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Primary Industries

New South Wales Murray and Lower- Darling Water Resource Plan

Surface Water (SW8)

Status and Issues Paper

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More information

www.dpi.nsw.gov.au

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (February 2017). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.

Published by the Department of Primary Industries.

Foreword

The NSW Government has agreed to develop water resource plans as part of implementing the Murray-Darling Basin Plan 2012 (the Basin Plan). The New South Wales Murray and Lower Darling Water Resource Plan (Surface Water) (SW8) (NSW Murray and Lower Darling Water Resource Plan) covers all surface water in the NSW Murray and Lower Darling valleys.

The *NSW Water Resource Plan Roadmap 2016–2019* sets out the key timelines, principles and processes that will guide development of the 22 water resource plans (WRPs) that NSW must deliver by 2019. Weekly progress reports and monthly newsletters will show how the Department is tracking against the project timelines in the Roadmap. Both will be available on the DPI Water website.

Water resource plans will align Basin-wide and state-based water resource management in that particular resource plan area. The plans will recognise and build on the state's existing water planning and management. They will include documents that set out the interrelated water management arrangements for each water resource plan area.

Before they can commence, final versions of water resource plans must meet Commonwealth accreditation requirements that ensure they are consistent with the Basin Plan.

This *Status and Issues Paper* summarises the status of water resources, and issues that NDPI Water will consider when developing the NSW Murray and Lower Darling WRP. Additional issues raised during submission and consultation periods will be considered during the development process.

As the NSW Murray and Lower Darling WRP development process progresses, DPI Water will publish additional technical reports to provide greater detail on many of the matters discussed in this paper.

Have your say

Stakeholder input is an integral part of the development of each water resource plan.

DPI Water invites Murray and Lower Darling stakeholders, particularly surface water users, to make submissions on issues listed in Section 3 of this *Status and Issues Paper*. Your input will help shape the water resource planning process to ensure that local issues and concerns are addressed.

This first round of submissions ensures that all issues are on the table when the Murray and Lower Darling water resource planning process starts.

Submissions should only raise issues relating to water sharing that are **not** covered in Section 3 of this the *Status and Issues Paper*, including:

- water sharing arrangements
- risks to the water resources
- risks to achieving water quality objectives
- complying with the Sustainable Diversion Limits
- managing critical water needs in extreme events
- providing for consistency with the Long-Term Watering Plan

Issues raised during the Status and Issues submissions process will be used to develop a full list of issues to be considered during the development of the draft NSW Murray and Lower Darling WRP.

All submissions, from brief emails to full technical papers, are welcome and will be given full consideration.

Submissions must be received by Friday 31 March 2017 and may be submitted via email or post:

- **email:** nswmurraylowerdarling.sw.wrp@dpi.nsw.gov.au
- **post:** PO Box 829 Albury NSW 2640

DPI Water will acknowledge all submissions in writing.

A second round of submissions on the draft NSW Murray and Lower Darling WRP will be invited later in the process. That submission period will be advertised in The Land, local papers and on the DPI Water website.

Documents and supporting material will be available on the DPI Water website at www.water.nsw.gov.au

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1 Water resource plans

1.1 Principles

Principles set down in the Murray-Darling Basin Plan 2012 (the Basin Plan), together with principles set by NSW Government, will guide the development of WRPs.

Principles guiding the Basin Plan are:

- there will be no adverse impacts on water available to a water access licence holder
- there will be no net reduction in the protection of planned environmental water
- the Commonwealth is responsible for funding bridging the gap between existing limits and SDL water
- the WRP will meet the requirements set out in the Basin Plan

Additionally, NSW requires that WRPs:

- balance social, cultural, economic and environmental needs of the community and catchments
- are cost neutral for NSW licence holders
- minimise change for water sharing plans (WSPs) within their initial ten-year period

1.2 Objectives of the water resource plan

The aim of the Basin Plan is to provide for a healthy working Basin into the future. WRPs are a key part of implementing the Basin Plan. They will address the objectives of the Basin Plan at a regional level.

Objectives include environmental, economic, social and cultural aspects.

For more information regarding the objectives of WRPs, refer to the DPI Water factsheet [Water resource plans – overview](#).

1.3 What the final water resource plan will look like

A WRP will be made up of at least one WSPs, a water quality management plan (WQMP), a risk assessment and other supporting documents. DPI Water will adjust the WSP where necessary to meet the requirements of the Basin Plan, and to address areas for improvement identified through consultation and technical studies.

NSW WRPs will meet the minimum requirements of the Commonwealth *Water Act 2007* and Basin Plan. Each water resource plan must:

- describe all water rights in the plan area
- demonstrate how compliance with the SDL prescribed in the Basin Plan will be assessed and maintained
- include a WQMP
- provide for environmental watering
- address risks to water resources identified in a risk assessment
- explain how essential human needs will be met in extreme events
- take account of Aboriginal peoples' water-dependent cultural values and uses

WSPs made under the NSW *Water Management Act 2000* will remain the mechanism for articulating water sharing in NSW. WSPs will be a key component of each WRP.

For more information regarding what WRPs will look like, refer to the DPI Water factsheet [Water resource plans – developing a water resource plan](#).

1.4 How water resource plans work with other water plans and projects

At the same time as DPI Water is developing the WRP, there are other important initiatives occurring in parallel. These include: the development of Long-Term Watering Plans (LTWPs), SDL adjustments, the Northern Basin Review, the Healthy Floodplains Project, NSW Prerequisite Policy Measures, NSW Planning Assumptions for surface water resources, NSW Management of Extreme Events, review of Trading Rules and the development of Regional Strategies.

For more information regarding these initiatives and how they relate to WRPs, refer to the DPI Water factsheet [Water resource plans – overview](#).

1.5 The water resource plan development process

DPI Water is developing the WRP according to a robust and transparent process which follows the National Water Initiative Guidelines and includes community engagement.

This Status and Issues phase will be followed by a Strategy and Rule Development phase. A draft NSW Murray and Lower Darling WRP (surface water) will be published and subject to public exhibition. A final NSW Murray and Lower Darling WRP (surface water) will then be submitted for approval by NSW Minister for Regional Water and the NSW Minister for the Environment, and finally for accreditation by the Commonwealth Minister for Agriculture and Water Resources.

For more information regarding the development process, refer to the DPI Water factsheet [Water resource plans – developing a water resource plan](#) and the [NSW Water Resource Plan Roadmap 2016–2019](#).

1.6 Consultation and stakeholder input

DPI Water will consult in accordance with the *National Water Initiative Policy Guidelines for Water Planning and Management* and the MDBA's *Handbook for Practitioners – Water resource plan requirements* to inform consultation and stakeholder input.

There will be a number of opportunities for public submissions and targeted consultation with stakeholders. Consultation will aim to give stakeholders information and to obtain input on issues and options for improved water resource management.

DPI Water will:

- seek public submissions on issues to be considered
- provide information to stakeholders to help them participate in the planning process
- undertake targeted consultation with stakeholders, including Aboriginal communities, prior to drafting the WRP
- seek public submissions on the draft WRP
- undertake further targeted consultation of the draft WRP after public exhibition, if required
- support Aboriginal communities via the DPI Water Aboriginal Water Initiative (AWI) to make submissions on the draft WRP and through ongoing community consultation, as required, after public exhibition

In addition to this consultation, a Stakeholder Advisory Panel (SAP) will be established for this WRP to provide early input on regulated river issues and options. Members include local licence holder representatives, environmental representatives drawn from the local Environmental Water Advisory Group and various agency representatives. The SAP is an advisory panel that will complement other consultation, particularly prior to drafting the WRP.

2 Status of the Murray and Lower Darling surface water resources

This section provides a brief overview of the status of the Murray and Lower Darling surface water resources.

2.1 The Murray and Lower Darling surface water resource plan area

The Murray and Lower Darling WRP (Surface Water) (SW8) will cover all the surface water resources of the Murray River and Lower Darling catchments (Figure 1). It will include the regulated river systems unregulated rivers flowing into the regulated river systems unregulated effluent creeks flowing out of the regulated river system on the plains and water captured through farm dams. Groundwater in the area is not included, and will be covered by the Murray Alluvium WRP (GW8) (the *Status and Issues Paper* is due for release 17 March 2017), the Darling Alluvium WRP (GW7) (the *Status and Issues Paper* is due for release 12 May 2017), the Western Porous Rock WRP (GW6) (the *Status and Issues Paper* is due for release 4 August 2017), and the Lachlan and South Western Fractured Rock WRP (GW11) (the *Status and Issues Paper* is due for release 4 August 2017).

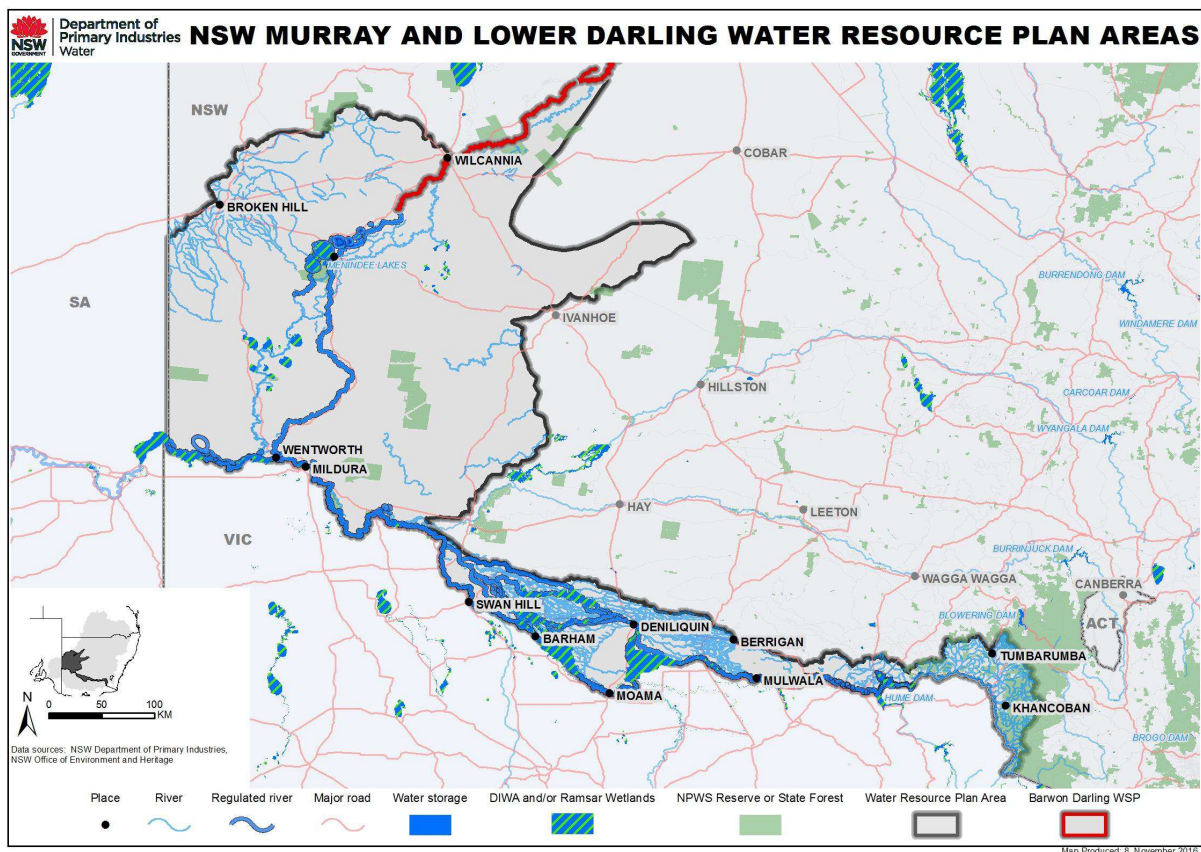


Figure 1: Murray and Lower Darling Water Resource Plan area.

The NSW Murray and Lower Darling Valley covers an area of over 186,000 km² and represents about 20% of the Murray-Darling Basin. The catchment is characterised by an alpine to montane climate in the Upper Murray, and a semi-arid climate in the lower Murray and Lower Darling. Mean maximum daily temperatures at Cabramurra in the Upper Murray are 21.5°C in January and 3.8°C in July, with annual rainfall of approximately 977 mm/year falling mostly in winter and spring (Bureau of Meteorology, Climate Data Online).

In the lower Murray-Darling, mean daily maximum temperature in summer is 32.2°C at Albury, 33.4°C at Broken Hill and 32.9°C at Wentworth, while in July mean daily maximum temperatures are 13.1°C at Albury and 15.6°C at both Broken Hill and Wentworth (Bureau of Meteorology, Climate Data Online).

The average annual rainfall in Menindee is approximately 244 mm/year and approximately 268 mm/year at Pooncarie (the Lower Darling area). Rainfall is generally well spread across seasons with slightly higher rainfalls occurring in the summer period in this region of the WRP area (Burrell et al. 2015b). Average annual rainfall within the Murray Valley ranges from approximately 979 mm/year at Tumbarumba in the east of the valley to approximately 356 mm/year at Moulamein in the mid-west. Rainfall generally shows a winter-spring dominance and is lowest in summer-autumn (Burrell et al. 2015a).

There are over 223,000 people in the Murray and Lower Darling (ABS 2011), with the urban regional centres the population hubs. The Murray and Lower Darling rivers flow through the traditional land of many Aboriginal nations, and the rivers and their floodplains have long been important for sustenance and spirituality (MDBA 2016). The plan area contains many significant spiritual and cultural sites, including Lake Mungo.

The dominant land use in the Murray catchment is natural landscapes and conservation (67%), followed by dryland cropping (14%), grazing (6.3%) and forestry (6%). Irrigation agriculture covers 2% of the catchment (Pitt et al. 2007). In the Lower Darling, grazing is the dominant land use covering 91.5% of the catchment, followed by natural landscapes, conservation and water sources (7.6%), and irrigation covers less than 1% (2001/2002 Land use mapping of Australia, Bureau of Rural Sciences).

2.2 Beneficial uses of the water resources

Aboriginal values and uses

Aboriginal Traditional Owner groups within the Murray and Lower Darling WRP area include Bangerang, Barkindji, Barapa Barapa, Maljangapa, Maraura, Muthi Muthi, Nyeri Nyeri, Ngiyampaa, Tati Tati, Wadi Wadi, Wamba Wamba, Weki Weki and Wiradjuri. Consultation has not yet been undertaken with these groups with regards to the Murray and Lower Darling WRP however, as identified in Section 1.6, there will be a number of opportunities for these groups to provide feedback on specific Murray and Lower Darling issues.

Engagement with Aboriginal communities across the Basin Plan area has provided an understanding that, at a landscape level, Aboriginal people's objectives and outcomes for the management of the water resources are founded in traditional owner group's obligations to the whole river system and associated river communities as an indivisible group. Aboriginal communities have a multi-faceted relationship with access to and use of water. This relationship ranges from a spiritual and cultural association, to an economic focus, to the location of special places.

Through the development of the Murray and Lower Darling WRP, DPI Water will provide opportunities for Aboriginal people's involvement in the process through the collection of social, spiritual and cultural data, including the identification of specific values and uses. Additional opportunities will be provided for Aboriginal communities and groups to provide submissions to DPI Water to inform the development of the Murray and Lower Darling WRP.

Historically the inclusion of issues and information relating to cultural values and uses of water by Aboriginal communities had proven difficult for DPI Water due to a lack of data and an inability to adequately address cultural water requirements. It has been highlighted through the AWI community engagement that this lack of cultural data has been one of the major risks to the long-term sustainability of cultural values, with significant consequences and threats to Aboriginal cultural heritage values and uses. These risks and associated management approaches are included in the DPI Water Risk Assessment Report.

Aboriginal knowledge of the environment can contribute to water management plans. The water resource plan process will continue to identify opportunities to better address the needs and aspirations of the Aboriginal Traditional Owner groups and communities in terms of equitable access to water for social, cultural, spiritual and economic use of water, including the views of Aboriginal peoples with regard to cultural flows.

A number of water-dependent asset types exist across the Basin Plan area landscape. Table 1 provides a description of some of these asset types.

Table 1: Water-dependent Aboriginal cultural asset types and their values and uses.

Water-dependent asset type	Description
Waterholes	There are specific waterholes that are a refuge for iconic species for Aboriginal people. Waterholes have a customary value and traditional use and connection. Other uses include resource-gathering. These resources have an economic value for Aboriginal peoples.
Wetlands	Wetlands have traditional and customary uses as well as spiritual values. The existence of many scarred trees and a range of traditional resources – vegetation, bird and fish, are indicative of Aboriginal occupation and use. After flood the wetlands would often be associated with customary/ceremonial use and have a cultural economic outcome through trade. Such areas are used now for cultural renewal practices.
Lagoons/ wetland bowls	A number of flood-dependent lagoons and wetland areas are sites of annual traditional resource-gathering and use. The areas have traditional connection and spiritual connection and are also used now for cultural renewal practices.
Transit stops – ephemeral flows	These areas were subject to natural flows to maintain water levels and water quality. Dependent on time of year, fish and other water-dependent resources may be present in the deeper water holes. These deeper holes traditionally provided a refuge to iconic species. The use of these areas has traditional and historic value, as well as contemporary knowledge-sharing. The areas also supported tool creation and occupation for periods of time as evidenced through grinding grooves and provided transit stop opportunities in times of flow and resource abundance. Specific location and times for use of these types of areas are part of the traditional songlines for the Traditional Owners and are an integral part of Aboriginal culture.
Occupation sites and camp grounds	Many occupation sites exist across the catchment landscape and waterscapes that have a direct reliance on water. These sites are evidenced by hearth sites, tool-making sites, grinding grooves and resource gathering sites. A number of these particular sites and camp grounds include the traditional use of water for childbirth and continue to have significance to Aboriginal women.
Spiritual sites and areas	There is a great deal of spiritual connection to water across the landscape of the Murray-Darling Basin. This connection is present in many dreaming and creation stories, artwork and cultural practices including dance and song. The detail of this relationship mostly remains guarded by Lore with Aboriginal people, however the connection to water is prevalent and evidenced in the cultural practices of the Aboriginal communities across the basin states.

Irrigated agriculture

The highest value crop in the Murray catchment is wheat. Rice is also an important crop with the Murray Irrigation Area producing 42% of Australia's rice. Other agricultural enterprises of economic importance to the region are dairy, sheep and beef, barley, vegetables, pastures for hay, oats and potatoes (Murray CMA 2007). There is some irrigation development in the Lower Darling catchment, including cotton and fodder and permanent plantings such as grapes and citrus.

The primary water supply for irrigation in the Murray and Lower Darling Valleys is the Murray and Lower Darling regulated rivers, followed by the alluvial groundwater sources.

Water for towns and essential human needs

Towns and riparian landholders depend on access to water for essential human needs and to support local commerce.

Towns have a higher priority access to water than general irrigation licences. WSPs recognise this priority by ensuring that a full share of water is allocated for annual town water supplies, except when exceptional drought conditions prevent this.

Town water supply licences in the Murray and Lower Darling Valleys have a total share component of 53,766 megalitres (ML)/year:

- 36,692 ML/year in the Murray regulated system
- 10,135 ML/year in the Lower Darling regulated system
- 639 ML/year in the Murray unregulated rivers
- 6,300L/year in the Lower Darling unregulated rivers

The *Water Management Act 2000* also requires WSPs to protect water for basic landholder rights, which are made up of domestic and stock rights, harvestable rights and native title rights. Water taken under a domestic and stock right may be used for normal household purposes around the house and garden and/or for stock drinking water.

In the Murray and Lower Darling regulated systems, requirements for basic landholder rights for domestic and stock rights are estimated to be 1,936 ML/year and 445 ML/year respectively. Additionally, share components of domestic and stock access licences total 17,081 ML/year in the Murray regulated system and 1,371 ML/year in the Lower Darling regulated system.

In the Murray and Lower Darling unregulated rivers, basic landholder rights for domestic and stock use are estimated at 664 ML/year and 2,079 ML/year respectively. Additionally, share components of domestic and stock access licences in the Murray unregulated rivers total 645 ML/year and 43 ML/year in the Lower Darling unregulated rivers.

Recreational water uses

Fishing is a popular recreational activity on the Murray and Lower Darling rivers and also on the Edward and Wakool rivers and the Great Darling Anabranch. Murray Cod, Golden Perch, Silver Perch, Carp, Catfish, Redfin Perch and Murray Crayfish are caught in these rivers. The Murray and Lower Darling WRP area supports an important recreational fishing industry. It is estimated that the Murray Valley has a recreational fishing value of over \$201M per year across Victoria, NSW and SA (Deloitte 2012) and the Lower Darling a value over \$17M per year.

The Murray and Darling rivers, Lake Hume, the Barmah Lakes and the Menindee Lakes system provide significant recreational opportunities for the community in the form of boating, canoeing, water skiing, swimming, and bird watching, often associated with nearby camping and other outdoor activities such as bushwalking.

2.3 Key environmental assets and ecosystem functions

The Murray and Lower Darling water resources support significant aquatic ecological values (Figure 2) including:

- significant Ramsar and Directory of Important Wetlands in Australia (DIWA) listed wetlands;
 - alpine fens, bogs and lakes in Kosciuszko National Park (NSW and Victoria)
 - Barmah Forest (28,525 ha) (Victoria)
 - Millewa Forest (33,636 ha) (Victoria)
 - Gunbower Forest (19,931 ha) (Victoria)

- o Koondrook Perricoota Forest (31,150 ha) (NSW)
- o Hattah-Kulkyne lakes (955 ha) (Victoria)
- o Menindee Lakes (47,500 ha) (NSW)
- o Great Darling Anabranch Lakes (269,000 ha) (NSW)
- o Riverlands (30,640 ha) (South Australia)
- o Coorong, Lakes Alexandrina and Albert Wetlands (140,500 ha) (South Australia)
- Habitat for threatened and endangered bird species including the Regent Honeyeater, Australian Bustard, Diamond Firetail, Superb Parrot, Bush Stone Curlew, Freckled Duck and migratory waders
- native fish species under threat including Murray cod, silver perch, rainbow fish, southern pygmy perch, trout cod, Murray hardyhead, purple spotted gudgeon, Murray jollytail, and the river snail;
- Supports three endangered aquatic ecological communities (EEC):
 - o Lower Murray River Aquatic EEC, containing 23 native fish species and over 400 recorded native invertebrate species
 - o Lowland Darling River Aquatic EEC, including 21 native fish species and hundreds of species of native invertebrates
 - o the Montane Peatlands and Swamps EEC of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions
- Supports numerous vegetation endangered ecological communities, including:
 - o *Halosarcia lylei* low open-shrubland EEC in the Murray Darling Depression Bioregion
 - o Myall Woodland EEC in the Darling Riverine Plains, Brigalow Belt South, Cobar Penneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregion
 - o Inland Grey Box Woodland EEC in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions
 - o *Allocasuarina luehmannii* Woodland EEC in the Riverina and Murray-Darling Depression Bioregions
 - o Sandhill Pine Woodland EEC in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions
 - o *Acacia melvillei* Shrubland EEC in the Riverina and Murray-Darling Depression bioregions.
- Supports 10 threatened River Styles including chain of ponds, anabranching gravel, low sinuosity and meandering gravel and sand, bank controlled sand and dune controlled anabranching (DPI Water, unpubl. data).

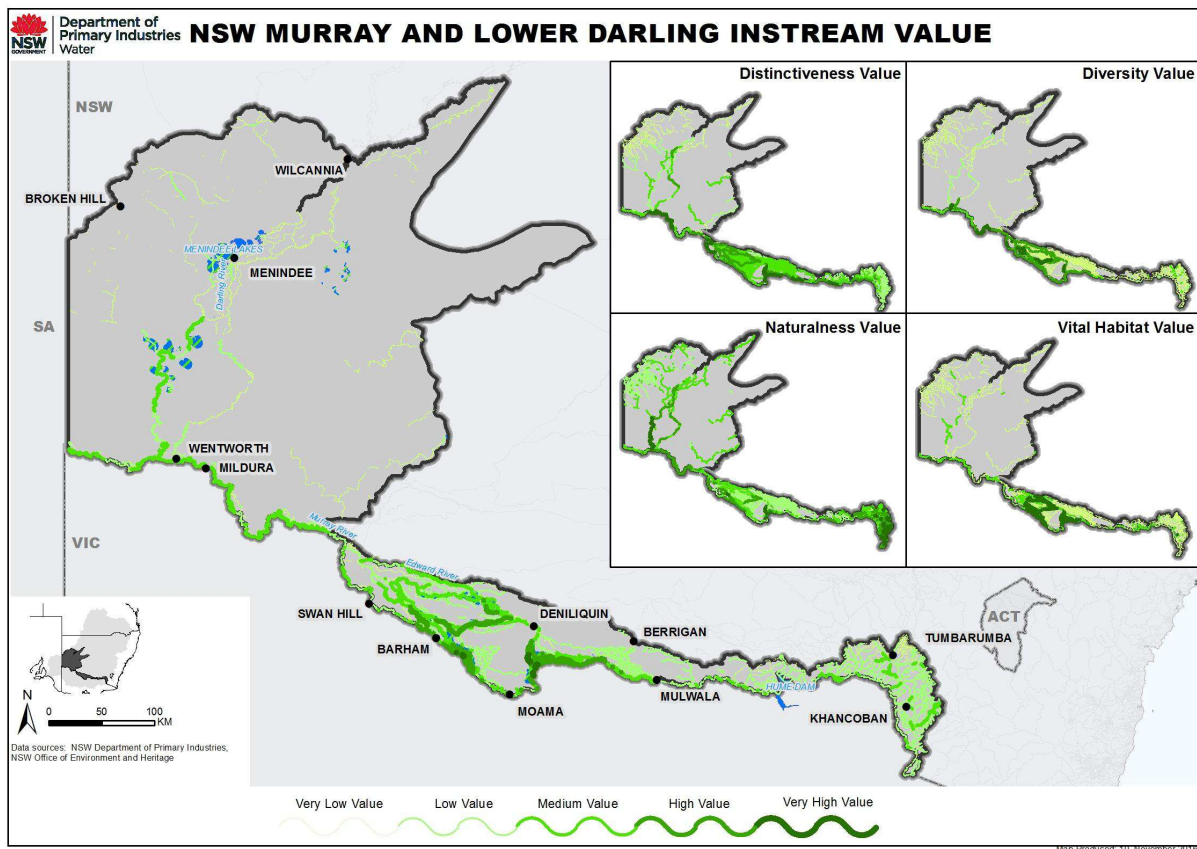


Figure 2: Map of HEVAE assessment outcomes for the Murray and Lower Darling Water Resource Plan area.

2.4 Stream flows

The Murray catchment is highly regulated, and the Snowy Mountains Hydroelectric Scheme (SMHS) involves complex and significant inter-valley diversions amongst the upper catchments of the Murray, Snowy and Murrumbidgee Rivers. Geehi Dam receives approximately 875 GL per annum via the SMHS from the Tooma, Snowy, Eucumbene and upper Murrumbidgee Rivers. From Tooma Dam, approximately 30% of the catchment (averaging 295 GL per year) is released to the Murrumbidgee catchment. As a result of these diversions, net flows in the Upper Murray River have increased by an average of 580 GL annually (NSW Office of Water 2012).

The middle Murray extends from the undulating slopes near Hume Dam (capacity 3,005 GL) across the floodplain to the confluence with the Murrumbidgee River and includes a complex network of anabranches, creeks, billabongs and lagoons. The largest storages in the catchment are in Victoria, including Dartmouth Dam (3,906 GL) on the Mitta Mitta River upstream of Hume Dam and Eildon Dam (3,390 GL) in the headwaters of the Goulburn River.

The Lower Murray Darling extends from the confluence of the Murrumbidgee River on the Murray and from Tilpa on the Darling River, to the South Australian border. It includes the Menindee Lakes (1,730 GL), the Great Darling Anabranch and Lake Victoria.

Figure 3 shows that periods of very low inflows occur on average once a decade into Hume Dam on the Murray River, the most recent being the millennium drought, whilst Figure 4 shows that low inflows occur much more frequently at Wilcannia on the Lower Darling River (Burrell et al. 2015b).

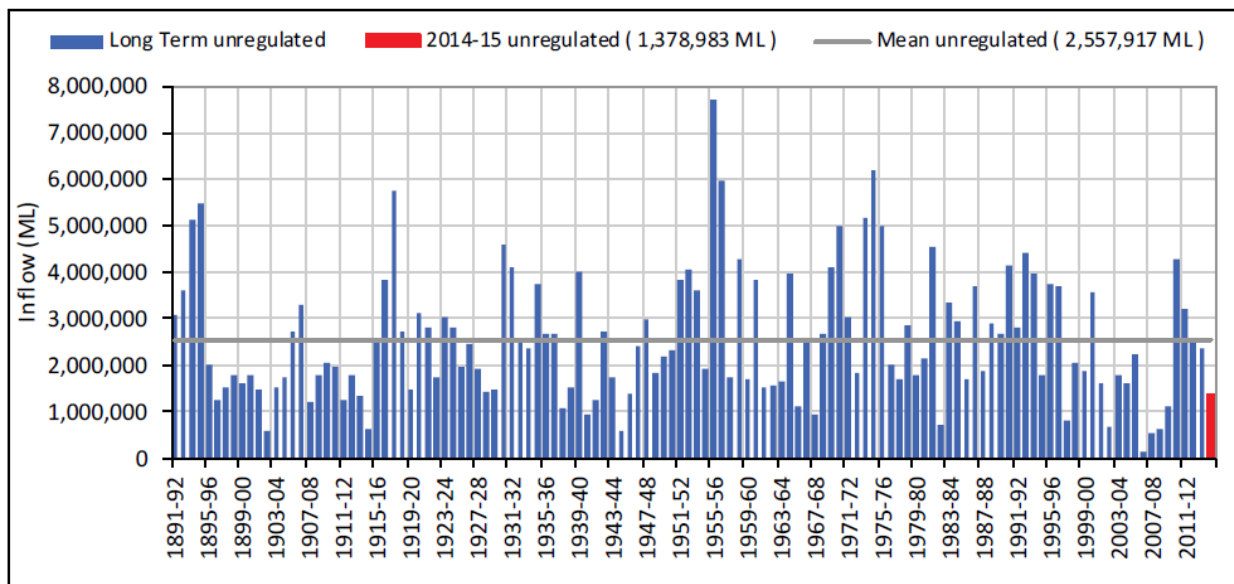


Figure 3: Long-term unregulated inflows to Hume Dam against mean inflow (Source: Burrell et al. 2015a).

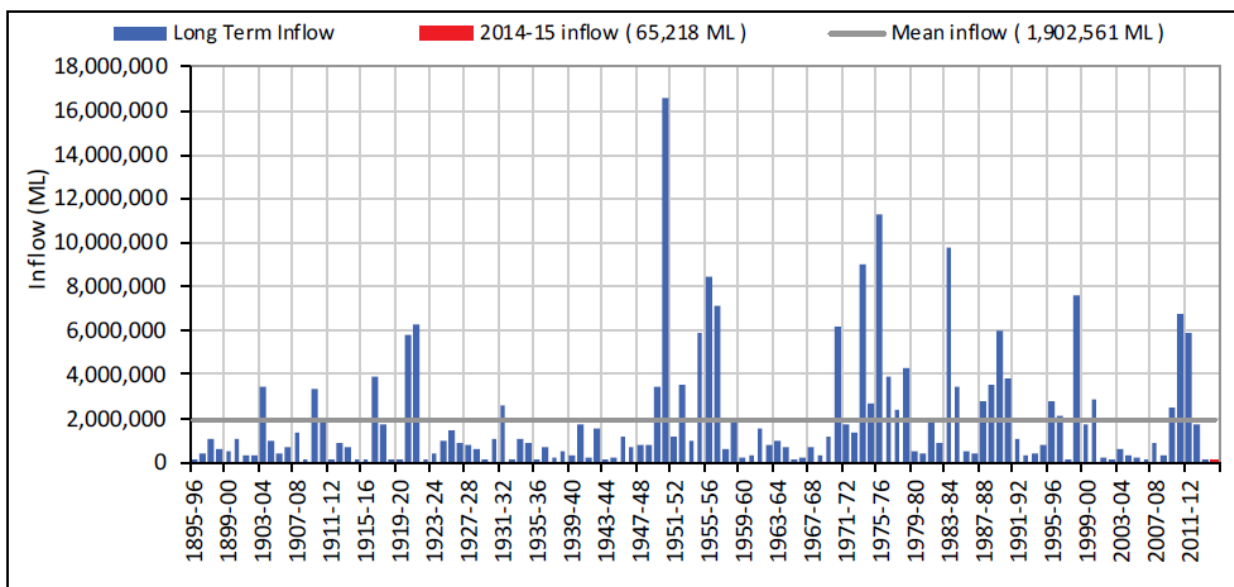


Figure 4: Long-term inflow at Wilcannia gauging station against mean inflow (Source: Burrell et al. 2015b).

For management purposes in the Murray and Lower Darling WRP area, sub-areas are categorised into ‘water sources’ for unregulated rivers and reaches for regulated rivers.

The NSW Murray Regulated River Water Source comprises all waters between the banks of the Murray River and some of its anabranches, from the upper limit of Hume Dam water storage, and from the Darling River downstream to the South Australian border (Figure 5). There are a number of other storages (e.g. Geehi Dam) in the Murray River above Hume Dam, which are part of the SMHS and are not officially gazetted to be regulated rivers.

The Lower Darling Regulated River includes all waters between the banks of the Lower Darling River from the upper limit of Lake Wetherell downstream to the upstream limit of the Wentworth Weir Pool storage (Figure 5).

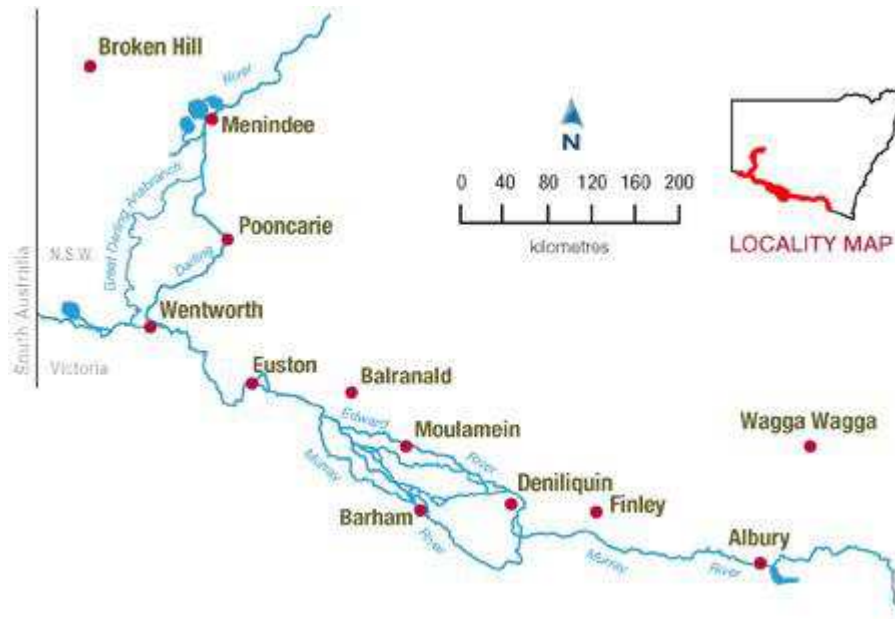


Figure 5: The NSW Murray and Lower Darling Regulated Rivers.

As with the climate, water available for take under water access licences varies substantially from year to year. Figure 6 shows the water taken since 2004 from the Murray Regulated River. The low levels of take from 2006 to 2011 are an effect of the millennial drought where general security licences had very low allocations. The water taken under Lower Darling Regulated River water access licences since 2004 is shown in Figure 7. A similar pattern to the Murray Regulated River is obvious due to low water allocations, however lower allocations began earlier (2004) within the Lower Darling.

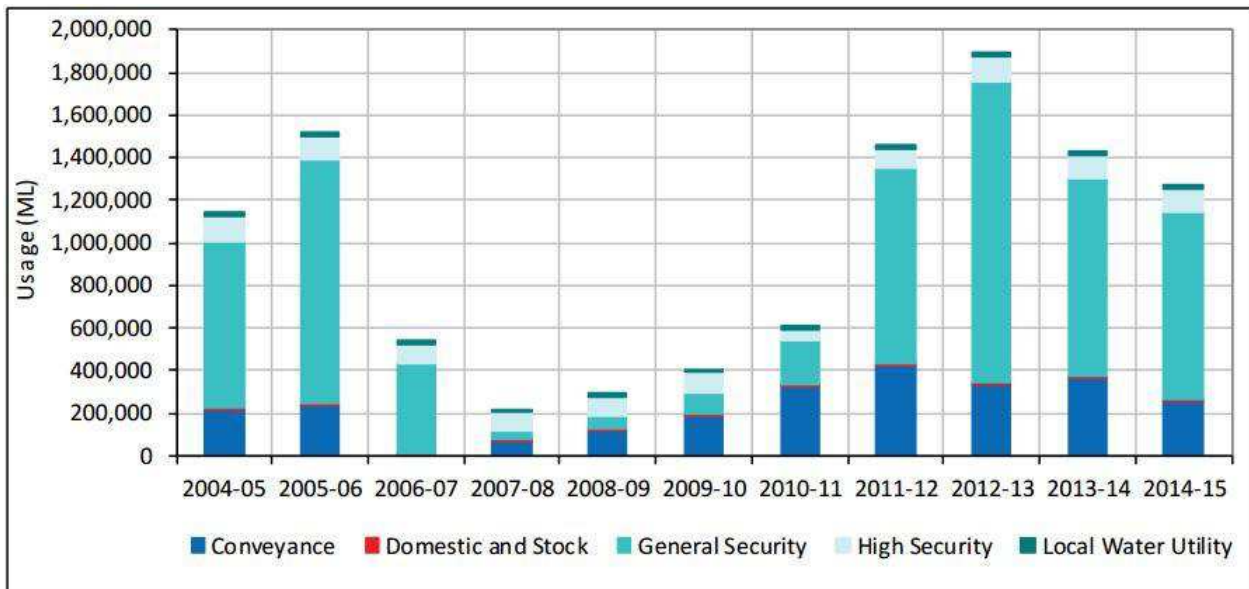


Figure 6: Water taken under NSW Murray Regulated River water access licences (Source: Burrell et al. 2015a).

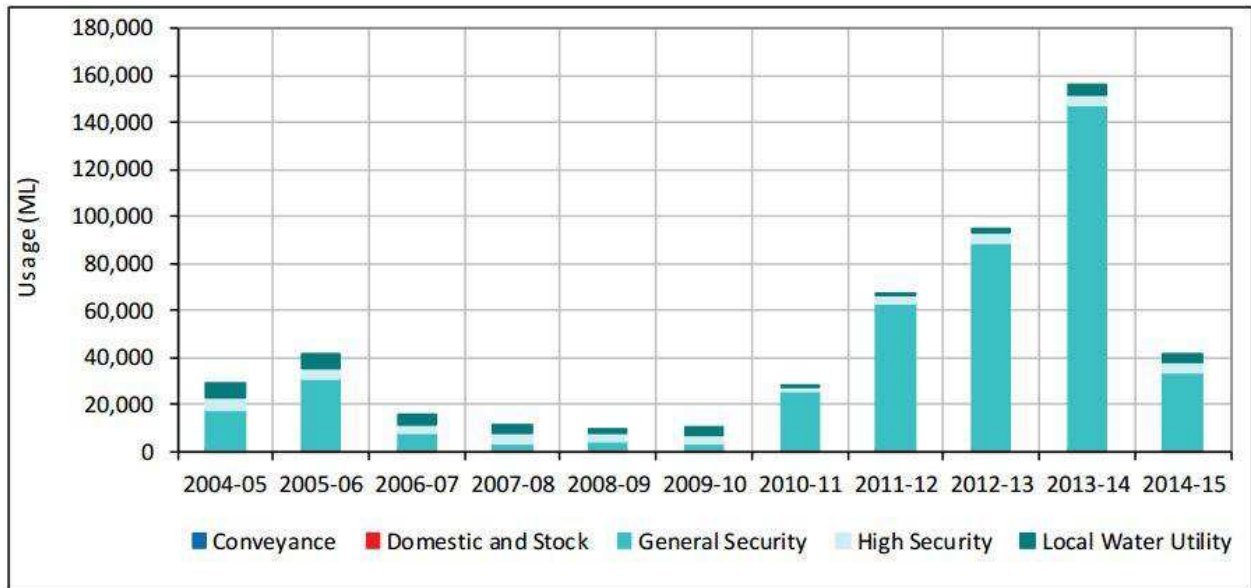


Figure 7: Water taken under Lower Darling Regulated River water access licences (Source: Burrell et al. 2015b).

The water sources of the Murray and Lower Darling unregulated rivers cover all other surface water sources in this planning area excluding the regulated reaches identified above. Generally, unregulated rivers are those where flows are not controlled by releases from storages. There are a total of 16 unregulated water sources within the Murray and Lower Darling surface water resource plan area, 15 of these are located within the NSW Murray River Valley. As there is no accurate water take records for unregulated water access licences, it is difficult to estimate actual volumes used from year to year and thus volumes are not included within this report.

2.5 Water Quality

The condition of water quality in the NSW Murray and Lower Darling WRP area varies from poor to good. Degraded water quality can put stress on a range of aquatic organisms, impact on Aboriginal cultural and spiritual uses of water, increase the cost of drinking water treatment, contribute to public health risks and decrease the suitability of water for irrigation.

The following water quality parameters are considered: dissolved oxygen (DO), pH, salinity, nutrients, sediments and turbidity, algae, temperature, organic carbon and toxicants.

The water quality status map (Figure 8) provides an overview of water quality condition within the NSW Murray and Lower Darling WRP area. It shows and assesses monitoring locations in the plan area using a water quality condition index (WaQI). The WaQI is a combined index for nutrients, pH, turbidity and dissolved oxygen. It scores water quality data collected by NSW Government against targets listed in the Basin Plan. Thermal pollution, harmful algal blooms, and salinity for irrigation water are also assessed and described in Table 2.

Changes to land use and natural river flows are the main causes of water quality problems within the catchment. Table 2 provides a summary of the status of water quality in the different regions of the plan area. The water quality management plan will describe the water quality issues in the NSW Murray and Lower Darling WRP area including possible management strategies.

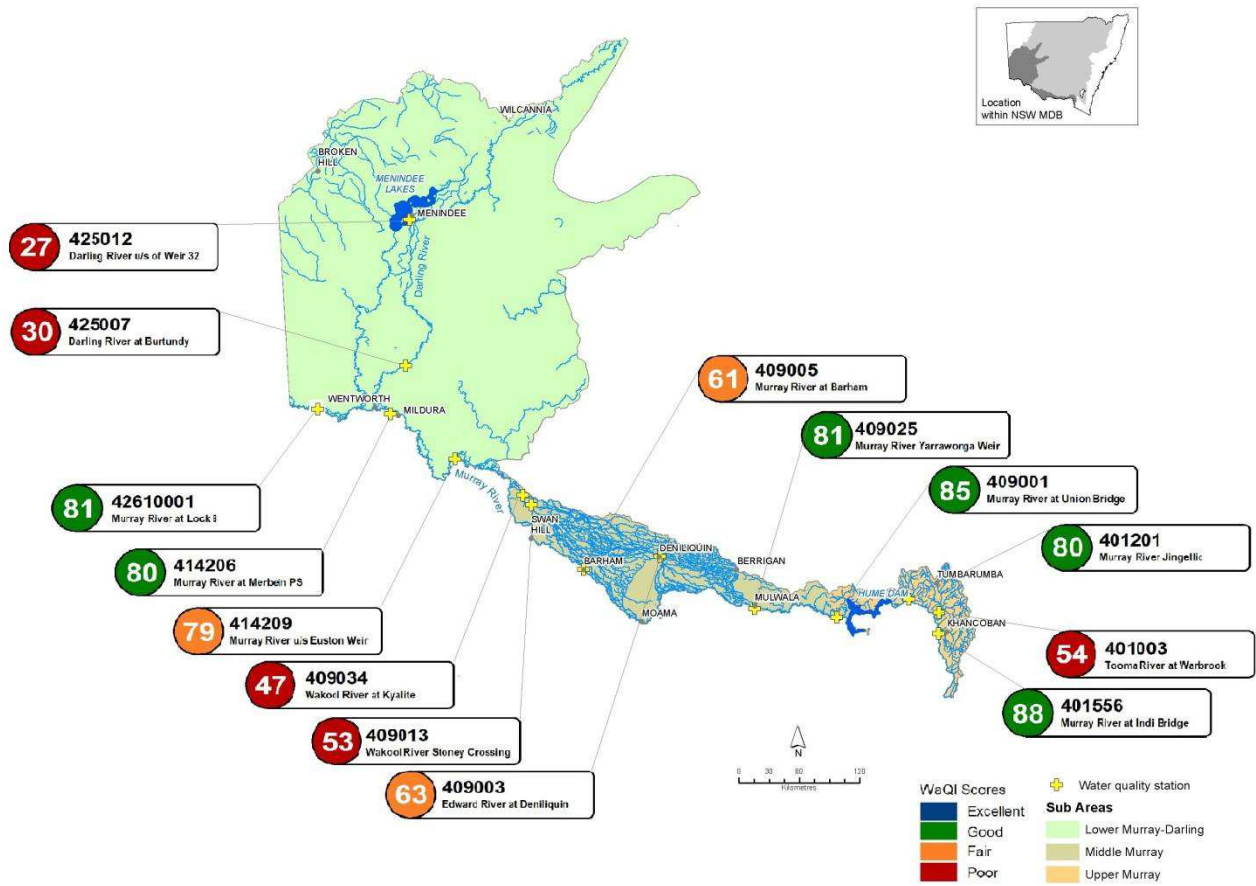


Figure 8: Water quality condition of the NSW Murray and Lower Darling surface water resource plan area. WaQI Scores: Blue = Excellent (100-95), Green = Good (94-80), Orange = Fair (79-60), Red = Poor (59-1).

Table 2: Summary of water quality assessment in the NSW Murray and Lower Darling WRP area.

	Upper Murray	Middle Murray	Lower Murray-Darling
Dissolved oxygen	Mostly within target range.	Mostly within target range, however hypoxic blackwater events are known to occur in the Edward-Wakool River systems.	Frequently outside target range. Unpredictable during low flows in the Darling River. Releases from Menindee Lakes into a stopped Darling River at the wrong time of the year can cause fish kills from low dissolved oxygen.
pH	Mostly within target range.	Mostly within target range.	Mostly within target range. Occasionally elevated in Darling River at Burtundy.
Salinity	Low.	Low, with minor localised salt inputs.	Mostly low, with occasional salt spikes.
Nutrients (nitrogen and phosphorus)	Mostly low in Murray river. Occasionally elevated in Tooma River.	Mostly low in Murray river. Frequently exceeds target value in Edward-Wakool River systems.	Mostly low in Murray river. Frequently exceeds target value in Darling River.
Suspended sediments and turbidity	Mostly low in Murray river. Occasionally elevated in Tooma River.	Mostly low in Murray river. Frequently exceeds target value in Edward-Wakool River systems.	Mostly low in Murray river. Very high, frequently exceeds target value in Darling River.
	<p>Turbidity is elevated due to a number of factors including the widespread conversion of land for cropping, river bank and riparian condition, presence of carp and grazing practices.</p> <p>In the Darling River, fine clay particles remain suspended in the water column, even during low flows, causing elevated turbidity levels.</p>		
Harmful algal blooms	Occur in some years during warmer months in Hume Dam. Rare in waterways above the Dam.	Occur in some years in the Murray River and in the Edward-Wakool River systems and in Lake Mulwala.	Occur in some years in during the warmer months in Menindee Lakes and the lower Darling and Murray Rivers.
Thermal pollution	Cold water pollution occurs in the Murray River up to 120km below Khancoban Dam.	Cold water pollution occurs in the Murray River up to 200 km below Hume Dam due to extremely large summer discharges.	Unknown.

3 Issues to be addressed in water resource plan development

3.1 How issues were identified

This section of the paper describes the water sharing issues that have been identified and which will be considered when developing the WRP. The Basin Plan requires WRPs:

1. comply with the SDL
2. identify opportunities to strengthen protection of Aboriginal values and uses
3. provide for environmental watering
4. manage medium to high risks identified in a risk assessment
5. identify measures to contribute to water quality objectives
6. specify how critical human water needs will be met in extreme events

Since 2013, DPI Water has been consulting with stakeholders in the Murray and Lower Darling Regulated water sources about concerns with the existing WSPs. While some of the issues have been resolved through the WSP replacement process and plan amendment processes, several issues remain to be addressed in the WRP. DPI Water is also consulting with the Aboriginal community regarding water-dependent cultural values, uses and issues.

In addition to this, DPI Water has identified issues through the following technical assessments:

- a risk assessment for the Murray and Lower Darling surface water resources; several medium to high risks were identified that need to be considered in developing the WRP
- an assessment of the status and causes of water quality degradation

Reports on these technical assessments will be made available separately.

3.2 Supporting Aboriginal values and uses

The AWI has engaged with Traditional Owners and the broader Aboriginal community across several WRP areas and have captured a range of issues identified through this process. Some similarity across WRP areas has been observed at a landscape level - however, each WRP area will likely be characterised by specific issues relevant to the WRP. DPI is yet to consult with Traditional Owners within the Murray and Lower Darling WRP area to capture specific issues relevant to the plan. This work will be ongoing and further opportunities to inform development of the water resource plan will be provided at the time of public exhibition and targeted consultation.

WSPs currently provide various forms of protection and benefit for Aboriginal peoples' values and uses, including specific-purpose Aboriginal cultural access licences. However, additional consideration around providing water for Aboriginal peoples' economic purposes and cultural flows is required as part of the WRP development process. The issues that can most likely be dealt with during the WRP development process are listed below, with additional issues listed in Appendix 2.

Issues identified by Aboriginal communities across the Basin

Issue	Status
Instream works are impacting on the general and natural flow of water within a system.	Potential for WRP risk assessment to consider.
Water quality is an issue in low flow times and generates significant weed growth. This hampers fishing and cultural renewal activities that use the water source.	Potential for WRP risk assessment to consider.
Availability of access to water for cultural practice and	Provision for specific-purpose licence however no

renewal activities is an issue that impacts the Aboriginal community's ability to plan and carry out cultural renewal events. There is a reliance on natural flows. However, planning around these events is problematic.

'cultural flows'. Potential for WRP risk assessment to consider.

3.3 Improving water sharing

Clarifying and simplifying environmental water rules

The *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016* establishes three environmental water accounts in the Murray Regulated Water Source: the Barmah-Millewa Environmental Water Allowance (EWA), the Barmah-Millewa Overdraw Environmental Water Allowance and the NSW Murray Regulated River Water Source Additional Environmental Water Allowance.

Issue – Murray Regulated	Status
Simplify environmental water account rules.	To be considered by DPI Water in consultation with the SAP and other relevant stakeholders.
Clarify the 'other environmental purposes' the Barmah-Millewa Allowance can be used for.	DPI Water will consider clarifying the environmental purposes for which the Barmah-Millewa Allowance can be used.

Improving plan objectives and performance indicators

Several stakeholders were critical of the WSP objectives and performance indicators. DPI Water has recognised the need to better align the objectives and performance indicators to allow the measurement and evaluation of the plan's outcomes.

The WSP will be part of the WRP, so its objectives must be consistent with those of the WRP. Under the Basin Plan, the WRP must address environmental and water quality objectives and identify the objectives of Aboriginal people.

Issue – all water sources	Status
Review objectives and performance indicators in the WSPs to better align the intended outcomes and the strategies.	The objectives for Murray and Lower Darling Regulated water source were modified when the plan was replaced in 2016 to improve the link between objectives and plan rules. DPI Water is further improving plan objectives and performance indicators. Appendix 1 includes a draft set of objectives for the NSW Murray and Lower Darling WRP. Once finalised, they will replace those in the current WSP.

Reviewing trade rules

Stakeholders and Government agencies have requested changes to the trading rules to allow trades between regulated and unregulated water sources.

Issue	Status
Permit crediting or trade of water shepherded from the unregulated Barwon-Darling to the Murray or Lower Darling regulated water sources.	Trade between unregulated and regulated water sources is prohibited by the Minister's Dealings Principles 2004. DPI Water will consider this issue initially at a state-wide level.
Permit trade of allocations from the Lower Darling regulated water source to the unregulated Darling Anabranch subject to analysis of impacts.	Trade between unregulated and regulated water sources is prohibited by the Minister's Dealings Principles 2004. DPI Water will consider this issue initially at a state-wide level.

Improving water supply

Stakeholders in the regulated water sources have raised concerns that their access to water has been or may be impacted in the future by other water users or water efficiency projects.

Issue – Lower Darling	Status
Lower Darling regulated water users seek input to water sharing arrangements in the upstream connected unregulated Barwon Darling system.	DPI Water will review consultation approaches to provide opportunity for downstream stakeholders to have a say in the development of upstream water resource plans.
Water users in the Lower Darling are concerned that users downstream of Menindee Lakes are disadvantaged by upstream water use and that WSP rules for the Barwon Darling unregulated water source don't consider connectivity between systems.	To be considered by DPI Water in consultation with the SAP.
Lower Darling water users are concerned about water security due to the creation of a licence under the Living Murray Initiative and the potential effect of carryover associated with this licence on future general security allocations.	To be considered by DPI Water in consultation with SAP and relevant stakeholders.

Issue – Murray regulated	Status
Review daily access rules to allow supplementary water to be accessed and debited against account water where the entitlement holder doesn't hold a supplementary access entitlement.	To be considered by DPI Water in consultation with the SAP.

Improving available water determinations and accounting rules

Several changes have been suggested to improve the accounting rules and the available water determination rules in the regulated rivers.

Issue - all	Status
Allow re-crediting of return flows.	DPI Water will consider this issue at a state-level initially.
Allow high security licence holders to carry over water to provide for greater security	To be considered by DPI Water in consultation with the SAP.

Issue – Murray Regulated	Status
Allow carried-over water to be spilt from accounts when the Hume Dam spills or water is released from the dam for flood management purposes.	To be considered by DPI Water in consultation with the SAP.
Review the available water determination rules for conveyance licences to enable delivery of high priority water in irrigation districts.	To be considered by DPI Water in consultation with the SAP.
Review maximum account limits for general security access licences	To be considered by DPI Water in consultation with the SAP.

Issue – Lower Darling Regulated	Status
Clarify how evaporative losses and dam spills affect carryover and the calculation of maximum achievable account balance.	DPI Water will provide further information on rule interpretation and intent
Consider permitting carryover only when allocations can be supplied	To be considered by DPI Water in consultation with the SAP.

Cease to pump rules

The *Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011* includes an amendment provision to change the cease to pump rule and gauge reference in the Mannus Creek Water Source should a new gauge be installed.

Issue- Murray Unregulated	Status
Review the gauge reference and cease to pump rule for Mannus Creek above/below Glenroy as a new gauge has been installed.	To be considered by DPI Water in consultation with relevant stakeholders.

Defining water source boundaries or descriptions

Regulated water sources are declared in regulated river orders published in the NSW Government Gazette and are then described in the appendices of regulated WSPs. The boundary of unregulated water sources is defined in the relevant unregulated WSP. Changes have been suggested to clarify some water source boundaries.

Issue - Lower Darling Regulated	Status
Restore the description of the Lower Darling Water Source to the WSP as it was mistakenly omitted when replaced in July 2016.	The description of the Lower Darling Water Source will be included in the WSP when amended as part of WRP developed. The omission of the description does not impact the plan rules as the legal definition of the regulated river water source is in the regulated river order published in the NSW Government Gazette.

Issue - Murray Unregulated	Status
Determine if the Indi Back Water should be located in the Swampy Plain Water Source or the Upper Murray Water Source given it receives flows from Khancoban Pondage.	To be considered by DPI Water in consultation with relevant stakeholders.

Issue - Murray Regulated	Status
Remove Nowranie Creek from the Murray Regulated River Water Source order as it is part of the Murrumbidgee Regulated River Water Source.	Amendment of the regulated river order will be considered by DPI Water during development of the WRP.

Reviewing mandatory conditions on licences and approvals

The WSP includes mandatory conditions that are imposed on water access licences and approvals.

Issue - all	Status
Review mandatory conditions relating to logbooks and metering requirements as they are impractical to implement.	To be considered by DPI Water initially at a state-wide level.

Adjustments to reflect water efficiency projects

Issue - all	Status
Water efficiency projects may require changes to WSP rules to facilitate implementation (e.g. Menindee Lakes and Broken Hill).	DPI Water is developing a business case for these projects. Until the business case is approved and the options are fully scoped the extent of plan amendments is unknown. DPI Water will continue to liaise with stakeholders on these projects and discuss WSP changes with the SAP should they be required.

3.4 Complying with the SDL

The Basin Plan sets two SDLs for all the surface waters of the Murray and Lower Darling WRP, one for the Murray and one for the Lower Darling, covering the regulated and unregulated water sources. The SDL is a long-term average diversion of water that allows changes from year to year, so long as the long-term average is not exceeded. It is divided into a baseline diversion limit (BDL) which equates to the long-term average amount of water that would have been taken during the historical climate condition (1/07/1895 – 30/06/2009) under State water management law as at 30 June 2009, and a ‘reduction’ to achieve a sustainable level of take. The Commonwealth is responsible for achieving the reduction through investment involving willing participants. Hence, complying with the SDL can be achieved without impacting on the reliability of water allocations for licence holders under the rules in the current WSPs.

Rather than being a simple number, the SDL is the amount of water that could be taken under the water rights, rules and level of development pre-Basin Plan, minus environmental water recovery. Under the Basin Plan, NSW is required to determine annual permitted take for all forms of take in the NSW Murray and Lower Darling WRP area. This volume is to be determined each year using models or other methods. Hence it can, where appropriate, vary from year to year depending on climate and water availability. This is a similar approach to that which has been used for Murray-Darling Basin Cap management, but different to the NSW long-term extraction limit compliance methodology as specified in existing WSPs.

Issue	Status
<p>Under the Basin Plan, compliance with the SDL is determined each year by summing a running balance of ‘unders’ and ‘overs’ from previous years. If the balance exceeds 20% of the SDL this may be a breach. WSPs have different arrangements for assessing compliance with extraction limits, which may not synchronise with the Basin Plan. The Basin Plan also provides for States to put forward reasonable excuses for SDL non-compliance.</p> <p>Long-Term Diversion Limit Equivalent (LTDLE) factors need to be established for each licence category in order to determine what percentage of each megalitre of water recovered for the environment contributes to bridging the gap between existing limits and the SDL.</p>	<p>These two issues will be addressed as part of the development of a NSW approach to addressing planning assumptions for surface water resources.</p>

3.5 Environmental watering

The *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016* established a Barmah-Millewa Environmental Water Allowance (EWA), Barmah-Millewa Overdraw Environmental Allowance and the NSW Murray Regulated River Water Source Additional Environmental Water Allowance. Water is credited, stored and released for specified environmental purposes in accordance with the WSP rules.

Additionally, since 2009, the NSW and Commonwealth governments have invested to obtain water access licences that can be used for environmental watering (‘held environmental water’). The LTWP currently being prepared by NSW Office of Environment and Heritage (OEH) will guide management of both planned and held environmental water in future.

The Basin Plan requires the WRP to provide for environmental watering to occur consistent with the LTWP. However, the way the environmental water is used, and any changes to management to facilitate its use, can affect water availability for other water users. For example, it could result in changes to water conveyance losses that impact on water available to licence holders.

Issue	Status
<p>Changes to the way environmental water will be managed and used can affect water availability for</p>	<p>OEH will propose environmental watering management objectives and rules. DPI Water will assess the impact</p>

<p>licence holders.</p> <p>How environmental water can be used is constrained by the current legislative and policy framework in NSW.</p>	<p>of these using the river system model. DPI Water is also investigating and developing new tools to increase transparency and availability of environmental water use.</p> <p>A state-wide approach, documented in the NSW Prerequisite Policy Measures Implementation Plan, is in the process of being finalised. This implementation plan will provide direction for any policy and legislative changes that NSW will make to improve environmental watering.</p>
<p>The effectiveness of planned environmental water should be assessed before additional provisions are made.</p>	<p>DPI Water is developing an improved monitoring and evaluation framework to evaluate the effectiveness of planned environmental water and other water sharing arrangements.</p> <p>The Commonwealth Environmental Water Holder and NSW Office of Environment are responsible for managing and evaluating the effectiveness of held environmental water.</p>

3.6 Managing risks

DPI Water has prepared a risk assessment, as required by the Basin Plan. The WRP must describe strategies to address medium to high risks where this can be done. These strategies will be appropriate for the nature of the risk and the confidence in the information used to assess the risks. Water availability risks are described in this subsection. Risks relating to water quality are included in Section 3.7 ‘Improving water quality’.

Risk of insufficient water for the environment

This assessment considers the risk to ecological values arising from the take of water and regulation of flows.

For the unregulated rivers in the NSW Murray and Lower Darling WRP area, there is significant uncertainty in the information used for this assessment. DPI Water has made assumptions about the use of water by licence holders because of the current lack of actual water take information on these rivers. It is likely that actual water take is less than the assumed amount/volume.

Issue	Status
<p>There are medium to high risks to ecological values on the regulated river system arising from the take of water and regulation of flows. These risks have been identified across a broad range of flow conditions.</p>	<p>Risk mitigation strategies have been proposed that seek to improve the variability and naturalness of low to medium flows through the current review of environmental water allocations and the ways in which irrigation water is delivered.</p> <p>The mitigation of risks associated with higher or less frequent flows will be addressed through the LTWP developed by OEH.</p>
<p>There are possible medium to high risks to ecological values on a small number of unregulated river water sources arising from the take of water. More information on water usage in unregulated water sources is needed to confirm whether this is the case.</p>	<p>Water access rules (e.g. cease-to-pump) protect low flows and minimise impacts on aquatic biota.</p> <p>Trade rules prevent risks being made worse by limiting trade into these areas.</p> <p>The current unregulated river WSP is due for review in 2026. During this period, relationships between water flow and aquatic biota will be assessed in several plan areas and a review of the adequacy of current access rules will be undertaken. Better information on unregulated water source water usage will be available by that time.</p>

Risks to water availability caused by increase in number of farm dams

There is some capacity for increases in farm dams in the catchment under the harvestable right. The risk assessment considers the best available estimate of likely growth rate in farm dams, and estimates the likely impact of this on water availability for ecological values and water for consumptive use.

The assessment shows there is no significant risk at the local and valley scale within the Murray Lower Darling WRP area. There is significant uncertainty in the information used for this assessment. While the assumed growth rate for farm dams is likely to be a reasonable estimate at a large scale, it may not be so at a local scale.

Issue	Status
There are low risks to ecological values in all areas arising from future growth in farm dams.	Subject to funding, DPI Water will monitor to determine if increases in farm dams occur in these areas and whether this changes the risk of farm dams to ecological values within this WRP area.

Risks to water availability arising from climate change

The risk assessment considers risks associated with changes to water availability under dry, median, and wet climate change scenarios. The assessment considers impacts on environmental assets (River Murray Channel, Koondrook-Perricoota Forest, and the Darling Anabranh Lakes), the Lower Darling Cap entitlement, general security, supplementary and high security licence holders.

Issue	Status
Climate change poses low or very low risk to all environmental assets irrespective of the scenario modelled.	Current WSPs already provide water trading and carryover of water allocations to help water licence holders cope with changing climate. Given the long-term nature of climate change trends and the uncertainty about which scenario will actually occur, the situation should be monitored and reassessed when the WRP is next reviewed.
Reductions in rainfall and runoff under the median and dry climate scenarios are either medium or high for high security, general security and supplementary water entitlements.	Risk to the River Murray Channel, Koondrook-Perricoota Forest, and the Darling Anabranh Lakes will be addressed in the LTWP prepared by OEH.
The Lower Darling Cap entitlement is under medium risk for the dry climate change scenario only.	

3.7 Improving water quality

The Basin Plan requires the WRP to specify measures to contribute to the achievement of water quality objectives. It also requires the plan to describe strategies to manage risks arising from water quality degradation, or explain why a risk cannot be addressed by the WRP.

Section 2.5 describes the status of water quality in the NSW Murray and Lower Darling WRP area. Changes to land use and natural river flows are the main causes of water quality problems within the catchment. The risk assessment identifies where water quality degradation is a risk to values and uses of water.

Issue	Status
There are locations where turbidity, nutrients, pH and dissolved oxygen results are outside of target ranges (see Section 2.5). Of these, the majority of risks to ecological values are medium to low except for elevated turbidity in the Murray River at Barham:	Cooperative natural resource management between community and government can mitigate some of these risks and reduce water quality degradation. DPI Water will work with partner agencies to identify those actions and suggest priority actions.
<ul style="list-style-type: none"> Poor water quality at these locations also impacts on Aboriginal people's health and wellbeing and their cultural and spiritual values as described in Section 3.2. 	Flow management can be of benefit in reducing some water quality risks. DPI Water will identify and assess improvements and changes to flow management as part of development of the WRP.

	<p>DPI Water's review of the Basin Plan water quality targets identifies inappropriate water quality targets and zone boundaries. It recommends:</p> <ul style="list-style-type: none"> • the Edward-Wakool Rivers should be included in the A3 Lowland Zone (Castlereagh, Macquarie, Lachlan and Murrumbidgee valleys) • alternative targets for the Darling River (Dml; Darling – middle and lower, Du; Darling – upper).
<p>Cold water from Khancoban Dam is a medium risk to ecological values. The impact of thermal pollution on Murray River has the potential to extend up to 120 km downstream of the dam.</p> <p>Cold water from Hume Dam is also a medium risk to ecological values. The impact of thermal pollution on the Murray River has the potential to extend up to 200 km downstream of the dam.</p>	<p>Khancoban Dam has recently been reclassified by the NSW Cold Water Pollution Interagency Group as a low priority for any mitigation actions.</p> <p>Hume Dam is a high priority dam for investigation (feasibility, design and cost of mitigation) in Stage 3 of the NSW Cold Water Pollution Strategy.</p>
<p>There is a medium risk of irrigated crop damage from salinity of water at Darling River at Weir 32, Menindee.</p> <p>Water taken from other waterways in the NSW Murray and Lower Darling water resource plan area presents a low risk.</p>	<p>NSW is party to the Basin Salinity Management Strategy 2030. Under this Strategy the government is monitoring salinity and where needed, identifying and implementing measures for salinity management.</p>
<p>There is a high risk of water being unsuitable for recreational use from harmful algal blooms at Lake Menindee, Darling River at Menindee and Lake Wetherell.</p> <p>All other sites are a low to moderate risk.</p> <p>Harmful algal blooms are caused by stable, warm conditions and high levels of nutrients.</p>	<p>NSW currently manages the risk of human exposure to blue-green algal blooms through a coordinated regional approach with the Regional Algal Coordination Committees.</p> <p>Land and flow management may be of benefit in reducing harmful algal bloom risks. DPI Water will identify and assess possibilities as part of development of the water quality management plan.</p>
<h3>3.8 Managing in extreme events</h3>	
<p>The Basin Plan requires the WRP to describe how critical water needs will be met in extreme events. Extreme events in this context include severe droughts and water quality events that could put at risk the supply of water for both human consumption requirements and non-human consumption requirements, for which a failure to provide for would cause prohibitively high social, economic and/or national water security costs.</p>	
<p>Issue</p> <p>The current NSW Murray Lower Darling Regulated River WSP requires the system to be managed so that a full allocation of water can be made available to towns through a repeat of the worst period of low inflows on record, at the commencement of the 2004 WSP. However, more severe droughts are possible, and unanticipated water quality events or system failures could occur. The current regulated river WSPs are unlikely to meet the requirements of the Basin Plan during extreme events.</p> <p>Review water sharing arrangements during extreme drought.</p>	<p>Status</p> <p>Councils responsible for town water supply commonly have drought management plans that include how water will be supplied in extreme events. These include measures such as backup supplies from groundwater, and plans for emergency infrastructure if needed. DPI Water will assess whether further measures are warranted as part of developing the Regional Water Strategy.</p> <p>A state-wide approach for the management of extreme events is being developed by DPI Water for consultation.</p> <p>A WRP is required to provide detail on how the water resources will be managed during an extreme dry period. DPI Water is currently developing a policy which will inform the WRP on this matter.</p>

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Appendices

Appendix 1: Draft objectives and strategies

Following from the evaluation of a number of WSPs, DPI Water is in the process of improving the logic framework of water plans to make objectives more relevant, and to clarify the relationship between objectives, strategies and performance indicators. This will help to properly frame the review of strategies and rules so that the impact on all objectives can be considered. It will also lead to the development of improved performance indicators, leading to more meaningful and efficient monitoring, reporting and evaluation of the plan after it is implemented.

Table 3 shows draft objectives with related strategies for the WRP. They will be refined as the plan is being developed, including harmonising with objectives being developed in parallel for the Murray and Lower Darling Long-Term Water Management Plan. They are presented here as a guide.

Table 3: Draft objectives for the WRP with related strategies.

BROAD OBJECTIVES	TARGETED OBJECTIVES	PROPOSED STRATEGIES
ENVIRONMENTAL		
Maintain or enhance the ecological condition of this water source and its dependent ecosystems (instream, riparian and floodplain) over the long-term	Maintain or improve population structure of native fish in medium and high value unregulated water sources	<ul style="list-style-type: none"> ● Protect low flows and/or pools ● Maintain a diversion limit ● Restrict trading into water sources
	Maintain or improve population structure of native fish in the regulated Murray and Lower Darling Rivers	<ul style="list-style-type: none"> ● Protect a proportion of medium to high flows ● Maintain an environmental water allowance and provision for held environmental water, and facilitate their effective use ● Maintain diversion limits
	Maintain or improve the transport of carbon and other nutrients through the Murray and Lower Darling regulated river systems and into the wetlands of the mid and lower rivers	<ul style="list-style-type: none"> ● Protect a proportion of medium to high flows ● Protect a portion of tributary inflows ● Maintain an environmental water allowance (EWA) and provision for held environmental water, and facilitate their effective use ● Maintain diversion limits
	Maintain or improve the connectivity and dispersal potential of fauna within unregulated water sources and between unregulated and regulated water sources	<ul style="list-style-type: none"> ● Protect low flows and/or pools ● Protect a proportion of medium to high flows ● Protect a portion of tributary inflows ● Maintain diversion limits
	Maintain or improve the quantity, diversity and water quality conditions of low-flow refugia habitats	<ul style="list-style-type: none"> ● Protect low flows and/or pools ● Maintain the water quality allowance and facilitate its effective use

	For wetlands and other water-dependent ecosystems, maintain quality of water sufficient to protect and restore the ecosystems	<ul style="list-style-type: none"> ● Identify and encourage cost-effective measures to address identified medium and high risks to ecosystems related to water quality degradation, and to contribute to achieving the defined targets where they are not being met ● Consider effect on water quality in any proposed changes to water management for other purposes ● Maintain the water quality allowance and facilitate its effective use
ECONOMIC		
Maximise the economic benefits derived from the use of irrigated water and from dependent industries supporting regional communities	Maintain or improve water access opportunities in low risk unregulated river systems so they meet enterprise requirements	<ul style="list-style-type: none"> ● Provide clearly defined water sharing rules and arrangements ● Provide flexible water trading rules ● Provide flexible account management rules ● Ensure changes to water management for other purposes do not have third party impacts on licence water rights that are not able to be negated or offset
	Maintain or improve water access opportunities in the regulated river systems	<ul style="list-style-type: none"> ● Provide clearly defined water sharing rules and arrangements. ● Provide flexible water trading rules ● Provide flexible account management rules ● Ensure changes to water management for other purposes do not have third party impacts on licence water rights that are not able to be negated or offset
	Maintain or improve water quality to minimise crop yield loss or soil degradation when used in accordance with best irrigation and crop management practices	<ul style="list-style-type: none"> ● Implement the Basin Salinity Management Strategy 2030 ● Maintain the water quality allowance and facilitate its effective use
Maximise the economic benefits derived from water-dependent commercial and industrial enterprises	Ensure sufficient water is available to local water utilities in the regulated river system	<ul style="list-style-type: none"> ● Provide for growth in local water utility entitlement ● Ensure sufficient water is set aside in storage to provide supply ● Ensure priority is given to maintaining town water supply needs
SOCIAL and CULTURAL		
Ensure adequate water supply to support critical human needs and basic landholder rights	Ensure sufficient water available to local water utilities in the Murray and Lower Darling regulated and unregulated river systems	<ul style="list-style-type: none"> ● Provide for growth in local water utility licences where necessary ● Ensure sufficient water is set aside in storages to provide supply ● Ensure priority is given to maintaining town water supply

		needs
	Maintain access to water for domestic and stock rights	<ul style="list-style-type: none"> ● Provide for growth in domestic and stock requirements where necessary ● Ensure sufficient water is set aside in storages to provide supply in the Murray and Lower Darling regulated rivers and some unregulated water sources ● Give priority to domestic and stock water right needs
	Minimise water quality risks from raw water taken for treatment for human consumption including the risk of the odour of drinking water being offensive to consumers, and maintain the palatability rating of the water	<ul style="list-style-type: none"> ● Continue to implement Drinking Water Management Systems as required by water suppliers operating licences.
Maintain or improve Aboriginal values, uses and assets which support and strengthen community	Maintain access for Native Title Rights	<ul style="list-style-type: none"> ● Provide for growth in Native Title Rights ● Ensure sufficient water is set aside in storage to provide supply in the regulated rivers ● Give priority to maintaining Native Title Rights water needs
	Improve opportunities for Aboriginal communities to access water	<ul style="list-style-type: none"> ● Provide access licences for Aboriginal cultural use ● Provide flexible water trading rules ● Provide flexible account management rules
	Maintain or improve water quality for Aboriginal communities' values and uses	<ul style="list-style-type: none"> ● Explore options to manage when developing Water Quality Management Plan
Maintain or improve fishing, swimming and other recreational uses of water	Minimise the risk to recreational water users from water quality issues caused by potentially toxic blue green algae	<ul style="list-style-type: none"> ● Implement regional algal contingency plans ● Identify and encourage cost-effective measures to minimise algal blooms ● Maintain the water quality allowance and facilitate its effective use
	Maintain or improve population of fish in unregulated water sources	<ul style="list-style-type: none"> ● Protect low and/or pools ● Maintain a diversion limit
	Maintain or improve population of fish in the regulated Murray and Lower Darling Rivers	<ul style="list-style-type: none"> ● Protect a proportion of medium to high flows ● Maintain an environmental water allowance and provision for held environmental water, and facilitate their effective use ● Maintain an end-of-system flow ● Maintain a diversion limit ● Protect a portion of tributary inflows

Table 4 provides a summary of objectives identified through broader Aboriginal community engagement. This list of objectives will be further assessed based on submissions received for this *Status and Issues Paper*.

Table 4: Objectives identified by Aboriginal peoples through consultation.

Objective 1	To identify opportunities to better address the needs and aspirations of Aboriginal communities in terms of equitable access to water for social, cultural, spiritual and economic purposes.
Objective 2	To ensure that Aboriginal communities' issues and concerns have been carefully considered with appropriate provisions that ensure the long-term sustainability of their cultural values and uses.
Objective 3	To support the removal of barriers that constrain and limit equitable access to water for Aboriginal communities, by reviewing policy gaps and legislation.
Objective 4	To ensure Aboriginal communities are appropriately consulted and informed of issues affecting their ability to participate in the decision-making process.
Objective 5	To identify and address water quality issues that are impacting on the Aboriginal values and uses across the WRP area. These impacts include the cultural connections to iconic species (fish, vegetation and birds), as well as the instream use of water for swimming, drinking and maternal use.
Objective 6	To address and identify the impacts on the spiritually-significant cultural values. Management of water quantity as well as water quality to inform the protection of these values and uses.

Appendix 2: Additional issues identified by Aboriginal communities

Issue	Status
<p>The term 'Cultural Flows' is identified by all Basins' Aboriginal Nations as an essential entitlement. Although cultural flows are often viewed as being similar to environmental flows, they provide social, spiritual, cultural and economic benefits that can't be satisfied by environmental flows or specific-purpose Aboriginal cultural water licences. Cultural and economic flows need to be considered as an entitlement within the WSP and WRP.</p>	No provisions for cultural flow entitlement in the WSP.
<p>Aboriginal Community Development Licences - The current Aboriginal Community Development water licence provisions are not equitable in general for Aboriginal people across NSW. There are no real opportunities for Aboriginal people to access water for economic use within the surface or groundwater sources within the Basin. There needs to be real opportunities that deliver real benefits for Aboriginal people that allow Aboriginal people to become involved in the water market, and create employment opportunities for Aboriginal people.</p>	These licences may only be issued in coastal river systems, subject to the relevant WSP providing for applications to be made.
<p>Constraints in the uptake of water licences - Aboriginal people do not have the capacity to access the water in terms of water infrastructure and cost of water licensing. This has made it impossible for Aboriginal communities to take up water licensing opportunities. In terms of funding to purchase water licences and water infrastructure - mostly all Aboriginal land councils and individuals have land that they wish to develop, but find it impossible to purchase water licences due to lack of funds. The creation of the water market has added to these difficulties. Aboriginal communities are seeking support in terms of waiving the cost of water licences and looking at additional opportunities for 'excess' water.</p>	Aboriginal communities/individuals have no or limited capacity or the funding to enter into the water market.
<p>Critical human water needs - Aboriginal remote communities have no access to basic drinking water. Many communities in the Basin have issues with accessing water for basic human needs to maintain health, hygiene and wellbeing. The current state of water quality in many systems does not provide water of reasonable health standard for a number of reasons including fertilizer and sediment run-off, various forms of pollution, bank erosion and riparian zone clearing.</p>	Current water quality across the WRP area is not sufficient for human consumption direct from the surface water source.
<p>Water quality issues are impacting the general health of the river and connected groundwater systems. This includes the health and reproduction of cultural food resources (e.g. fish are covered in sore spots). Water quality is also significantly important to spiritual and ceremonial sites and the general health of the river and aquifer systems.</p>	Limited data for the WRP processes to address water quality considerations regarding Aboriginal values and uses.