Department of Primary Industries
Office of Water

Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources

Background document

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Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources Background Document

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More information

Rural Water Planning

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1.0 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. In July 2004, 31 water sharing plans commenced in NSW, bringing these water sources and some 80% of water extracted in NSW under the management and licensing provisions of the WMA 2000.

In recent years, water sharing plans for unregulated[1] rivers and groundwater systems have been completed using a broad scale 'macro' approach based on whole river catchments or aquifer systems. Approximately 95% of the water extracted in NSW is now covered by the WMA 2000. The macro planning process was designed to develop water sharing plans covering most of the remaining water sources across NSW. Each macro plan covers a large river basin rather than a single sub-catchment, or in the case of groundwater systems, covers a particular type of aquifer, for example upriver and flood plain alluvials. Macro plans generally apply to catchments or aquifers with less intensive water use.

The *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016* (hereafter referred to as the Macleay water sharing plan) covers 33 surface water sources (and connected alluvials) and 1 floodplain alluvial groundwater water source (refer to Appendix 1).

This document provides background to the development of the rules in the Macleay water sharing plan and includes information on the purpose of the plan, the policy framework supporting it, a description of the Macleay catchment including land and water use, and the processes used for developing the 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 Macleay 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**
- **Rule summary sheets** for each water source detailing 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. This includes:

- *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*, that 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*, that 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*, that 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.

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

2.0 Purpose of the plan

2.1 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 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 WMA 2000 with the overall objective of achieving "sustainable and integrated management of the State's water for the benefit of both present and future generations" (DLWC 2001). Water sharing plans play a major role in achieving this objective by providing a legal basis for sharing of water between the environment and consumptive water users.

Under the WMA 2000, water sharing plans must protect water sources and dependent ecosystems as well as the basic rights of landholders to extract water. Accordingly access to water is prioritised as follows: environmental water and basic landholder rights (BLR) 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 recognise the economic benefits commercial users 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 allows separation of water licences from land tenure. This facilitates trade of access licences and encourages more efficient use of water resources and movement of licences to new and higher value industries.

In conjunction with the WMA 2000, Water sharing plans set rules to encourage commercial users to operate productively. Because commercial water access licences are granted in perpetuity, this provides greater security of water access entitlements. Water sharing plans define access rules for ten year periods, providing all users with greater certainty regarding sharing arrangements.

2.2 Benefits for water users

The introduction of water sharing plans benefits water users by providing:

- Greater certainty by fixing water sharing arrangements for a 10 year period
- Clear trading and access rules which will help foster trading of water
- Greater security with perpetual water access licences

2.3 Environmental considerations

Water sharing plans preserve water for river health and protection of ecosystems dependent on river flows including wetlands, lakes, estuaries and floodplains.

This share of water reserved for the environment is also intended to sustain the river's aquatic fauna and flora. The Macleay water sharing plan sets rules for unregulated streams and alluvial aquifers in the plan area.

2.3.1 Unregulated streams

Rivers experience natural variation in flows which are necessary for different hydrologic, geomorphic, biological and chemical processes to occur.

Flood flows scour channels, move sediments and inundate floodplains. Medium flows oxygenate water and allow fish passage and Low flows; maintain river connectivity and assist the survival of aquatic and riparian flora and fauna. To preserve a healthy river system this range of stream flow regimes must be maintained.

In order to protect a proportion of these flows for the benefit of the environment, water sharing plans impose new access restrictions on days when stream 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.

Water sources in the Macleay plan area have been classified as having high, medium or low instream values. Those with high instream value are protected through the plan by preventing entitlement being traded into the water source (except from upstream connected water sources).Trades are allowed into some water sources with lower instream values in order to encourage movement of water extraction away from areas of higher environmental value.

2.3.2 Alluvial aquifers (upriver and floodplain)

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 from 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 aquifer recharge. The remainder of the recharge is reserved for the environment.

The Macleay water sharing plan defines access rules for alluvial aquifers in the plan area. Water sharing rules for fractured rock and porous rock aquifers and coastal sands aquifers are dealt with in separate Water Sharing Plans.

The Macleay water sharing plan also includes rules for the location of new works and extraction from existing works to protect high priority groundwater dependent ecosystems and other environmentally sensitive areas such as rivers or streams.

3.0 Objectives of the plan

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

- Protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources
- Protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources
- Protect basic landholder rights
- Manage water sources to ensure equitable sharing between users
- Provide opportunities for enhanced market based trading of access licences and water allocations within environmental and system constraints
- Provide water allocation account management rules which allow sufficient flexibility in water use
- Contribute to the maintenance of water quality
- Provide recognition of the connectivity between surface water and groundwater
- Adaptively manage these water sources

4.0 Scope of the plan

The Macleay water sharing plan covers unregulated rivers and their associated upriver alluvials as well as the floodplain alluvial groundwater water source.

Incorporating surface and groundwater sources into one plan recognises water source interactions and permits development of effective and equitable water sharing rules.

In 2004, water sharing plans commenced for Apsley River, Commissioners Waters and Toorumbee Creek water sources. These water sharing plans have been incorporated into the Macleay water sharing plan. DPI Water made minor changes to the Apsley River, Commissioners Waters and Toorumbee Creek plans to ensure rules are consistent with current legal format, policy and water management practices. These changes have no or minimal impact on water users.

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

The Macleay water sharing plan defines 33 water sources that are contained within the Macleay River Extraction Management Unit (EMU). The Macleay water sharing plan also defines the Macleay Floodplain Alluvial groundwater source (the floodplain alluvial water source). Water sources are shown on the maps in Appendix 1 and listed in Appendix 2. Management zones have been established in 4 water sources these are also shown on the maps in Appendix 1.

5.0 Policy framework

A number of national, state and regional plans and policies guided the development of water sharing plans for NSW, including:

- Water Management Act 2000
- Access Licence Dealing Principles Order 2004
- National Water Initiative
- Natural Resource Commission state-wide targets
- Northern Rivers Catchment Action Plan
- Water planning policies and other considerations

5.1 The Water Management Act 2000

The WMA 2000 is based on the concept of ecologically sustainable development i.e. managing water resources to ensure availability of water resources for current and 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.

The most recent version of the WMA 2000 is available from the NSW Government legislation website, http://www.legislation.nsw.gov.au/. Water sharing plans provide the regulatory framework to deliver the aims and objectives of the WMA 2000.

5.2 Access Licence Dealing Principles

The *Access Licence Dealing Principles Order 2004* (hereafter referred to as the Dealing Principles) underpins water dealings in NSW.

The Dealing Principles specify that dealings must consider:

- Impacts on other water users
- Impacts on the water source
- Impacts on indigenous, cultural, heritage and spiritual matters
- Maximising social and economic benefits

The Dealing Principles specify rules for different types of dealings such as conversion to a new licence category, licence subdivision or consolidation, assignment of rights or allocation, change of water source, amended extraction components and interstate dealings. The Dealing Principles also specify requirements that must be met for a dealing to be permitted and the conditions under which 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 environmental values or hydrologic stress.

5.3 National Water Initiative

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

The NWI sets out guidelines, outcomes and timelines for water plans and planning processes. Until 2014 the NWI was implemented and monitored by the National Water Commission, an independent statutory body responsible for providing advice to COAG on national water issues. The Commission was responsible for undertaking a biennial assessment of each state's progress with implementing the NWI. The role of the National Water Commission ceased in December 2014 and some of its water management functions were transferred to other agencies.

5.4 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 developed a Standard for Quality Natural Resource Management, and 13 statewide 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 state, regional, catchment and local levels.

The NRC 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 plan success against this standard and its associated targets. In 2013 the NRC reviewed 31 water sharing plans that were due to expire in 2014 and provided advice to the Minister for Primary Industries.

In 2012 the NRC reviewed state-wide standards 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.

5.5 Northern Rivers Catchment Action Plan

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 (LLS) and transferred the functions of catchment management authorities into this new organisation to provide agricultural support, natural resource management and emergency management to rural communities through a single organisation. North Coast Local Land Services (North Coast LLS) will be responsible for continuing the delivery of natural resource management programs on the NSW north coast, including catchment management plans.

The draft Northern Rivers Catchment Action Plan 2013 is a 10-year strategic plan that sets the direction for the sustainable use and care of the natural resources of the north coast. The Macleay water sharing plan contributes to the goals and targets of this plan, in particular Goal 3, relating to the maintenance of healthy, resilient, sustainable and ecological functional landscapes and seascapes supporting vibrant communities and viable natural resource–based industries.

5.6 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.

5.6.1 Protecting pools, lagoons and lakes

Pools in NSW are 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.

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

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 reviewed 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 if the default rules would significantly impact on current irrigation operations. For example the Interagency Regional Panel sought to provide scope to allow some draw down from the Gara Dam where irrigators could demonstrate a history of use (refer to 9.1.3 for more details).

5.6.2 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 considered to have a lesser degree of connectivity 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.

5.6.3 Protecting basic landholder rights

As defined under the WMA 2000, basic landholder rights (BLR) consist 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 water sharing plans to protect BLR. The plan does this by identifying requirements for domestic, stock and native title rights at the start of the plan and considering these requirements when designing the rules for licensed water extraction. Because the access rules for licensed extraction do not apply to BLR, extractions taken under BLR are afforded higher priority than licensed extractions.

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. At the start of the plan no native title rights were recognised. Should native title rights be granted during the life of the Macleay water sharing plan the plan provides for these rights to be recognised.

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

The Macleay water sharing plan provides an estimate of the water requirements for BLR 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 BLR through the development of mandatory guidelines.

5.6.4 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 local water utility access licences.

5.6.5 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 (the Initiative) 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 water access licences for cultural purposes such as manufacturing traditional artefacts, hunting, fishing, gathering,

recreation and for cultural and ceremonial purposes. Aboriginal cultural licences can also be used for drinking, food preparation, washing and watering domestic gardens. These cultural licences are limited to 10 ML/year per application. Opportunity for granting licences for Aboriginal cultural purposes throughout the Macleay 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

5.6.6 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. 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.

5.6.7 Water interception activities

Changes in land use activities can potentially result in the interception of significant quantities of surface runoff and through flow. Activities that can impact on water quantity include increased farm dam capacity or the development of significant areas of new forestry plantations in a catchment. Under the National Water Initiative, 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[2] but can place restrictions on instream dams 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.

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

6.0 Description of the plan area

6.1 Catchment description

The Macleay water sharing plan covers 33 surface water sources (and the connected alluvials) and one floodplain alluvial groundwater water source. The plan covers an area of around 11,450 km^2 and is located on the mid north coast of NSW. The plan includes the towns of Armidale, Kempsey, Guyra, Walcha and South West Rocks.

The Macleay catchment includes extensive areas of the northern tablelands consisting mainly of gently rolling hills, a sparsely populated and mountainous escarpment area with deep gorges and a coastal area ranging from foothills to coastal plains (DLWC 1999).

The Macleay River catchment is bounded to the north by the Nambucca catchment, to the south by the Hastings River catchment, and to the west by the New England Tablelands

[2] 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.

which forms part of the Great Dividing Range. The major tributaries that enter the Macleay River include Apsley River, Chandler River, Styx River, Tia River, Dyke River, Yarrowitch River and Commissioners Waters.

The Macleay River terminates in an estuarine system which opens to the Pacific Ocean north of South West Rocks. The Macleay estuary covers 740 km^2 and is classified as a mature barrier estuary which is wave dominated with an open entrance. The tidal limit in the Macleay River is located approximately 54 km from the ocean entrance (25 km upstream of Kempsey at “Belgrave Falls”).

6.2 Water management structures

All rivers and creeks in the Macleay River water sharing plan area are unregulated, however some substantial instream structures exist. For example, Malpas Dam that is located on the Gara River (near Guyra) toward the top of the Macleay catchment. Malpas Dam is operated by Armidale & Dumaresq Council (Armidale Council) and is the primary town water supply for Armidale. However, generally users rely on natural flows for their water supply, although small dams and other small weirs may be present.

6.3 Aboriginal history

Prior to European settlement, for many millennia, the Dunghutti and Anaiwan people were the traditional owners and custodians of the region. The territory of the Dunghutti people is thought to have extended over the entire Macleay River valley. The territory of the Aniwan people is thought to have encompassed mainly tableland areas. Occupation of the escarpment area by Aboriginal people is not well understood but it appears likely that the gorges were occupied for at least part if not all of the year (NPWS 2005).

It is thought that the contact between coastal and tablelands groups was limited and this is supported by archaeological and linguistic evidence (for example, differences in regional distribution of stone-axe raw materials and rock-art styles and language and kinship systems) (NPWS 2005).

6.4 Early European settlement and land use

The first European known to have visited the planning area was John Oxley (NPWS 2005). Early exploration led to initial European settlement in 1826. The earliest industry to become established in the region was cedar logging, as loggers moved up the coast searching for the valuable soft wood. Cedar growing on the banks of the Macleay River attracted timber getters to the area in the early 1800s. By 1841, there were 200 men engaged in the local logging activities. However, the following year, the industry declined sharply as accessible stands were depleted (NPWS 2005). Logging of the extensive timber resources of the Styx River area commenced in the early 20th Century following construction of the Armidale-Kempsey and Point Lookout Roads (NPWS 2005).

Farming soon followed cedar collection and European squatters occupied land in the planning area in the early 1830s, and squatting leases were formalised in 1839. Cattle were run through the gorges but occupation was by absentee owners. After the establishment of cattle production sheep, dairy cattle and maize were produced (NPWS 2005).

The remains of Australia’s first commercial hydro-electric scheme, constructed at Gara Gorge in 1893-94 to power the town and gold mines of nearby Hillgrove, are of national cultural significance. The scheme was plagued by floods and droughts but continued operating until 1920 when Hillgrove had become too small for the scheme to be economically viable (Jackson, 1984).

6.5 Current land use

The main agricultural land use in the plan area is livestock grazing for the dairy and beef cattle industries. Beef and sheep grazing for wool dominate agricultural activities on the

tablelands. Dairying, beef cattle grazing and the growing of fodder crops such as sorghum and maize dominate agricultural activities in the eastern part of the catchment (Hope and O'Connor, 2001).

Manufacturing is an important employer in the region, with the homes of Milo (Nestle) and Akubra present within the Kempsey Shire (Kempsey Shire Council, 2016). A thriving commercial fishing industry exists in the Macleay catchment. Species targeted include prawns and a variety of finfish. Oyster farming is also an important local industry in the Macleay River estuary (Kempsey Shire Council, 2016).

Tourism has become a more established industry in recent decades, with recreational boating, swimming, water-skiing and jet-skiing are popular uses of the estuary. Significant recreational fishing activity also takes place across the catchment, with both freshwater and marine species targeted (Kempsey Shire Council, 2016).

6.6 Climate

The Macleay catchment is characterised by a diverse climate with cooler average temperatures experienced on the tablelands and warmer average temperatures experienced on the coast. Average annual rainfall varies throughout the catchment with generally more rainfall experienced on the coast than on the tablelands. Average annual rainfall varies from 795.2 mm in Uralla[3] (Figure 1) to 1,491 mm at South West Rocks (Figure 2) (BOM, 2015). Average annual temperatures vary from 19.4^{o}C (station 056348 with 21 years of data) in Armidale (Figure 3) to 23.2^{o}C in South West Rocks (Figure 4) (BOM 2015).

[3] Note* Whilst Uralla falls marginally to the west of the catchment the site was chosen due to the long time series of data available for the station.

Figure 1 Uralla (Dumaresq St) (056034) Annual rainfall

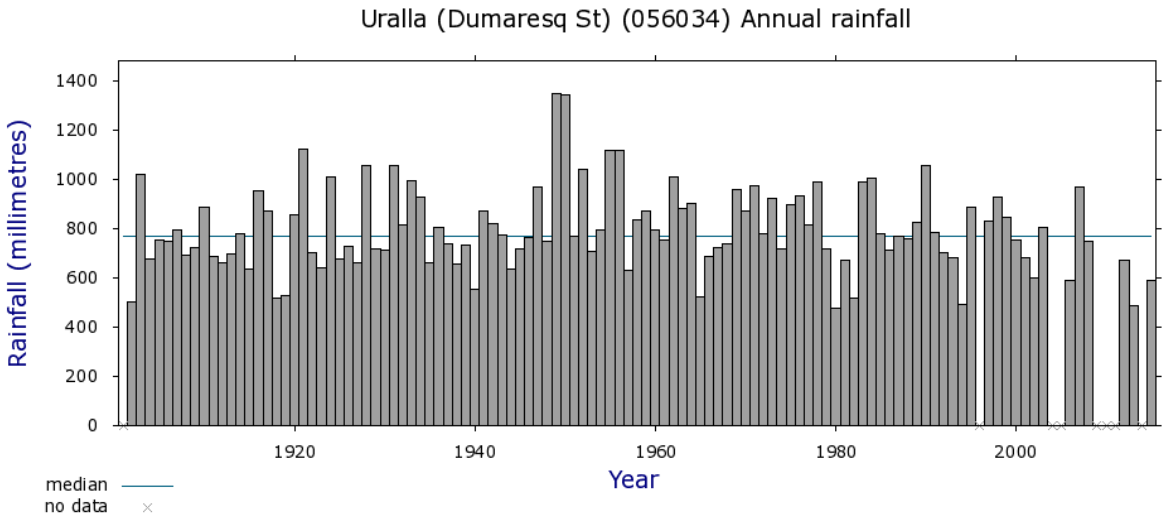

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Figure 2 South West Rocks (Smoky Cape Lighthouse) (059030) Annual rainfall

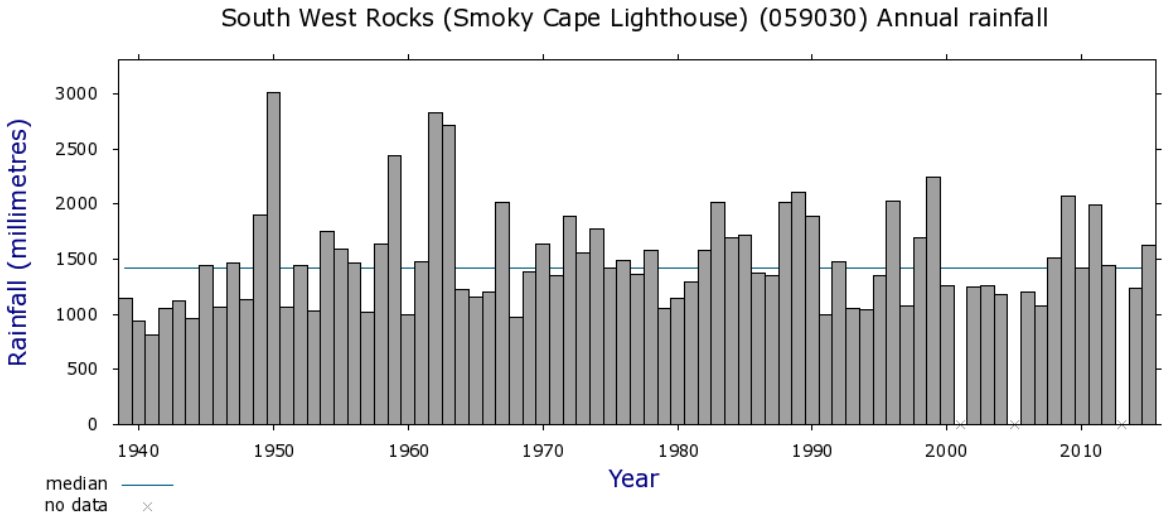

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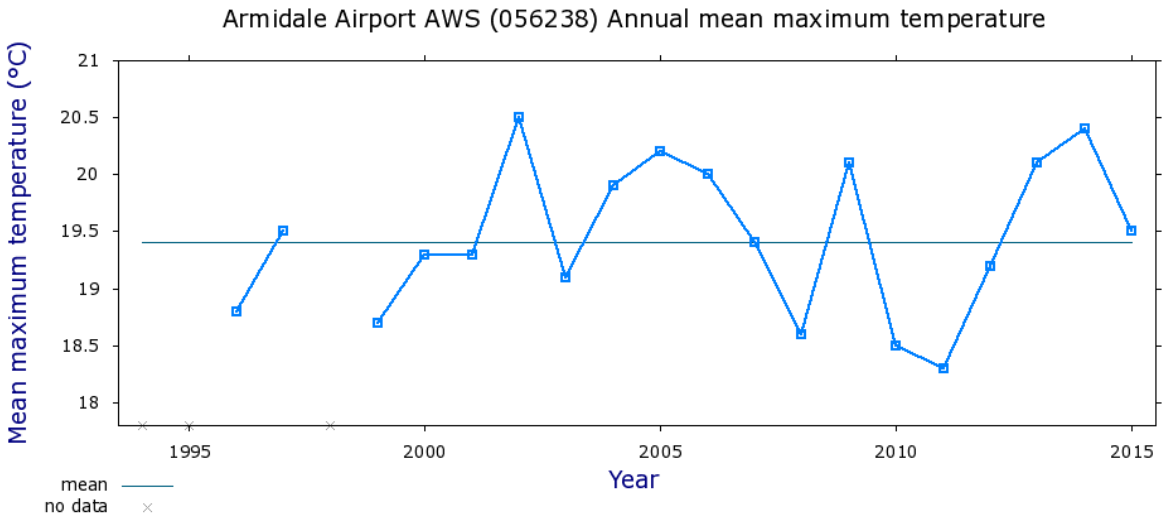
Figure 3 Armidale Airport AWS (056238) Annual mean maximum temperature



Note: Data may not have completed quality control
Observations made before 1910 may have used non-standard equipment

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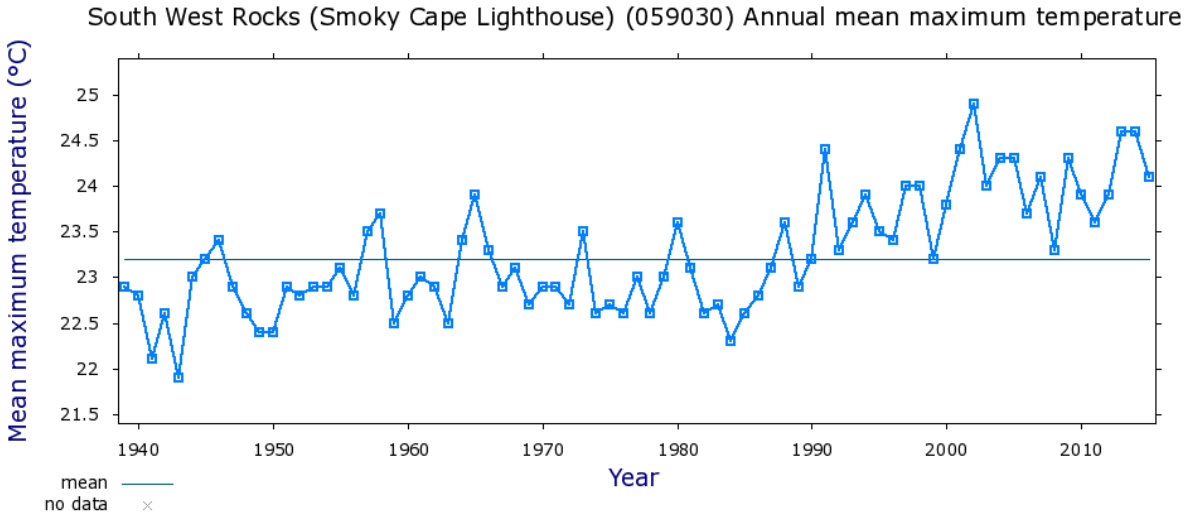
Figure 4 South West rocks (Smoky Cape Lighthouse) (059030) Annual mean maximum temperature



Note: Data may not have completed quality control
Observations made before 1910 may have used non-standard equipment

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6.7 Ecological values

The planning area supports a diverse assemblage of plant communities. Their distribution is strongly influenced by marked climatic gradients that range from coastal floodplains to tableland areas.

The western part of the catchment includes extensive tableland and escarpment areas. The tableland areas to the west and south form part of the New England Tablelands and are largely cleared for grazing. Introduced plant species are prevalent in the tablelands in areas where native vegetation has been cleared (NPWS 2005). However, to the east of the tablelands the landscape changes and gives rise to substantial escarpment areas that are characterised by spectacular gorges and waterfalls and diverse ecological features. Over 900 native plant species have been recorded in the upper Macleay River Gorges (NPWS 2005). This part of the planning area includes the Oxley Wild Rivers National Park which is included in the Central Eastern Rainforest Reserves of Australia (CERRA) World Heritage Area. This part of the planning areas also includes the Macleay Gorges and Kunderang

Wilderness Areas (NPWS 2005) that have been identified as having large intact and undisturbed expanses of natural landscapes.

The escarpment country flattens out toward the coast and the landscape changes from foothills to coastal plains to wide floodplains (DLWC 1999). The floodplain includes wetlands that are listed as an Endangered Ecological Community (EEC) in NSW under the *Threatened Species Conservation Act 1995* (NPWS 2005). The floodplain area also includes parts of the Limeburners Creek Nature Reserve and the Collombatti Swamp that are listed under the Commonwealth Governments Directory of Important Wetlands in Australia. They are recognised as providing important habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail and are good examples of wetlands occurring within a biogeographic region in Australia (DECC 2010).

6.7.1 Threatened species

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

Threatened frog species known to occur in the planning area include the Booroolong, Tusked, Green and Golden Bell, Stuttering, Green Thighed and the Yellow-spotted Tree. Threatened bird species known to occur in the planning area include the Blue Billed Duck, Australasian Bittern, Black Bittern, Brolga and the Comb Crested Jacana.

6.7.2 Estuary sensitivity

Estuary specialists from DPI Water and the Office of Environment and Heritage (OEH) have 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 within the Macleay catchment, tend to be highly sensitive to inflow variations, with most being only intermittently connected to the ocean. Barrier estuaries such as the Macleay River estuary are generally less sensitive to inflow variations. As they mature and infill with sediment they tend to become long and narrow 'river' estuaries.

Table 1 lists the sensitivity of the Macleay River estuary. 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 1 Inflow sensitivities for the Macleay River estuary

Name of estuary	Inflow sensitivity - low flows	Inflow sensitivity - high flows
Macleay River	Medium	Medium

6.8 Groundwater

Groundwater aquifers in the planning area are primarily found in alluvial sediments. Alluvial sediments can be categorised as 'upriver alluvium' or 'coastal floodplain alluvium'.

The upriver alluvium nominally occurs upstream of the tidal limit and is sandier than the coastal floodplain alluvium. The upriver alluvium consists of medium to coarse grained sand, silts and gravel deposits. Groundwater from the aquifer is typically highly connected to the surface water. As a result of this connection, coupled with the coarser sediments, water quality is typically good with high yields potentially obtainable in some areas. The upriver alluvial aquifer extends along the Macleay River (and some tributaries) upstream from the

tidal limit at Belgrave Falls to the Macleay Gorges water source. The upriver alluvium is found in the following surface water sources.

• Collombatti Creek	• Dungay Creek	• Dyke River
• Five Day Creek	• Georges River	• Gills Bridge Creek
• Hickeys Creek	• Macleay Gorges	• Macleay Valley
• Mungay Creek	• Nulla Nulla Creek	• Stockyard Creek
• Toorumbee Creek	• Warbro Brook	-

The floodplain alluvial groundwater source is located below the tidal limit of the Macleay River (below Belgrave falls) and is contained within the Coastal Macleay Water Source. These alluvial deposits generally consist of fine grained sand, silts and clays. Bore yields are generally low to moderate and are typically only suitable for stock purposes or small scale irrigation. Water quality in these areas can be variable with some areas being fresh and others being impacted by estuarine environments resulting in higher salinities. Coastal floodplain alluvials are underlain by acid sulphate soils. Dewatering of acid sulphate soils, via for example, groundwater extraction, can result in the acidification of groundwater and other adverse water quality impacts.

6.9 River flows

There are a number of gauges within the Macleay catchment monitoring stream flows on a daily basis. Of which three gauges are used as flow reference points in the plan against which access rules are measured. Table 2 documents the gauges that are used to set access rules in the Macleay water sharing plan area.

Table 2 Flow reference points

Gauge	Location	Commenced
206001	Styx @ Jeogla	1918
206009	Tia @ Tia	1927
206011	Macleay @ Turners Ft	1945

6.10 Entitlement and water use

At the commencement of the water sharing plan approximately 14,635 ML/year of surface and groundwater entitlement occurs in the plan area (Table 3).

Note: This estimate includes estimates for unregulated river and aquifer access entitlement and does not include local water utility entitlement and or stock and domestic entitlement.

This entitlement is divided between unregulated surface water (14,333 ML/year) and alluvial groundwater (302 ML/year). An additional 17,888 ML/year of entitlement has been issued for local water utility access in the planning area of which 10,141 ML/year is issued for groundwater extraction from the Macleay Valley water source and 750ML/year is issued for surface water extraction in the Malpas Dam water source. There has been an embargo on granting new surface water licences on the north coast since 2007. Alluvial aquifers were embargoed in 2008.

Table 3 Total unregulated and aquifer access entitlement* for each water source at plan commencement

Water source	Unregulated river entitlement (ML/yr)	Aquifer access entitlement (ML/yr)
Apsley Gorge	0	0
Apsley River	326	0
Bakers Creek	100	0
Blue Mountain Creek	253	0
Chandler Gorge	0	0
Chandler River	301	0
Christmas Creek	0	0
Coastal Macleay	1,836	0
Collombatti Creek	8	0
Commissioners Waters	2	0
Dungay Creek	265	0
Dyke River	0	0
Euroka Creek	0	0
Five Day Creek	60	0
Gara River	1,412	0
Georges River	0	0
Gills Bridge Creek	273	0
Green Gully	0	0
Hickeys Creek	76	0
Kunderang Brook	0	0
Macleay Gorges	2	0
Macleay Valley	3,432	162
Malpas Dam	144	0
Mungay Creek	103	0
Nulla Nulla Creek	66	0
Oaky River	55	0
Salisbury Waters	1,476	0
Stockyard Creek	0	0

Water source	Unregulated river entitlement (ML/yr)	Aquifer access entitlement (ML/yr)
Styx River	213	0
Tia River	703	0
Toorumbee Creek	0	0
Warbro Brook	304	0
Yarrowitch River	759	0
Coastal Macleay Floodplain Alluvial	0	140
TOTAL	**14, 333**	**302**

* 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/year for local water utility and domestic & stock access licences. For ease of reporting, the total share component is recorded as ML/year.

6.10.1 Water extraction in the alluvium

Most of the alluvial groundwater entitlement issued in the planning area occurs in the upriver alluvium toward the downstream extent of the alluvium. Of which most is allocated for town water supply purposes for Kempsey Shire Council (Kempsey Council) and extracted from Kempsey Council's bore field at Sherwood. A small amount of entitlement is issued in the floodplain alluvium however, traditionally there has been minimal extraction from the alluvium. The Macleay River water sharing plan does not differentiate between the upriver and the coastal floodplain alluvium; both types of alluvium are subject to the same rules.

Of the total groundwater entitlement, more than 90% is for town water supply, with the remainder being for irrigation and farming purposes No entitlement is issued for domestic and stock bores. Although domestic & stock bores need to be licensed, water access licences are not issued for groundwater extracted for domestic and stock purposes.

Detailed water use is not available for the alluvial groundwater sources because there is not yet broad scale metering in these water sources. The NSW Government is exploring this issue through the Water Use Monitoring Program.

6.10.2 Local water utility requirements

Kempsey Shire Council operate a number of water supply schemes. Steuart McIntyre Dam is of interest to the Macleay water sharing plan. Steuart McIntyre Dam is an offstream storage that has a capacity of 2,500 ML. It provides potable water to Kempsey as well as other towns in the lower Macleay catchment.

Steuart McIntyre Dam is supplied by ground and surface water sources within the Macleay Valley Water Source. Groundwater is supplied by extraction from the Sherwood borefield. Surface water is supplied indirectly by pumping from the Macleay River to the Sherwood borefield recharge channel.

Armidale Council operate a number of water supply schemes in the upper Macleay catchment. Malpas Dam is of interest to the Macleay water sharing plan area and is the major provider of town water to Armidale.

Malpas Dam has a capacity of 13,000 ML and sources its water from the Gara River.

7.0 The process of developing the Macleay River 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 Macleay River water sharing plan was guided by three panels:

- State Interagency Panel
- North Coast Working Group
- North Coast Interagency Regional Panel (IRP).

In summary, the draft Macleay River water sharing plan was prepared based on:

- Indicative rules generated by a risk and values classification (explained later in this section)
- Deliberations of the North Coast Working Group and the North Coast Regional Panel
- Feedback from stakeholders during 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 Macleay River water sharing plan.

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.

7.1 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 statewide significance.

The State Interagency Panel is chaired by DPI Water and comprises representatives from DPI (Water, Agriculture and Fisheries), OEH and LLS (formerly catchment management authorities). DPI Water is responsible for overall project management.

7.2 North Coast Interagency Regional Panel

The North Coast Interagency Regional Panel (the Regional Panel) comprises representatives from DPI (Water, Fisheries and Agriculture), OEH, and the North Coast LLS (formerly Northern 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 include:

- Ensure water sharing rules are consistent with State policy
- Review the water management units provided by DPI Water
- Review economic, social and environmental values
- 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 proposed rules
- Review submissions and make changes to plan rules as necessary

The Regional Panel leverage local knowledge and subject matter experts when developing and recommending water sharing rules.

7.3 North Coast Working Group

The North Coast Working Group (the Working Group) comprises a range of officers representing the various functions of DPI Water including 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.

7.4 Water source classification method

In developing water sharing plans for unregulated rivers, DPI Water classifies each water source based on risks and value 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 demand for licensed extraction relative to river flows
- 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
- Economic dependence of the local community on activities requiring licensed water extraction
- Sensitivity of estuaries to the removal of freshwater inflows.

For the Macleay 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 including the following data irrigation, hydrologic, aquatic ecology, fisheries, and threatened species. 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**.**

7.5 Refining the indicative rules

Guided by the indicative access and trade rules, the Interagency Regional Panel used local knowledge and expertise to develop access and trade rules for the draft water sharing plan. Indicative rules were revised based on site specific considerations such as:

- Availability of infrastructure (e.g. river gauges)
- Availability of management systems (e.g. systems to manage the rules)
- Existing management rules (e.g. licence conditions or Water Users Association rostering rules which distribute low flow access amongst licensed users)
- Whether flow regimes in different areas of a water source required different management rules

For example, water users in the Macleay catchment have long recognised the need for cease-to-pump rules and have willingly participated in water sharing arrangements since 2005. These existing water sharing arrangements, plus licence restrictions in place (as a result of Land Board hearings) were examined by the Interagency Regional Panel to determine if they achieved required levels of environmental protection and provisions for BLR.

Consideration was also given to each of the estuaries in the plan area to determine if 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.

7.6 Consultation

Consultation on the proposed rules for the Macleay River draft water sharing plan began in March 2015 and continued through the development of the water sharing plan until after the close of public exhibition in April 2015. The consultation process was facilitated by DPI Water 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
- Specific comments on the Minister's notes included in the draft water sharing plan.

The following organisations were consulted:

- Kempsey Shire Council
- Armidale and Dumaresq Shire Council
- NSW DPI (Fisheries and Agriculture)
- North Coast LLS (formally Northern Rivers CMA)
- Aboriginal community through Aboriginal Water Initiative staff.

7.7 Public exhibition

Public exhibition is the formal exhibition of a draft water sharing plan where the Minister invites submissions on the draft plan and seeks comment on a range of key issues. Public exhibition of the draft Macleay River water sharing plan was held from 2 March 2015 until 17 April 2015 with the plan documents available for viewing at the following locations Armidale Library, Kempsey Library and Walcha Council.

Licence holders were sent letters that explained the exhibition process and ways to have their say on WSP details, including, an invitation to attend face to face appointments with DPI Water staff to discuss specific issues. Fourteen appointments were held, seven in Armidale and seven in Kempsey. Fifteen written submissions were received.

Comments made during public exhibition and subsequent meetings with key stakeholders were reviewed by DPI Water and the Interagency Regional Panel. A number of key plan provisions including updated rules for governing operation of Kempsey Council and Armidale Council town water supplies were made as a direct result of community feedback.

8.0 Water sharing rules

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

- Planned environmental water to protect instream environmental values
- Water required to meet BLR
- Water 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
- Available water determinations (AWDs)
- Rules for granting access licences
- Rules for managing water allocation accounts
- Flow classes and daily access rules for managing licensed extraction from unregulated rivers and alluvial aquifers
- Rules for water supply work approvals
- Access licence dealing rules controlling trade of water within or into other water sources

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

8.1 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 applied to water access licences
- On an annual basis environmental water is protected through the establishment of long term average annual extraction limits.

The Interagency Regional Panel set cease-to-pump rules for each water source in the Macleay 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.

8.2 Requirements for water

The Macleay water sharing plan defines all licensed and unlicensed requirements for water within the Macleay 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 the number of properties with river frontage in each water source, and estimated water usage based on property size, climatic region and land use.

At the start of the Macleay River water sharing plan:

- BLR was estimated at 2,677 ML per year
- Domestic and stock access licences accounted for 208 ML of entitlement per year
- Local water utility access licences accounted for 17,822 ML of entitlement per year
- Unregulated river access licences accounted for 14,333 unit shares (a unit share is equivalent to 1 ML in years where 100% of entitlement is allowed to be extracted)
- Aquifer access licences accounted for 302 unit shares

8.3 Managing extractions

The Macleay water sharing plan establishes a long term average annual extraction limit (LTAAEL) for the Macleay River Extraction Management Unit (EMU) and a LTAAEL for the floodplain alluvial groundwater water source to manage extractions.

8.3.1 The Macleay River EMU LTAAEL

The LTAAEL for the Macleay River EMU comprises:

- The sum of share components in the Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Brook, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Brook and Yarrowitch River water sources at plan commencement (32 525 ML/year), plus
- The sum of BLR estimates for the above water sources (2 677 ML/year), plus
- Share components granted in the water sources over the life of the plan for the above water sources under the *Water Management (General) Regulation 2011*.

At plan commencement the LTAAEL for the Macleay River EMU was 35 202 ML/year. The LTAAEL for the EMU incorporates an allowance to increase entitlement following conversion of low flow entitlement to high flow entitlement.

8.3.2 The LTAAEL for the floodplain alluvial groundwater source

The LTAAEL for the floodplain alluvial groundwater source comprises:

- The sum of the share components in the flood plain alluvial, plus
- An estimate of future water requirements in the floodplain alluvial

At plan commencement the LTAAEL for the floodplain alluvial groundwater source is 1,599 ML/year.

8.3.3 Growth in use response for the Macleay River EMU and the Floodplain Alluvial groundwater source

To protect water for the environment and supply to existing users, it is important to control growth in water use above the LTAAEL. For the Macleay River EMU and the floodplain alluvial groundwater source, 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 and aquifer 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 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.

8.4 Granting new access licences

Consistent with the WMA 2000, the Macleay 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. The water sharing plan does however permit the granting of several other categories of access licence: Aboriginal community development, Aboriginal cultural, domestic and stock licences (only from tidal pools) and high flow only access licences.

8.4.1 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. This

effectively prevents the issuing of any new irrigation licences. However in some coastal rivers, higher and more reliable flows are common and provide an opportunity for licences to be granted for Aboriginal community development activities, provided this additional extraction would not negatively impact on ecological values.

In coastal catchments, Aboriginal community development licences[4] (ACDLs) may be granted which allow water to be pumped from rivers during the high flows and stored in farm dams or tanks, to be used as needed. For the purpose of issuing these licences, high flows are defined as those that are exceeded 50% of the time (the top half of the flow regime).

The Interagency 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. On this basis, the Macleay River water sharing plan has made provision for the granting of ACDLs in the following water sources: Apsley River, Chandler River, Commissioners Waters, Macleay Valley, Oaky River, Styx River and Tia River.

Since granting ACDLs would mean less water remains in the river at these higher flows to meet other users' and environmental needs, it is necessary to limit the total volume that can be extracted for ACD purposes. The water sharing plan allows for a total of 1 560 ML/year to be granted across all water sources where ACDLs are permitted.

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 considering a relaxation of some of the criteria used to assess eligibility for ACDLs.

8.4.2 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.

8.4.3 Domestic and stock access licences

Domestic and stock access licences may be granted where applicants can demonstrate a history of extraction within the tidal pool of the Coastal Macleay water source.

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.

8.4.4 High-flow-only access licences

In many coastal unregulated rivers in NSW there is significant competition for water during dry periods. Incentives were created aimed at encouraging extraction during times of higher flows rather than at times of low flow. 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.

The Macleay River water sharing plan includes an incentive to allow those licences that are converted to high-flow-only access to be granted additional volumes of water. The plan states that for every unit of unregulated river access licence entitlement surrendered, 5 units of unregulated river (high flow) access licence entitlement will be granted. The high flow access commences at the 50th percentile (i.e. the flow that is exceeded on 50% of days).

[4] 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.

Statewide 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 surrendered low flow is reserved for the environment
- There is a no highly sensitive estuary or other identified high flow sensitive feature such as wetlands within the EMU
- There is no significant extraction already occurring in high flow periods
- Conversion would not significantly impact on tidal pool users or town water supplies

The Interagency Regional Panel considered these factors in relation to the Macleay River plan area and recommended that high flow conversions be made available in the Apsley River and Macleay Valley water sources.

8.5 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 from the account as water is extracted throughout the water year. A licence holder's account is not permitted to go into debit.

Unregulated rivers experience significant variation in annual flow volumes. 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 mega litres; 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 daily access rules. AWDs combined with any carryover allowance enable licence holders to use up to twice their water allocation in a year provided that over any consecutive three year period they do not exceed the sum of their water allocations for those three years.

An example of three year accounting for an unregulated river access licence holder with a share component of 50 shares is shown in Table 4.

Table 4 Example of unregulated river access licence accounting rules for a licence with 50 unit shares

Year	Balance brought forward (ML)	AWD (ML/unit share)	Account balance after AWD credited (ML)	Usage (ML)	Account balance at end of year (ML)	Water Carried Over to next year (ML)
1	0	2	100 ML	0	100	*50
2	50	1	100 ML	50	50	50
3	50	1	100 ML	**100	0	0
4	0	1	50 ML	***0	50	50

* Only 50 ML can be carried over as carryover is limited to 1 ML/unit share. The remaining 50 ML is forfeited
** 100 ML is the maximum that can be extracted in this year, that is, twice the unit shares for the year
*** Although with the AWD there is 50 ML in the account, no water is available for extraction as the maximum extraction over three years is the sum of AWDs in those 3 years which in this example is 150 ML and this was extracted in year 2 and 3 so no extraction can occur in year 4

8.6 Access rules

Indicative access rules were developed by DPI Water and the Regional Panel. These rules were placed on public exhibition and comments sought from stakeholders.

8.6.1 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 5.

For some water sources, the Interagency Regional Panel recommended cease-to-pump rules should 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 Interagency 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.

This information may also be found on individual rule summary sheets for the Macleay catchment that are available on DPI Water's website www.water.nsw.gov.au. These rules were developed using risk and value assessment, with input from key resources, subject matter experts and public exhibition.

The Apsley River and Macleay Valley water sources are the only water sources for which a full range of flow classes have been defined. This is due to the fact that they can be easily managed by a flow reference point.

Table 5 Summary of final access rules for the Macleay River water sharing plan

Water source	Flow classes	Access rules	Flow reference point
Apsley River	Very low flow = ≤ 1 ML/day A Class = >1 ML/day ≤16 ML/day B Class = > 16ML/day ≤ 39ML/day C Class = > 39 ML/day	Cease-to-pump at 1 ML/day Pumping restrictions: 8 hours/day at 5 ML/day or less (down to the CtP) at the reference point	206018
Coastal Macleay (Tidal Management Zone)	**Yr 1-3:** Very low flow = ≤ 13 ML/day A Class = > 13 ML/day **Yr 4-6:** Very low flow = ≤ 19 ML/day A Class = > 19 ML/day **Yr 7-10:** Very low flow = ≤ 30 ML/day A Class = > 30 ML/day	**Yr 1-3:** Cease-to-pump at 13 ML/day **Yr 4-6:** Cease-to-pump at 19 ML/day **Yr 7-10:** Cease-to-pump at 30 ML/day	206011
Commissioners Waters (Commissioners Waters Management Zone)	Very low flow = ≤ 1 ML/day A Class = > 1 ML/day ≤13 ML/day B Class = > 13 ML/day	Cease-to-pump at 1 ML/day Pumping restrictions: 12 hours/day at 9 ML/day or less (down to >5 ML/day); 8 hours/day at 5 ML/day or less (down to the CtP) at the reference point.	206008

Water source	Flow classes	Access rules	Flow reference point
Commissioners Waters (Dumaresq Creek Management Zone)	Very low flow ≤ 1 ML/day A Class = > 1ML/day ≤13 ML/day B Class = > 13 ML/day	Cease-to-pump of 1 ML/day when Armidale Dumaresq Council **IS NOT** discharging water from the treatment plant. Cease-to-pump of less than 1ML/day whilst Armidale Dumaresq Council water treatment plant, **IS** discharging water into Dumaresq Creek. Pumping restrictions: 12 hours/day at 9 ML/day or less (down to > 5 ML/day); 8 hours/day at 5 ML/day or less (down to the CtP) at the reference point.	206008
Georges River	Very low flow = No visible flow A Class = Visible flow	Cease-to-pump when there is no visible flow at the reference point.	Georges Creek Road Crossing
Hickeys Creek	Very low flow = No visible flow A Class = Visible flow	Cease-to-pump when there is no visible flow at the reference point	Secombs Lane Bridge
Macleay Gorges	Very low flow = ≤ 13 ML/day A Class = > 13 ML/day	Cease-to-pump of less than 13 ML/day	206024

Water source	Flow classes	Access rules	Flow reference point
Macleay Valley	**Yr 1-3:** Very low flow = ≤ 13 ML/day A Class = > 13 ML/day ≤ 1 014ML/day B Class = > 1 014 ML/day ≤ 1 419 ML/day C Class = > 1 419 ML/day **Yr 4-6:** Very low flow = ≤ 19 ML/day A Class = > 19 ML/day ≤ 1 014ML/day B Class = > 1 014 ML/day ≤ 1 419 ML/day C Class = > 1 419 ML/day **Yr 7-10:** Very low flow = ≤ 30 ML/day A Class = > 30 ML/day ≤ 1 014ML/day B Class = > 1 014 ML/day ≤ 1 419 ML/day C Class = > 1 419 ML/day	**Yr 1-3:** Cease-to-pump at 13 ML/day **Yr 4-6:** Cease-to-pump at 19 ML/day **Yr 7-10:** Cease-to-pump at 30 ML/day	206011
Nulla Nulla Creek	Very Low Flow = No visible flow A Class = Visible flow	Cease-to-pump at no visible flow at the reference point	Nulla Creek Road Crossing
Styx River	**Yr 1-5:** Very low flow = ≤ 7 ML/day A Class = > 7 ML/day ≤ 110 ML/day C Class = > 110 ML/day **Yr 6-10:** Very low flow = ≤ 10 ML/day A Class = > 10 ML/day ≤ 110 ML/day C Class = > 110 ML/day	**Yr 1-3:** Cease-to-pump at 7 ML/day **Yr 6-10:** Cease-to-pump at 10 ML/day	206001

Water source	Flow classes	Access rules	Flow reference point
Tia River	Very low flow = ≤ 2 ML/day A Class = > 2ML/day ≤ 66 ML/day C Class = > 66 ML/day	Cease-to-pump at 2 ML/day	206009
Warbro Brook	Very low flow = ≤ 8 ML/day A Class = > 8 ML/day	Cease-to-pump at 8 ML/day	206011
Yarrowitch River	Very low flow = ≤ 3 ML/d A Class = > 3 ML/d	Cease-to-pump at 3 ML/day	Yarrowitch River at Yarrobindi Bridge

Water source	Flow classes	Access rules	Flow reference point
Apsley Gorge Bakers Creek Blue Mountain Creek Chandler Gorge Chandler River Christmas Creek Coastal Macleay (Non-Tidal Management Zone) Collombatti Creek Dungay Creek Dyke River Euroka Creek Five Day Creek Gara River Gills Bridge Creek Green Gully Kunderang Brook Malpas Dam Mungay Creek Oaky River Salisbury Waters Stockyard Creek Toorumbee Creek	No flow classes defined.	Licence holders are not permitted to take water when there is no visible flow at the pump site, or where water is being taken from a pool, when the volume of water in that pool is less than the full capacity of the pool.	Pump site or the outflow of the pool from which water is taken

8.6.2 Access to very low flow

Those activities that are considered critical human needs or animal health requirements are permitted to access very low streamflows, that is, flows below the cease-to-pump. Licences with access to very low flows are listed in Schedule 1 of the plan. They include the taking of water for:

- Domestic supply
- Town water supply, until major augmentation of scheme infrastructure occurs
- Fruit washing
- Cleaning dairy plant and processing equipment for the purpose of hygiene
- Poultry washing and misting
- Cleaning enclosures used for intensive animal production for the purposes of hygiene

8.6.3 Total daily extraction limits

One of the plan's main objectives is to share water between users 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.

Daily extraction limits are calculated based on a policy method developed by the DPI Water that assigns a proportion of extraction from the upper limit of each flow class. Full details of this policy can be found in the document *Advice to Water Management Committees. No. 6 Daily extraction management in unregulated rivers* which is available on the DPI Water website www.water.nsw.gov.au

Under this policy, daily extraction limits should generally be set at less than 30% of the flow threshold. However where demands for extraction are already very high and the economic impact of a significant reduction in access would be high, the volumes may be set at up to a maximum of 60 per cent of the upper limit of the flow class.

The application of daily extraction limits is however dependent on the existence of a comprehensive gauging network and the use of water meters. While this infrastructure is not currently in place within the Macleay water sharing plan area, the plan allows for TDELs to be established in these water sources at a later date, if required.

8.6.4 Alluvial licences

Following advice provided by DPI Water hydrogeologists, the Interagency Regional Panel agreed that the connectivity between groundwater and surface water within a 40 metre wide buffer zone along the river from the high bank was minimal. Accordingly it was considered unnecessary to impose access management rules on the few alluvial licences for existing bores located within this buffer zone.

The exceptions are also provided for access licences for stock and domestic, local water utility, food safety and essential dairy care purposes. However at some future time, alluvial bores may be subject to local impact rules developed to address local groundwater issues and implemented through Ministerial Order.

8.7 Water supply works approvals

8.7.1 Construction of dams

Consistent with statewide policy, the Macleay River water sharing plan prohibits the construction of instream dams in the water sources which have been assessed to have high instream values: Coastal Macleay, Georges River, Green Gully, Stockyard Creek, Styx River, and the Tia River. Following advice from the Regional Panel and being consistent with trading rules proposed for the upstream management zones of the Dungay Creek and

Euroka Creek water sources, instream dams are also prohibited in these management zones.

8.7.2 Construction of bores in alluvial aquifers

The Macleay 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 provides consent in writing
- 500 metres from an approved water supply bore that is used by a local water utility or major water utility
- 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 that demonstrates that 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 plan commencement there were two high priority GDEs and no groundwater dependent cultural sites. Should additional GDEs or culturally significant sites be identified during the life of the plan, 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.

8.8 Dealing rules

The objective of dealing (trading) rules is to encourage development of a water market whilst recognising and protecting the needs of the environment and third party interests.

The NWI established guidelines for water trading. Trading of water entitlement within the water sharing plan area needs to maximise flexibility for users to use water to its highest value without having an adverse impact on water sources or existing water users.

Refer to Table 6 for a summary of the trading rules included in the water sharing plan.

Table 6 Summary of water dealing rules

Water source	Dealing rule	Justification
Apsley Gorge	Not permitted (except from the upstream Apsley River, Tia River, Yarrowitch River and Green Gully Water Sources).	There is no entitlement in the water source and not allowing trade in will provide additional protection for instream values.
Apsley River	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Trading rules in the Apsley River Water Source were updated to reflect current policies and be consistent with surrounding water sources.
Bakers Creek	Trade into the water source of an additional 65ML/year is permitted.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply. Trade rules are influenced by instream values. Recent investigations into the presence of instream values suggest that the risk a modest increase in entitlement would not impact on instream values present in the system. The Regional Panel recommended to allow an additional 65ML/year of entitlement be traded into the water source.
Blue Mountain Creek	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Chandler Gorge	Not permitted (except from the upstream Styx, Oakey, and Chandler rivers).	There is no entitlement in the water source and allowing trade in from upstream water sources only will offer instream values protection.

Water source	Dealing rule	Justification
Chandler River	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Christmas Creek	Permitted, but only up to a maximum of 40ML from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for trade into the water source to an upper limit.
Coastal Macleay	**Tidal Management Zone** Permitted, to an additional 500ML from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River. **Non-Tidal Management Zone** Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	**Tidal Management Zone** Current policy provides for trade into the management zone to an upper limit. The Regional Panel sought advice from the community on an appropriate upper limit should be. The Regional Panel considered advice and recommended to allow for an additional 500ML of entitlement in the Tidal Management Zone. **Non-Tidal Management Zone** Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.

Water source	Dealing rule	Justification
Coastal Macleay Floodplain Alluvium	Trades into the water source are not permitted.	Current policy provides for no trade into the water source.
Collombatti Creek	Permitted, but only up to a maximum of 67ML from Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Commissioners Waters, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for trade into the water source to an upper limit.
Commissioners Waters	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Trading rules in the Commissioners Waters Water Source were updated to reflect current policies and be consistent with surrounding water sources.
Dungay Creek	**Upstream Trading Zone** Not permitted. **Downstream Trading Zone** Trades permitted (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	**Upstream Trading Zone** Current policy provides for trade into the water source to an upper limit. The Regional Panel considered advice from DPI Water experts that substantial instream ecological values existed in the upper reaches of the water source and that trade in restrictions should apply. The Regional Panel recommended establishing a no trade in management zone to protect instream values. **Downstream Trading Zone** Current policy provides for a no net gain trading rule or from upstream water sources (of which there are none) to apply.
Dyke River	Trades into the water source are not permitted.	There is no entitlement in the water source and not allowing trade in will provide additional protection for instream values.

Water source	Dealing rule	Justification
Euroka Creek	**Upstream Trading Zone** Not permitted. **Downstream Trading Zone** Trades permitted (up to 15ML) from Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	**Upstream Trading Zone** Current policy provides for trade into the water source to an upper limit. The Regional Panel considered advice from DPI Water experts that substantial instream ecological values existed in the upper reaches of the water source and that trade in restrictions should apply. A management zone that prohibited trades into the management zone was established to protect instream values. **Downstream Trading Zone** Current policy provides for trade into the water source to an upper limit.
Five Day Creek	Permitted up to 100ML but only if the entitlement is from Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for trade into the water source to an upper limit.
Gara River	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River, Malpas Dam or from the Malpas Dam and Commissioners Waters water sources (upstream water sources).	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are two) to apply to the water source.
Georges River	Trades into the water source are not permitted.	Current policy provides for a no trade in rule.
Gills Bridge Creek	Trades into the water source are not permitted.	There is a small amount of entitlement in the water source and not allowing trade in will provide additional protection for instream values.
Green Gully	Trades into the water source are not permitted.	Current policy provides for a no trade in rule.

Water source	Dealing rule	Justification
Hickeys Creek	Permitted from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River but only up to a maximum of 87ML.	Current policy provides for trade into the water source to an upper limit.
Kunderang Brook	Trades into the water source are not permitted.	There is no entitlement in the water source and not allowing trade in will provide additional protection for instream values.
Macleay Gorges	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from Christmas Creek, Coastal Macleay, Collombatti Creek, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gills Bridge Creek, Georges River, Hickeys Creek, Macleay Valley, Mungay Creek, Nulla Nulla Creek, Toorumbee Creek, Warbro Creek, Stockyard Creek, or from the Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek**,** Chandler Gorge, Chandler River, Commissioners Waters, Gara River, Green Gully, Kunderang Creek**,** Malpas Dam, Oaky River, Salisbury Waters, Styx River, Tia River, Yarrowitch River (upstream water sources).	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are 16) to apply to the water source.
Macleay Valley	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from Christmas Creek, Coastal Macleay, Collombatti Creek, Dungay Creek, Euroka Creek, Gills Bridge Creek, Apsley Gorge or from the Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Dyke River, Commissioners Waters, Gara River, Green Gully, Kunderang Creek, Malpas Dam, Macleay Gorges, Oaky River, Salisbury Waters, Styx River, Tia River, Yarrowitch River (upstream water sources).	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are 17) to apply to the water source.
Malpas Dam	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source

Water source	Dealing rule	Justification
Mungay Creek	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Nulla Nulla Creek	Permitted, from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke Creek, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River water sources but only up to a maximum of 230ML.	Current policy provides for trade into the water source to an upper limit.
Oaky River	Permitted, from Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River water sources but only up to a maximum of 221 ML.	Current policy provides for trade into the water source to an upper limit.
Salisbury Waters	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain), from Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Stockyard Creek	Trades into the water source are not permitted.	Current policy provides for a no trade in rule.

Water source	Dealing rule	Justification
Styx River	Trades into the water source are not permitted.	Current policy provides for a no trade in rule.
Tia River	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Toorumbee Creek, Warbro Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Toorumbee Creek	Trades into the water source are not permitted.	Trading rules in the Toorumbee Waters Water Source were retained to reflect the existing arrangements. There is no entitlement in the water source and not allowing trade in will continue protection for instream values.
Warbro Brook	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Yarrowitch River.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.
Yarrowitch River	Permitted, only if the total licensed entitlement in the water source does not increase (no net gain) from, Apsley Gorge, Apsley River, Bakers Creek, Blue Mountain Creek, Chandler Gorge, Chandler River, Christmas Creek, Coastal Macleay, Collombatti Creek, Commissioners Waters, Dungay Creek, Dyke River, Euroka Creek, Five Day Creek, Gara River, Georges River, Gills Bridge Creek, Green Gully, Hickeys Creek, Kunderang Creek, Macleay Gorges, Macleay Valley, Malpas Dam, Mungay Creek, Nulla Nulla Creek, Oaky River, Salisbury Waters, Stockyard Creek, Styx River, Tia River, Toorumbee Creek, Warbro Creek.	Current policy provides for a no net gain trading rule OR from upstream water sources (of which there are none) to apply to the water source.

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
- 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.

9.0 Adaptive management

Adaptive management refers to the practice of change in response to new available information such as monitoring or extraction data or an improvement in understanding or capability, such as modelling. Such information may 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 NWI, and has been allowed for during the life of the Macleay 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 Macleay River water sharing plan are discussed below. Following this is a discussion about monitoring, evaluation and reporting which are key activities for the adaptive management of water sharing plans.

9.1 Amendment provisions

The Macleay 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
- Updating information in Schedules or deleting them if no longer required.

The final Macleay River water sharing plan also includes the following amendments that are specific to the Macleay catchment.

9.1.1 Establish a salinity based access rule for the Tidal Management Zone of the Coastal Macleay water source.

The Interagency Regional Panel supported implementing a salinity based cease to pump rule for access to the Tidal Management Zone (measured as electrical conductivity) should sufficient data become available to guide establishment of an appropriate monitoring site and a suitable salinity threshold on which to base a cease to pump.

However, in the absence of sufficient data the Interagency Regional Panel supported the inclusion of an amendment provision in the water sharing plan that provides the flexibility to transition to a salinity based cease to pump should sufficient data become available during the life of the water sharing plan. It was also agreed that stakeholders will be consulted over a suitable threshold prior to changing to a salinity based cease to pump. It is the DPI Water's view that any cease to pump threshold should be set at a level that ensures the extent and location of the tidal pool remains unchanged for at least 95% of the time.

9.1.2 Malpas Dam operations

Malpas Dam is operated by Armidale Council and located near Guyra on the Gara River toward the top of the Macleay catchment. Malpas Dam provides the primary town water supply

for Armidale. The dam captures most inflows from the upstream Gara River and Urandangie Creeks and according to existing licensing conditions is required to release only small amounts of water downstream.

DPI Water, the Interagency Regional Panel and stakeholders noted that existing bypass rules provided insufficient downstream flows for extractive and environmental values. In recognition of this and following modelling to show that the dams town water supply role would not be compromised if additional releases occurred, DPI Water, the Interagency Regional Panel and Armidale Council agreed to a suite of draft bypass rules.

These rules mimic flow variability in the system, provides additional water for environmental and consumptive values and provides certainty in timing and release volumes. The draft bypass rules represented a major step forward in providing additional and varied flows downstream of Malpas Dam.

The bypass rules were discussed with stakeholders during and after public exhibition. The draft bypass rules were revised in light of stakeholder feedback and discussions between DPI Water, Armidale Council staff and stakeholders. The revised bypass rules included in the Macleay water sharing plan represent an even better outcome for:

- Downstream users via the provision of more water (particularly in lower flows) more often, transparency and security in the timing of releases,
- Environmental values via the delivery of greater and more varied flows.

9.1.3 Access rules for in-river dam pools – Gara

Gara Dam is located on the Gara River. Gara Dam was part of Armidale Councils town water supply system, but is no longer in use for this purpose. Since construction it is believed that a number of people adjacent to Gara Dam have become dependent on water from this storage for irrigation purposes and that these persons have traditionally accessed water after the Gara River ceases to flow.

The cease to pump rule included in the Macleay water sharing plan for the Gara River water source does not allow persons to take water from the Gara River or the Gara Dam after the Gara River ceases to flow.

DPI Water and the Interagency Regional Panel were concerned that persons who traditionally made use of the Gara Dam may be unaware of the impact the new cease-to-pump rule may have on their operations. Accordingly an amendment provision was included in the Macleay water sharing plan providing persons who can demonstrate a history of drawing down Gara Dam an opportunity to continue to do so.

To be eligible for a cease-to-pump rule that differs from the rest of the Gara River water source and reflects historical use stakeholders have 12 months, from water sharing plan gazettal, to apply in writing and demonstrate their historic use. DPI Water will then assess each application and make a determination as to whether a different cease-to-pump rule should apply to the individual applicant.

9.2.0 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 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 water sharing plans. The framework will assess the inputs, outputs and outcomes of the water sharing plans and operations. The assessment will consider the:

- Process of plan development (appropriateness)

- Performance of the plan during operation (efficiency)
- 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)
- Audit of plans
- Review of each plan at the end of its ten year term.

9.2.1 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.

To better 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.

9.2.2 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 WMA 2000 the Minister for Natural Resources, 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 DPI (Water, Agriculture and Fisheries), OEH, LLS and NRC (invited to participate as observers).

Reflecting the requirements of the WMA 2000 the focus of the audit is on the extent to which the provisions of 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 implementation of existing plans and robustness of new plans
- Identify opportunities for linking audit findings with other related processes, particularly the review of catchment action plan targets

9.2.3 Plan review

At the end of the water sharing plan's 10 year life the Minister may, on recommendation by the NRC (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

- A report by the NRC 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 LLS 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.

10.0 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 not included in the legislation that are 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 riverbeds or floodplains.

Aquifer: An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. The volume of water stored in an aquifer, the rate at which water can recharge, the volume of water extracted from it, and the rate at which water can move through the aquifer are all controlled by the geologic nature of the aquifer.

Conversion factor: The adjustment factor that is to be applied to share components when they are cancelled and reissued in a different water source and vice versa, or as a different category. It is designed to allow movement of water from one water source to another or from one licence category to another whilst minimising the impacts on third parties of such movements. These impacts result in that the value of a unit of share component (in terms of the average water allocations) that result from it may vary from one water source to another or from one licence category to another.

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

Flow reference point: 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: Ecosystems that rely on groundwater for their species composition and their natural ecological processes.

Individual daily extraction limit (IDEL): The daily volume limit that may apply for a particular licence holder for each flow class. The IDEL will be specified as part of the extraction component on the access licence. It establishes a share of the TDEL for that flow class.

Instream refuge habitat: Stream habitat containing pools that retain water for longer periods of time during drought and low flow. Instream biota will migrate to these more permanent habitats to survive.

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 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.

Total daily extraction limit (TDEL): The total limit on the daily volume of water that access licence holders in a particular category can take from a flow class. It is the sum of all the IDELs in that flow class.

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

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

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

11.0 References

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Appendix 1 - Macleay water sharing plan maps

Figure 5 Water Sources in the Macleay River Extraction Management Unit

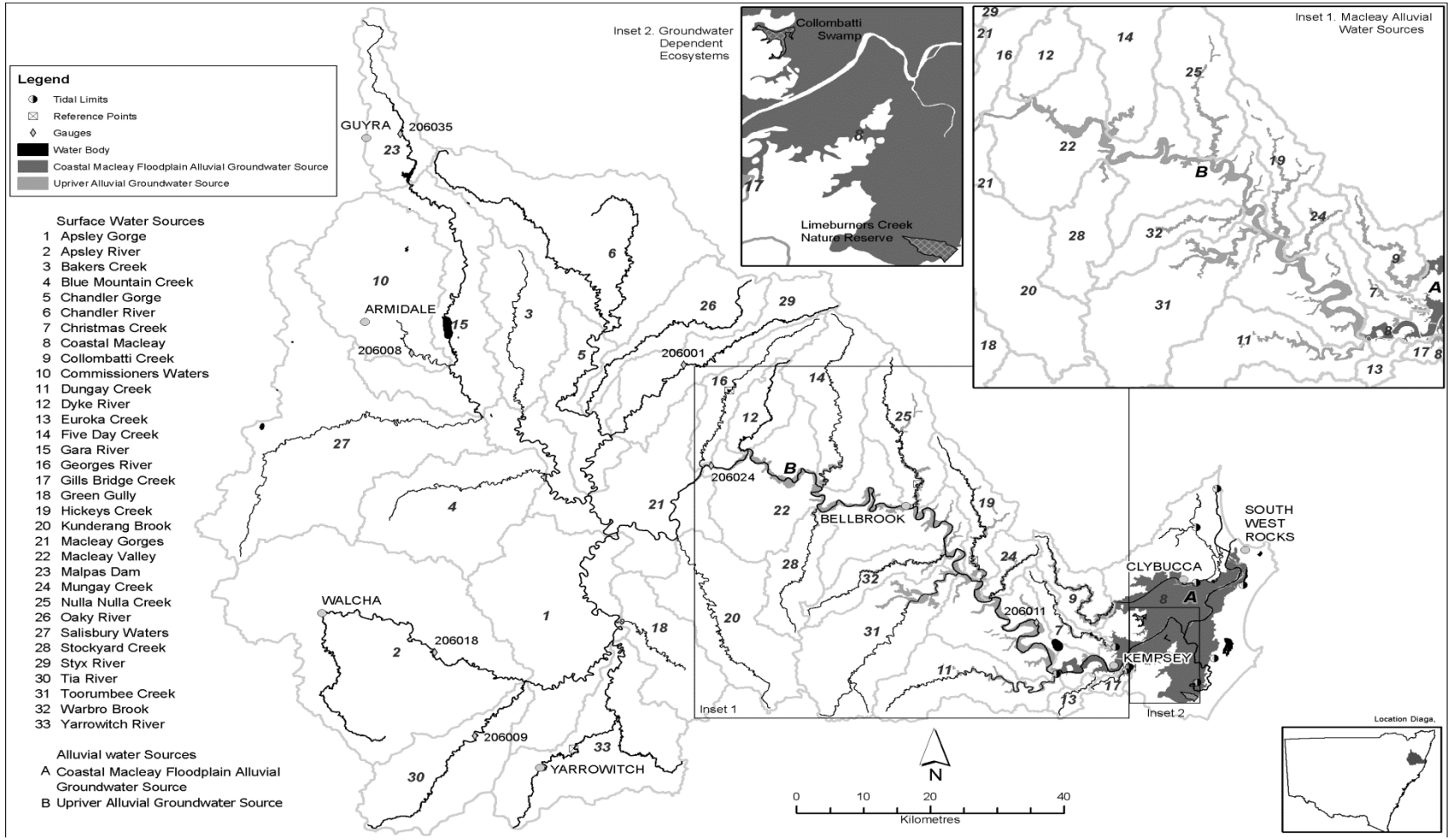


Figure 6 Trading zones for the Dungay Creek water source

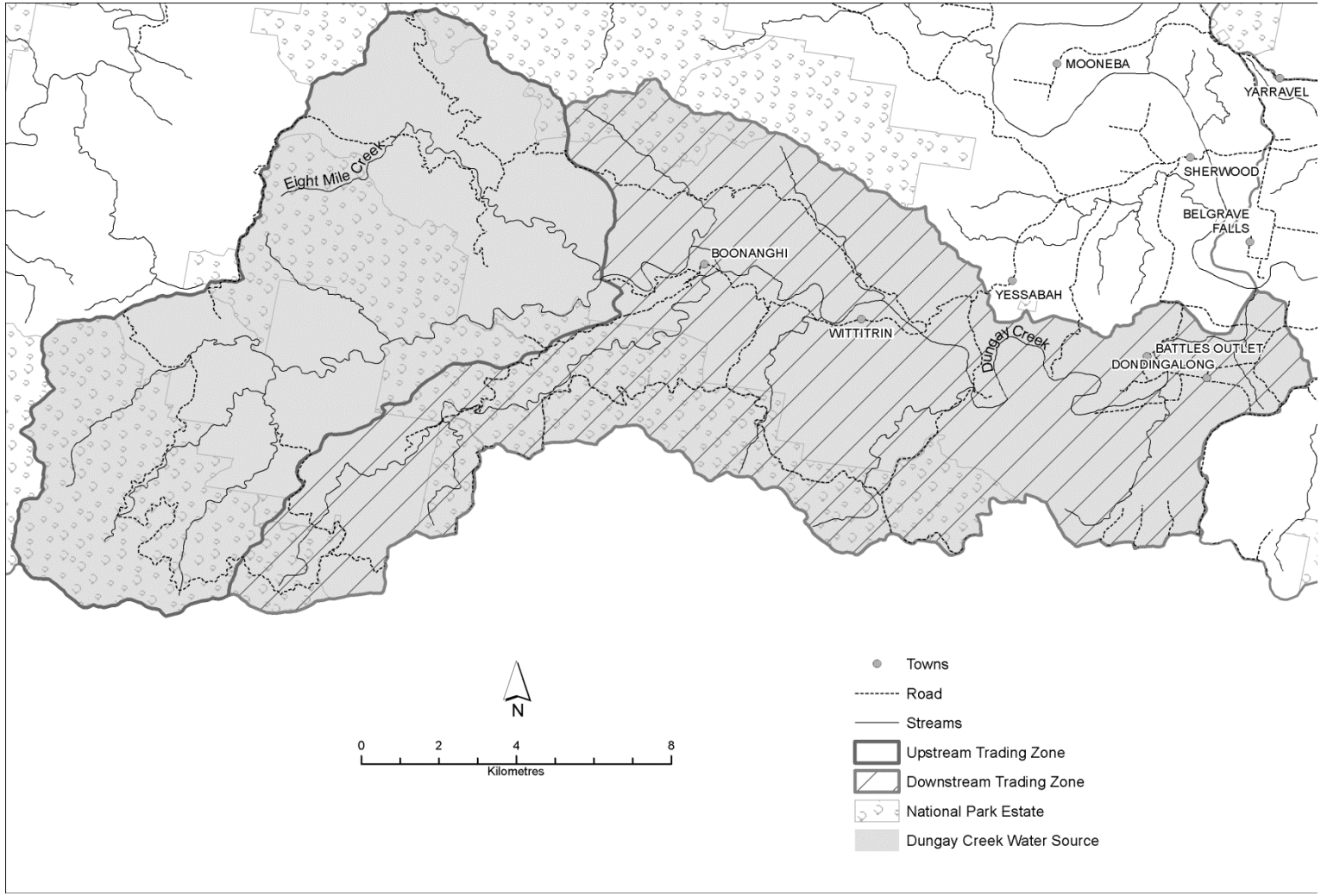


Figure 7 Water sharing plan map – Trading zones for the Euroka Creek water source

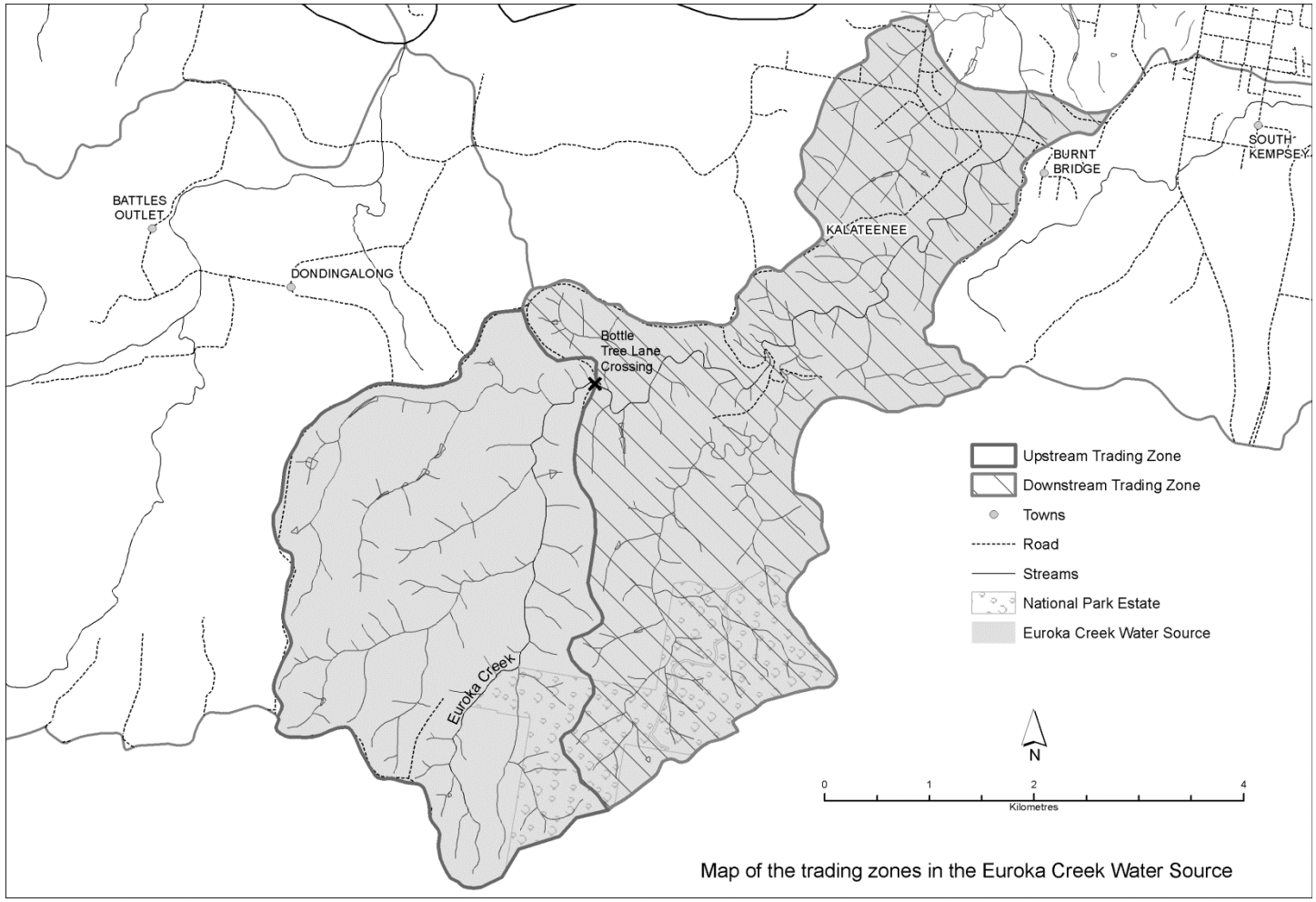
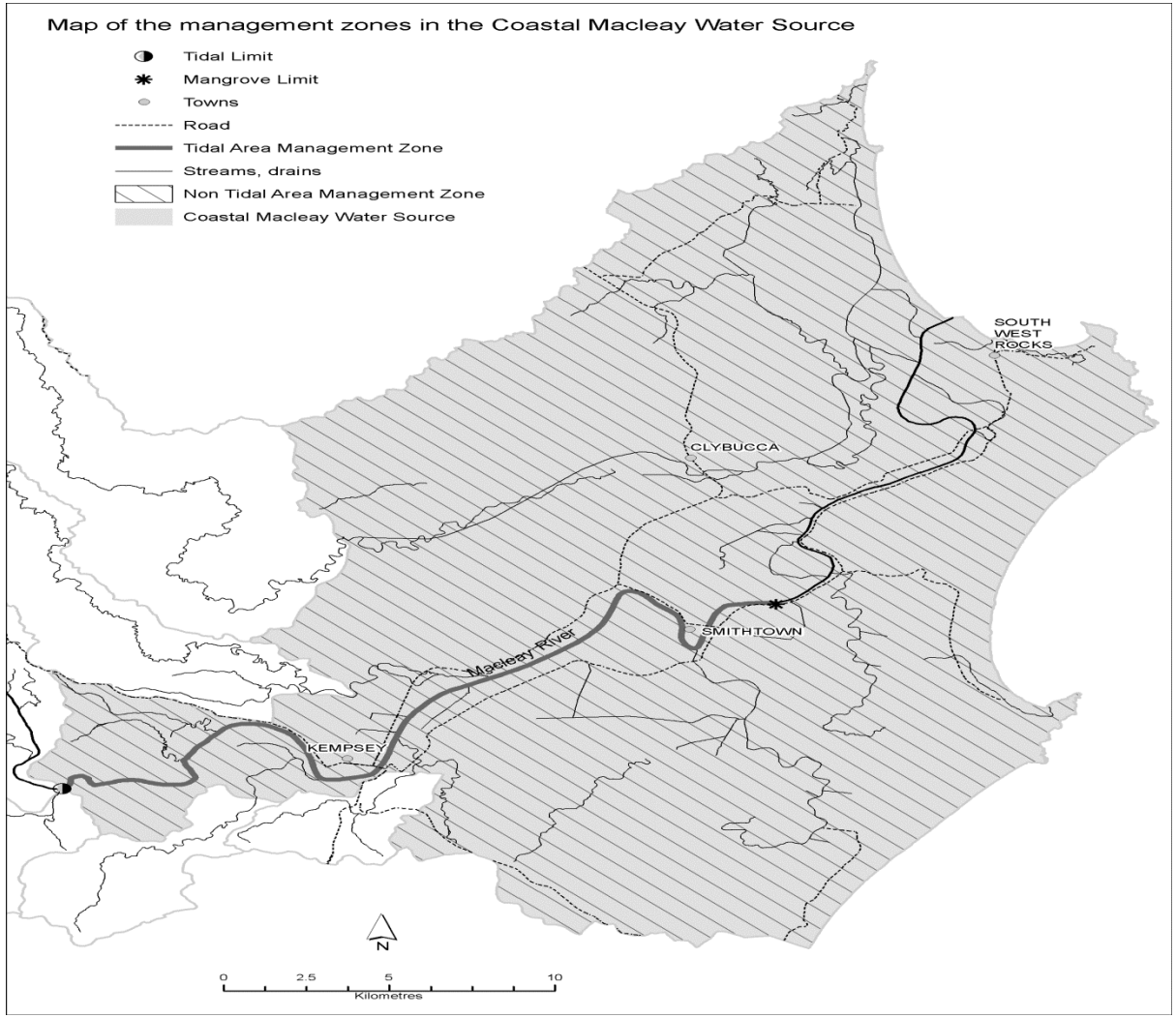


Figure 8 Trading zones for the Coastal Macleay water source



Appendix 2 - Water sources contained within the Macleay River Extraction Management Unit

- Apsley Gorge Water Source
- Apsley River Water Source
- Bakers Creek Water Source
- Blue Mountain Creek Water Source
- Chandler Gorge Water Source
- Chandler River Water Source
- Christmas Creek Water Source
- Coastal Macleay Water Source
- Collombatti Creek Water Source
- Commissioners Waters Water Source
- Dungay Creek Water Source
- Dyke River Water Source
- Euroka Creek Water Source
- Five Day Creek Water Source
- Gara River Water Source
- Georges River Water Source
- Gills Bridge Creek Water Source
- Green Gully Water Source
- Hickeys Creek Water Source
- Kunderang Brook Water Source
- Macleay Gorges Water Source
- Macleay Valley Water Source
- Malpas Dam Water Source
- Mungay Creek Water Source
- Nulla Nulla Creek Water Source
- Oaky River Water Source
- Salisbury Waters Water Source
- Stockyard Creek Water Source
- Styx River Water Source
- Tia River Water Source
- Toorumbee Creek Water Source
- Warbro Brook Water Source
- Yarrowitch River Water Source

Appendix 3 - Identified threatened species

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

It should also be noted that some threatened species are highly sensitive to low flow extraction, whilst other threatened species, such as plants that occur in the riparian zone, are less sensitive. Threatened species considered to be highly sensitive to low flows are given a higher priority for protection. Table 7 shows threatened species that are known (K) or expected (E) to occur in each water source.

Table 7 Threatened species and other environmental values known or expected to occur in the Macleay water sources

	Apsley Gorge	Apsley River	Bakers Creek	Blue Mountain Creek	Chandler Gorge	Chandler River	Christmas Creek	Coastal Macleay	Collombatti Creek	Commissioners Waters	Dungay Creek	Dyke River	Euroka Creek	Five Day Creek	Gara River	Georges River	Gills Bridge Creek	Green Gully	Hickeys Creek	Kunderang Brook	Macleay Gorges	Macleay Valley	Malpas Dam	Mungay Creek	Nulla Nulla Creek	Oaky River	Salisbury Waters	Stockyard Creek	Styx River	Tia River	Toorumbee Creek	Warbro Brook	Yarrowitch River
Threatened frog species																																	
Booroolong Frog	E	K	K	E	E	K	-	-	-	K	E	E	-	K	K	E	-	E	E	E	K	E	K	-	E	E	K	K	K	K	E	E	E
Davies' Tree Frog	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Giant Barred Frog	E	-	-	E	E	-	E	E	E	-	E	E	K	E	-	E	E	E	E	E	E	E	-	K	E	E	-	K	E	-	E	E	-
Glandular Frog	E	E	-	E	E	E	-	-	-	-	E	E	-	K	-	K	-	E	E	E	E	E	-	-	E	K	-	E	K	K	E	E	E
Green and Golden Bell Frog	-	-	K	-	-	-	-	K	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-
Green-thighed Frog	E	-	E	E	E	-	E	K	E	-	K	E	K	E	-	E	E	E	E	E	E	E	-	E	E	E	E	E	E	-	E	E	E

	Apsley Gorge	Apsley River	Bakers Creek	Blue Mountain Creek	Chandler Gorge	Chandler River	Christmas Creek	Coastal Macleay	Collombatti Creek	Commissioners Waters	Dungay Creek	Dyke River	Euroka Creek	Five Day Creek	Gara River	Georges River	Gills Bridge Creek	Green Gully	Hickeys Creek	Kunderang Brook	Macleay Gorges	Macleay Valley	Malpas Dam	Mungay Creek	Nulla Nulla Creek	Oaky River	Salisbury Waters	Stockyard Creek	Styx River	Tia River	Toorumbee Creek	Warbro Brook	Yarrowitch River
Loveridge's Frog	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peppered Frog	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pouched Frog	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-crowned Toadlet	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-
Sphagnum Frog	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	K	K	-	-	-	-	-	K	K	-	K	-	-
Stuttering Frog	E	E	-	E	E	K	-	E	E	-	K	E	-	K	-	K	-	E	E	E	K	E	-	-	E	E	E	K	K	E	E	E	E
Tusked Frog	-	K	K	-	K	K	-	-	-	K	-	-	-	-	K	-	-	-	-	-	-	-	K	-	-	K	K	-	K	-	-	-	-
Wallum Froglet	E	-	-	E	E	-	E	K	E	-	E	E	E	E	-	E	E	E	E	E	E	E	-	E	E	-	-	E	-	-	E	E	-
Yellow-spotted Tree Frog	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-
Threatened bird species																																	
Australasian Bittern	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beach Stone-curlew	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Apsley Gorge	Apsley River	Bakers Creek	Blue Mountain Creek	Chandler Gorge	Chandler River	Christmas Creek	Coastal Macleay	Collombatti Creek	Commissioners Waters	Dungay Creek	Dyke River	Euroka Creek	Five Day Creek	Gara River	Georges River	Gills Bridge Creek	Green Gully	Hickeys Creek	Kunderang Brook	Macleay Gorges	Macleay Valley	Malpas Dam	Mungay Creek	Nulla Nulla Creek	Oaky River	Salisbury Waters	Stockyard Creek	Styx River	Tia River	Toorumbee Creek	Warbro Brook	Yarrowitch River
Black Bittern	-	-	-	-	-	-	E	K	E	-	E	-	E	E	-	-	E	-	E	-	-	E	-	K	E	-	-	E	-	-	E	E	-
Black-necked Stork	-	-	-	-	-	-	E	K	E	-	-	-	K	-	-	-	K	-	E	-	-	E	-	E	-	-	K	E	-	-	E	-	-
Blue-billed Duck	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-
Brolga	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Comb-crested Jacana	-	-	-	-	-	-	-	K	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-
Freckled Duck	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greater Sand Plover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magpie Goose	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-
Mangrove Honeyeater	-	-	-	-	-	-	-	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Osprey	-	-	-	-	-	-	-	K	-	-	E	-	-	K	-	-	-	-	-	-	K	K	-	-	-	-	-	-	-	-	-	-	-
Painted Snipe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	K	-	-	-	-	K
Other Fauna																																	

	Apsley Gorge	Apsley River	Bakers Creek	Blue Mountain Creek	Chandler Gorge	Chandler River	Christmas Creek	Coastal Macleay	Collombatti Creek	Commissioners Waters	Dungay Creek	Dyke River	Euroka Creek	Five Day Creek	Gara River	Georges River	Gills Bridge Creek	Green Gully	Hickeys Creek	Kunderang Brook	Macleay Gorges	Macleay Valley	Malpas Dam	Mungay Creek	Nulla Nulla Creek	Oaky River	Salisbury Waters	Stockyard Creek	Styx River	Tia River	Toorumbee Creek	Warbro Brook	Yarrowitch River
Large-footed Myotis	-	-	-	-	-	K	-	-	-	-	K	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Threatened wet flora																																	
Cyperus aquatilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-
Eleocharis tetraquetra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-
Fine-leaved Tuckeroo	-	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maundia triglochinoides	-	-	-	-	-	-	-	K	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ravine Orchid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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. Regional 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 - Regional Panel and support staff

Table 8 North Coast Regional Panel-membership and expertise

Name	Agency	Role	Expertise
Toong Chin	OEH	Technical support	Regional experience in NRM management, floodplain planning and interagency coordination.
Rik Whitehead	DPI (Agriculture)	Technical support	Regional experience in NRM management, coastal agricultural industries, catchment management and interagency coordination.
Marcus Riches	DPI (Fisheries)	Technical support	Regional experience in NRM management, catchment planning, fisheries management and interagency coordination.
Dave Miller	DPI (Water)	Technical support	Water planning/administration/policy. Geomorphology. Riparian management. Stream ecology/restoration.

Table 9 Support staff membership and expertise

Name	Agency	Role	Expertise
Dale Gollan	DPI Water	Plan Coordinator	Water sharing plan development and stakeholder liaison.
Peter Hackett		Technical support.	Licensing and compliance officer, local knowledge of water users, WUAs, local access arrangements and reference points.

Appendix 5 - Reference information used by Regional Panel

DPI Water data sets:

- Licensing Administrator System – the DPI Water statewide database holding the licence details including volume of entitlement, location details and stream orders.
- Hydstra – Hydstra is an DPI Water statewide database that holds all flow record data.
- 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.
- Volumetric Conversion Database – used to help determine the Peak Daily Demand for each water source.
- Regional Geographic Information Systems – the DPI Water 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 NSW DPI.
- Threatened species (other) – Data supplied by OEH.
- Index of Social Disadvantage – Australian Bureau of Statistics.
- Employment in Agriculture - Australian Bureau of Statistics

Other agency data

- National Parks and Wildlife (OEH) Wildlife Atlas – statewide flora and fauna database
- NSW Fisheries (NSW DPI) modelled data sets (Fish Community Index, Fish Community Vulnerability).
- NSW Fisheries (NSW DPI) freshwater and saltwater recreational fishing database.