



Department of  
Primary Industries  
Water

# Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources

Background document



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*Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources: Background document*

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**More information**

Rural Water Planning

[www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

**Acknowledgments**

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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 unregulated<sup>1</sup> 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.

This document provides background to the development of the rules in the Clyde River water sharing plan. It includes information on the purpose of the plan and the policy framework that supports it, a description of the Clyde catchment including land and water use, and the process of developing the various water sharing rules in the plan. This document is part of a range of material available specifically on the plan including:

- the *Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources 2016* - a legal instrument written in its required statutory format
- *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW*
- Summary sheets for each water source detailing the management rules.

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](http://www.water.nsw.gov.au). This 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. Access and trading rules for pools* – explains the method used to set access and trading rules for pools in unregulated water sources across the state
- *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.

## Why are water sharing plans being prepared?

Expansion of water extraction across NSW in the twentieth century has placed most valleys at or close to the limit of sustainable water extraction. This has seen increasing competition

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<sup>1</sup> 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.

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 has the overall objective of “sustainable and integrated management of the State’s water” (DLWC 2001). Water sharing plans play a major role in achieving this objective by providing a legal basis for sharing water between the environment and consumptive water users.

Under the WMA 2000, water sharing plans must protect water sources and their dependent ecosystems, and must protect the basic rights of landholders to extract water. In this way, environmental water and basic landholder rights are afforded priority over licensed water extractions. Among licensed water users, priority is given to water utilities and licensed stock and domestic use, ahead of commercial purposes such as irrigation and other industries.

Water sharing plans also recognise the economic benefits that commercial users such as irrigation and industry can bring to a region. When a plan commences access licences held under the *Water Act 1912* are converted to access licences under the WMA 2000 which separates the water licences from land tenure. This facilitates the trade of access licences and encourages 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 define the access rules for commercial users for ten years providing all users with greater certainty regarding sharing arrangements.

### **Benefits for water users**

The introduction of water sharing plans will benefit water users by providing:

- greater certainty by setting water sharing arrangements for a ten year period
- clear trading and access rules which will help foster trading of water
- greater security with existing water licences converted to perpetual water access licences under the WMA 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. The Clyde River water sharing plan sets rules for unregulated streams and alluvial aquifers in the plan area. The scope of the water sharing plan is discussed later.

### **Unregulated streams**

Rivers naturally experience a range of flows which 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 flora and fauna. To preserve a healthy river system this range of stream flows must be maintained.

In order to protect a proportion of these flows for the benefit of the environment, water sharing plans impose 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 flows fall below a set level.

Environmental water can also be protected through trading rules. Each water source in the Clyde River water sharing plan area has been classified as having high, medium or low instream values. Water sources with high instream value are protected through the plan by not allowing any water licences to be traded into the water source. Trades are allowed into some water sources with lower value in order to encourage the movement of extraction from high to lower environmental value areas.

### **Alluvial aquifers**

Aquifers are underground layers of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be extracted. Aquifers can store large volumes of water, often accumulated over thousands, or tens of thousands of years. Water enters (or recharges) aquifers via rainfall, surface flows from rivers and lakes, or flow from adjacent aquifers. Water sharing plans aim to achieve sustainable groundwater extraction by limiting extractions to a proportion of the aquifer recharge. The remainder of the recharge is reserved for the environment.

The Clyde River water sharing plan defines cease-to-pump rules for alluvial aquifers in the plan area. Water sharing rules for fractured rock and porous rock aquifers are dealt with in the *Water Sharing Plan for the South Coast Groundwater Sources 2016*. The Clyde River water sharing plan also includes rules controlling the location of new works and extraction from existing works to protect groundwater-dependent ecosystems and areas of cultural significance.

## A water sharing plan for the Clyde River

This water sharing plan formalises water sharing arrangements in the Clyde River and provides a consistent approach to managing water across the plan area.

### Objectives of the plan

The objectives of the Clyde River water sharing plan are to:

- a) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources, and
- b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of the water sources, and
- c) protect basic landholder rights, and
- d) manage these water sources to ensure equitable sharing of water between users, and
- e) provide opportunities for enhanced market-based trading of access licences and water allocations within environmental and system constraints, and
- f) provide water allocation account management rules which allow sufficient flexibility in water use, and
- g) contribute to the maintenance of water quality, and
- h) provide recognition of the connectivity between surface water and groundwater, and
- i) adaptively manage these water sources, and
- j) 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)*.

### Scope of the plan

The *Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources 2016* (or the Clyde River water sharing plan) covers two discrete water resources: unregulated rivers and alluvial groundwater. Since there are no regulated rivers in the plan area, the water sharing plan applies to all rivers in the plan area.

Incorporating both the surface and groundwater resources into the one plan recognises their interaction and allows for the development of water sharing rules that are linked and are equitable within and between these resources.

Water sharing plans divide plan areas into several “water sources”, which usually coincide with sub-catchment boundaries. Access and trading rules are developed for each of these water sources. If water sharing rules need to be more refined, water sources may be divided into management zones. Conversely, rules about annual extractions are generally made at a broader scale within extraction management units (EMUs), which usually consists of several water sources.

The Clyde River water sharing plan establishes a number of water management units including 35 water sources and three extraction management units as listed in Appendix 1. The location and extent of these water sources are shown on the map in Appendix 2.

## Policy and planning framework

A number of national, state and regional plans and policies have guided the development of water sharing plans on the south coast including:

- *Water Management Act 2000*;
- Access Licence Dealing Principles Order 2004;
- National Water Initiative;
- Natural Resource Commission state-wide targets;
- Catchment Actions Plans; and
- Water planning policies and other considerations.

### Water Management Act 2000

The *Water Management Act 2000* (WMA 2000) was passed by NSW Parliament in December 2000, establishing a new statutory framework for managing water in NSW. The objective of the Act is to ensure the sustainable and integrated management of the state's water for the benefit of both present and future generations.

The WMA 2000 is based on the concept of ecologically sustainable development i.e. managing current development so that it will not threaten the availability of resources for future generations. The WMA 2000 recognises the need to allocate 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 access from land title.

Water sharing plans are the main tool through which the WMA 2000 achieves its objective. The major changes required to water management have meant that the WMA 2000 has been progressively implemented, and the old *Water Act 1912* progressively phased out as water sharing plans commence.

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

### Access Licence Dealing Principles

The *Access Licence Dealing Principles Order 2004* (hereafter referred to as the Dealing Principles) draws on the objects and water management principles of the WMA 2000 and provides state-wide guidance and rules for applications to undertake water dealings including trade.

The 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.

The Dealing Principles specify rules for different types of dealings (such as conversion to a new category, subdivision, consolidation, assignment of rights or allocation, changing water sources, amending extraction components and interstate dealings). They specify the requirements that must be met for a dealing to be permitted, and the conditions under which a dealing is prohibited.

Water sharing plans must be consistent with the Dealing Principles. Water sharing plans can also put additional restrictions in place such as restricting trade into a particular area due to its environmental values or hydrologic stress.

## 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 have agreed on actions to achieve a more cohesive national approach to the way Australia manages, measures, plans for, prices, and trades 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.

## Natural Resource Commission targets

The Natural Resource Commission (NRC) was established in 2003 to provide the NSW Government with independent advice on natural resource management issues. To achieve this, the NRC has developed a Standard for Quality Natural Resource Management, along with 13 state-wide targets for natural resource management which have been embedded in the NSW State Plan. The Standard is designed to apply to natural resource management at all scales including at the state, regional, catchment and local level.

The NRC's Standard requires the use of the best available knowledge, 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 are progressing. The NRC reviews water sharing plans against this standard and its associated targets. In 2013 the NRC reviewed 31 water sharing plans that were due to expire in 2014, and extended to 2016, and provided advice to the Minister for Primary Industries.

In 2012 the NRC reviewed the state-wide standard and targets, including monitoring, evaluation and reporting arrangements in NSW. They recommended five new state-wide targets that provide a sharper focus on the key long-term issues of concern to the Government and community and revised the monitoring, evaluation and reporting strategy to support the implementation of the new targets.

## Catchment Action Plans

Catchment Action Plans are statutory, non-regulatory plans that were previously prepared by the state's catchment management authorities under the *Catchment Management Authorities Act 2003* (now repealed). In January 2014 the NSW Government established Local Land Services and transferred the functions of catchment management authorities into this new organisation. South East Local Land Services will be responsible for continuing the delivery of natural resource management programs on the south coast.

The Southern Rivers Catchment Action Plan 2023 is a 10-year strategic plan that sets the direction for the sustainable use and care of the natural resources of the south coast and Snowy region. The Clyde River water sharing plan contributes to the goals and targets of this plan, in particular Goal 3, relating to the maintenance of diverse, healthy, connected and productive natural environments. The implementation of water sharing plans on the south coast is one of the key strategies to be implemented in supporting land and water managers to maintain or improve the condition of priority freshwater, marine and estuarine assets (SRCMA 2013).

## Water planning policies and considerations

A number of policies and guidelines have been developed since commencement of the WMA 2000. These policies have arisen in response to specific water management issues

that need to be considered during the development of water sharing plans. These policies directly influence the planning process and the formulation of water sharing rules.

### Protecting pools, lagoons and lakes

Pools 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. For the purpose of this policy a pool refers to any lentic water bodies (standing water) within or associated with unregulated rivers in NSW, including waterbodies that fall within the definition of a lake according to the Dictionary of the WMA 2000 (the exception is tidal pools and estuaries).

The policy document *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](http://www.water.nsw.gov.au). This document provides guidance for Interagency Regional Panels in setting water access and trading rules for pools that are covered by unregulated river water sharing plans.

The general approach is to establish a default access rule where no draw down is allowed below full pool capacity for the majority of pools. This default rule may be revised, where it is justifiable and feasible to do so, to allow limited access to pools based on local hydrological, environmental and socio-economic considerations.

Default rules vary depending on the pool type. Generally the default rule for artificial pools is to adopt the existing licence conditions; however in some circumstances where this may not be appropriate, alternate rules will need to be developed. For natural pools, the default rule requires users to stop pumping when the pool is less than its full capacity (approximated by the greatest pool volume at which there is no visible flow leaving the pool). The plan process allows for more lenient access rules to be set in the default rules would significantly impact on current irrigation operations.

### Managing surface water and groundwater connectivity

A key objective of the NWI is 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource'. Most alluvial aquifers have a relatively high degree 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 less connected to surface water sources and are included in groundwater-specific plans.

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

### Protecting basic landholder rights

Under the WMA 2000 basic landholder rights 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 where groundwater is accessed under a domestic and stock right, the bore must still be approved by DPI Water.

The WMA 2000 requires that water sharing arrangements must protect basic landholder rights. The plan does this by identifying the requirements for domestic, stock and native title rights at the start of the plan and taking these requirements into consideration when designing the rules for licensed water extraction. As the access rules for licensed extraction do not apply to basic landholder rights this provides a higher priority of access for those users.

The requirements of harvestable rights have been inherently considered in the water sharing process, as access rules are based on river flows that result after harvestable rights

extractions have occurred. There are currently no extractions for native title rights, however the plan allows for these rights should they 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 basic landholder rights. These restrictions are outside the framework of the water sharing plan.

The water sharing plan provides an estimate of the water requirements for basic landholder rights within each water source, noting that these rights may increase during the life of the plan. The water sharing plan cannot limit or restrict these rights, but the WMA 2000 provides for restrictions on basic landholder rights through the development of mandatory guidelines.

### **Protecting town water supply access**

Under the WMA 2000, extractions for town water supply are afforded a higher priority than extractions for commercial purposes such as irrigation. 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. Local water utilities (LWUs) such as local councils are issued with local water utility access licences. The WMA 2000 allows for annual trade but not permanent trade of entitlement between LWU access licences.

### **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 established the Aboriginal Water Initiative in 2012 to facilitate effective engagement with Aboriginal communities in the water sharing process and ensure that measurable Aboriginal water outcomes are achieved. The Initiative aims to build Aboriginal peoples' capacity to participate as water users, protect their rights to water, maintain a healthy environment, and take full advantage of economic opportunities.

Water sharing 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/yr per application. Opportunity for granting licences for Aboriginal cultural purposes throughout the Clyde catchment is included in the water sharing plan.

For further information refer to *Our Water Our Country. An information manual for Aboriginal people and communities about the water reform process* which is available from the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

### **Protecting estuary health**

Streamflow and groundwater discharge have an influence on many ecological components of an estuary, and play a significant role in the health of these systems. Therefore, water extraction from surface water or groundwater sources may have an impact on the ecological health of estuaries. Some estuaries are highly sensitive to freshwater inflows, whilst others are more resilient to changed inflows. The size and shape of estuaries vary and this, combined with the amount of freshwater inputs and extractions, determines the estuary's overall sensitivity to freshwater extraction. Where possible, extractions will be limited in catchments found to be highly sensitive to freshwater inflows.

The document *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation* provides further information about the principles used to determine estuary sensitivity to freshwater inflows.

### Water interception activities

Changes in land use activities can potentially result in the interception of significant quantities of surface runoff and throughflow. 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 NWI, significant interception activities should be accounted for within a plan's extraction limit.

Water sharing plans cannot restrict the volume of water collected under harvestable rights<sup>2</sup> but can place restrictions on instream dams – dams that are located on streams of third order or higher. Under state-wide policy the construction of new instream dams is prohibited in those water sources in which high instream values have been identified.

Placing restrictions on forestry activities is beyond the scope of the water sharing plan. DPI Water recognises the potential impacts of forestry activities on catchment hydrology and is currently developing state-wide policy in relation to this issue.

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<sup>2</sup> The maximum harvestable right dam capacity is calculated based on providing the ability to harvest 10% of the mean annual runoff from the landholder's property. It is determined using a calculator provided on the DPI Water website, with input parameters being property location and property size.

## Description of the plan area

The area covered by the Clyde River water sharing plan comprises the Clyde River catchment and adjoining coastal catchments between Broulee and Jervis Bay on the south coast of NSW (Appendix 2). The plan covers approximately 3,300 km<sup>2</sup> and contains 35 water sources of which 22 comprise small coastal streams and lagoons that flow directly to the sea. The plan area includes the towns of Batemans Bay, Sussex Inlet, Milton, Ulladulla and Huskisson which are all located on the coastal plain.

The Clyde River catchment is bounded by the Bundawang Range in the west with a plateau between the river and the coast forming the eastern boundary (DLWC 1999). The major tributaries entering the Clyde River are the Yadboro River, Bimberamala River, Currowan Creek and Buckenbowra River. The Clyde River flows into the sea at Batemans Bay. The catchment is largely undeveloped and around 95% of the banks and adjoining land along the river remains as native forest (SRCMA 2006).

The Clyde River estuary covers an area of approximately 17.5 km<sup>2</sup>, reaching upstream to the confluence with Cyne Mallowes Creek. The estuary is classified as a drowned river valley which is tide dominated (OEH 2012).

The water sharing plan includes many coastal streams between Batemans Bay and Jervis Bay that are not hydrologically connected to the Clyde River. These include Tomaga River and Candlagan Creek to the south, large coastal lakes such as Durras Lake, Termeil Lake, Burrill Lake, Conjola Lake, and Swan Lake to the north, and the catchments surrounding St Georges Basin and Jervis Bay. Most of the coastal lakes are shallow estuarine lakes that are intermittently open to the sea. Burrill Lake, Conjola Lake and St Georges Basin are all wave-dominated barrier estuaries (OEH 2012).

## Water management structures

All of the rivers and creeks in the Clyde River water sharing plan area are considered unregulated, having no major dams for water supply. Water users rely on natural river flows, although small dams and weirs may be present. Major instream structures include a weir on Croobyar Creek near Milton and Ulladulla Weir which is used as a tidal barrage.

The catchment includes several dams for the purpose of town water supply:

- Porters Creek Dam has a capacity of 1,900 ML and is operated by Shoalhaven Water;
- Deep Creek Dam has a capacity of 4,900 ML. It is operated by Eurobodalla Shire Council to provide a secure water supply for Eurobodalla Shire. The dam is filled by pumping from the Moruya (Deua) and Buckenbowra Rivers (Eurowater 2007); and
- Buckenbowra Dam has a capacity of 4.6 ML. It is operated by Eurobodalla Shire Council and is used to store water before transferring it to Deep Creek Dam (Eurowater 2007).

## Aboriginal history

Prior to European settlement the Yuin people were the traditional custodians of the south coast region. They occupied the coastal plains from the Shoalhaven River in the north to the Murray River in the south, and within this tribal area 13 sub tribal groups existed (Patterson Britton & Partners Pty Ltd 2009). The Yuin people travelled throughout the coastal zone and west into the Monaro tablelands for a variety of reasons including the sharing of resources and ceremonial purposes (Goulding and Waters 2005).

The earliest recorded population figure for the Eurobodalla area was recorded by the missionary Harper in his visit to Bateman's Bay in 1826 during which he met with a group of

146 Aboriginals noting that there were others nearby as evidenced by the smoke from various fires. In 1839 there were 117 Aboriginal people recorded in the Batemans Bay area.

The Yuin people were displaced from their land due to European settlement and the associated land use changes that occurred in the region. The arrival of whaling and sealing vessels travelling to the south coast during the early 1800s may have also transmitted diseases to the local Aboriginal people resulting in declining population numbers (Goulding and Waters 2005).

In the late 1800s and early 1900s Aboriginal population in the Clyde River district was centred on Batemans Bay and Nelligen. In 1893 an area of 60 acres was reserved for Aboriginal people on Currowan Creek near Nelligen and in 1902 nine acres was reserved on the edge of Batemans Bay township. Records from the Aboriginals Protection Board in 1899 show 16 Aboriginal people living in Batemans Bay and 9 at Nelligen. By 1902 there were 27 people living in Batemans Bay, increasing to 49 people by 1911. The reserve at Nelligen continued to support 8 or 9 people during this time.

Numerous sites around the Clyde River estuary are considered culturally significant by the Aboriginal community. One of the most significant areas is the Cullendulla Creek lowlands, which contain Aboriginal burial, midden and artefact scatter sites (Mills 1994).

### Early European history and land use

During December of 1797, George Bass, on an official journey of exploration along the south coast of NSW noted that the landscape of Bateman's Bay was hilly on the north and south sides and that:

"Grass grows tolerably upon them, but they seem only fit for feeding cattle. The land on the west side is low and wet, but a few grassy risings might afford good sites. The vallies (sic) and the slopes of several of the little hills at some distance back are capable of cultivation, some of them to great advantage. The only difference remarkable in the vegetable productions is the increased size of the swamp oaks" (Goulding and Waters 2005)

In 1821 a government party aboard the Snapper sailed from Sydney to explore the Bateman's Bay area. A report by Lieutenant Robert Johnston was later reproduced in the Sydney Gazette:

"I perceived an Inlet in the Head of the Bay.....which I have the Satisfaction to report to your Excellency, proved to be the Entrance of a fine, clear, capacious River, having a Bar, over which I carried nine feet Water, and then depend gradually in the Space of half a mile to six Fathoms, from whence I carried regular Soundings.....the Distance of twenty-five miles, and then encamped for the Night on the Western Bank. Considering this to be a Discovery, I named it 'River Clyde'."(Goulding and Waters 2005)

Early settlement on the south coast was patchy due to the rugged mountainous nature of the country. In the late 1820s a small number of pastoralists and settlers began to move into the area, and the 1830s and 1840s saw European settlement slowly increase due to the granting of more land for new properties. Many of the people and stock that moved into the area at this time came down from the tablelands via Braidwood and Araluen while others came by sea (Gibbney 1980).

In the 1840s timber harvesting began and sawmills proliferated in the 1860s (Goulding and Waters. 2005). The late nineteenth century saw a dramatic increase in the industry as contracts to supply sleepers for the state's developing railway network were acquired. In 1883 there were 13 sawmills in the Clyde River area including Kioloa, Batemans Bay, Shallow Crossing, Currowan Creek and Termeil (Goulding and Waters 2005). Timber was shipped from the Clyde River and Nelligen wharf by the Illawarra Steam Navigation Company (Eurobodalla Coast Tourism 2013).

Alluvial gold was discovered at Mogo Creek in the mid-1850s and by 1871 around 50 men were working in Mogo Creek. The township of Mogo developed rapidly to support the mining population. At its peak in the late 1800s there were more than 17 hotels in the area. The goldfields continued to be worked into the 20<sup>th</sup> century but by 1913 all the mines in the Mogo area had closed.

Although the miners were a largely transient population, this new phase resulted in the development of roads and the establishment of coach services and roadside inns. The gold rushes also led to greater demand for agricultural products to feed the dramatically increased population. Beginning in the mid-1860s there was a shift from beef cattle to dairy and the 1880s and 1890s saw a large scale move to dairying though out the South Coast and the development of the butter and cheese industry in the region. (Goulding and Waters 2005).

### Current land use

Batemans Bay has developed as a major commercial centre on the Eurobodalla coast. As well as acting as a regional service provider, Batemans Bay provides a range of tourism experiences focussing on the estuary and offshore activities such as fishing, diving and whale-watching.

Batemans Bay and the Clyde River estuary support a regionally important oyster industry with oyster leases covering around 249 ha of the estuary. The Clyde River estuary is the fifth largest producer of the Sydney rock oyster (*Saccostrea glomerata*) in NSW, and the largest on the south coast. It supports 17 growers who produce 610,000 dozen oysters a year (SRCMA 2011). The Clyde River estuary also supports a commercial fishing industry and is the eighth largest finfish producer on the south coast.

The Clyde River catchment encompasses the Shoalhaven region in the north (from Berry to North Durras) and the Eurobodalla region in the south (from North Durras to Broulee). The Shoalhaven region supports a large manufacturing industry that includes the manufacture of paper, starches and chemicals, valves, yachts and surf clothing (RDA-Far South Coast 2010). The industry contributes around \$450 million to the economy and the number of businesses has more than doubled in the last 20 years (RDA-Far South Coast 2010). Agriculture generates around \$40 million to the Shoalhaven economy through dairy, nursery, seed and flower products, small-scale wine producers and the fishing industry (RDA-Far South Coast 2010).

The Eurobodalla region has traditionally been an agricultural region, with extensive grazing land and highly productive dairy producers (RDA-Far South Coast 2010). Today the agriculture industry accounts for just three per cent of workers in the region. Other key industries include property and business services, education and manufacturing (ACT Commissioner for Sustainability and the Environment 2009).

Over 85,000 ha (around 47%) of the Clyde River catchment is protected as national parks and nature reserves. The largest national parks are Morton, Monga and Budawang, of which the last two are declared wilderness areas. Clyde River National Park features 9 km of estuary foreshores while Murrumbidgee National Park protects 44 km of coastal forests, beaches and lagoons.

The 81,628 ha of State Forests within the Clyde River catchment represents about 44% of the catchment area. They are managed for a range of uses, principally timber production and are subject to harvesting for sawlogs and other timbers such as poles, fencing, firewood and pulpwood (WBM Oceanics 2004).

## Climate

The Clyde River catchment experiences a cool temperate climate. Mean annual rainfall along the coast varies from 1,400 mm at Jervis Bay to 1,000 mm at Batemans Bay and Broulee in the south (Figure 1). Away from the coast mean annual rainfall is generally within the range of 1,000-1,200 mm per year. Rainfall in the north tends towards a summer-autumn dominance such as at Ulladulla where mean monthly rainfall from February to June exceeds 100 mm (Figure 2). In the south, rainfall shows a slight spring-summer dominance with mean monthly rainfall at Batemans Bay ranging from 43 mm in July to 98 mm in February.

January and February are generally the hottest months with mean maximum temperatures at Ulladulla being 24°C in both months (BOM 2014). Further south at Batemans Bay the mean monthly temperature in January reaches 25.8°C. Mean minimum temperatures for July are 4.1°C at Ulladulla and 3.7°C at Batemans Bay for July (BOM 2016).

Figure 1: Average annual rainfall for the Clyde River catchment

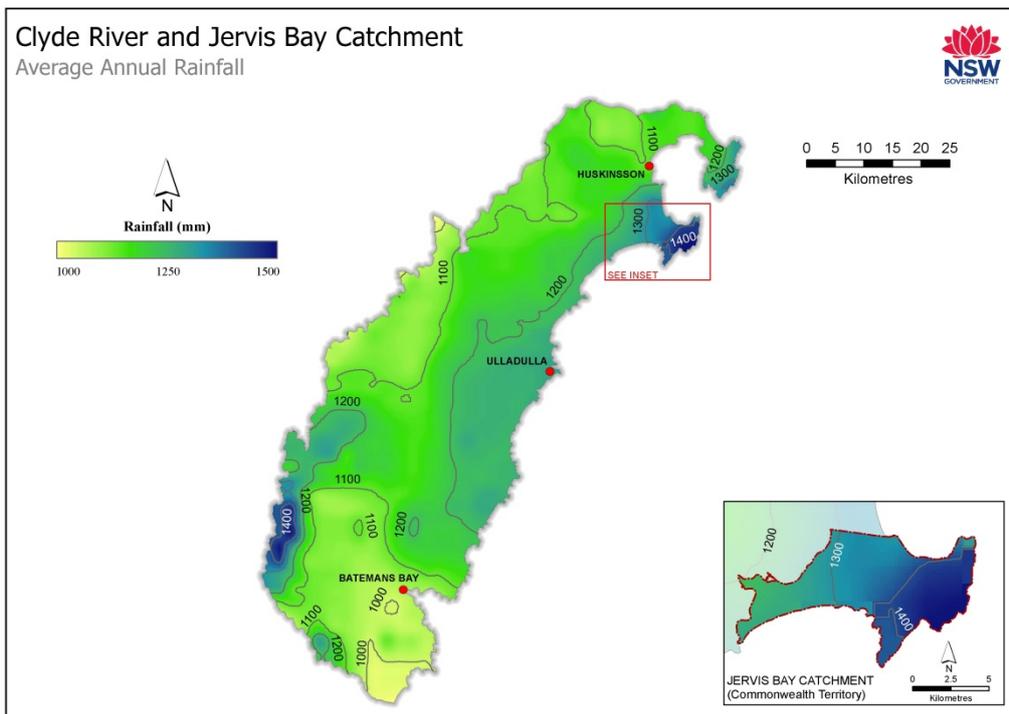
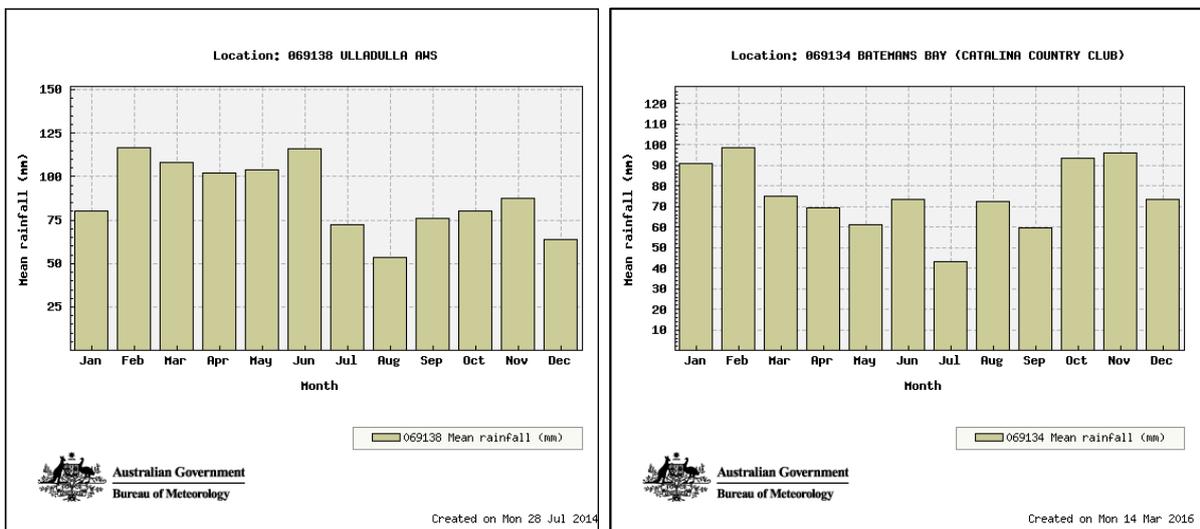


Figure 2: Average monthly rainfall at Ulladulla (1991-1994) and Batemans Bay (1985-2015)



Source: BOM 2016 Climate Data Online

## Ecological values

The Clyde River catchment contains several wetlands of state and national significance. The estuary itself is included as a wetland of national significance in the Directory of Important Wetlands in Australia (Department of the Environment 2010). It supports relatively large areas of mangrove, saltmarsh and seagrasses making it a representative example of an estuarine wetland that is in good condition. A number of other coastal lakes and wetlands north of the Clyde River are also of national significance. Details of these wetlands listed from north to south are shown in Table 1 (Department of the Environment 2010).

**Table 1: Nationally important wetlands in the Clyde River catchment**

Wetland	Description	Significant values
Wollumboola Lake	Large brackish coastal lake intermittently connected to the ocean.	Supports surrounding wetlands of casuarina forest, teatree scrub, saltmarsh and sedgelands. Supports threatened flora and fauna species and habitat for migratory waders. Important fisheries habitat with 41 species recorded.
Beecroft Peninsula	Northern headland of Jervis Bay.	Diverse vegetation with high conservation value. Supports variety of freshwater and estuarine types including mangroves, saltmarsh and sedgelands, as well as other habitats including coastal scrub, heathland, eucalypt forest and littoral rainforest.
Jervis Bay	Large estuarine inlet with surrounding tidal, intertidal and estuarine wetlands.	Supports large areas of seagrass and a number of significant wetlands associated with major tributaries that enter the bay. Supports endangered ecological communities, threatened flora and fauna species, and provides habitat for migratory waders.
St Georges Basin	Large estuarine inlet	Supports large areas of seagrasses, habitat for migratory waders and threatened flora and fauna species
Meroo Lake	Large coastal lagoon with associated estuarine wetlands.	Supports large stand of estuarine sedgeland which is near its southern limit. Contains a mosaic of vegetation communities not often seen elsewhere. Supports threatened fauna species including the only population of Green and Golden Bell Frog found in coastal lakes.
Tabourie Lake	Large estuarine lake	Supports significant areas of saltmarsh and threatened flora and fauna species.
Termeil Lake	Large coastal lagoon	Largely undisturbed catchment. Supports a significant complex of freshwater wetlands in very good condition and threatened fauna species.
Durras Lake	Large coastal lake intermittently connected to the ocean.	Significant habitat for prawns, crustaceans and fish. Catchment is largely undisturbed with less than 1% cleared. Supports threatened flora and fauna species.
Clyde River Estuary	Large estuary	Supports relatively large areas of mangroves, saltmarsh and seagrass beds. Important fisheries habitat, supports threatened fauna species and provides habitat for migratory waders.
Cullendulla Creek and Embayment	Drowned creek gully	Example of a geomorphological system that is uncommon in NSW providing a record of shoreline trends over the past 10,000 years. Important geomorphic research site. Supports mangrove and saltmarsh communities. Significant Aboriginal site.

The Clyde River supports the largest area of estuarine wetlands of any estuary on the south coast (WBM Oceanics 2004). There are 54 discrete wetlands protected under *State Environmental Planning Policy No. 14 (Coastal Wetlands)* comprising significant areas of mangroves, seagrass and saltmarsh (WBM Oceanics 2004).

The Cullendulla Creek floodplain contains sand ridge features of national scientific interest as they represent a landform that is uncommon in NSW. The estuarine wetland, including the sand flats at the mouth of the creek, is an important area for waterbirds, including international migratory waders. Aboriginal sites in the Cullendulla Creek area are of cultural and scientific significance with over thirty Aboriginal sites recorded in the area (Mills 1994).

Batemans Bay is one of only two estuaries on the Eurobodalla coast that supports strapweed (*Posidonia australis*), a seagrass which is sensitive to habitat change, and recovers slowly if disturbed. Healthy beds are located in sheltered areas of the bay at Batehaven and Longbeach. The dominant seagrass in the estuary is *Zostera spp* which occurs in Cullendulla Creek, Buckenbours Creek and as far up the river as Cyne Mallowes Creek (Creese *et al* 2009).

### Threatened species

The ecological values and threatened species known or expected to occur in each of the Clyde River Water Sources are identified in Appendix 3. These species have been considered as part of the macro-classification approach to determining water sources with high environmental values.

The Clyde River catchment supports a known population of Australian Grayling, an endangered fish species that is listed as Vulnerable under the Threatened Species Conservation Act 1995. The Australian Grayling occurs in coastal streams and lagoons from the Shoalhaven River southwards to the Otway Ranges of Victoria and in Tasmania. Adult fish spawn in freshwater and the newly hatched larvae drift downstream and out to sea where they remain for around six months. Juveniles then return to the freshwater environment in late spring where they remain for the rest of their lives (Backhouse *et al* 2008).

There are no reliable population estimates for Australian Grayling however the species is reported to be relatively uncommon. All rivers and streams where this species is found are therefore important to the species survival as it is unknown which populations are the most effective in terms of reproductive success (Department of the Environment 2013). The Clyde River is considered to be one of the most important habitats for this species on the south coast of NSW (Backhouse *et al* 2008). Further research and surveys on the size and distribution of Australian Grayling populations are being undertaken as part of a national recovery plan (Backhouse *et al* 2008).

A number of threatened frog species are found within the Clyde River catchment including the Giant Burrowing Frog, Green and Golden Bell Frog, Littlejohn's Tree Frog, and Stuttering Barred Frog which are known to occur in most of the Clyde Water Sources. The catchment's coastal lagoons and estuaries support 14 threatened bird species including migratory waders that are protected under international agreements.

Waterwheel plant (*Aldrovanda vesiculosa*) is an aquatic member of the sundew family that is listed as endangered in NSW under the TSCA 1995. It is known to occur in freshwater lagoons and wetlands from the Clyde River catchment south to Wallaga Lake. The plant floats below the water surface where it traps and digests aquatic insects.

### Estuary sensitivity

Estuary specialists from the Office of Environment and Heritage and former Department of Water and Energy assessed each of the state's estuaries to determine how sensitive they are to changes in freshwater inflows (DWE 2009).

The assessment ranks the sensitivity of estuaries based on their physical attributes – size, shape and the ratio of catchment size to the surface area of the estuary. Small estuaries, such as the coastal lagoons north of Batemans Bay, tend to be highly sensitive to inflow variations, with most being only intermittently connected to the ocean. Barrier estuaries such as the Clyde River estuary and St Georges Basin are generally less sensitive to inflow variations. As they mature and infill with sediment they tend to become long and narrow ‘river’ estuaries.

Table 2 lists the sensitivity of each of the estuaries in the Clyde River water sharing plan. The method used for assessing estuary sensitivity is detailed in *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*.

**Table 2: Inflow sensitivities for the estuaries within the plan area**

Name of estuary	Inflow sensitivity low flows	Inflow sensitivity high flows
St Georges Basin	Low	Low
Swan Lake	High	High
Berrara Creek	High	High
Nerrindillah Creek	High	High
Lake Conjola	Medium	Medium
Narrawallee Inlet	Medium	Medium
Mollymook Creek	High	High
Ulladulla Harbour	Low	Low
Burrill Lake	Low	Low
Tabourie Lake	High	Medium
Termiel Lake	High	Medium
Meroo Lake	High	Medium
Willinga Lake	High	High
Kioloa Lagoon	High	High
Durras Lake	High	High
Clyde River	Low	Low
Tomaga River	High	Medium

### Tidal pools

For the purposes of macro planning a tidal pool is defined as the freshwater section of a coastal river that is affected by both tidal and freshwater processes. This is usually the section between the tidal water fluctuation limit and the upper mangrove limit (DWE 2009). Depending on the river and its characteristics, tidal pools across the state vary significantly and in some cases may represent a significant proportion of the estuary and in others may be ephemeral or diminish significantly during low flows events (DWE 2009).

Tidal pools on the south coast tend to be relatively small and ephemeral compared to those on the north coast of the state. The tidal pool on Candlagan Creek is classified as an ephemeral tidal pool, while the tidal pool on the Clyde River disappears during extended periods of low flow (DWE 2009).

## Groundwater

The northern part of the Clyde catchment consists of extremely rugged mesa and canyon formations carved from sandstones, conglomerates and siltstones of the Sydney Basin, whilst the remainder consists of steep ridge and valley terrain carved from the metasediments of the Lachlan Fold Belt (Wray *et al* 2010). The main aquifer of the region is the Sydney Basin - South Coast groundwater sources. The plan area also contains small coastal sand aquifers, small alluvial aquifers and aquifers of the Lachlan Fold Belt.

There has been relatively little development of the alluvial groundwater system in the Clyde River catchment. The most extensive alluvial deposits along the Clyde River extend to approximately 250 metres wide and consist of a series of discontinuous sandy loam and silty sand deposits overlying coarse gravels (Wray *et al* 2010).

Alluvial deposits occur to some extent in most of the coastal water sources. The largest deposits are associated with Currumbene Creek, Tomerong Creek (St Georges Basin), Wandandian Creek, Narrawallee Inlet, Conjola Lake, Tabourie Lake, Meroo Lake and the Tomaga River.

## River flows

There are currently four active gauges within the Clyde River catchment that monitor streamflows on a daily basis. Three of these gauges are used as flow reference points to define the water sharing rules within the plan (Table 3). Historical records are also available for several discontinued gauges throughout the catchment.

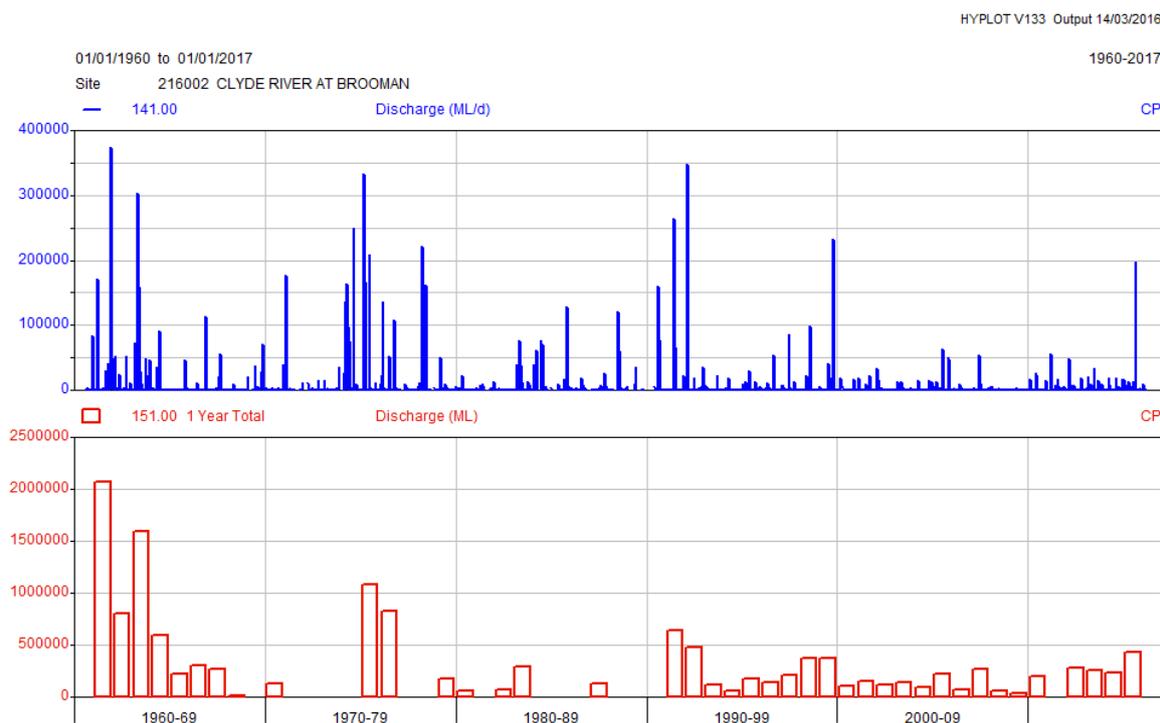
Average annual flow in the Clyde River at Brooman is 340,652 ML/yr for the period 1960 to 2013. Annual streamflows have ranged from 17,139 ML in 1968 to over 2,000,000 ML in 1961. Major floods have occurred in the Clyde River in 1961, 1963, 1975, 1976, 1991 and 1992 with the peak flow of these events all exceeding 250,000 ML/d (Figure 3).

The Clyde River rarely ceases to flow. Daily flows in the river at Brooman are less than 1 ML/d around 2% of the time.

Table 3: Gauges used as flow reference points

Gauge	Location	Catchment area	Mean Annual Flow	Commenced
216002	Clyde River at Brooman	857 km <sup>2</sup>	340,652 ML/yr	1960
216004	Currumbene Creek at Falls Creek	95 km <sup>2</sup>	20, 486 ML/yr	1969
216009	Buckenbowra River at Buckenbowra No. 3	168 km <sup>2</sup>	29,976 ML/yr	1985

Figure 3: Daily (monthly maximum) and annual flows in the Clyde River at Brooman 1960-2015



### Entitlement and use

At the commencement of the plan, there were approximately 95 water licences in the Clyde River water sharing plan area covered by the plan, totalling 3,493.5 ML/yr of entitlement (Table 4). The majority of this is for unregulated surface water licences (3,462.5 ML/yr) while alluvial groundwater entitlement totals 31 ML/yr. The total entitlement for the plan represents approximately 1% of the average annual discharge of the Clyde River at Brooman.

There has been an embargo on granting new water licences on the south coast since 2007. Alluvial aquifers were embargoed in 2008.

These figures do not include extractions that may be occurring from various tidal pools within the plan area which are currently not licensed under the *Water Act 1912*. Under the WMA 2000, which takes effect when a water sharing plan commences, all works located in the tidal pool will need to be licensed. DPI Water has developed a tidal pool licensing regulation and is currently identifying unlicensed works, determining the associated history of use and establishing whether a licence should be granted under that regulation. The following water sources have been identified as having tidal pools where extraction may potentially be occurring:

- Clyde Estuary;
- Currowan Creek;
- Cyne Mallowes Creek;
- Mid Clyde River; and
- Nelligen Creek.

Table 4: Total entitlement\* and number of licences for each water source

Extraction Management Unit	Water Source	Unregulated river entitlement (ML/yr)	Aquifer access entitlement (ML/yr)	Number of licences
Buckenbowra River	Buckenbowra River	1,384	0	1
	<b>SUB-TOTAL</b>	<b>1,384</b>	<b>0</b>	<b>1</b>
Clyde Coastal	Berrara Creek, Durras Lake Tributaries, Kioloa, Moona Moona Creek, Nerrindillah Creek, North Jervis Bay, Tabourie Lake, Termeil Lake, Wollumboola Lake	0	0	0
	Burrill Lake	190	0	4
	Candlagan Creek	1.5	5	4
	Conjola Creek	62	0	3
	Conjola Lake	7	0	2
	Currambene Creek	94	0	4
	Meroo Lake	4	0	1
	Narrawallee Inlet	218	6	18
	South Jervis Bay	5	0	1
	St Georges Basin	14.5	0	8
	Swan Lake	7	0	4
	Tomaga River	45.5	5	15
	Wandandian Creek	128	0	10
	Willinga Lake	0	10	2
	<b>SUB-TOTAL</b>	<b>776.5</b>	<b>26</b>	<b>76</b>
Clyde River	Bimberamala River, Boyne Creek, Currowan Creek, Cyne Mallows Creek, Holland Creek, Nelligen Creek, Yadboro River	0	0	0
	Clyde Estuary Tributaries	36	0	5
	Cockwhy Creek	10	5	4
	Mid Clyde River	252	0	7
	Pigeon House Creek (TWS)	1,000	0	1
	Upper Clyde River	4	0	1
	<b>SUB-TOTAL</b>	<b>1,302</b>	<b>5</b>	<b>18</b>
<b>TOTAL</b>		<b>3,462.5</b>	<b>31</b>	<b>95</b>

\* Under the WMA 2000, licences are granted "share component" rather than "entitlement". The term "entitlement" has been retained in this document due to its common usage. Share component is granted as unit shares for unregulated river access licences, and as ML/yr for local water utility and domestic & stock access licences. For ease of reporting, the total share component has been recorded as ML/yr.

### Water extraction in the unregulated surface water sources

The majority of the unregulated surface water licences in the plan area are located along Wandandian Creek, Croobyar Creek (Narrawallee catchment) and Tomaga River and its tributaries. The north-western and south-western part of the plan area contains few licences due to the majority of the area being national park.

Three water sources, Wandandian Creek, Narrawallee Inlet and Burrill Lake, were classified as having medium economic dependence on commercial extraction. No water sources were classified to have high economic significance to local communities.

Of the total entitlement across the plan area, 69% is for town water supply, 26% is for agriculture, 1.5% for industrial purposes, 1.5% for recreational purposes and the remainder is for stock, domestic and farming purposes. Agricultural uses of water include irrigated pastures for dairy and to a lesser extent beef and horticulture.

Long-term records of water use are not available as there is no broad-scale metering in the plan area.

### Water extraction in the alluvium

Alluvial groundwater is extracted from nine water sources in the plan area (Table 4). The largest entitlements are located in the Candlagan Creek, Cockwhy Creek, Narrawallee Inlet, Tomaga River, and Willinga Lake Water Sources. The majority of alluvial aquifer licences are used for stock, domestic and farming purposes.

Alluvial sediments can be categorised as 'upriver alluvium' or 'coastal floodplain alluvium'. Upriver alluvium nominally occurs upstream of the tidal limit and is sandier than coastal floodplain alluvium. The Clyde River water sharing plan does not differentiate between upriver and coastal floodplain alluvium; both types of alluvium are subject to the same rules. At plan commencement, all alluvial aquifer licences in the Clyde River water sharing plan were located in the upriver alluvium.

As with surface water, no detailed water usage data is available in the alluvial groundwater sources.

### Local water utility requirements

Two town water supplies are located within the Clyde River catchment. These supplies are administered through Shoalhaven City Council and Eurobodalla Shire Council. Together these licences comprise a large proportion of the total entitlement in the plan (Table 5).

Porters Creek Dam is managed by Shoalhaven Water to supply town water to Milton, Mollymook, Ulladulla, Kings Point, Burrill Lake, Lake Tabourie and Narrawallee. Water is extracted from the Buckenbowra River by Eurobodalla Shire Council to supply town water to South Durras and Batemans Bay.

Deep Creek Dam, the major town water storage (4,900 ML) for Eurobodalla Shire, is located about 5 kilometres south of Batemans Bay in the Clyde Estuary Tributaries Water Source. An integrated water supply system allows water extracted from the Buckenbowra, Moruya (Deua) and Tuross rivers to be transferred to and stored in Deep Creek Dam.

Table 5: Town water supplies, location and entitlement in the plan area

Water supply	Water Source	Entitlement (ML/yr)	Percentage of total entitlement
Porters Creek Dam	Pigeon House Creek	1,000	29%
Buckenbowra River	Buckenbowra River	1,384	40%

Generally, town water supplies are sourced from Deep Creek Dam during:

- droughts or periods of high demand, when river intakes cannot provide sufficient water; and
- flood periods, when river water is dirty and not suitable for distribution (Eurowater 2007).

During normal conditions, streamflows from the Moruya (Deua) and Tuross rivers provide sufficient water to meet town water demands.

With the continued increase in population within the Clyde River catchment together with the drought events experienced over the last decade, local water utilities are currently investigating ways to increase their bulk water supplies. Eurobodalla Shire Council has developed an integrated water cycle management strategy (DPWS 2010) that investigates options available for securing the region's water supplies for drought periods. These include options such as raising the wall of Deep Creek Dam, creating new southern off-river storage on the Tuross River, creating new central off-river storage on the Moruya River and desalination (DPWS 2010). Any town water supply augmentations will need to meet conditions specified in the plan to protect environmental flows in accordance with the plan.

## The process of developing the water sharing plan

DPI Water is responsible for implementing the WMA 2000, including developing water sharing plans for the state's water resources. DPI Water established several interagency panels to assist with the development of water planning policies and water sharing plans. The preparation of the Clyde River water sharing plan was guided by three panels:

- the State Interagency Panel;
- the South Coast Working Group; and
- the South Coast Interagency Regional Panel.

The role of each of these panels is discussed below.

The draft Clyde River water sharing plan was prepared based on:

- the indicative rules generated by a risk and values classification (explained later in this section);
- the deliberations of the Working Group and the Regional Panel; and
- feedback from stakeholders during targeted consultation.

The draft plan was publicly exhibited throughout the plan area. Comments and feedback received during the public exhibition period were considered by the Working Group and the Regional Panel in finalising the water sharing plan.

This section describes the panels and briefly discusses the process of developing the Clyde River water sharing plan including the risks and values classification, refining the indicative rules, and the specific outcomes of panel deliberations, targeted consultation and public exhibition.

Full details of the macro-planning approach and the classification method is available in the document *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*. This document is available on the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

### State Interagency Panel

The State Interagency Panel has overall responsibility for the strategic direction of water planning in NSW, 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 State Interagency Panel also has the role of making water sharing decisions in cases where regional panels cannot reach agreement or where the issue has state-wide significance.

The State Interagency Panel is chaired by DPI Water and comprises representatives from the Department of Primary Industries, the Office of Environment and Heritage and Local Land Services (formerly catchment management authorities). DPI Water is responsible for the overall project management.

### South Coast Working Group

The South Coast Working Group (the Working Group) comprises a range of officers representing the various functions of DPI Water such as plan and policy development, licensing and compliance, hydrometrics and environmental protection. The Working Group was responsible for collating information and developing recommendations to be considered by the Regional Panel.

## Interagency Regional Panel

Interagency Regional Panels were established across NSW to develop water sharing plans. The South Coast Interagency Regional Panel (the Regional Panel) comprises representatives from the Department of Primary Industries, the Office of Environment and Heritage and the South East Local Land Services (formerly Southern Rivers Catchment Management Authority) as an observer. Appendix 4 lists the names of panel representatives and their areas of expertise, and also lists relevant colleagues who the panel had access to for specific technical and scientific information.

The key responsibilities of the Regional Panel were to:

- ensure water sharing rules are consistent with state policy;
- review the water management units provided by DPI Water;
- review 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 water access and dealing 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.

The South Coast IRP used local knowledge and expertise in developing and recommending the water sharing rules through a consensus decision-making approach.

## Water source classification method

In developing water sharing plans for unregulated rivers, DPI Water classifies each water source based on the risks and values of water extraction.

Specifically the classification process involves assessing:

- instream values (such as threatened fish species) and the risk to these values posed by existing or increased extraction;
- hydrologic stress, based on the demands for licensed extraction relative to river flows;
- the risk to instream values posed by extractions;
- extraction value, a qualitative assessment of the economic value of the agriculture which relies on the water licensed for extraction;
- the economic dependence of the local community on activities requiring licensed water extraction; and
- the sensitivity of estuaries to the removal of freshwater inflows.

For the Clyde River water sharing plan, each water source was classified according to these values and risks. The Regional Panel then reviewed these classifications against a range of reference material and data including irrigation data, hydrologic data, aquatic ecology information, fisheries data, and threatened species data. Extraction patterns by local water utilities were also examined. A list of data and reference material that was used by the panel can be found in Appendix 5.

As part of this review, the Regional Panel revised the indicative classifications for several water sources:

- Buckenbowra River – Risk to instream values were revised from low to medium based on the significant level of town water extracted from the water source and

revised the instream values from high to medium due to existing dry land agricultural development in the catchment

- Burrill Lake – Hydrologic stress and risk to instream values was revised from low to medium based on the considerable level of licensed entitlement and BLR and the instream values were revised from high to medium due to the considerable level of development in the water source
- Candlagan Creek – Instream values were revised from high to medium due to the considerable level of development in the water source
- Clyde Estuary Tributaries – Community dependence on extraction was revised from medium to low based on the small volume of total entitlement in this water source
- Conjola Creek – Instream values were revised from high to medium due to a moderate level of agricultural development in the water source
- Currambene Creek – Instream values were revised from high to medium based on the significant level of development in the catchment
- Cyne Mallowes Creek – In stream values were revised from high to medium due to the small catchment areas of the water source and the relatively small contribution to flows in the Clyde River
- Kioloa – Instream values were revised from high to medium due to the significant percentage of cleared land in the water source
- Meroo Lake – Instream values were revised from high to medium due to the significant percentage of cleared land in the water source
- Narrawallee Inlet – Instream values were revised from high to medium due to the considerable level of agricultural development in the water source
- Nerrindillah Creek – Instream values were revised from low to medium due to the high percentage of uncleared land in this water source
- Pigeon House Creek – Hydrologic stress was revised from medium to low on the basis that the Macro process reflected the hydrologic impact of irrigation entitlement
- St Georges Basin – Instream values were revised from high to medium due to the considerable development in the water source
- Tabourie Lake – Instream values were revised from high to medium due to the level of development in the water source
- Termeil Lake – Instream values were revised from high to medium due to the level of development in the water source
- Tomaga River – Instream values were revised from high to medium due to the level of development in the water source
- Wandandian Creek – Hydrologic stress was revised from low to medium due to the considerable level of agricultural development in this water source
- Willinga Lake – Instream values were revised from high to medium based on the level of development in the water source

The finalised water source classifications were used to generate *indicative* access and trade rules which are discussed in the following section. The final classifications determined by the Regional Panel for all water sources are summarised in Appendix 6.

## Refining the indicative rules

Along with dealing rules, the flow classes and daily access rules generated the most discussion and feedback from stakeholders. The Regional Panel used local knowledge and expertise to develop the access rules for the water sharing plan. As discussed previously the macro classification approach was used to define some indicative water sharing rules and in some instances these were refined by the panel using site specific considerations such as:

- the availability of infrastructure such as river gauges;
- the availability of management systems;
- any existing water sharing arrangements; and
- whether flow regimes within different areas of a water source required differing management rules for those sub-areas.

A limited number of water users in the Clyde River catchment have had a water sharing agreement in place via the conditions on their licence. These existing water sharing arrangements, plus any licence restrictions in place as a result of Land Board hearings were examined by the Regional Panel to determine whether they achieved the required level of environmental protection and provided for BLR.

Consideration was also given to each of the estuaries in the plan area to see if any additional catchment-wide protection was required. The specific requirements of threatened species in relation to reproductive needs, migration or other particular ecological activities were considered where information was available.

## Consultation

The draft rules formulated by the Regional Panel underwent targeted consultation with specific interest groups<sup>3</sup> and water users who had the opportunity to provide input to proposed water management rules before the plan was drafted.

Targeted consultation on the proposed rules for the Clyde River draft water sharing plan began in December 2005 and continued through the development of the water sharing plan until public exhibition in May 2013. The consultation process was facilitated by the former Southern Rivers CMA (now South East Local Land Services) whose role was to ensure that all stakeholders and interested parties had an opportunity to examine and comment on the proposed water sharing rules.

In particular, stakeholders were encouraged to provide:

- feedback on the potential economic and social impacts of proposed rules;
- local knowledge and expertise, for example, other natural or socio-economic values that have not yet been considered by the panel;
- feedback on the practical elements of the proposed water sharing rules to ensure they are easily implemented by the licence holders. This included 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;
- confirmation that there were no unintended outcomes from the plan; and
- specific comments on the Minister's notes included in the draft water sharing plan.

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<sup>3</sup> 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.

The following organisations were consulted during the targeted consultation process:

- Shoalhaven City Council;
- Eurobodalla Shire Council;
- NSW DPI;
- Southern Rivers CMA;
- Coast Watchers (environmental organisation); and
- Aboriginal community through Aboriginal Officers at the Southern Rivers CMA.

### Public exhibition

Public exhibition is the formal exhibition of a draft water sharing plan where the Minister invites submissions on the draft plan and in particular seeks comment on a range of key issues.

Public exhibition of the draft Clyde River water sharing plan was held from 6 May to 28 June 2013 with the plan documents available for viewing at six locations on the south coast (Nowra, Sanctuary Point, Milton, Moruya, and two locations in Batemans Bay). Licence holders were sent letters advising of the public exhibition period. Public meetings were held at Milton and Moruya on 21 and 22 May 2013 respectively. The objectives of this consultation were:

- to provide background to stakeholders as to why the water sharing 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.

Three written submissions were received on the draft plan (two from water users and one from Eurobodalla Shire Council). The main issues raised in the submissions related to the proposed cease-to-pump rule and town water supply.

In July 2013 the South Coast IRP considered all of the issues raised in written submissions and those voiced at public consultation meetings. A summary of these issues and the resulting outcomes and decisions of the Panel are presented in Appendix 7.

## Water sharing rules

The Clyde River water sharing plan establishes a framework for water sharing that defines:

- planned environmental water to protect instream environmental values;
- water that is required to meet BLR;
- water that is required to meet licensed water extraction (including domestic and stock, local water utilities, unregulated river access licences and aquifer access licences);
- long-term extraction limits and available water determinations (AWDs) for each water source;
- rules for granting access licences;
- rules for water allocation account;
- flow classes and daily access rules for managing licensed extraction from unregulated rivers and alluvial aquifers;
- rules for water supply work approvals; and
- access licence dealing rules, which control the trade of water within or into other water sources.

The following section provides further background on each of these components, and outlines the information and methods used in developing the specific water sharing rules.

### Planned environmental water

The water sharing plan identifies and protects water for environmental purposes in each water source. This is defined as 'planned environmental water' and consists of water that is remaining within the stream or aquifer after water has been taken for BLR and access licences in accordance with the rules of the plan.

In unregulated streams planned environmental water is generally delivered through two mechanisms:

- On a daily basis environmental water is protected through the implementation of 'cease-to-pump' rules and total daily extraction limits which are applied to water access licences.
- On an annual basis environmental water is protected through the establishment of long-term average annual extraction limits.

The Regional Panel set cease-to-pump rules for each water source in the Clyde River catchment which are discussed in the section on daily flow rules. For water sources where cease-to-pump rules could not be practically linked to a gauging station, the plan applies simple visual rules to protect environmental water such as a 'no visible flow' rule, and no pumping from instream or off-river pools when the pool is less than full capacity.

### Requirements for water

The water sharing plan defines all of the licensed and unlicensed (BLR) requirements for water within the Clyde River catchment. BLR (comprising domestic and stock, and native title rights) must be provided for and protected within a water sharing plan. The water sharing plan provides an estimate of the water requirements for domestic and stock rights within each water source. BLR requirements were estimated using ABS data of houses without reticulated water supply and estimated water usage based on climatic / landscape region and land use.

At the start of the Clyde River water sharing plan:

- BLR were estimated at 237 ML/yr;
- Domestic and stock access licences accounted for 38 ML of entitlement per year;
- LWU access licences accounted for 2,384 ML of entitlement per year;
- Unregulated river access licences accounted for 1,040.5 unit shares (a unit share is equivalent to 1 ML in years where 100% of entitlement is allowed to be extracted); and
- Aquifer access licences accounted for 31 unit shares (a unit share is equivalent to 1 ML in years where 100% of entitlement is allowed to be extracted).

## Managing extractions

The Clyde water sharing plan establishes long term average annual extraction limits (LTAAELs) to manage extractions from surface water resources and alluvial groundwater in each of the three EMUs.

The LTAAEL for the Buckenbowra EMU comprises:

- the number of share components in the Buckenbowra River Water Source at plan commencement (1,384 ML/yr); plus
- an estimate of BLR in these water sources (43 ML/yr); plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

The LTAAEL for the Clyde River EMU comprises:

- the number of share components in the Bimberamala River, Boyne Creek, Clyde Estuary Tributaries, Cockywhy Creek, Currowan Creek, Cyne Mallowes Creek, Holland Creek, Mid Clyde River, Nelligen Creek, Pigeon House Creek, Upper Clyde River, Yadbora River water sources at plan commencement (1,307 ML/yr); plus
- an estimate of BLR in these water sources (49 ML/yr); plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

The LTAAEL for the Clyde Coastal EMU comprises:

- the number of share components in the Berrara Creek, Burrill Lake, Candlagan Creek, Conjola Creek, Conjola Lake, Currambene Creek, Durras Lake, Kioloa, Meroo Lake, Mooa Moona Creek, Narrawallee Inlet, Nerrindillah Creek, North Jervis Bay, South Jervis Bay, St Georges Basin, Swan Lake, Tabourie Lake, Termeil Lake, Tomaga River, Wandandian Creek, Willinga Lake and Wollumboola Lake Water Sources at plan commencement (802.5 ML/yr); plus
- an estimate of BLR in these water sources (145 ML/yr); plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

At plan commencement, the LTAAELs for the Buckenbowra EMU, Clyde River EMU and the Clyde Coastal EMU were 1,427 ML/yr, 1,356 ML/yr and 947.5 ML/yr, respectively.

The LTAAELs for all three EMUs incorporate an allowance to increase entitlement following conversion of low flow entitlement to high flow entitlement.

To protect water for the environment and the supply to existing users, it is important to control any growth in water use that is above the LTAAEL. In each EMU, a reduction in allocated water may be triggered if the average annual usage over any three year period exceeds the LTAAEL by more than five per cent. Reductions in allocation will be

implemented by reducing the available water determination (AWD) which is the basis of crediting water into the water allocation account of each water access licence. The AWD for unregulated river access licences is set at 1 ML per unit share unless a reduction in allocation is required. If a reduction in allocation is required the AWD for unregulated river access licences will be reduced to less than 1 ML per unit share in order to manage extractions.

Specific purpose access licences such as domestic and stock or local water utility access licences, will be permitted to extract 100% of their share component, except in years of exceptional drought. During periods of extremely low stream flow, daily access rules may limit extraction so that the full annual entitlement cannot be realised.

This approach to managing long term extractions in the Clyde River water sharing plan is the default position adopted for all unregulated rivers across the state.

### **Granting new access licences**

Consistent with the WMA 2000, the Clyde River water sharing plan does not permit the granting of new unregulated river access licences. Any new commercial development must purchase entitlement from existing access licences consistent with the dealing rules defined in the water sharing plan. Similarly, the plan does not permit the granting of Aboriginal community development licences<sup>4</sup> (ACDLs) or the conversion to high-flow-only access licences – the reasons for this are discussed below. The water sharing plan does however permit the granting of Aboriginal cultural licences, and domestic & stock licences (only from tidal pools).

### **Aboriginal community development access licences**

Many of the rivers in NSW already have a high number of irrigation licences and are generally judged to be ‘stressed’, particularly during dry times when river flows are low. However in coastal rivers, higher and more reliable flows may provide an opportunity for licences to be granted for Aboriginal community development activities, provided this extraction would not have a negative impact on ecological values.

The Regional Panel recommended that no new licences be granted in water sources with high conservation value, or in areas that could not support high flow licences. The Clyde River water sharing plan does not permit ACDLs in any water source due to the small area of the catchment and significant stress already present from existing water users.

The restriction of ACDLs to high flows has been raised as a general issue across all water sharing plans. DPI Water is currently working with the Aboriginal community through the Aboriginal Water Initiative to address these concerns and look at options for allowing limited access to lower flows.

### **Aboriginal cultural access licences**

Aboriginal cultural access licences of up to 10 ML per year may be granted to Aboriginal persons or Aboriginal communities for any personal, domestic or communal purpose such as drinking, washing, gardening, making traditional artefacts, or for recreation or ceremonial purposes. The water sharing plan allows for the granting of these licences in any water source.

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<sup>4</sup> These are a sub-category of unregulated river and aquifer access licences called “Aboriginal community development.” This new category of licences is not fully commercial. While they may be temporarily traded, they cannot be permanently traded and as such will remain in the Aboriginal community for the life of the licence. These arrangements are currently being reviewed by DPI Water.

### Domestic and stock access licences

Under the *Water Management (General) Regulation 2011*, domestic and stock access licences may be granted where applicants can demonstrate a history of extraction within the tidal pool of the following water sources:

- Clyde Estuary Tributaries;
- Cockwhy Creek;
- Currowan Creek;
- Cyne Mallowes Creek;
- Mid Clyde River; and
- Nelligen Creek.

This provision recognises that under the *Water Act 1912* no licence was required to extract water from a tidal pool and therefore there are a number of existing users that will need to obtain a licence under the WMA 2000.

### High-flow-only access licences

Many of the coastal unregulated rivers within NSW have significant competition for water during dry periods. Therefore, there is merit in developing incentives that aim to move extraction out of the low flows and into the higher flows, to improve environmental conditions and reduce competition. To utilise higher flows, it is generally necessary to construct on-farm water storage. Water can then be pumped during periods of higher flow and stored for use at a later time, therefore enhancing security of supply.

State-wide guidelines recommend that high flow conversions only be adopted in specified water sources if:

- the water source is classified as having important instream values at high risk from extraction or in water sources having high hydrological stress;
- there are adequate mechanisms in place to ensure the surrendered low flow is reserved for the environment;
- there is a no highly sensitive estuary or other identified high flow sensitive feature such as a wetland within the EMU;
- there is no significant extraction already occurring in high flow periods; and
- the conversion would not significantly impact on tidal pool users or town water supplies.

The Regional Panel considered these factors and recommended that conversion to high-flow-only access licences not be permitted in the Clyde River water sharing plan due to the relatively small catchment area of each water source, the significant level of existing entitlement and the high ecological values of the Clyde Valley.

### Water allocation accounts

Water usage by individual licence holders is managed through water allocation accounts. Water is credited to the account when an AWD is made (at the start of the water year), and debited as water is extracted throughout the water year. A licence holder's account is not permitted to go into debit.

Unregulated rivers have enormous variation in annual flow volumes between years. It is important to allow this variability to be reflected in water accounting practices.

Unused water allocation may be carried over from one water year to the next. The maximum amount that may be carried over in unregulated river access licence accounts is 100% of the share component where share component is expressed in megalitres; or 1 ML per unit share where share component is expressed in unit shares.

Unregulated river access licence accounts are managed under three-year accounting rules, subject to compliance with the daily access rules. AWDs combined with any 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.

### **Flow classes and daily access rules**

For some water sources, the Regional Panel recommended that cease-to-pump rules be implemented incrementally to provide water users time to adapt to the new rules.

In water sources where the existing cease-to-pump rule under the *Water Act 1912* was more stringent than the proposed rule, the existing access rule was generally adopted. This was based on the premise that with no change to current operations there should be no adverse social or economic impact. In these circumstances the Regional Panel acknowledged that many of the existing cease-to-pump rules had been negotiated by water users or stipulated as outcomes of Rural Land Board hearings, had been in place for a period of time, and seemed to be adequately protecting values while providing certainty for water users.

The water sharing rules for several water sources were revised from the indicative rules to reflect discussions with stakeholders and to incorporate feedback from the targeted consultation and public exhibition processes. Specific revisions included developing access rules to encourage trade out of the Clyde Valley, and revising the cease-to-pump level for a specific instream pool in the lower reaches of the Mid Clyde Water Source.

### **Access rules to encourage trade out of the Clyde Valley**

The Regional Panel recognised the high ecological values of the Clyde River. The Clyde Valley is often presented as the most pristine and ecologically sound catchment along the NSW South Coast.

Historically, agricultural water usage in the Clyde River catchment has been minimal and is thought to be only a fraction of the licensed entitlement of 266 ML/yr. A major reason for this low level of water usage is the lack of agriculturally productive soils in the valley. Many soils in the Clyde catchment have high levels of aluminium which will restrict the growth of many crops and pastures.

During the preparation of the water sharing plan, the OEH representative expressed concerns that although current water usage is low, the activation of sleeper entitlement could result in a considerable increase in hydrological stress during low stream flows.

To address OEH's concerns whilst recognising the low level of water usage, the Regional Panel recommended that access rules be tied to the total volume of entitlement in the water source. If current entitlement is reduced to 50% (< 133 ML/yr) then a cease-to-pump level of 2 ML/day will be retained. If total entitlement is not reduced to 50%, then a higher cease-to-pump level of 10 ML/day may be applied from Year 6 of the plan.

### **Cease-to-pump level for a specific instream pool in the lower reaches of the Mid Clyde Water Source**

Following public exhibition of the plan, the Working Group and Regional Panel considered more closely the potential impacts of the proposed rules on the largest horticultural enterprise in the Clyde River catchment, a berry farm located in the lower reaches of the Mid Clyde Water Source, just upstream of the tidal limit.

The daily water requirements of this enterprise are minimal in relation to stream flows: peak daily demand is estimated to be 0.04 ML/day during summer. The volume of the instream pool from which water is extracted is estimated to be 30 ML, and hydrological records show that the inflows into this pool are at least 2 ML/day for 98% of all days. The potential hydrological impacts of water extracted by this enterprise are minimal. The potential risks to

instream values are arguably insignificant considering the location of this enterprise immediately upstream of the tidal pool.

The berry farm provides seasonal employment to several workers and attracts many tourists. The farm is a good example of water-efficient, high value agriculture which significantly contributes to the regional economy.

Given the low level of threat to instream values posed by water extractions, and the importance of this enterprise to the regional economy, the Regional Panel recommended that the licence for this enterprise be subject to a cease-to-pump rule of “no visible flow from the pool” rather than 2 ML/day at the Brooman gauge, which is the access rule for the water source. This condition only applies to the converted *WA 1912* licence issued to the berry farm upon commencement of the water sharing plan. This condition cannot be traded from the berry farm licence to any other works.

### **Final water access rules**

Following public exhibition and consideration of the issues raised during public exhibition, the water sharing rules were finalised. The final water access rules including flow classes, cease-to-pump rules and the staged implementation approach adopted by the Regional Panel are summarised in Table 6. This information may also be found on individual rule summary sheets for the Clyde River catchment that are available on the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au). These rules were developed using the risk and value assessment, a wide range of resources, targeted consultation and public exhibition.

The Cockwhy Creek, Mid Clyde River, Upper Clyde River and Currambene Creek Water Sources are the only water sources for which a full range of flow classes have been defined. This is due to the relatively high extraction pressure within these water sources, and the fact that they can be easily managed by a flow reference point (GS 218008).

### **Access to very low flow**

Those activities that are considered critical human needs or animal health requirements are permitted to access the very low stream flows, that is, flows below the cease-to-pump level. Licences with access to very low flows are listed in Schedule 2 of the plan. They include the taking of water for:

- domestic supply;
- town water supply, until major augmentation of the scheme 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.

**Table 6: Summary of access rules for the Clyde River water sharing plan**

Water Source	Flow classes	Access rules	Flow reference point
Buckenbowra River	No flow classes defined	Cease-to-pump at 3 ML/day	216009
Cockwhy Creek, Mid Clyde River, Upper Clyde River	Very low flow $\leq$ 2 ML/day A Class > 2 ML/day	Cease-to-pump at 2 ML/day From year 6 of the plan if total entitlement in these water sources is equal to or greater than 133 ML/yr the plan may be amended so that the cease-to-pump is at 10 ML/day	216002
Currambene Creek	Very low flow $\leq$ 0.5 ML/day A Class > 0.5 ML/day	Cease-to-pump at 0.5 ML/day	216004
Burrill Lake, Candlagan Creek, Clyde Estuary Tributaries, Conjola Creek, Conjola Creek, Conjola Lake, Kioloa, Meroo Lake, Narrawallee Inlet, Nerrindillah Creek, South Jervis Bay, St Georges Basin, Swan Lake Basin, Tabourie Lake, Termeil Lake, Tomaga River, Wandandian Creek, Willinga Lake	No flow classes defined	Cease-to-pump when no visible flow, or when pool level is less than full.	No flow reference point
Berrara Creek, Bimberamala Creek, Boyne Creek, Currowan Creek, Cyne Mallowes Creek, Durras Lake, Holland Creek, Moona Moona Creek, Nelligen Creek, North Jervis Bay, Wollumboola Lake	No licences are present and licences are not able to be traded in, therefore no access rules are specified		
Pigeon House Creek		The only licence in this water source is for the taking of town water supplies from Porters Creek Dam and trade into the water source is not permitted. Therefore no specific access rules have been established.	

### Total daily extraction limits

One of a water sharing plan's main objectives is to share water between users, including the environment, during low flows. This objective is achieved through the use of total daily extraction limits (TDELs). A TDEL is the total volume of water that may be extracted daily under access licences from an unregulated river in a particular flow class. TDELs are used where peak daily demands exceed supply and a cease-to-pump rule alone is not sufficient to ensure an adequate environmental share of the water within that flow class.

The Clyde River water sharing plan sets a TDEL for town water extracted from the Buckenbowra River to assist the sharing of water between town water, BLR and the environment. The TDEL is calculated as:

$$TDEL (ML/day) = 0.5 \times (\text{daily stream flow (ML/day)} - 3)$$

where daily stream flow is measured at Gauge 216009 (Buckenbowra River at Buckenbowra No. 3).

The plan allows for TDELs to be developed for other water sources, if required.

### Alluvial licences

For management purposes, the Clyde River water sharing plan will establish a 40 metre wide buffer zone along the river from the high bank. This recognises the strong connectivity between groundwater and surface water at the boundary between the two. Existing bores located within the 40 metre buffer zone will be managed according to the same daily access rules that apply to surface water licences in the water source. Access licences for stock and domestic, town water, food safety or essential dairy care purposes are not subject to these daily access rules. These access rules will apply to alluvial water users from Year 6 of the plan to allow them to become familiar with the cease-to-pump concept and adjust management practices.

In addition to the plan rules, alluvial bores may be subject to local impact rules, which are developed to address local groundwater issues, and are implemented through Ministerial Orders.

### Water supply works approvals

#### Construction of dams

Consistent with statewide policy, the Clyde River water sharing plan prohibits the construction of instream dams in those water sources which have been assessed to have high instream values: Berrara Creek, Bimberamala River, Boyne Creek, Clyde Estuary Tributaries, Cockwhy Creek, Conjola Lake, Currowan Creek, Cyne Mallowes Creek, Durras Lake, Holland Creek, Mid Clyde River, Moona Moona Creek, Nelligen Creek, North Jervis Bay, South Jervis Bay, Swan Lake, Upper Clyde River, Wandandian Creek, Wollumboola Lake and Yadbora River.

#### Construction of bores in alluvial aquifers

The Clyde River water sharing plan sets the distances that new bores may be permitted to be constructed from streams, other bores, GDEs and cultural sites. These distance rules were set based on statewide recommendations.

The plan prohibits new bores within 40 metres of a third order stream or higher, except for bores that:

- are the result of a conversion from an unregulated river access licence; or
- are drilled into the underlying non-alluvial material, and the slotted intervals of the production bore commence deeper than 30 metres; or

- the applicant can demonstrate that the bore will have minimal impact on base flows in the stream.

In relation to distances from other bores, new groundwater bores are not permitted within:

- 100 metres of an approved water supply bore nominated by another access licence;
- 100 metres of an approved water supply bore from which BLR is being extracted;
- 50 metres from the property boundary unless the owner of the adjacent property consents in writing;
- 500 metres from an approved water supply bore that is used by a LWU or major water utility; and
- 100 metres from a Department observation or monitoring bore.

These restrictions do not apply if the new bore is solely for accessing BLR, or is replacing an existing groundwater bore or is for the purpose of monitoring or environmental management. The Regional Panel recommended that new bores may be permitted closer than the minimum distances if a hydrologic assessment is undertaken and can demonstrate that the impacts of extraction will be minimal.

The water sharing plan specifies rules for new bores located near high priority GDEs and culturally significant groundwater dependent sites. At the start of the plan there were three specified GDEs or cultural sites. The plan rules state that no new works will be approved within 100 metres of either type of site for bores that supply BLR, and within 200 metres for any new water access licences. These sites are specified in Schedule 5 of the Plan.

### Dealing rules

The objective of dealing rules (trading rules) is to allow the development of a water market whilst recognising and protecting the needs of the environment and third party interests. The NWI has established guidelines for water trading. Trading of water entitlement within the water sharing plan area needs to maximise the flexibility for users to be able to use water to its highest value without having an adverse impact on water sources or existing water users.

The water sharing plan prohibits trade into 19 water sources and permits trade into 15 water sources up to a specified level of entitlement (Table 7).

Alluvial groundwater licences:

- are subject to the same dealing rules as surface water licences i.e. not permitted to be traded into areas with high instream values or high hydrological stress;
- may be traded between alluvial aquifers, subject to assessment; and
- are not permitted to be converted to surface water licences.

Surface water licences are permitted to be converted to alluvial groundwater licences, subject to assessment.

Table 7: Summary of water dealing rules

Water Source	Dealing rule	Justification
Berrara Creek, Bimberamala Creek, Conjola Lake, Currowan Creek, Durras Lake, Holland Creek, Moona Moona Creek, Nelligen Creek, North Jervis Bay, Swan Lake Basin, Upper Clyde River, Wandandian Creek, Yadboro River	Trade into water source not permitted	High instream values
Boyne Creek, Buckenbowra River, Cockywhy Creek, Cyne Mallowes Creek, Pigeon House Creek, South Jervis Bay,	Trade into water source not permitted	Part of an overall strategy to reduce the total entitlement in the Clyde River catchment
Wollumboola Lake	Trade into water source not permitted	No entitlement be permitted into this water source to protect the ecological values of the lake and associated wetlands
Burrill Lake	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 137 ML/year*	Regional Panel revised initial classification of high instream values to medium for these water sources based on the considerable level of entitlement present
Candlagan Creek	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 51 ML/year	
Conjola Creek	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 157 ML/year	
Currambene Creek	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 199 ML/year	
Clyde Estuary Tributaries	Trade into water source permitted only from Cockwhy Creek, Mid Clyde River and Upper Clyde River and only if the total entitlement in the water source does not exceed 100 ML/year	Part of an overall strategy to reduce total entitlement in the Clyde River upstream of Shallow Crossing
Kioloa	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 44 ML/year	Regional Panel revised initial classification of high instream values to medium based on the significant percentage of cleared land in the catchment
Meroo Lake	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 35 ML/year	
Mid Clyde River	Trade into water source permitted only from upstream water sources	High instream values and part of an overall strategy to reduce the total entitlement in the Clyde River catchment
Narrawallee Inlet	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 90 ML/year*	Regional Panel revised initial classification of high instream values to medium based on the considerable level of agricultural development in the water source

Water Source	Dealing rule	Justification
Nerrindillah Creek	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 28 ML/year	Medium instream values
St Georges Basin	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 194 ML/year	Regional Panel revised initial classification of high instream values to medium based on the level of development present
Tabourie Lake	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 87 ML/year	
Termeil Lake	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 24 ML/year	
Tomaga River	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 105 ML/year	
Willinga Lake	Trade into water source permitted only if the total licensed entitlement in the water source does not exceed 27 ML/year	

\*Note: the current entitlement in this water source is above that of the level specified to allow trade into the water source. Therefore trade will only be permitted in if the total entitlement decreases to the defined level.

## Adaptive management

Adaptive management refers to the practice of change in response to new information such as monitoring or some other improvement in understanding. In the case of water sharing plans, such information could include socio-economic studies, hydrological modelling, ecological studies and information about Aboriginal cultural values.

Adaptive management is a requirement of both the WMA 2000 and the National Water Initiative, and has been allowed for during the life of the Clyde River water sharing plan through the inclusion of amendment provisions. These provisions allow some aspects of the water sharing plan to be changed within defined limits. Specific amendment provisions in the Clyde River water sharing plan are discussed below. Following this is a discussion about the monitoring, evaluation and reporting framework for water sharing plans. Monitoring, evaluation and reporting are key components to adaptive management.

## Amendment provisions

The Clyde River water sharing plan includes a number of specified amendments that may be made to the plan during its 10 year period of operation. Standard amendments that apply to all water sharing plans include:

- amending water sources, management zones or EMUs;
- establishing new or additional flow classes in any water source where management zones are added or amended;
- amending water sources for which dams on third order streams or higher will not be granted;
- amending requirements for metering or record keeping in relation to licensed access works; and
- updating information in Schedules or deleting them if no longer required.

## Monitoring, evaluation and reporting

DPI Water has developed a Monitoring, Evaluation and Reporting Framework in collaboration with key stakeholders. The framework conforms to NSW and Commonwealth government guidelines for monitoring, evaluation and reporting, and demonstrates an adaptive management approach to water planning required under the principles of the WMA 2000. The evaluation framework aims to inform the community of the outcomes of water sharing plans, and to collate the results of various legislatively required evaluations and relevant knowledge to inform the review of the water sharing plans. The framework will assess the inputs, outputs and outcomes of the water sharing plans and their operations. The assessment will consider:

- the process of plan development (appropriateness);
- the performance of the plan during operation (efficiency); and
- the socio-economic, environmental and cultural outcomes of the plan (effectiveness).

The main strategies in place to assist in evaluating water sharing plans include:

- assessment of performance indicators (using an Environmental Flows Monitoring and Modelling program);
- an audit of plans; and
- review of each plan at the end of its ten year term.

## Performance indicators

Part 2 of the water sharing plan includes a number of standard performance indicators that will be monitored over the life of the water sharing plan. It is not practical 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 water sharing plan as improved methods are developed.

In order to assess performance indicators, DPI Water has established an Environmental Flows Monitoring and Modelling program which is designed to make the results of environmental flow studies more transferable between water sources and to develop more generic relationships between flow, hydraulics and ecological responses. This will enable a more efficient and effective evidence based approach to support monitoring and evaluation of water sharing plans in NSW.

## Audit

The WMA 2000 requires that water sharing plans be audited regularly, at intervals of not more than five years, to determine whether the provisions of the plan are being implemented. Under section 44 of the Act the Minister for Primary Industries, Lands and Water must appoint an Audit Panel to undertake this review.

The Audit Panel reflects the membership of the State Interagency Panel for Water Sharing and comprises representatives from the Department of Primary Industries, Office of Environment and Heritage, and Local Land Services. Representatives from the NSW Natural Resources Commission and DPI Fisheries are invited to participate in the audit process as observers.

Reflecting the requirements of the WMA 2000 the focus of the audit is on the extent to which the provisions in the plan have been implemented. The audit does not attempt to assess the outcomes or effectiveness of the plan in achieving its objectives (this is considered by DPI Water through its monitoring and evaluation process).

When conducting an audit the panel will review a range of analysis and material provided by DPI Water to:

- identify patterns of implementation activities across water source types, across plans and types of water sharing plan provisions;
- identify actions required to address instances of partial and non-implementation;
- develop broad recommendations for improving the implementation of existing plans and the robustness of new plans; and
- identify opportunities for linking the audit findings with other related processes, particularly the review of catchment action plan targets.

## Plan review

At the end of the water sharing plan's 10 year life the Minister may, on recommendation by the Natural Resources Commission (under Section 43A of the WMA 2000), extend a water sharing plan for another 10 years or replace the plan. An extension does not allow for any changes to the water sharing plan. If any changes are proposed then a replacement water sharing plan needs to be prepared.

The WMA 2000 requires that when deciding whether to extend or replace an existing plan, the Minister must consider:

- the most recent audit of water sharing plans conducted under section 44; and
- a report from the Natural Resources Commission prepared within the previous five years, on the extent to which the water sharing plan has contributed to relevant state-

wide natural resource management standards and targets of the relevant Local Land Service catchment action plan.

Under the WMA 2000 a water sharing plan may be extended for 12 months past the expiry date of the plan to allow for a replacement plan to be prepared.

## Glossary

Many of the terms in this document are defined in the WMA 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 BLR 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:** 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 WM Act, 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:** A plan made under the *Water Management Act 2000*, which sets out the rules for sharing water between the environment and water users.

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

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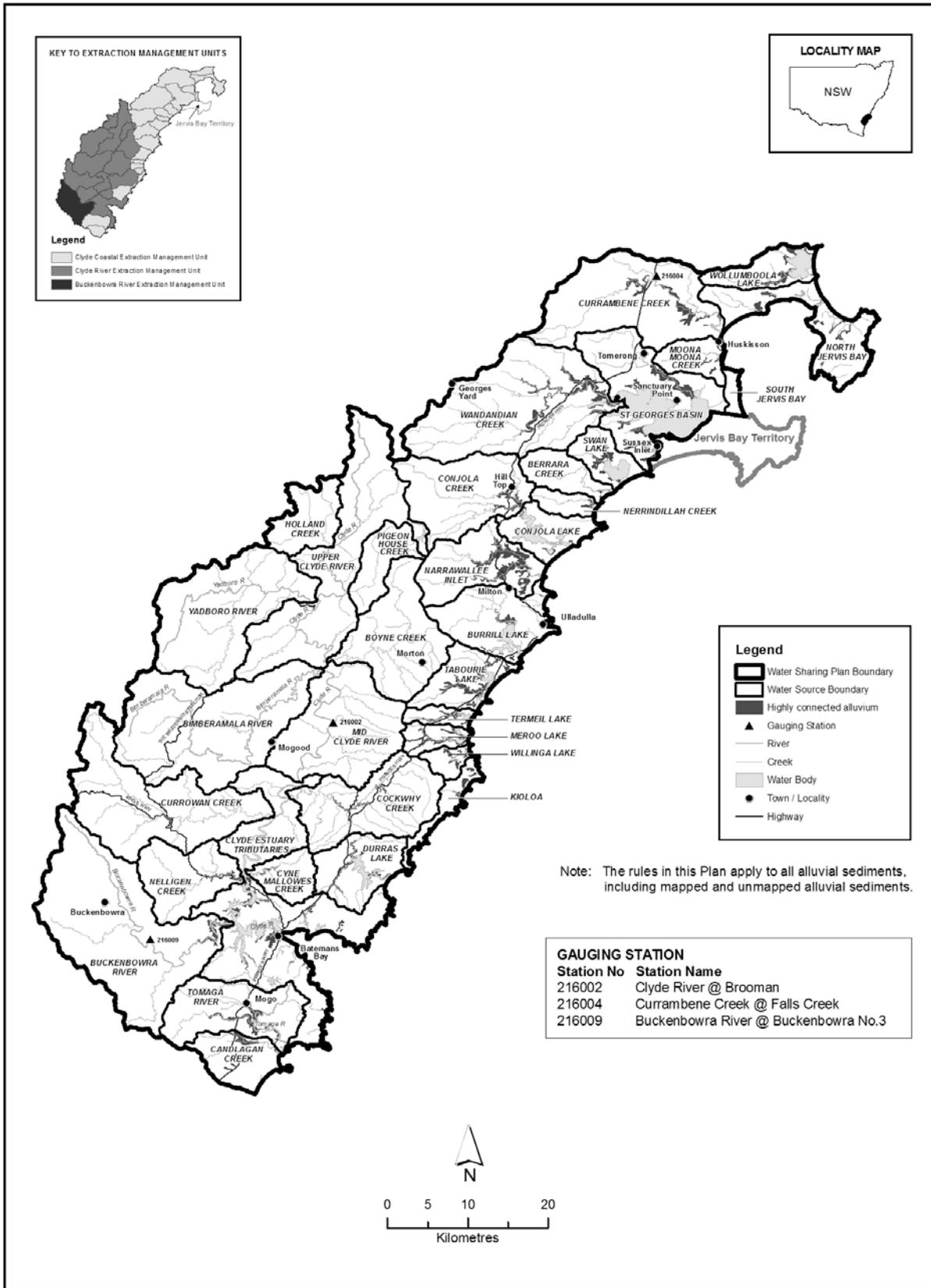
## Appendix 1

### Water management units established by the Clyde River water sharing plan

Buckenbowra River EMU	Clyde Coastal EMU	Clyde River EMU
Buckenbowra River Water Source	Berrara Creek Water Source	Bimberamala River Water Source
	Burrill Lake Water Source	Boyne Creek Water Source
	Candlagan Creek Water Source	Clyde Estuary Tributaries Water Source
	Conjola Creek Water Source	Cockwhy Creek Water Source
	Conjola Lake Water Source	Currowan Creek Water Source
	Currambene Creek Water Source	Cyne Mallowes Creek Water Source
	Durras Lake Water Source	Holland Creek Water Source
	Kioloa Water Source	Mid Clyde River Water Source
	Meroo Lake Water Source	Nelligen Creek Water Source
	Moona Moona Creek Water Source	Pigeon House Creek Water Source
	Narrawallee Inlet Water Source	Upper Clyde River Water Source
	Nerrindillah Creek Water Source	Yadboro River Water Source
	North Jervis Bay Water Source	
	South Jervis Bay Water Source	
	St Georges Basin Water Source	
	Swan Lake Water Source	
	Tabourie Lake Water Source	
	Termeil Lake Water Source	
	Tomaga River Water Source	
	Wandandian Creek Water Source	
	Willinga Lake Water Source	
	Wollumboola Lake Water Source	

## Appendix 2

### Water sharing plan map



## Appendix 3

### 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. 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 tables below show threatened species that are known (K) or expected (E) to occur in each water source.

Table 8: Threatened species that are known or expected to occur in the Clyde River catchment

	Fish		Frogs					Macro-invertebrates		Birds													Other Fauna		Wet Flora	Declared locations					
	Australian Grayling	Alpine Tree Frog	Booroolong Frog	Giant Burrowing Frog	Green and Golden Bell	Little John's Tree Frog	Red-crowned Toadlet	Stuttering Barred Frog	Adam's Emerald Dragonfly	Giant Dragonfly	Australasian Bittern	Black Bittern	Black-tailed Godwit	Blue-billed Duck	Broad Billed Sandpiper	Freckled Duck	Great Knot	Greater Sand Plover	Lesser Sand Plover	Little Tern	Osprey	Regent Honeyeater	Sanderling	Terek Sandpiper	Greater Broad Nosed Bat	Large Footed Myotis	Waterwheel Plant	SEPP Wetlands	Other Nationally Important Wetlands	Declared Wilderness Area	Other
Berrara Ck				K	K	K		E			K	K	K		K				K	K	K	K		K	K		K				
Bimberamala R	K	E		K	K	K		E			K	K	K			K	K	K	K	K	K	K	K	K	K				K		
Boyne Creek	K			K	K	E		K			K	K	K		K	K	K	K	K	K	K	K	K	K	K	K					
Buckenbowra R	K	E		K		K		E			K	K	K		K	K	K	K	K	K	K	K	K	K	K	K	K		K		
Burrill Lake	K			K	K	K		E			K	K	K		K				K	K	K		K	K		K					
Callala Creek				K	K	K		E			K	K	K		K				K	K	K		K	K		K					K

	Fish								Frogs								Macro-invertebrates		Birds												Other Fauna		Wet Flora	Declared locations			
	Australian Grayling	Alpine Tree Frog	Booroolong Frog	Giant Burrowing Frog	Green and Golden Bell	Little John's Tree Frog	Red-crowned Toadlet	Stuttering Barred Frog	Adam's Emerald Dragonfly	Giant Dragonfly	Australasian Bittern	Black Bittern	Black-tailed Godwit	Blue-billed Duck	Broad Billed Sandpiper	Freckled Duck	Great Knot	Greater Sand Plover	Lesser Sand Plover	Little Tern	Osprey	Regent Honeyeater	Sanderling	Terek Sandpiper	Greater Broad Nosed Bat	Large Footed Myotis	Waterwheel Plant	SEPP Wetlands	Other Nationally Important Wetlands	Declared Wilderness Area	Other						
Candlagan Ck				K	K	E	E			K	K	K			K	K	K	K	K	K	K	K	K	K	K	K	K	K	K								
Clyde Est Tribs	K			K	K	E	E			K	K	K			K	K	K	K	K	K	K	K	K	K	K	K	K	K	K								
Cockwhy Creek	K			K	K	E	E			K	K	K		K	K	K	K	K	K	K	K	K	K	K	K	K											
Conjola Creek	K			K	K	K	E			K	K	K		K				K	K	K	K		K	K		K											
Currambene Ck				K	K	K	E			K	K	K		K				K	K	K	K		K	K		K					K						
Currowan Creek	K	E	K	K	K	K	K			K	K	K			K	K	K	K	K	K	K	K	K	K	K	K	K	K									
Cyne Mallowes Ck	K			K	K	E	E	K	K	K	K	K			K	K	K	K	K	K	K	K	K	K	K	K	K	K	K								
Durras Lake				K	K	E	E			K	K	K		K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K								
Holland Creek	K			K	K	K	K			K	K	K			K	K	K	K	K	K	K	K	K	K	K	K	K	K			K						
Kioloa				K	K	K	E			K	K	K		K				K	K	K	K		K	K		K	K										
Lake Conjola	K			K	K	K	E			K	K	K		K				K	K	K	K		K	K		K											
Lake Tabourie	K			K	K	K	E			K	K	K		K				K	K	K	K		K	K		K	K										
Lake Wollumboola	K																																				

	Fish							Frogs							Macro-invertebrates		Birds													Other Fauna		Wet Flora	Declared locations			
	Australian Grayling	Alpine Tree Frog	Booroolong Frog	Giant Burrowing Frog	Green and Golden Bell	Little John's Tree Frog	Red-crowned Toadlet	Stuttering Barred Frog	Adam's Emerald Dragonfly	Giant Dragonfly	Australasian Bittern	Black Bittern	Black-tailed Godwit	Blue-billed Duck	Broad Billed Sandpiper	Freckled Duck	Great Knot	Greater Sand Plover	Lesser Sand Plover	Little Tern	Osprey	Regent Honeyeater	Sanderling	Terek Sandpiper	Greater Broad Nosed Bat	Large Footed Myotis	Waterwheel Plant	SEPP Wetlands	Other Nationally Important Wetlands	Declared Wilderness Area	Other					
Meroo Lake				K	K	K		E			K	K	K		K				K	K	K		K	K		K	K		K	K						
Mid Clyde River	K			K	K	E		E			K	K	K			K	K	K	K	K	K	K	K	K	K	K										
Moona Moona Ck				K	K	K		E			K	K	K		K				K	K	K		K	K		K	K		K	K		K				
Narrawallee Inlet	K			K	K	K		E			K	K	K		K				K	K	K		K	K		K										
Nelligen Creek	K	E		K	K	E		E			K	K	K				K	K	K	K	K	K	K	K	K	K										
Nerrindillah Creek				K	K	K		E			K	K	K		K				K	K	K		K	K												
North Jervis Bay				K	K	K		E			K	K	K		K				K	K	K		K	K		K					K					
Pigeon House Ck	K			K	K	K		K					K								K		K	K						K						
St George Basin	K			K	K	K		E			K	K	K		K				K	K	K		K	K		K										
South Jervis Bay	K			K	K	K		E			K	K	K		K				K	K	K		K	K		K					K					
Swan Lake				K	K	K		E			K	K	K		K				K	K	K		K	K		K										
Termeil Lake				K	K	K		E			K	K	K		K				K	K	K		K	K	K		K	K		K	K					
Tomaga River	K			K	K	E		E			K	K	K			K	K	K	K	K	K	K	K	K	K		K									

	Fish							Frogs							Macro-invertebrates		Birds													Other Fauna		Wet Flora	Declared locations			
	Australian Grayling	Alpine Tree Frog	Booroolong Frog	Giant Burrowing Frog	Green and Golden Bell	Little John's Tree Frog	Red-crowned Toadlet	Stuttering Barred Frog	Adam's Emerald Dragonfly	Giant Dragonfly	Australasian Bittern	Black Bittern	Black-tailed Godwit	Blue-billed Duck	Broad Billed Sandpiper	Freckled Duck	Great Knot	Greater Sand Plover	Lesser Sand Plover	Little Tern	Osprey	Regent Honeyeater	Sanderling	Terek Sandpiper	Greater Broad Nosed Bat	Large Footed Myotis	Waterwheel Plant	SEPP Wetlands	Other Nationally Important Wetlands	Declared Wilderness Area	Other					
Upper Clyde River	K	E		K	K	K		K			K	K	K			K	K	K	K	K	K	K	K	K	K	K	K			K						
Wandandian Ck	K			K	K	K		E			K	K	K		K				K	K	K	K		K	K		K									
Willinga Lake				K	K	K		E			K	K	K		K				K	K	K	K		K	K		K									
Yadboro River	K	E		K	K	K		E			K	K	K			K	K	K	K	K	K			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 panel deliberations. Panels 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 4

### IRP and support staff - membership and expertise

Table 9: IRP - membership and expertise

Name	Agency	Role	Expertise
Tracey Brownbill	DPI Water	Agency representative	Water planning and policy, catchment management, consultation
Brett Miners	Southern Rivers CMA	Observer	Catchment management, river rehabilitation
Anne Muir	NSW DPI	Agency representative	NSW DPI regional input to water reforms, agriculture, catchment management and land use/strategic planning.
John O'Connor	NSW DPI	Agency representative	Catchment management, local knowledge of catchments, agricultural issues.
John Patten (replaced by D Weicek)	OEH	Agency representative	OEH regional input to water reforms, conservation issues.
Danny Wiecek	OEH	Agency representative	OEH regional input to water reforms, conservation issues.

Table 10: Support staff - membership and expertise

Name	Agency	Role	Expertise
Bob Britten	DPI Water	Hydrogeological support	Groundwater analysis and hydrology.
Andrew Craig		Water sharing plan coordination	Local knowledge, facilitation and consultation.
Christine Hill		Socio-economic support	Economic and social policy
Kylee Wilton		Plan writing	Water planning and policy
Brendan Fletcher		Plan writing	Water planning and policy
Craig Jones		Compliance support	Water licensing and monitoring
Wayne Ryan		Licensing	Licensing support, local knowledge.
Simon Williams		Environmental water	Flow requirements for freshwater biota.
Kimberley Williamson		Planning Support	Facilitation and consultation
Eva Ciecko		GIS support	Map production
Adam Wiggins		Hydrometrics support	Local hydrometrics knowledge
Simon Morton		Hydrological support	Hydrological modelling

## Appendix 5

### Reference information used by Interagency Reference Panel

#### DPI Water data sets

- Licensing Administrator System (LAS) – DPI Water’s 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 – DPI Water’s land use and topographic information

#### Other data sets

- Stressed rivers reports – used as the basis for identifying where there are instream barriers
- Threatened species (fish) – Data supplied by DPI Fisheries
- 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) Wildlife Atlas – statewide flora and fauna database
- DPI Fisheries modelled data sets (Fish Community Index, Fish Community Vulnerability)
- DPI Fisheries freshwater and saltwater recreational fishing database.

## Appendix 6

### Final classification summary

Table 11: Value matrix used to determine indicative dealing rules

	Low hydrologic stress or hydrologic risk	Medium hydrologic stress or hydrologic risk	High hydrologic stress or hydrologic risk
<b>High Instream Values</b>	<b>a</b> Berrara Creek Bimberamala River Clyde Estuary Tributaries Conjola Lake Currowan Creek Durras Lake Holland Creek	Mid Clyde River Moona Moona Creek Nelligen Creek North Jervis Bay South Jervis Bay Swan Lake Upper Clyde River Yadboro Creek	<b>b</b> Wandandian Creek*  <b>c</b>
<b>Medium Instream Values</b>	<b>D</b> Boyne Creek Buckenbowra River* Candlagan Creek* Cockwhy Creek* Conjola Creek* Currambene Creek* Cyne Mallowes Creek* Kioloa*	Meroo Lake* Narrawallee Inlet* Nerrindillah Creek* Pigeon House Creek* St Georges Basin* Tabourie Lake* Termeil Lake* Tomaga River* Willinga Lake*	<b>e</b> Burrill Lake*  <b>f</b>
<b>Low Instream Values</b>	<b>g</b>	<b>h</b>	<b>i</b>

\* Represents a change to the initial classification based on Regional Panel local knowledge



## Appendix 7

### Summary of submissions received on the draft plan

Table 13: Summary of issues raised in written submissions for the draft Clyde River water sharing plan

Issue	Concerns raised	Outcomes and decisions
Cease-to-pump	<p>Cease-to-pump will affect the viability of a particular horticultural business on the Clyde River.</p> <p>Building dams on the property to store water is impractical.</p>	<p>The IRP considered the individual circumstances of the business and agreed that as water is extracted from a large pool and daily water usage is quite small that the business is not likely to have any significant impact on river hydrology.</p> <p>The final plan exempts this licence holder from complying to the 2 ML/d cease-to-pump but imposes a visible flow condition on the pool.</p>
Maintain lower cease-to-pump beyond Year 5 of the plan by surrendering or trading out entitlement	Any increase in the cease-to-pump level should be linked to a growth in usage rather than a decrease in total entitlement.	<p>No change to cease-to-pump.</p> <p>The panel has previously expressed a desire to protect the Clyde catchment's high environmental values. The proposed rule is intended as a low cost option which provides long term protection of a relatively intact catchment.</p>
Town water supply	Various town water supply issues relating mostly to water supplies from the Tuross and Deua catchments	No changes relevant to Clyde River water sharing plan