to the area that they had irrigated over the six year period from 1993–94 and conversion rates developed to establish licensed entitlements and derive average levels of water use. There was no pattern of growth in irrigated areas over the survey period in any of the river systems, so the Cap is based on the information calculated as an average of the yearly assessments over the survey period.

The Cap for unregulated surface water in the Lachlan is assessed and reported on at the catchment scale and any growth management actions required will also be applied at this scale.

The Basin Plan

The Commonwealth *Water Act 2007* requires the Murray-Darling Basin Authority (MDBA) to develop a water management plan for the Murray-Darling Basin (Basin Plan). The Basin Plan will be a legally enforceable document that provides for the integrated management of all the Basin's water resources. Some of the main functions of the Basin Plan will be to:

- set and enforce environmentally sustainable limits on the quantities of surface water and groundwater that may be taken from Basin water resources;
- set Basin-wide environmental objectives, and water quality and salinity objectives;
- develop efficient water trading regimes across the Basin;
- set requirements that must be met by state water resource plans; and
- improve water security for all uses of the Basin water resources.

The Basin Plan will provide the new foundation for managing the Basin's water resources in accordance with any rules and plan accreditation criteria established by the MDBA.

At the heart of the Basin Plan will be limits on the quantities of surface water and groundwater that can be taken from Basin water resources. These are known as ‘sustainable diversion limits’ (SDLs). As the SDLs come into effect, they will replace the current Murray-Darling Basin Ministerial Council Cap on diversions in the Basin. They will set limits on the taking of both groundwater and surface water from the Basin.

Further details can be found on the MDBA website www.mdba.gov.au in the Basin Plan section.

Natural Resource Commission’s statewide targets

Water sharing plans also comply with the Natural Resources Commission (NRC) statewide standards and contribute to the relevant statewide targets such as Targets 5 and 6 (see www.nrc.gov.au for details) which is a requirement of the State Plan under Goal 22 (see www.nsw.gov.au/stateplan for details). The NRC was established in 2003 to provide the NSW Government with independent advice on natural resource management issues. To achieve this it has developed and recommended a Standard for Quality Natural Resource Management and 13 statewide targets for natural resource management in NSW, which have been embedded in the NSW State Plan. As with the NWI, the components of the State Standard focus on the use of the best available knowledge, use of appropriate information management systems, delivery of integrated outcomes, engagement of the community and regular monitoring, measuring, evaluation and reporting to specify how delivery of the targets is progressing. The NRC reviews plans against this Standard and its associated targets.

Lachlan Catchment Action Plan

This Plan is consistent with and contributes to the catchment targets identified in the most recent Lachlan Catchment Action Plan (Lachlan CMA 2013), in particular management target T18:

“Improved condition of riparian areas, wetlands, flood dependent ecosystems and groundwater dependent ecosystems”.

The Plan will contribute to achieving this management target by:

- setting a defined share of water for riverine ecosystems;
- protecting very low flows;
- implementing trading rules to maintain or reduce entitlement in high conservation value streams; and
- adopting an adaptive management approach, giving the Minister the ability to adjust rules once information becomes available, or upon remake of the next plan.

One of the Local Land Service’s responsibilities, as observer on the Interagency Regional Panel, was to provide the Panel with advice on the alignment of the proposed classification and extraction limits and rules with the priorities in the Lachlan Catchment Action Plan.

Water planning policies and considerations

There are a number of state policy issues that require consideration with the development of this plan and the associated water sharing rules:

- protecting pools, lagoons and lakes;
- managing surface water and groundwater connectivity;
- protecting basic landholder rights;
- protecting town water supply access;
- protecting Aboriginal values; and

- water interception activities.

Protecting pools, lagoons and lakes

Pools in NSW can provide an important source of water for licence holders, landholders and communities. Pools also have a key ecological function as a critical refuge and habitat for flora and fauna.

Pools include lentic water bodies (standing water) in or associated with unregulated rivers, including anything falling within the definition of a “lake” found in the Dictionary of the *Water Management Act 2000*, except for tidal pools and estuaries.

‘*Macro water sharing plans – the approach for unregulated rivers. Access and trading rules for pools*’ can be found on the DPI Water website www.water.nsw.gov.au. This document has been developed to provide additional guidance for Interagency Regional Panels (IRPs) in setting water access and trading rules for pools that are covered by unregulated river water sharing plans.

The approach uses an assessment of the environmental values of the pools to select rules that adequately protect these values while not having a disproportionate effect on water availability for extraction. Because it is not practical to identify and create site specific rules for every natural pool in a water sharing plan area, the focus of the approach adopted is to establish a default access rule of no draw down below full pool capacity for the majority of natural pools. ‘Full capacity’ can be approximated by the greatest pool volume where there is no visible flow out of that pool. Depending on specific hydrological, environmental and socio-economic considerations, there may be a strong argument to set less restrictive access rules for some pools. IRPs may modify the default access rules where justified and feasible.

Different default rules apply depending on the pool type. Artificial pools created by structures are treated differently to natural pools. Generally the default rule for artificial pools is to adopt the existing licence conditions, however there may be some circumstances where the default rule may not be appropriate and alternate rules will need to be developed.

Managing surface water and groundwater connectivity

A key objective of the National Water Initiative is ‘recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource’.

Most alluvial aquifers have some level of connectivity with their associated surface water sources. Accordingly, most alluvial water sources are included in a water sharing plan that covers both surface water and its connected alluvial groundwater. Conversely, most porous rock, fractured rock and coastal sands aquifers are considered to have a lesser degree of connectivity and are covered by groundwater specific plans.

Within the Murray-Darling Basin, it is generally not practical for groundwater and surface water to be treated as one water source due to the Murray-Darling Basin Ministerial Councils Cap, as the Cap does not apply to groundwater sources within the Basin.

Consistent with the statewide approach, extraction from highly connected aquifer access licences that relate more closely to the regulated river will be managed annually, via available water determinations, whilst highly connected aquifer access licences that related more closely to unregulated water sources may be managed daily, for example linked to unregulated river cease-to-pumps (see below “*access rules*”).

For information about the principles used to develop water sharing rules for groundwater sources refer to the *Macro water sharing plans – the approach for groundwater. A report to assist community consultation*.

Protecting basic landholder rights

Under the *Water Management Act 2000* (WMA 2000), basic landholder rights (BLR) are made up of domestic and stock rights, harvestable rights and native title rights. Water may be extracted under these rights without the need for a water access licence, although in the case of accessing groundwater under a domestic and stock right, the bore must still be approved by DPI Water.

The principles of the WMA 2000 require that water sharing must protect BLR. The Lachlan Unregulated Plan does this by identifying the water requirements for domestic and stock and native title rights at the start of the plan and taking these requirements into consideration when designing rules for licensed water extractions. As the access rules for water access licences do not apply to BLR users this provides these users with a higher level priority of water access. The requirements of harvestable rights have been inherently considered as the design of access rules is also based on river flows that result after harvestable rights extractions have occurred. There are currently no extractions for native title rights. However, these rights may be activated during the plan's ten year term.

Domestic and stock rights can be restricted by the Minister to protect the environment or public health, or to preserve existing BLR. These restrictions are outside the framework of the plan.

The Lachlan Unregulated Plan provides an estimate of the water requirements for domestic and stock rights within each of the water sources, noting that these rights may increase during the life of the plan. The plan cannot limit or restrict these rights, but the WMA 2000 itself provides for restrictions on BLR, through the development of mandatory guidelines.

Protecting town water supply access

Towns have a higher priority for access to water than commercial licences. Water sharing plans recognise this priority by ensuring that a full share of water is allocated for annual town water supplies except where exceptional drought conditions prevent this. The annual share for every town water supply will be specified on the town's licence. Towns may be able to sell part of their annual account water to other towns but, unlike commercial users, will not be able to sell the licence outright.

In unregulated surface water and groundwater sources, towns will not need to change their existing water access arrangements unless their infrastructure is upgraded. In this case, when a major augmentation of the works occurs, town water utilities will need to meet conditions specified in the plan to ensure that there is enough water flowing to protect the environment and consider any potential impacts on other consumptive users.

Any development of new water storages in the plan area must be undertaken within the bounds of the plan. The plan is not prescriptive in endorsing any particular option since economic considerations vary over time. Instead, the plan sets a framework within which development of future water supplies can occur in a sustainable manner.

Protecting Aboriginal Values

Aboriginal people have a spiritual, customary and economic relationship with land and water that provides an important insight into natural resource management. The NSW Government is determined to ensure that Aboriginal culture is maintained across the state and that Aboriginal communities benefit from the new opportunities that the water market will bring.

Macro plans recognise the importance of rivers and groundwater to Aboriginal culture. The plans will allow Aboriginal communities to apply for a water access licence for cultural purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation, and for cultural and ceremonial purposes. An Aboriginal cultural licence can also be used for drinking, food preparation, washing, and watering domestic gardens. These cultural licences are limited to 10 ML/y per application.

Further input was sought from the Aboriginal community during the development of the Lachlan Unregulated Plan to identify water dependent cultural assets which may be relevant for consideration in the development of the plan, or to determine the level of interest in licences for cultural use.

Water interception activities

A change in land use activities can potentially result in the interception of significant quantities of water. Examples of activities that can impact on water quantity include increased farm dam capacity or the development of significant areas of new forestry plantations in a catchment. Under the National Water Initiative (NWI), significant interception activities should be accounted for within a plan's extraction limit.

Acknowledgement of floodplain harvesting activities

Floodplain harvesting is the collection, extraction or impoundment of water flowing across floodplains, excluding the following types of water extraction:

- taking of water under any other type of water access licence that is not a floodplain harvesting access licence or an applicable water access licence exemption;
- taking of water under a basic landholder right, including the harvesting of rainwater runoff; and
- runoff of irrigation water and stormwater which is subsequently captured in tailwater return systems or other means in accordance with licence conditions or methods which have been approved by DPI Water.

Floodplain harvesting works can generally be put into two categories:

- Purpose built works specifically built to facilitate floodplain harvesting, including pumps, structures or other works that divert water into or from storages, supply channels, depressions or otherwise impound flows; and
- Works built for multiple purposes that have the effect of facilitating floodplain harvesting, such as:
 - levees, conveying works and off-river storages constructed in billabongs or depressions; and
 - below ground level channels from which the water is delivered into storages.

Floodplain flows can originate from local runoff that has not yet entered the main channel of a river, or from water that has overflowed from the main channel of a stream during a flood.

In unregulated river water sources, floodplain harvesting has generally already been recognised and licensed as part of the process that converted area based water licences to volume based licences.

However, further volumetric entitlements, measurement and long term limits for floodplain harvesting may be established in the future under the NSW Floodplain Harvesting Policy which was under development at the time of publishing.

In-river dams

In-river dams on streams of third order or greater are permitted subject to:

- the Farm Dams Policy (harvestable rights);
- the NSW Weirs Policy;
- the water sharing plan; and
- a minimal harm test under the WMA 2000.

Under the Farm Dams Policy, a farm dam that is less than the maximum harvestable rights dam capacity is considered a basic landholder right and can be built on a first or second order stream without the need for a water access licence.

Under the NSW Weirs Policy, the construction of new weirs is discouraged, but can be done where “it can be demonstrated that the primary component of the proposal is necessary to maintaining the essential social and economic needs of the affected community” (DLWC, 1997).

Consistent with State Interagency Panel policy, the water sharing plan prohibits dams on streams of third order or higher in water sources that have been assessed to have high in-stream values.

If the criteria of the Farm Dams Policy, the NSW Weirs Policy and the water sharing plan can be met, then an application can be made. The application would be assessed against the minimal harm test under the *Water Management Act 2000*.

Considering that 18 water sources were assessed with high in-stream values, the opportunities for dam applications are restricted. Therefore, there is little risk of future in-stream dams increasing the interception of stream flows.

Exemptions for farm dams

Farm dams currently require an access licence when:

- they are located on a third order (or greater) river, irrespective of the dam capacity or purpose;
- they exceed the maximum harvestable right dam capacity for the property, which enables the capture of 10% of the mean annual run-off from the property; or
- they are on a permanent (spring fed) first or second order stream.

Unlicensed extraction from farm dams that doesn't match any of the above criteria may be permitted under “harvestable rights”, a component of the Basic Landholder Rights. The full activation of harvestable rights within the area of the plan is considered highly unlikely. The Plan cannot actually limit these rights. The provisions relating to harvestable rights are unaffected by any of the rules identified in the plan.

Developing the plan

The plan rules were developed by the Lachlan Interagency Regional Panel (IRP) based on consensus decision making. The approach used for setting the plan rules involved the consideration of government policy and then rule refinement according to local knowledge and expertise.

Different methods were used to develop water sharing rules for surface water and groundwater sources. Information about how rules were developed for surface water and groundwater systems is provided below, as well as how these rules were modified by the IRP or changed as result of consultation.

Consultation

The IRP's initial draft rules underwent targeted consultation with specific interest groups³ and water users where significant changes in management were proposed before the plan was drafted. Formal public exhibition⁴ of the draft plan ensured wider public consultation.

While developing the Lachlan Unregulated water sharing plan, the participating agencies (DPI Water, OEH, DPI Agriculture and the LLS) identified areas where better data was needed for making future water planning decisions. Similarly, the community might have suggested areas where further analysis or data gathering is required.

The former Lachlan CMA helped with the public consultation process, to ensure that all stakeholders and interested parties have an opportunity to examine and comment on the proposed water sharing rules. In particular, stakeholders were encouraged to provide:

- local knowledge and expertise – for example, there may be other natural or socio-economic values that have not yet been considered by the IRP;
- feedback on the practical elements of the proposed water sharing rules - to make certain they are easily implemented by the licence holders;
- confirmation that there are no unintended outcomes from the Lachlan Unregulated water sharing plan – it is essential that this be given due consideration before the Lachlan Unregulated water sharing plan is finalised; and
- specific comments on the Minister's notes included in the draft plan.

Targeted consultation for the draft Lachlan Unregulated water sharing plan

Targeted consultation on the proposed rules for the draft Lachlan Unregulated water sharing plan began in October 2010 and finished in mid December 2010. The objectives of this consultation were:

- to provide background for key stakeholders as to why the plan was being developed, how they were developed, what rules were proposed in the various areas and how stakeholders could provide feedback; and
- to provide a first opportunity to informally consult and to test the suitability of the proposed water sources and management zones, flow reference points and access and trading rules where significant changes were proposed from current management.

³ Targeted consultation refers to informal consultation held with key stakeholders to test the suitability of the proposed water sharing rules and provide feedback on the rules potential impacts.

⁴ Public exhibition is the formal exhibition of a draft Plan where the Minister invites submissions on the draft Plan and in particular will seek comment on a range of key issues.

Targeted consultation for Mandagery Creek

Public submissions regarding replacement of the Mandagery Creek water sharing plan were called for in 2012. These submissions and additional information were collated and reviewed in 2013. A report was submitted to the Minister recommending the plans be replaced.

Key stakeholders were informed of the proposed changes to the rules in the Mandagery Creek water source through an information session held in Eugowra on 3 December 2015. This meeting was attended by thirteen licence holders and a representative from Lachlan Valley Water. There was discussion around the proposed cease-to-pump and trading rules.

A further targeted consultation meeting was held in Canowindra on 18 February 2016 to discuss the proposed access rules with two licence holders and Lachlan Valley Water. Based on feedback from this meeting DPI Water recommended deferring any changes to access rules until the development of the forthcoming water resource plan.

Public exhibition

Public exhibition of the draft Lachlan Unregulated water sharing plan was held from 29 August 2011 to 14 October 2011, with seven public meetings held across the plan area. The objectives of this consultation were:

- to provide background to stakeholders as to why the plan was being developed, how it has been developed to date, what rules were proposed in the various areas and how stakeholders could provide feedback;
- to formally consult with a broad range of stakeholders to explain the proposed water sharing rules and how they will be implemented; and
- to seek feedback in writing from stakeholders and the general community about the proposed water sharing rules.

Thirty-two written submissions were received from a wide range of stakeholders. The IRP reviewed all the submissions and consequently made changes to the draft water sharing rules proposed. During this review process, if updated data became available, it was also incorporated into the planning process. Information about how the rules were refined is detailed in 'Refining the rules for local circumstances' below.

No public exhibition period was held for the merging of the replacement plan for the Mandagery Creek water source. This was because the plan had already been subject to public exhibition when it was first developed, and the consultation process was managed by targeted consultation as detailed above.

Negotiated outcomes

A critical aspect of developing water sharing rules is talking to stakeholders about the proposed rules and how they will affect water users and local communities. This local input was essential in developing the final recommendations for the plan. In some areas water users worked with DPI Water staff, providing information and discussing management options and possible impacts before final recommendations were made.

Water sharing rules for unregulated water sources

Water sharing rules that the IRP focused on include:

- rules for the protection of a specific environmental asset;
- access rules – which determine at what flow levels, river heights, proportion of full capacity of a pool or times extraction is allowed ; and
- dealing rules – which control the trade of water (both permanent transfer of access licence entitlements and temporary assignment of water allocation between access licences, the change of water sources and the location for extraction).

Other management rules that were considered in the development of the plan include:

- extraction limits – which set the total volume of water that can be extracted on a long-term average annual basis from the water source ; and
- assessing growth – how growth in diversions are assessed.

These rules form the basis of mandatory conditions on water access licences and approvals.

Classification method

DPI Water has adopted a ‘macro planning’ approach to developing plans for unregulated rivers. This approach is described in *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*⁵.

The process for the development of the water sharing rules involves weighing up the risk to instream natural values against community dependence on irrigated agriculture for each water source. The assessment also included hydrologic stress, which is the amount of water extracted relative to river flow.

The macro approach has been used to guide the Interagency Regional Panel (IRP) in its development of water sharing rules that consist of:

- access rules – which determine at what flow levels, river heights, proportion of full capacity of a pool or times extraction can occur
- dealing rules – which control the trade of water (both permanent transfer of access licence entitlements and temporary assignment of water allocation between access licences)

Initial classification of the Lachlan Unregulated water sources was undertaken in line with the ‘macro classification’ process. Based on this classification and the indicative rules, the Lachlan IRP recommended draft access and trading rules for each of the 22 unregulated water sources in the 2012 plan.

The water sharing plan for Mandagery Creek was developed prior to the macro planning approach, and as such doesn’t use the classification method.

Protecting high instream values

The Lachlan catchment contains a significant number of threatened flora and fauna species, some of which are sensitive to water extraction (Appendix 2). These species were considered when assessing the instream values of the water sources, which guided access rules.

The entire aquatic ecological community of the Lower Lachlan from downstream of Wyangala Dam to the Great Cumbung Swamp is listed as an endangered ecological community (EEC) in the *Threatened Species Conservation Act 1995*. EECs are assemblages

⁵ Available on the DPI water website www.water.nsw.gov.au in the macro water sharing plan section

of species occupying a particular area (plant or animal communities) that is in danger of becoming extinct.

The plan area covers a large number of wetlands including eight nationally significant wetlands which are recognized through the Directory of Important Wetlands in Australia and nine regionally significant wetlands. Most of the wetlands are located at the downstream end of the catchment with some located mid catchment.

Water sources with high instream values will be given special protection in the Lachlan Unregulated water sharing plan via a ‘no trades in’ rule, with the exception of trades from upstream water sources. This means that no further increase in water entitlement is allowed in these areas.

Access rules

Under the macro planning process, generic access rules (Table 4) are determined by balancing the risk to instream values (a product of instream value and hydrologic stress) and the community dependence on extraction. The assumption under the macro approach for inland unregulated catchments is that hydrologic stress in each water source is ‘high’, unless specific information indicates otherwise. This is based on:

- most inland unregulated streams have been embargoed since the early 1990s; and
- Stressed River Assessments show consistent scores of ‘high’ stress across the inland unregulated streams.

For the majority of water sources, pumping is not permitted from natural pools when the water level in the pool is lower than its full capacity. This basic rule could only be recommended due to a number of factors; including lack of appropriate reference points (for example river gauges) other than the pump site.

For many existing licences in the catchment there were no previous access rules; therefore any major change to access should be incremental to allow irrigators time to adjust. It would not be acceptable to expect water users comply with a strict rule when previously there were no rules.

This access rule provides protection of natural pools which are important for drought refuge, as well as domestic and stock water supplies.

Table 4: Generic access rules for rivers and creeks under the macro approach

Rule level	Indicative cease-to-pump rule	Indicative environmental rule	Instream value	Community dependence
1	No pumping unless flows exceed a specified level at the reference point	Consider commence-to-pump rule	High	Low
2	No pumping unless there is a visible flow at the reference point	Consider commence-to-pump rule	↑	↓
3	No pumping if it draws down the pool	Consider commence-to-pump rule		
4	Exception to no drawing down pools rule for example allow pool drawdown to a specified level		Low	High

Dealings rules

Trading rules under the macro planning process for inland catchments are guided by the following principles:

- where instream values are considered high, no trades are permitted into that water source;
- where a water source is under high hydrologic stress, (which is a default assumption, because of the lack of flow and usage data available) no trades are permitted into the water source;
- trades into downstream water sources are permitted regardless of stress or instream value, as long as the water sources have a direct hydrologic connection;
- trades through a regulated river are not permitted, for example a licence cannot be traded from an unregulated water source upstream of the regulated reach to a water source downstream of the regulated reach; and
- trading within water sources is generally permitted, however in some areas trading may be restricted to protect high value areas or to limit demand in areas where competition for water is already high.

As a result of these principles, trades are not permitted into many unregulated water sources across the plan area.

Trades between water sources have been permitted in some circumstances where there is a direct hydrologic connection (for example trades are permitted from Tyagong Creek Water Source to Western Bland Creek Water Source and from Burrangong Creek Water Source to Western Bland Creek Water Source).

It is important to note that the macro approach is used only as a tool to develop indicative rules for the IRP to consider. The IRP use local knowledge and expertise to refine / revise the indicative rules so that they are appropriate for specific water sources. This process is discussed in the following section.

Refining the rules for local circumstances

Some water sources have unique circumstances that require additional consideration and negotiation. Often these water sources are split into management zones to allow better management of specific areas. The water sources listed below have water sharing rules that differ from the default approach, and have been designed specifically for that area. In some cases these rules were developed by the Interagency Regional Panel (IRP), however in many cases the initial rule was changed as a result of feedback received during consultation.

Lachlan River above Reids Flat Water Source

- The IRP adjusted the cease-to-pump rule from that recommended by the indicative rules based on local knowledge. It is thought that the level of hydrological stress associated with extraction in this water source is medium rather than high (as identified in the macro classification process).
- The IRP therefore recommended the access rule that aligned a medium level of hydrological stress (93rd percentile cease-to-pump – 2 ML/day) rather than high hydrological stress (90th percentile cease-to-pump – 3 ML/day).
- To allow water users time to plan for the new access arrangements, the IRP recommended that implementation of the cease-to-pump rule for rivers and creeks be staged.

Boorowa River and Hovells Creek Water Source

- The IRP adjusted the cease-to-pump rule from that recommended by the indicative rules based on local knowledge. It is thought that the level of hydrological stress associated with extraction in this water source is medium rather than high (as identified in the macro classification process) due to elevated levels of salinity limiting full extraction use.
- The IRP therefore recommended the access rule that aligned with a medium level of hydrological stress (90th percentile cease-to-pump – 0 ML/day) rather than high hydrological stress (80th percentile cease-to-pump – 3 ML/day).

Crookwell River Water Source

- The IRP adjusted the cease-to-pump rule from that recommended by the indicative rules based on local knowledge. It is thought that the level of economic dependence in this water source is high rather than low (as identified in the macro classification process) due to the presence of the potato industry.
- The IRP therefore recommended the access rule that aligns with a high level of economic dependence (95th percentile cease-to-pump – 2 ML/day) rather than low economic dependence (80th percentile cease-to-pump – 16 ML/day).
- To allow water users time to plan for the new access arrangements, the IRP recommended that implementation of the cease-to-pump rule for rivers and creeks be staged.

Abercrombie River above Wyangala Water Source

- To allow water users time to plan for the new access arrangements, the IRP recommended that implementation of the cease-to-pump rule for rivers and creeks be staged.
- The Cooks Vale and Tuena Creek water sources have been split into management zones; the area upstream of the junction of the Abercrombie River and the Bolong River and the area downstream of the junction of the Abercrombie River and the Bolong River. This has been done for trading purposes. The decision was based on the high value of the upper part of the water source and the fact that most licences are located in the lower part of the water source. Trading is not permitted from the downstream catchment area into the upstream catchment area.

Unregulated Effluent Creeks Water Source

- Water in this water source comes primarily from the Lachlan regulated river. Water can therefore only be extracted for irrigation purposes once the requirements of the *Water Sharing Plan for the Lachlan Regulated River 2004* have been met. This is essentially once storages are full, orders have been met and environmental and replenishment flows have been provided for. The access rules in this water source were required to ensure that all environmental flows from the Lachlan Regulated River are protected and that replenishment flows from the Lachlan Regulated River are used solely for stock and domestic purposes.
- Given the above mentioned restrictions on extractions, the prevalence of high value ecosystems, and the small number of irrigation licences in this water source, the IRP recommended no trading between the effluent creeks – only trading along each of the creeks. This allows for some trading but attempts to minimise increasing irrigation demand on any one creek.

- The access rule applied to Lake Waljeers differs to the rule set for the rest of the water source given it is an off-stream water body which receives water under different circumstances. The cease-to-pump rule is linked to a drawdown level in the lake, which is set at a level to recognise both the socio-economic and environmental values associated with the lake.
- Given the significant environmental value of the lake, the IRP recommended no trading onto the lake.

Mid Lachlan Unregulated Water Source

- The access rule for Booberoi Creek, differs to the rule access applied to the rest of this water source given that water in Booberoi Creek comes primarily from the Lachlan regulated river. Water can therefore only be extracted for irrigation purposes once the requirements of the *Water Sharing Plan for the Lachlan Regulated River 2004* have been met. This is essentially once storages are full, orders have been met and environmental and replenishment flows have been provided for.
- Given this situation, the IRP recommended no trading onto Booberoi Creek to ensure there is increase in irrigation demand on the creek.

Access to very low flow

Those activities that are considered critical human needs or animal health requirements are permitted to continue to access water when the cease-to-pump applies. Licences with access to very low flows include:

- domestic supply;
- stock supply for first five years of the Plan, after which the cease-to-pump rule will apply;
- town water supply, until major augmentation of the schemes infrastructure occurs
- fruit washing;
- cleaning of dairy plant and processing equipment for the purpose of hygiene;
- poultry washing and misting; and
- cleaning of enclosures used for intensive animal production for the purposes of hygiene.

Users of basic landholders rights are also exempt from the cease-to-pump rules.

Refining the rules for Mandagery Creek

Changes to the rules in the Mandagery Creek water source have been limited to:

- standardising clauses to make them consistent with the latest water sharing plans and legislative framework;
- incorporating policy developments since 2004;
- removing total daily extraction limits (TDELs); and
- reviewing trading provisions.

TDELs were removed in the replacement plan as these daily flow sharing arrangements were not implemented in the 10 years since the plan commenced due to infrastructure limitations. Given the Lachlan Unregulated and Alluvial plan does not establish TDELs, this change will make the Mandagery Creek rules consistent with the other unregulated water sources in the Lachlan Valley.

The trading rules were changed to prohibit trading into the water source and open up trading within the water source. Trades into the water source were prohibited in the replacement plan due to high instream values and high hydrologic stress present in the Mandagery Creek Water Source. Trades within the water sources were prohibited between management zones in the original plan, which was unnecessarily restrictive. In the replacement plan trades between zones are permitted except into a trading zone on Mandagery Creek below Eugowra. The trading zone protects this area as it has high instream values.

Managing extraction in unregulated water sources

Long Term Average Annual Extraction Limit (LTAAEL)

The Lachlan Unregulated Extraction Management Unit (EMU) includes the 23 unregulated water sources covered by this Lachlan Unregulated water sharing plan. Extractions from all these unregulated water sources within the EMU are managed collectively under a single LTAAEL.

For surface water in inland NSW, the LTAAEL is based on the Murray-Darling Basin Ministerial Council (MDBMC) Cap which was introduced in 1995 to halt growth in extractions across the Basin.

The LTAAEL for the Lachlan Unregulated EMU is equal to the total of the estimated annual extraction of water averaged over the period from July 1993 to June 1999; plus an estimate of annual extraction of water under domestic and stock rights and native title rights in this EMU, at the commencement of this Lachlan Unregulated water sharing plan.

Growth in use

To protect the water set aside for the environment and the supply to existing users, it is important to control any growth in water used over time that is above the limit specified in the Lachlan Unregulated water sharing plan, that is growth in extractions above the LTAAEL. The Interagency Regional Panel had some scope in determining how growth was assessed for each EMU including the period of time extractions are averaged over, and the amount of tolerance permitted in order to allow for climatic variations.

For the Lachlan Unregulated EMU a growth-in-use response will be triggered if the average annual usage over five years exceeds the LTAAEL by more than 5%.

This decision was based on the knowledge that rivers and streams in the western slopes and plains experience high variability in flows which results in high variability in extraction. Increasing the period of time extractions are averaged over minimizes the impacts of climatic variability and the risk of growth being falsely triggered. Based on this principle, a five year averaging period, rather than a three year averaging period was chosen for the EMU.

Available water determination

Available water determinations (AWDs) are primarily used to credit water into a licences' water allocation account. Specific purpose access licences such as domestic and stock or local water utility access licences, will generally receive 100% of their share component, although in dry years, daily access rules may limit extraction so that the full annual entitlement cannot be realised.

AWDs are also used to manage growth in extractions above the LTAAEL. That is if growth occurs then the maximum AWD will be reduced to less than 1 ML per unit share in order to manage growth.

The AWD for unregulated river access licences will be 1 ML per unit share, unless a growth-in-use response is required.

Carryover and water accounts

A water allocation account will be established for each water access licence. Water is credited to the account when an AWD is made and debited when water is extracted. A licence holder's account is not permitted to go into debit.

Unregulated rivers have enormous variation in annual flows between years. It is therefore important to allow this variability to be reflected in accounting practices. Unregulated river access licence account management will operate under three year accounting rules. AWDs combined with the carryover allowance will enable licence holders to use up to twice their

water allocation in a year provided that over a consecutive three year period they do not exceed the sum of their water allocations for those three years.

For the first three years of the Lachlan Unregulated water sharing plan, this maximum volume that may be taken may not exceed a volume equal to three times the access licence share component (where this is expressed in megalitres), or three megalitres per unit share (where the share component is expressed in unit shares). This restriction in the first three years is due to the allocation of 200% (where the share component is expressed as a volume) or 2 ML per unit share (where the share component is expressed in unit shares), made in the first year of the plan to allow the operation of these accounting rules from year one of the plan.

The maximum amount of unused water allocation that can be carried over from one water year to the next in unregulated river access licence accounts will be 100% of the share component (where this is expressed in megalitres), or 1 ML per unit share (where the share component is expressed in unit shares).

Example of unregulated river access licence three year accounting rules

An example of three year accounting for an unregulated river access licence holder with a share component of 50 shares is shown in Table 5.

Table 5: Example of unregulated river access licence accounting rules

Year	Account balance (ML at start of year)	AWD (ML/unit share)	Usage (ML)	Account balance (ML at end of year)	Carryover (ML)
1	0	2	0	100	50*
2	50	1	50	50	50
3	50	1	100**	0	0
4	0	1	0***	50	50

* Only 50 ML can be carried over as carryover is limited to 1 ML/unit share. The remaining 50 ML is forfeited

** 100 ML is also the maximum that can be extracted in this year, that is, twice the allocation for the year which is 2x 50 ML = 100 ML

*** Although with the AWD there is 50 ML in the account, no water is available for extraction as the maximum extraction over three years is the sum of AWDs in those 3 years which in this example is 150 ML and this was extracted in year 2 and 3 so no extraction can occur in year 4

Water sharing rules for alluvial groundwater sources

In preparing the Lachlan Unregulated water sharing plan, the IRP recommended a range of water sharing and management rules:

- access rules – for highly connected groundwater sources, access rules linked to surface water rules may apply;
- dealing rules – which control the trade of water (both permanent transfer of access licence entitlements and temporary assignment of water allocation between access licences, the change of water sources and the location for extraction);
- extraction limits – which set the total volume of water that can be extracted on a long term average annual basis from the water source;
- assessing growth – how growth in diversions are assessed;
- rules for granting works approvals – what types of set back conditions are required; and
- rules for the protection of a specific environmental asset.

These rules form the basis of mandatory conditions on water access licences and approvals.

Defining connectivity

For the purposes of developing plans for inland aquifer systems in NSW, DPI Water has defined a highly connected system as a system in which “70% or more of the groundwater extraction volume is derived from stream flow within a single irrigation season”. This is a simplified version of, but still reasonably consistent with, the key findings and conclusions circulated for discussion amongst state jurisdictions by the Murray-Darling Basin Commission (MDBC) in their report “Evaluation of the connectivity between surface water and groundwater in the Murray-Darling Basin” (MDBC, 2008).

There are two alluvial groundwater sources in the plan area. Using the above definitions of connectivity, the Belubula Valley Alluvial Groundwater Source is considered to ‘highly connected’ to surface water, whilst the Upper Lachlan Alluvial Groundwater Source is considered to be ‘less highly connected’ to surface water, as less than 70% of usage is derived from the streamflow over an irrigation season.

Access rules

For highly connected water sources, specific rules that recognise that the same water resource is both above and below the ground surface may be applied. Aquifers that are highly connected to unregulated surface water sources may be linked to the surface waters daily access rules. Aquifers that are highly connected to regulated surface water sources may be linked to annual management through linked available water determinations (AWDs).

In unregulated water sources, groundwater extraction can be linked to the adjacent surface water access rule, with a time lag of between 14 and 28 days. The time lag recognises the delayed impact that groundwater pumping has on river flows.

In order to implement lagged surface water cease-to-pump rules to aquifer access licences, the relevant cease-to-pump rules must relate to a telemetered gauge.

Aquifers that are highly connected to regulated surface water sources may be linked to annual management through linked AWDs. The Belubula Valley Alluvial Groundwater Source is highly connected to the Belubula Regulated River. To recognise the connection between the river and the groundwater source a component of the AWD for the Belubula Valley Alluvial Groundwater Source will be linked to the Belubula Regulated River AWD for high security access licences. See section below on available water determinations for more details.

Dealings

Dealings (trading) rules are intended to provide for efficient water markets whilst recognising and protecting the needs of the environment and third party interests. In most macro plans, dealings are allowed within a groundwater source but not into or out of the groundwater source.

Consistent with the Minister's dealing principles, there is no trading permitted between the two alluvial groundwater sources covered by the plan.

For the Upper Lachlan Alluvial Groundwater Source, trade is also prohibited between the eight management zones as the sustainable level of extraction for each management zone is not known.

Rules for water supply works approvals

In accordance with the principles of the *Water Management Act 2000*, the Lachlan Unregulated water sharing plan sets rules to minimise the cumulative impacts resulting from groundwater extraction. To do this, the plan specifies rules which prohibit new/amended works from extracting water within certain distances of other water users, contaminated sites, groundwater dependent ecosystems (see following section) and groundwater dependent culturally significant sites. This is to prevent unacceptable or damaging levels of draw down of water occurring in the local vicinity of these users and sites.

A standard set of distance criteria for common groundwater aquifer types (for example fractured rock, alluvium, coastal sands and porous rock) was produced by comparing the various rules in similar geological provinces. The standard rules were then endorsed by the State Groundwater Panel.

This process has resulted in consistent rules across aquifer types considered the most current thinking in terms of managing local impacts of extraction and protecting groundwater dependent ecosystems. However, the plan development process allows for changes to the rules to cater for local conditions. The distance criteria may be altered due to a number of different factors, such as lot size where property sizes may lead to different interference distance criteria, aspects of the local hydrology and groundwater dependence of town water.

In the Lachlan Unregulated water sharing plan, regional staff made draft recommendations on rules for the plan which were then compared against the standard rules. The IRP then made a final decision as to which rule would be adopted, striving to remain consistent with the standard rules where possible while being sensitive to any unique attributes of the groundwater sources in the plan area.

For new works there are rules to:

- minimise interference between neighbouring works;
- locate works away from contaminated sites;
- protect water levels in groundwater dependent ecosystems;
- protect groundwater dependent culturally significant sites;
- manage surface and groundwater connectivity; and
- manage temporary local impacts that may affect water levels, water quality and aquifer integrity.

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which have their species composition and natural ecological processes determined to some extent by the availability of groundwater. GDEs can include cave systems, springs, wetlands and groundwater dependent endangered ecological communities.

High priority GDEs are identified during the planning process and are listed in a schedule to the plan. The IRP then has the opportunity to review and amend the GDE list as well as the rules that have been developed to protect them based on their expertise.

The list of high priority GDEs compiled at this stage can either be amended after year five of the plan as further GDEs are identified or during the life of the plan on submission to and approval by the Minister.

Two high priority GDEs have been identified in the Upper Lachlan Alluvial Groundwater Source which are listed in a schedule of the plan.

Refining the rules for local circumstances

Some groundwater sources have unique circumstances that require additional consideration and negotiation. The groundwater sources listed below have water sharing rules that differ from the generic approach and have been developed specifically for that area. In some cases these rules were developed by the IRP, however in many cases the initial rule was changed as a result of feedback received during consultation.

Upper Lachlan Alluvial Groundwater Source

The Upper Lachlan Alluvial groundwater source is currently split into eight management zones which are used to restrict trading across the water source. Each of these zones is hydrologically different and in some areas it is questionable if there is a strong connectivity between the zones. Given the sustainable limits of these zones is not known, these management zones have been retained to minimise any future impacts of trading. Unrestricted trading across the water source may result in localised drawdown local impacts area which would require additional management.

The IRP originally recommended 100% carryover for this water source but realised given the volume of the LTAAEL, the level of entitlement and the storage capacity of the aquifer, this percentage was too high. For more details see section below on 'Carryover and Water Accounts'.

Upper Lachlan and Belubula Valley Alluvial Groundwater Sources

The IRP recommended the granting of supplementary water access licences (SWALs) as an adjustment mechanism for active users in the event that a growth-in-use response is triggered. Implementing SWALs was discussed at length with the community during consultation and widespread support was indicated. On the recommendation of the community, the Lachlan Unregulated water sharing plan includes a table which sets out the ratio of the SWAL available water determination for each year of the plan that SWALs will be implemented. Including the table in the plan provides users with more information in regard to the implementation of SWALs. For more details on SWALs see section below on 'Supplementary Water Access Licences'.

Managing extraction in alluvial groundwater sources

Long Term Average Annual Extraction Limit (LTAAEL)

For this and other similar plan areas, NSW has resolved that the LTAAEL for highly connected and alluvial groundwater resources within NSW's portion of the Murray-Darling Basin shall be set equal to current average usage. This is based on the principle that current levels of groundwater pumping are considered to be having acceptable impacts on surface water sources. Any extraction beyond this level will result in additional impact on the rivers, groundwater dependent ecosystems and other users of these connected water resources.

LTAAELs have been determined for each of the two alluvial groundwater sources as detailed below.

Upper Lachlan Alluvial Groundwater Source

The LTAAEL for the Upper Lachlan Alluvial Groundwater Source is 94,196 ML/year, defined by the sum of:

- average usage (1997–1998 to 2009–2010) from bores metered by Water NSW; plus
- an estimate of basic landholders rights; plus
- an estimate of usage from perpetual bores (currently with no volumetric entitlement).

The LTAAEL was based on the sum of each individual's maximum five year average usage over the metered period from 1997 to 2010.

Belubula Valley Alluvial Groundwater Source

The LTAAEL for the Belubula Valley Alluvial is 2,883 ML/year, defined by the sum of:

- average usage (1997–1998 to 2009–2010) from bores metered by Water NSW; plus
- an estimate of basic landholders rights; plus
- an estimate of usage from perpetual bores (currently with no volumetric entitlement).

The LTAAEL was based on the sum of each individual's maximum five year average usage over the metered period from 1997 to 2010.

Growth in use

Extractions are managed to the LTAAEL. Should growth in extraction above the LTAAEL be assessed to have occurred, an appropriate growth-in-use response will be taken. The current statewide position is to set the LTAAEL for highly connected and alluvial systems at current average usage. Therefore, the growth-in-use response described in the plan is one which allows for the 'peaks' and 'troughs' of usage above and below the average, over the period from which the LTAAEL has been defined, to be replicated.

To take into account the regular variations in climate and the associated variations in extractions in the Upper Lachlan and Belubula Valley Alluvial Groundwater Sources, the IRP recommended a five year averaging period and an exceedance threshold of 10% for assessing growth. These parameters were chosen to allow regular variations in extractions associated with climatic variability to occur without triggering a growth-in-use response.

Supplementary Water Access Licences (SWALs)

In many inland alluvial groundwater sources, entitlement is significantly greater than the LTAAEL set by water sharing plans. If extractions increase beyond the LTAAEL and a growth-in-use response is triggered, the AWD will be reduced to wind back extractions. This reduction in the AWD would impact those users that have historically used a significant proportion of their entitlement.

Supplementary water access licences (SWALs) can be used to provide some short term protection against the impacts of growth-in-use for highly active users by preferentially distributing a proportion of the available water to individuals with a history of extraction. This will allow historic water use patterns to be maintained with limited need to purchase additional water in the short term. This is a temporary measure to help active users adjust and will be phased out by year 10 of the plan when SWALs will be cancelled.

In the Upper Lachlan and Belubula Valley Alluvial Groundwater Sources, SWALs will only be implemented if the average extraction exceeds the LTAAEL by 10% or more and a reduction in an AWD (i.e. less than 0.8ML/share) is required to bring average extractions back to the LTAAEL.

SWALs are not permitted to be traded and any unused volume associated with a SWAL cannot be carried over from one water year to the next.

An individual's SWAL share component is based on their maximum average use over a consecutive five year period between 1997 and 2010. The share component for each individual SWAL is listed as a schedule in the plan.

A table has been included in the plan setting out the ratio of the SWAL AWD for each year of the plan. SWALs will be implemented if the AWD for aquifer access licences needs to be adjusted to 0.8 ML/unit share or less due to growth-in-use. The ratio for the SWAL AWD is set from year two of the plan and reduces by 0.1 every year so that by year 10 of the plan SWALs will be cancelled. If SWALs are granted, the ratio of the SWAL AWD will be set according to the year in which a growth-in-use occurs, as set out in the table in the plan. This schedule provides greater certainty for users if SWALs are granted.

Available water determination

AWDs are primarily used to credit water into a licence's water allocation account. AWDs will be applied differently for the licences within the Belubula Valley Alluvial Groundwater Source.

The AWD for a groundwater source is also used to manage growth in extractions above the LTAAEL. If growth is assessed to have occurred, then the maximum AWD will be reduced to respond to this growth, that is, a maximum AWD of less than one megalitre per unit share.

Belubula Valley Alluvial Groundwater Source

To recognise the connection between the Belubula Valley Alluvial Groundwater Source and the Belubula Regulated River, the AWD for licences within the Belubula Valley Alluvial Groundwater Source is based on two components:

- a river recharge component (this is based on the percentage of the Belubula Valley Alluvial Groundwater Source LTAAEL derived from river recharge) that will fluctuate in accordance with the availability of resources in the regulated river. That is, if the AWD for high security licences within the Belubula Regulated River is zero then this portion of the AWD for the Belubula Valley Alluvial Groundwater Source would also be zero; and
- a rainfall and other recharge component (this is based on the percentage of the LTAAEL derived from rainfall and other sources of recharge) that will be consistently available on a long term average basis.

The river recharge component will be linked to the AWD for Belubula Regulated River (high security) access licences. This is in recognition of the need to not increase regulated river losses during periods of reduced surface water availability. If these losses were allowed to exacerbate, then this potentially impacts future allocations for high priority surface water licences. Linking AWDs will therefore protect against increasing losses from the Belubula Regulated River to the groundwater, during times of reduced allocations in the river.

The AWD for the Belubula Valley Alluvial Groundwater Source will be based on 70% of the AWD for the Belubula Regulated River (high security) access licence AWD, plus 30% of the aquifer access licence AWD or lower amount as a result of a growth-in-use response.

The percentage of the AWD linked to the river has been informed by hydrogeological analysis which shows that as much as 90% of the water extracted under an average annual pumping season originates from the river (SKM 2012).

The linking of the AWD for the Belubula Valley Alluvial Groundwater Source is a major change from current management, but is believed to have limited impacts, as the AWD for the Belubula Regulated River (high security) access licences is only less than one megalitre per unit share in extreme drought.

Upper Lachlan Alluvial Groundwater Source

For those aquifer access licences in the Upper Lachlan Alluvial Groundwater Source, AWDs will credit water annually to accounts, generally one megalitre per unit share, or lower as a result of a growth-in-use response.

Carryover and water accounts

In both the alluvial groundwater sources, entitlement is considerably higher than the LTAAEL. There is therefore a possibility of triggering a growth-in-use response, particularly if a substantial amount of carryover is allowed for. Modelling suggests that even at current levels of extraction there will be local areas within the groundwater source that will be subject to localised drawdown of groundwater (Bilge, 2012). This is already apparent in management zones 1 and 7 of the Upper Lachlan Alluvial Groundwater Source.

Licence holders in the Upper Lachlan Alluvial Groundwater Source can carry over up to 20% of their entitlement from one year to the next. Twenty percent carryover provides some flexibility in business operations whilst also trying to minimise the potential for causing areas of localised drawdown.

Licence holders in the Belubula Valley Alluvial Groundwater Source can carry over up to 25% of their entitlement from one year to the next. This aquifer allows a greater amount of carryover than the Upper Lachlan aquifer as it has an AWD linked to the high security users on the Belubula Regulated River. This linkage will help moderate the maximum annual extraction in the aquifer and therefore a higher percentage of carryover in accounts can be permitted.

Adaptive management

Adaptive management is an important part of a water sharing plan. Adaptive management refers to the process of ongoing data collection monitoring, evaluation and review during the life of the plan that either enables plan amendment or remaking of a better plan after ten years. Adaptive management is a requirement of both the *Water Management Act 2000* and the National Water Initiative, and has been allowed for during the life of the plan through amending provisions.

Where adaptive management is identified, further studies may be undertaken within agencies or by external organisations which may assist in informing the review of plan provisions.

Amendment provisions

There are a number of amendment provisions which allow the plan to be changed as a result of further studies or to allow implementation of specific rules. The amendment provisions detailed in this section – protection of regulated releases, and exemption for stock watering – were part of the rule development process undertaken by the IRP. There may be other general amendment provisions included in the plan which are not mentioned in this document. Please refer to the plan for a full list of amendment provisions.

Protection of regulated releases

The *Water Sharing Plan for the Lachlan Regulated River Water Source 2004* (the Regulated Plan), commenced in 2004. The Regulated Plan contains provisions for the delivery of environmental water, as well as stock and domestic replenishment flows to unregulated water sources below the regulated river, which the regulated plan must protect. Under the *Water Act 1912* the regulated releases are protected by various methods, including through licence conditions, by formal order and various ad hoc arrangements.

To ensure these flows are protected, the Lachlan Unregulated water sharing plan includes access rules for the taking of water where environmental and replenishment flows are delivered as a result of the regulated plan. The Lachlan Unregulated water sharing plan also includes an amendment provision which allows it to be amended if the flows are not being adequately protected by the proposed access rules.

Exemption for stock watering

Stock and domestic access licences are exempt from the cease-to-pump rules for the first five years of the Lachlan Unregulated water sharing plan, when water is being taken for the purpose of stock watering. The plan includes an amendment provision which allows this exemption to be extended beyond the five year period. The plan may be amended if the outcomes of a review demonstrate the cease-to-pump rules will cause unacceptable socio-economic impacts.

Evaluation of plan performance

The evaluation framework for water sharing plans is currently being developed. The objectives of the project are:

- to inform the community of the results from the 10 year operation of water sharing plans; and
- to collate the results of the various legislatively required evaluations, along with other relevant learnings to inform the remake of water sharing plans.

The evaluation framework will use a system of “program logic” to organise the inputs, outputs and outcomes from water sharing plans and their operation. Evaluation questions and monitoring indicators allow assessment of these steps to rate a water sharing plan for its:

- process of development (appropriateness);

- performance during operation (efficiency); and
- socio-economic environmental and cultural outcomes (effectiveness).

DPI Water's approach conforms to NSW and Commonwealth government guidelines for monitoring, evaluation and reporting and demonstrates the adaptive management approach to water planning required under the principles of the NSW *Water Management Act 2000*. DPI Water has also chosen to organise the evaluation questions and monitoring indicators using the NSW Natural Resource Commission's auditable standard for natural resource management.

Performance indicators

The Lachlan Unregulated water sharing plan includes a number of performance indicators that will be monitored over the 10 year life of the plan.

It is not practicable to monitor all issues in all water sources. The performance indicators identify that monitoring will be undertaken for specific issues in key water sources. The actual procedure for monitoring each indicator may change over the period of the plan as improved methods are developed.

The Environmental Flows Monitoring and Modelling program has been designed to make the results of environmental flows studies more transferable between water sources and to develop more generic relationships between flow, hydraulics and ecological responses. In adopting this approach it enables a more efficient and effective evidence based approach to support monitoring and evaluation requirements of NSW water sharing plans and identifies specific knowledge gaps to allow further investigative work to be prioritized.

Plan review

Under the *Water Management Act 2000*, the Natural Resources Commission is required to undertake a review of the Lachlan Unregulated water sharing plan prior to any decision to extend its term or to make a new plan.

The evaluation framework developed will consider the statutory requirements for the different types of evaluation:

- An audit of the plan, at intervals of no more than five years, for the purpose of ascertaining whether its provisions have been given effect; and
- An audit of the plan by the Natural Resources Commission to assess to what extent the water sharing provisions have contributed to the relevant state wide targets, and natural resource standards and targets in the relevant catchment management area. The Natural Resources Commission will call for public submissions when undertaking its review.

Glossary

Many of the terms in this document are defined in the *Water Management Act 2000* and are therefore not redefined here. However, there are some terms that are not and have therefore been defined below to assist with understanding the water sharing plan.

Account water: The balance in an access licence water allocation account at a particular time. An access licence water allocation account records water allocations accrued under the licence as well as water allocations taken, assigned or re-credited. The operation of the account is also governed by rules for the carrying over of credits from one accounting period to the next and rules for the maximum credit that may be allowed to accumulate in the account as established in a water sharing plan.

Alluvial, alluvium: Sediment deposited by a stream of running water, in particular along river beds or flood plains.

Critical habitat: Areas of habitat (land or water) that are crucial to the survival of particular threatened species, populations or communities.

Cumulative impact: The combined impact of all surface water extraction.

Ecological values: The intrinsic or core attributes associated with naturalness, diversity, rarity and special features, but excluding representativeness used to classify water sources for apportioning water management rules.

Endangered ecological communities: Ecological communities listed in Schedule 1 of the *Threatened Species Conservation Act 1995* or Schedule 4 of the *Fisheries Management Act 1994*.

Ephemeral: Temporary or intermittent; for instance, a creek or wetland which dries up periodically.

Extraction of water: Removal of water from a river for off-stream storage or consumptive use.

Extraction management unit (EMU): A group of water sources; defined for the purpose of managing long-term annual average extraction.

Flow classes: The range of daily flow rates in a river which provides the framework for sharing water on a daily basis.

Flow duration curve: A plot that shows the percentage of time that flow in a stream is likely to equal or exceed some specified value of interest.

Flow gauging station: A device used to measure the height of a river, from which the flow in the river can be calculated.

Flow reference point (FRP): The site from which the flow data is calculated to determine the rates associated with a flow class and then to implement the daily access rules during the life of the plan.

Full capacity: The volume of water that is impounded in the pool, lagoon or lake when the level of water in the pool, lagoon or lake is at the highest water level where there is no visible flow out of that pool.

Groundwater: The water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated.

Groundwater dependent ecosystems (GDEs): Ecosystems that rely on groundwater for their species composition and their natural ecological processes.

Long-term average annual extraction limit (LTAAEL): The target for total extractions (under all water access licences plus an estimate of basic landholder rights within an EMU)

which is used to assess whether growth-in-use has occurred. The actual annual extractions (metered plus estimated) are averaged over a fixed period of time defined by the water sharing plan when comparing with the LTAAEL. If the fixed period of time is greater than one water year, then in any one water year, extractions can exceed the LTAAEL without triggering a growth-in-use response.

Macro water sharing plans: Plans which apply to a number of water sources across catchments or different types of aquifers. The macro planning process is designed to develop broader-scale plans covering most of the remaining water sources in NSW.

Management zone (MZ): An area within a water source used for defining the location of applicability of water sharing rules, but secondary to the water source. A management zone (MZ) is more likely to be designated where local dealing restrictions are in place or where ‘cease-to-pump’ rules for works approvals apply.

Pools: Lentic water bodies (standing water), including anything falling within the definition of a “lake” found in the Dictionary of the *Water Management Act 2000*, except for tidal pools and estuaries.

Riparian: Relating to or living or located on the bank of a natural watercourse, such as a river or stream.

Visible flow: The continuous downstream movement of water that is perceptible to the eye.

Water sharing plan (plan): A plan made under the *Water Management Act 2000*, which sets out the rules for sharing water between the environment and water users within whole or part of a water management area or water source.

Water year: The 12 months running from 1 July to 30 June.

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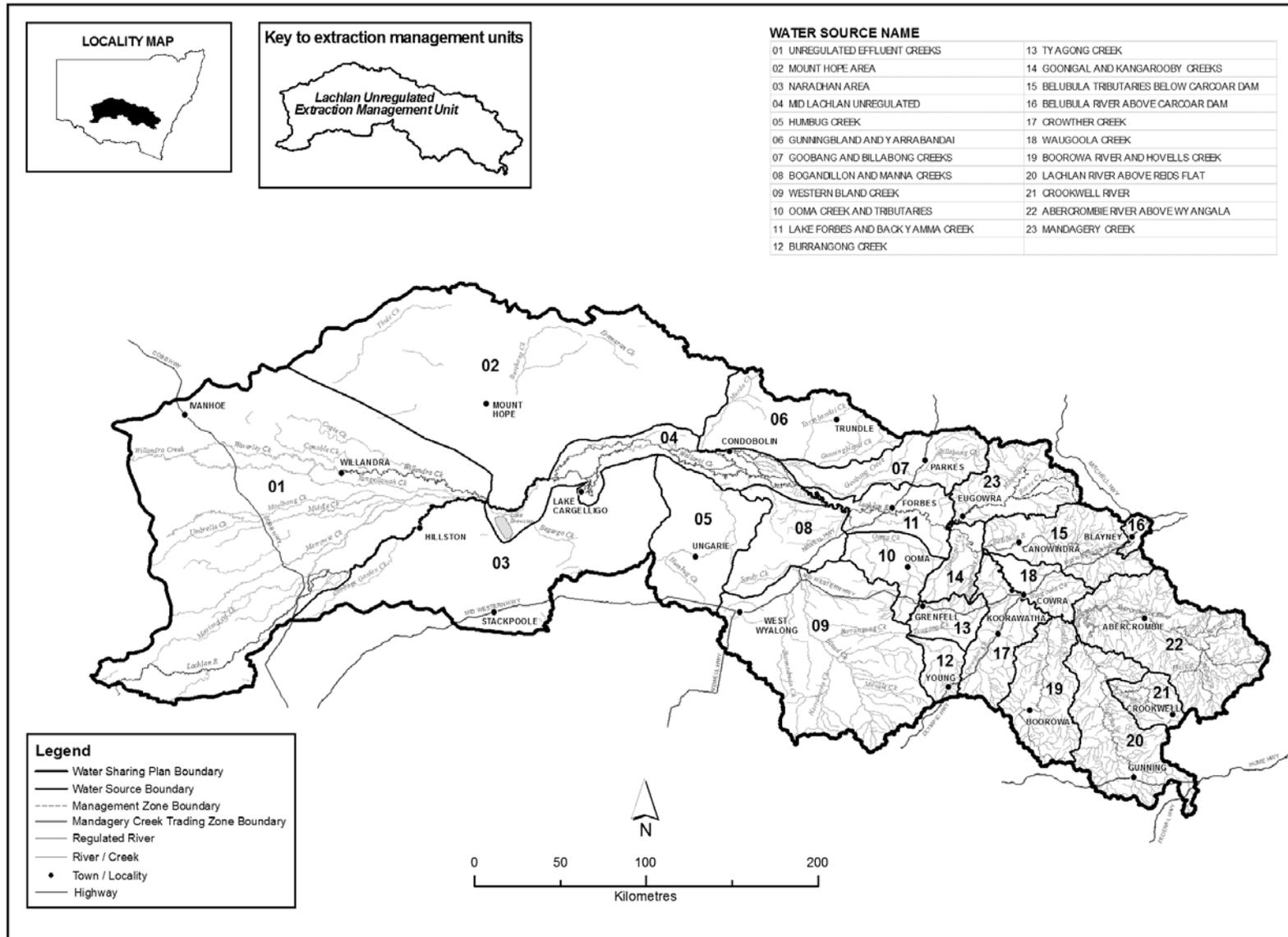
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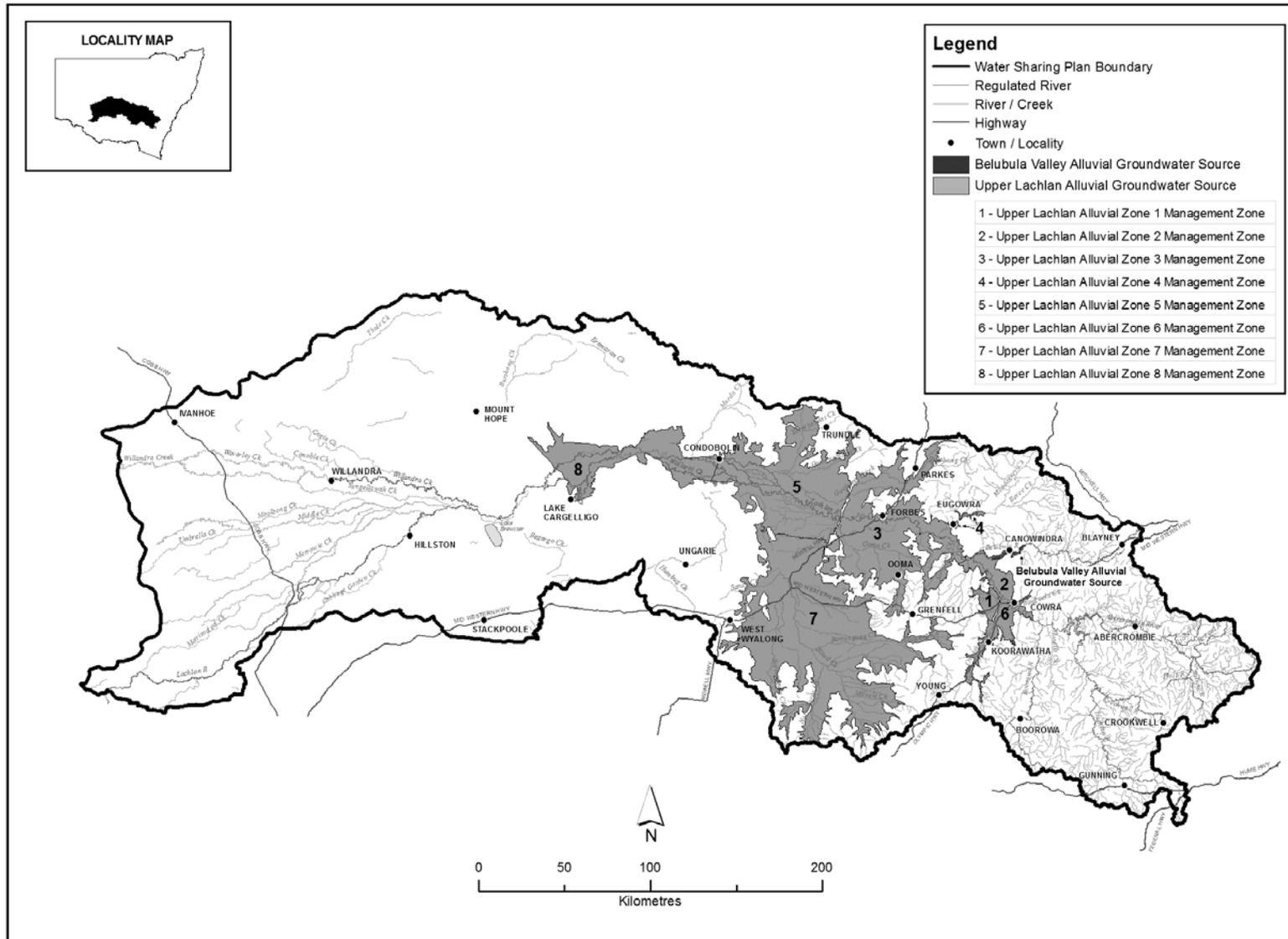
Appendices

Appendix 1: Water sharing plan maps

Map 1 of 2 - Unregulated Lachlan Extraction management Unit



Map 2 of 2- Lachlan Alluvial Groundwater Sources



Appendix 2: Identified threatened species

It is important to note that the macro water sharing plan process is concerned with protecting in stream water values that relate to extraction. Therefore, only threatened species that are likely to be sensitive to extraction have been considered when assessing the water source values.

It should also be noted that some threatened species are highly sensitive to low flow extraction, whilst other threatened species, such as plants that occur in the riparian zone, are less sensitive. Accordingly, threatened species considered to be highly sensitive to low flows are given a highly priority for protection.

The table below shows threatened species that are known (K) or expected (E) to occur in each water source.

	Lachlan R above Reids Flat	Crookwell River	Abercrombie River above Wyangala	Boorowa R & Hovells Ck	Waugoola Ck	Belubula R above Carcoar Dam	Belubula Tribs below Carcoar Dam	Goonigal & Kangaroo Cks	Tyagong Ck	Burrangong Ck	Crowther Ck	Western Bland Ck	Ooma Ck & Tribs	Lake Forbes & Back Yamma Ck	Goobang & Billabong Cks	Gunningbland & Yarrabandai	Bogandillon & Manna Cks	Humberg Ck	Mt Hope Area	Naradhan Area	Unregulated Effluent Cks
Fish Species																					
Macquarie Perch	K	K	K	K	K	K	K	K			K		K								
Silver Perch	K	K	K	K	K		K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
Southern Pygmy Perch	K	K	K	K	K		K	K	K	K	K	K	K	K			K	K		K	
River Snail																		K	K	K	K
Murray Cod	K	K	K	K	K	K	K			K		K		K	K				K	K	
Trout Cod	K	K	K																		
Olive Perchlet		K																		K	
Eel-Tailed Catfish		K	K											K	K			K		K	
Frog Species																					
Booroolong Frog	K	K	K	K	K	K	K	K	K		K	K		K	K						
Giant Burrowing Frog			E																		

	Lachlan R above Reids Flat	Crookwell River	Abercrombie River above Wyangala	Boorowa R & Hovells Ck	Waugoola Ck	Belubula R above Carcoar Dam	Belubula Tribs below Carcoar Dam	Goonigal & Kangaroo Cks	Tyagong Ck	Burrangong Ck	Crowther Ck	Western Bland Ck	Ooma Ck & Tribs	Lake Forbes & Back Yamma Ck	Goobang & Billabong Cks	Gunningbland & Yarrabandai	Bogandillon & Manna Cks	Humbug Ck	Mt Hope Area	Naradhan Area	Unregulated Effluent Cks	
Green and Golden Bell Frog	K	K	E																			
Littlejohn's Tree Frog			K																			
Red-Crowned Toadlet			K																			
Southern Bell Frog	K		K	K	K		K	K	K	K	K	K	K	K	K	K	K	K	E	K		
Stuttering Barred Frog			K																			
Yellow-Spotted Bell Frog	K	K																				
Sloane's Froglet	E	E		E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
Macroinvertebrate Species																						
Adam's Emerald Dragonfly	K	K	K																			
Giant Dragon Fly			E																			
Birds																						
Australasian Bittern	K	K	K	K	K	E	K	K	K	K	K	K	K	K	K	K	K	K	K	E	K	K
Black-Necked Stork	K		K	K	K		K	K	K		K	K		K	K				K	K	K	
Black-Tailed Godwit	K		E	K	K	E	E	K	K	K	K	K	K	K	K	K	K	K	E	K	K	
Blue-billed duck	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
Brolga	K		E	K	K		K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
Freckled Duck	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
Magpie Goose	K	K	K	E	E		E	K	K	K	E	K	K	K	K	K	K	K	K	K	K	

	Lachlan R above Reids Flat	Crookwell River	Abercrombie River above Wyangala	Boorowa R & Hovells Ck	Waugoola Ck	Belubula R above Carcoar Dam	Belubula Tribs below Carcoar Dam	Goonigal & Kangaroo Cks	Tyagong Ck	Burrangong Ck	Crowthor Ck	Western Bland Ck	Ooma Ck & Tribs	Lake Forbes & Back Yamma Ck	Goobang & Billabong Cks	Gunningbland & Yarrabandai	Bogandillon & Manna Cks	Humbug Ck	Mt Hope Area	Naradhan Area	Unregulated Effluent Cks	
Painted Snipe	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
Regent Honeyeater	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K				
Other Fauna																						
Greater Broad-nosed Bat	K	K	K																			
Large-footed Myotis	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K		K	E	
Wet Flora Species																						
Western Water-starwort																						K
Floating Swamp Wallaby-grass	K	K	K	K	K		K	K	K	K	K	K	K	K	K	K	K	K				
Declared locations																						
World Heritage Area			K																			
Lachlan Lowland Aquatic EEC				K	K		K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
Other Nationally Important Wetlands																	K			K	K	

Disclaimer

The Office of Environment and Heritage (OEH) has provided assessments on the presence of threatened species and their sensitivity to extraction to inform the classification of water sources through the Macro Water Sharing Planning process. The assessments were undertaken for the specific purpose of developing an initial classification of water sources. They were based on the most accurate and relevant data/ information sourced and analysed at the time.

Initial classifications were a first step to inform IRP deliberations. IRPs considered a range of information and used local knowledge in determining a final classification. The assessments are not absolute – for example the absence of threatened species for an assessment does not necessarily mean the threatened species are not present.

These assessments should not be used for any purpose other than classification of catchment management units as part of the Macro Water Sharing Planning process.

Appendix 3: Interagency regional panel and support staff

Lachlan regional panel membership and expertise for 2012 plan development

Name	Agency	Role	Name	Agency	Role
Interagency Regional Panel			Support Staff		
Tracey Brownbill	DPI Water	Chair and agency representative	Maksudul Bari	DPI Water	Economics
Gary Coady (replaced by Tracey Brownbill)	DPI Water	Agency representative	Anne Brook	DPI Water	Media and community relations
Greg Markwick	DPI Agriculture	Agency representative	Bunty Driver	DPI Water	Media and community relations
Fin Martin	LLS	Observer	Patrick Driver	DPI Water	Aquatic ecology
Paul Packard	OEH	Agency representative	Lyn Gorham	DPI Water	Licensing
			Tahir Hameed	DPI Water	Hydrology
			Sally Hunt	DPI Water	Plan writing
			Kenneth Kolstad	DPI Water	Hydrogeology
			Vicki Martin	DPI Water	GIS
			Manju Mathew	DPI Water	Communications
			Nicky Smith	DPI Water	Plan coordinator
			Sri Sritharan	Water NSW	Regulated river operations
			Kimberley Williamson	DPI Water	Planning support

Lachlan regional panel membership for 2016 Mandagery Creek plan replacement

Name	Agency	Role
Interagency Regional Panel		
Tracey Brownbill	DPI Water	Agency representative, chair
Paul Packard	OEH	Agency representative
Allan Lugg	DPI Fisheries	Agency representative
Ken Harrison	DPI Ag	Agency representative
Shona Whitfield	LLS	LLS observer

Appendix 4: Interagency regional panel reference materials

Office Data Sets

Licensing Administrator System (LAS) – the DPI Water statewide database holding the licence details including volume of entitlement, location details and stream orders.

Hydsys – Hydsys is a DPI Water statewide database that holds all flow record data. Flow records are available for most water sources in the Central West area.

Regional Groundwater Monitoring Network – DPI Water is developing a regional groundwater monitoring network to be used to monitor alluvial groundwater levels and assess stream / surface water connectivity.

Regional Geographic Information Systems – the DPI Water Land use and topographic information

Central Data Sets

Stressed rivers reports – used as the basis for identifying where there are instream barriers.

Threatened species (fish) – Data supplied by NSW fisheries within the NSW DPI.

Threatened species (other) – Data supplied by OEH.

Index of Social Disadvantage – Australian Bureau of Statistics.

Employment in Agriculture - Australian Bureau of Statistics

Other Agency Data

National Parks and Wildlife (OEH) statewide atlas – statewide flora and fauna database

NSW Fisheries (NSW DPI) modelled data sets (Fish Community Index, Fish Community Vulnerability).

NSW Fisheries (NSW DPI) freshwater and saltwater recreational fishing database.