



Natural Resources Commission

Final report
**Review of the Water Sharing Plan for
the Central Coast Unregulated River
Water Sources 2009**

April 2020



Acknowledgement of Country

The Natural Resources Commission acknowledges and pays respect to traditional owners and Aboriginal peoples. The Commission recognises and acknowledges that traditional owners have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We value and respect their knowledge in natural resource management and the contributions of many generations, including Elders, to this understanding and connection.

In relation to the Central Coast area, the Commission pays its respects to Guringai Traditional Owners past, present and future, as well as other Aboriginal peoples for whom these waterways are significant. The Commission hopes that the involvement of Traditional Owners, Aboriginal peoples and Local Aboriginal Land Councils throughout the review process will help to shape collaborative water planning and sharing that is beneficial to Aboriginal peoples and their Country.

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Document No. D19/0775

ISBN: 978 1 925204 44 5

Acronyms and units of measurement

Act	Water Management Act 2000 (NSW)
AHIMS	Aboriginal Heritage Information Management System
Commission	the Natural Resources Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DPI-Fisheries	Department of Primary - Industries - Fisheries
DPIE-EES	Department of Planning, Industry and Environment - Environment, Energy and Science (the former Office of Environment and Heritage)
DPIE-Water	Department of Planning, Industry and Environment - Water
EPA	Environment Protection Authority
ICOLL	Intermittently Closed and Open Lakes and Lagoons.
IDEL	Individual Daily Extraction Licences: 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 is a share of the total daily extraction limit
LGA	Local Government Area
LTADEL	Long-term Annual Average Extraction Limit
MER	Monitoring, Evaluation and Reporting
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage
Plan	the Water Sharing Plan for the Lower North Coast unregulated river and alluvial water sources 2009
SMART	Specific, measurable, achievable, relevant and time-bound
TDEL	Total Daily Extraction Limit

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Executive summary

In line with its statutory responsibility under the *Water Management Act 2000* (the Act), the Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009* (the Plan).

The Commission is tasked with assessing the extent to which the Plan has achieved its environmental, social, cultural and economic outcomes, and advising on whether changes to the Plan provisions are warranted. The Commission has drawn on a range of evidence, including targeted consultation, document review, public submissions and expert technical advice.

A lack of clear outcomes and limited monitoring, evaluation and reporting (MER) activities made it difficult to determine the Plan's performance. This report presents the Commission's findings using the best available evidence.

Advice on Plan extension and replacement

The Commission's review has identified a range of areas for improvement that justify a plan replacement process. The Commission also supports a two-year extension to allow enough time and resources to make the required Plan improvements.

The Commission is therefore recommending that the Plan is:

- **extended for a further two years until June 2022** to allow for information exchange between the Plan replacement process and Central Coast Council's *Integrated Water Resource Plan* and the revised *Lower Hunter Water Plan* (both due for completion in 2021).
- **replaced by June 2022** addressing the recommendations in this report and incorporating (as appropriate) considerations in Central Coast Council's *Integrated Water Resource Plan* and the revised *Lower Hunter Water Plan*.

Priority issues to address in the development of the replacement plan include:

- reviewing key provisions to protect the environment to ensure they are evidence based, transparently reported and their implementation monitored
- considering future risks from climate change and risks outside Plan regulation
- managing future risks to town water supply
- improving Aboriginal access to water entitlements and participation in decision-making
- improving flow measurement and reporting
- supporting more effective water account management and trade
- improving the Plan's objectives, strategies and performance indicators
- developing a Plan-specific MER framework.

Summary of findings

The Plan has two fundamental risks:

- 1 Ecological assets and their water requirements are not clearly defined.
- 2 Population increases, water scarcity and hydrological stress threaten future utility supply security.

The Commission acknowledges recent water security initiatives including the two-way pipeline between the Hunter region and the Central Coast and the planning processes underway to assess the most appropriate infrastructure to improve regional drought resilience and meet future population growth demands.

Environmental outcomes

The Commission reviewed the Plan's performance against the current environmental outcomes, objectives and performance indicators and found that:

- the Plan needs to define and prioritise environmental water requirements in line with the water management principles of the Act
- Long-term Average Annual Extraction Limits (LTAAELs) and flow management rules are set with some consideration of the key water dependent assets in high ecological value water sources, however without consideration of the flow regimes required to protect these assets
- Most water sources do not have a robust evidence base to inform flow sharing rules. The LTAAELs and flow sharing rules of the Plan should be reviewed to ensure they are sustainable and to support future utility needs. This should consider future climate change scenarios, secular climate variability and their potential impact on inflows. Flow sharing rules are particularly important in water sources with high economic dependency, high instream value and those under high hydrological stress.
- river condition across the catchment is moderate on balance but the catchment is under stress
- the provisions protect groundwater dependent ecosystems through rules to grant or amend water supply works approvals near sensitive environmental areas. However, there are opportunities to improve these in terms of defining groundwater dependent ecosystems and ensuring set back distances are consistent with the *NSW Aquifer Interference Policy 2012*.
- The potential impacts of mining activities on water sources need to be considered in the Plan to require and account for mitigation of groundwater drawdown from mining operations.

Social and cultural outcomes

The Commission reviewed the Plan's performance against the current social and cultural outcomes, objectives and performance indicators and found that:

- Central Coast Council is the largest licence holder under the Plan, with town water users the main beneficiaries – the Council receives about 80 percent of the allocated volume in its role as the third largest utility in NSW, after Sydney and Hunter water corporations
- the region's population grew by 15 percent between 2008 and 2019 and is set to increase by a further 20 percent by 2036 – population growth presents a key risk to town water

supply, particularly given the region is currently experiencing high levels of hydrological stress

- Central Coast Council, Hunter Water Corporation and the Department of Planning, Industry, Environment – Water (DPIE-Water) are addressing future risks to supply security through water resource planning activities including updated modelling, infrastructure planning, and supply and operational considerations – outputs from these activities will include the Central Coast Council’s *Integrated Water Resource Plan* and a revised *Lower Hunter Water Plan*, which are expected to be completed in 2021
- the replacement Plan should incorporate regional water planning activities
- any action to increase utility supply to meet future needs should only be considered after water management improvement practices such as efficiency measures and behaviour change initiatives have been implemented, and environmental water requirements are defined, considering future climate and population growth projections.
- the Plan provides for basic landholder rights as follows:
 - **domestic and stock rights** and **harvestable rights** are small in comparison to licenced entitlement by volume and are being met – reasonable use guidelines are needed to allow for updated modelling and estimates of extraction
 - **native title rights** are provided for, but future native title determinations need to be proactively planned for and accommodated in the Plan and timeframes should be specified for required amendments following a successful native title claim
- Aboriginal outcomes can be improved as follows:
 - Aboriginal water values, rights and interests need to be better defined and supported in consultation with relevant Aboriginal stakeholders in the Plan area
 - provisions to allocate water for Aboriginal cultural purposes are in line with other water sharing plans, but there is no evidence that water has been accessed under these provisions or that water has been reserved for use under these entitlements
 - barriers to the access and use of Aboriginal water entitlements need to be addressed, including lack of awareness, multiple licence categories with differing restrictions, and lack of agency processes for applying for licences and providing allocations for cultural flows
 - there is a significant need to improve the engagement and involvement of Aboriginal stakeholders to deliver the Plan’s cultural outcomes, particularly in decision-making and leadership in water.

Economic outcomes

The Commission reviewed the Plan’s performance against the current economic outcomes, objectives and performance indicators and found that:

- the Plan provided some opportunities for trade, although trade has not been extensive
- some stakeholders have expressed interest in undertaking more trading, although any changes to increase the flexibility of trading rules should consider environmental requirements and impacts on other water users
- the Plan provides flexibility in account management rules to encourage responsible use of available water
- no data were available around changes in the economic benefits derived from water extraction and use over the Plan period.

Monitoring, evaluation and reporting

The Commission reviewed the Plan's MER arrangements and found that:

- as with many water sharing plans, the Plan does not have a robust MER framework – this limits the available data, the evaluation of outcomes and strategic adaptive management
- water use in the Plan area is well metered relative to other regions, with approximately 80 percent entitlement by volume and 70 percent of the LTAAEL metered by the local water utility
- there were significant gaps in the knowledge base when the Plan was developed and these have yet to be addressed - in the absence of additional data or studies, amendments intended to improve Plan provisions affected by knowledge gaps have not been made
- the Plan does not provide suitable, well-defined objectives, strategies and performance indicators in line with best-practice approaches or present a clear logical flow between these components.

Recommendations

Key recommendations from the Commission's review are provided in **Table 1**. Other suggestions for complementary actions to improve the Plan are provided in **Table 2**. Actions marked with an asterisk (*) are strategic initiatives which the Commission considers DPIE-Water should implement across NSW to support all water sharing plans outcomes.

Table 1: Recommendations

Overall	
1	The Plan should be: <ul style="list-style-type: none">a) extended for a further two years until June 2022 to allow for information exchange between the Plan replacement process and Central Coast Council's <i>Integrated Water Resource Plan</i> and revised <i>Lower Hunter Water Plan</i> (both due for completion in 2021)b) replaced by June 2022 addressing the recommendations in this report and incorporating relevant considerations in Central Coast Council's <i>Integrated Water Resource Plan</i> and the revised <i>Lower Hunter Water Plan</i> – in the case that this additional information is not available in time for the replacement Plan, include a clause that the Plan must be amended to integrate this information within 6 months of it becoming available.
Environmental outcomes	
2	In developing the replacement Plan, DPIE-Water should assess whether LTAAEL is the best hydrological indicator to manage these water sources. LTAAELs and flow sharing rules at a minimum should be reviewed and revised to incorporate best available information on population growth projections and ensure the Plan functions appropriately under a range of climate change scenarios – the Plan should also allow for Plan amendments to address longer-term water availability.
3	In the next two years during replacement Plan development, collect (as required) and report (reviewed in year four at a minimum) to: <ul style="list-style-type: none">a) describe the natural flow regime

-
- b) map and ground-truth the presence and extent of water dependent environmental assets including estuarine and coastal ecosystems
 - c) identify key assets and classify high priority ecosystems and high ecological value aquatic ecosystems using the High Ecological Value Aquatic Ecosystem framework, including those assets identified in (b)
 - d) define the flow requirements of key assets
 - e) determine the impact of the Plan on the flow regime identified in (a) and the flow requirements of key assets identified in (d).
-

4 To strengthen environmental water sharing rules, DPIE-Water should:

- a) define water sharing rules – including flow class provisions – in the replacement Plan – this should be based on environmental water requirements and prioritise the protection of water sources and their dependent ecosystems based on continuing risk assessments of coastal water sharing plans
 - b) build on existing hydrological flow studies and assess estuarine flow requirements, adequate flows to support fish passage and other key species
 - c) revise ‘no visible flow’ rules so that flow sharing rules are based on best available evidence and key environmental assets are protected, particularly in water sources with high ecological values
 - d) revise flow reference points for suitability, this may include additional reference points to support measured cease to pump rules rather than ‘no visible flow’ access rules
 - e) revise flow sharing rules for the Wyong River
 - f) revise total daily extraction limits (TDELs) for Ourimbah Creek and Wyong River
 - g) include flow sharing provisions for Mangrove Creek and Mooney Mooney Creek
 - h) until better information is available to support implementation of a) to g), incorporate a suitable buffer factor in cease to pump rules to allow for uncertainty.
-

5 In developing the replacement Plan, DPIE-Water should review groundwater dependent ecosystem requirements to build on groundwater assessment processes used for other recent water sharing plans, specifically to:

- a) clearly define groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type - connectivity should include both discharge of groundwater to surface water and surface water recharge to groundwater systems
 - b) confirm the presence, classification and extent of groundwater dependent ecosystems across the Plan area to reflect current knowledge obtained through on-ground studies and allow for plan amendments as studies progress
 - c) define if any action is required regarding potential impacts on low- or medium-priority groundwater dependent ecosystems
 - d) continue the review of setback distances for work near identified groundwater dependent ecosystems and standardise these based on the *NSW Aquifer Interference Policy 2012*.
-

6 Consider future mining activities and their potential impacts to water sources as part of the replacement Plan:

- a) at a minimum, the Plan should require full mitigation of groundwater drawdown take from mining operations
 - b) DPIE-Water should account for any mitigation annually (within the LTAAEL, see **Section 4.2**) and daily (the timescale at which cease to pump rules operate).
-

Social and cultural outcomes

- 7* Continue work to improve Aboriginal engagement and outcomes, including work to:
- a) strengthen and expand the nation-by-nation engagement developed as part of the inland water resource plan process to coastal areas and to other representative Aboriginal groups
 - b) use the strengthened engagement process to identify Aboriginal values and uses, objectives and outcomes, and flow allocations in the Plan area, then link these to strategies, performance indicators and measuring and reporting requirements.
 - c) simplify licence categories or co-design other water access mechanisms in consultation with Aboriginal peoples that can support identified Aboriginal water values, rights and uses.
 - d) include a timeframe of three months to initially amend the Plan to acknowledge any native title determinations and Indigenous Land Use Agreements and allocate enough time to undertake detailed engagement with stakeholders on the final Plan amendment and allocation process.

Monitoring, evaluation and reporting

- 8 DPIE-Water should include the following in the replacement Plan:
- a) SMART objectives, strategies and performance indicators that align with the water management principles in the Act and clearly address the prioritisation of environmental, social (including native title) and economic outcomes
 - b) clear logical links demonstrated between the objectives, strategies, performance indicators and rules.
-
- 9 Finalise the MER framework for coastal water sharing plans by 2020, and include the following as part of the replacement Plan:
- a) plan-specific MER requirements following the established framework
 - b) clear governance arrangements for MER, including roles and responsibilities
 - c) timely public reporting of the results of monitoring and evaluation activities to support transparency, public awareness and active compliance
 - d) appropriate governance arrangements and timeframes for adaptation and improvement, particularly in response to new information such as climate change
 - e) metering and record keeping provisions consistent with the NSW Government's new framework for measurement and metering of water take.

Plan updates and implementation

- 10 DPIE-Water should revise provisions in the replacement Plan to:
- a) reflect current governance and infrastructure arrangements
 - b) revisit the Plan boundary so that all alluvial groundwater sources are included
 - c) improve the clarity of language.

Table 2: Suggested actions to support Plan implementation

Overall

- A DPIE-Water should consult with stakeholders in the Greater Hunter region to identify and address potential opportunities or impacts arising from the replacement of other plans in this region, particularly the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. This may include concurrent timing for the development of replacement plans with similar expiry timeframes and changes (if warranted) to other plans.

Environmental outcomes

- B DPIE-Water should work with WaterNSW to improve the quality of the flow record of each water source. At a minimum, DPIE-Water should:
- a) work with WaterNSW to install flow measurement infrastructure at Mangrove Creek and Mooney Mooney Creek
 - b) ensure flow data record is reliable
 - c) ensure models account for secular flow variations to inform flow sharing provisions in the replacement Plan.

Social and cultural outcomes

- C* Continue to develop the NSW Aboriginal Water Framework by end-2020 to provide consistent and transparent guidelines and resourcing for Aboriginal water access and involvement in water planning and management. At a minimum, the framework should consider:
- a) relevant guidelines and legislation, including any need for legislative reforms
 - b) Aboriginal water values and its uses
 - c) processes for allocating water for Aboriginal interests including cultural, environmental, social and economic purposes
 - d) processes for improving Aboriginal water access and use, through simplified licencing or other identified mechanisms
 - e) clear requirements for including native title determinations and proactive processes for undertaking other land/water use agreements
 - f) strengthened Aboriginal engagement processes across the state to expand on the basin engagement process, broaden the stakeholder base (to include Traditional Owners, Nations, Local Aboriginal Land Councils and other relevant groups), and increase Aboriginal staff with capacity to lead and maintain engagement.
 - g) appropriate Aboriginal-led governance and decision-making arrangements, such as an Aboriginal Water Holder
 - h) adequate resources including dedicated Aboriginal staff with capability in water planning and management, and funding, such as an Aboriginal Water Trust.

Economic outcomes

- D* DPIE-Water should continue to implement their program to improve all trade information, including coordination with agencies to:
- a) ensure consistent data sets exist across agencies, so that trade data are consistent
 - b) support improvements to price reporting by licence holders
 - c) ensure account management rules are fit for purpose and implementable
 - d) consider environmental and industry impacts as part of any review of trade rules.

Monitoring, evaluation and reporting

- E* DPIE-Water should identify Plan-specific and state-wide research needs and knowledge gaps across all water sharing plans and seek to address these gaps in collaboration with other organisations and research institutions.
- F* DPIE-Water should make all monitoring, modelling and research publicly available to improve accountability and transparency.

Plan updates and implementation

- G* Adopt processes that support the replacement and implementation of the Plan:
- a) enhance communication of the Plan through active, simple, and consistent language and modes of communication
 - b) improve implementation and enforcement of the Plan using clear and consistent governance, roles and responsibilities
 - c) strengthen existing processes for stakeholder engagement developed as part of the water reform action plan, and include an area-specific stakeholder engagement plan – this needs to specify appropriate forums for engagement, such as a stakeholder advisory panel, which includes a range of stakeholders with diverse interests and localised knowledge of water. better communicate the current balance of water sharing and include a relevant performance indicator.

1 Review background

1.1 Water sharing plans and the Commission's role

Water sharing plans are statutory instruments under the Act. They prescribe how water is managed to support sustainable environmental, social, cultural and economic outcomes. They are intended to provide certainty for water users over the life of plans, which is typically ten years, unless a plan is extended.

The Plan commenced on 1 August 2009 and is due for extension or replacement on 1 July 2020.¹ The Commission has a role under Section 43A of the Act to review water sharing plans approaching expiry and provide a report to the Minister on:

- the extent that water sharing provisions of the Plan have materially contributed to the achievement of, or the failure to achieve, environmental, social, cultural and economic outcomes
- if changes to Plan provisions are warranted.

Depending on its review findings, the Commission may recommend a plan is extended or replaced with a new water sharing plan.

In 2016, the Plan was amended to include the former *Water Sharing Plan for the Jilliby Jilliby Creek Water Source 2003* and former *Water Sharing Plan for the Ourimbah Creek Water Source 2003*. The merger of the plans involved updating requirements within the Jilliby and Ourimbah plans to reflect current legislation, data, audits and stakeholder feedback.² It also involved the inclusion of alluvial aquifers.

This review focusses on the Plan's current provisions and does not consider previous versions of provisions governing water sharing for the Jilliby and Ourimbah plans that may have been different prior to the merger.

1.1.1 Water management principles

The Commission is required to consider the water management principles listed in the Act in its review. The Act makes it clear that water sharing is not about balancing uses and values; it is about firstly providing for the environment and secondly recognising basic landholder rights above other uses. The relevant water sharing principles are found in Section 5(3) of the Act and are part of a broader set of water management principles.³ The Act specifies that:

- a) sharing of water from a water source must protect the water source and its dependent ecosystems, and
- b) sharing of water from a water source must protect basic landholder rights, and
- c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

¹ Parliament of NSW (2009) *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009*. Available at: <https://www.legislation.nsw.gov.au/#/view/regulation/2009/346>.

² Department of Primary Industries (DPI)-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 8. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

³ *Water Management Act 2000*, Section 5.

Further, Section 9(1) of the Act emphasises that the water management principles should be prioritised in the order that they are set out in Section 5(3) of the Act.

1.2 Review approach

The Commission's review was informed by a range of evidence, including:

- **stakeholder consultation** – with government agencies, community and industry organisations
- **consultation with Aboriginal stakeholders** – the Commission provided the opportunity for input to relevant Local Aboriginal Land Councils and government agencies
The Darkinjung and Metropolitan Local Aboriginal Land Councils provided feedback, while the Guringai Tribal Link Aboriginal Corporation expressed interest in participating but was unable to contribute due to unforeseen circumstances
- **document review** – the Commission reviewed the Plan and its background document and obtained both publicly available information and unpublished reports from water management agencies, including DPIE-Water – in line with requirements, the Commission considered other relevant state-wide and regional government policies or agreements that apply to the catchment management area
- **technical advice** – consultants provided expert analysis on Plan provisions and opportunities for improvement
- **submissions** – when reviewing water sharing plans, the Commission must call for and consider public submissions. The Commission called for submissions via letters and emails to key stakeholders, advertising in local newspapers and on the Commission's website

Stakeholders were asked to respond to the following five questions to assess the contribution of the Plan to environmental, social, cultural and economic outcomes:

- To what extent do you feel the plan has contributed to social outcomes?
- To what extent do you feel the plan has contributed to environmental outcomes?
- To what extent do you feel the plan has contributed to economic outcomes?
- To what extent do you feel the plan has contributed to meeting its objectives?
- What changes do you feel are needed to the water sharing plan to improve outcomes?

Ten submissions were received. Non-confidential submissions will be made public on the Commission's website.

The Commission would like to thank all the stakeholders who contributed to this review.

For reference, the roles of the various NSW water management agencies are summarised in **Figure 1**, noting that as of 1 July 2019 the former Department of Industry – Water (DoI-Water) is now DPIE-Water and the former Office of Environment and Heritage (OEH) is now the Environment, Energy and Science Group (EES) within DPIE.

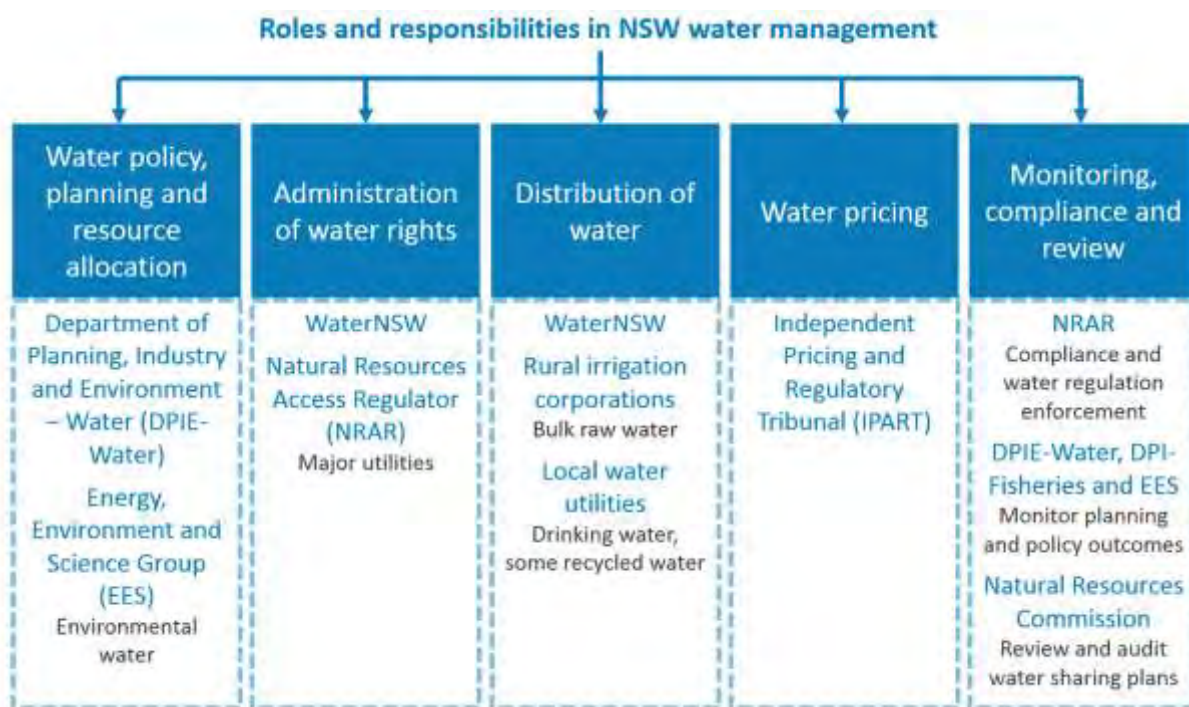


Figure 1: Roles and responsibilities in rural and regional water management⁴

The Commission evaluated the Plan’s performance against its stated objectives and performance indicators, which were linked to each of the broader outcome categories required under the review (environmental, social, cultural and economic outcomes). Limited monitoring has been undertaken to measure the outcomes achieved against each stated objective, making it difficult to determine plan performance. This report presents the Commission’s findings using the best available evidence.

The Plan objectives, indicators and their relevant outcome category are shown in **Table 3**. To allow for future evaluation, a robust MER framework should be developed. This is discussed further in **Chapter 7**.

⁴ Revised from DoI-Water (2019) *NSW Regional Water Statement*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/218404/NSW-Regional-Water-Statement.pdf.

Table 3: Objectives and indicators used for the Commission’s evaluation

Stated Plan Objective	Stated Plan Performance Indicator	Primary outcome category
10(a) protect, preserve, maintain or enhance the important river flow dependent ecosystems of these water sources	12(a) change in low flow regime 12(b) moderate to high flow regime 12(d) change in, or maintenance of, ecological value of key water sources and their dependent ecosystems	Environmental
10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources	12(g) extent to which native title rights requirements have been met 12(i) extent of recognition of spiritual, social, economic and customary values of water to Aboriginal people	Social (Cultural)
10(c) manage these water sources to ensure equitable sharing between users ⁵	There is no clear performance indicator to measure this objective.	Social
10(d) protect basic landholder rights	12(e) extent to which basic landholder rights requirements have been met	Social
10(e) manage local water utility/major utility water supply for the benefit of the community while recognising the environmental needs of the water sources	12(c) change in local water utilities access 12(f) extent to which major and local water utility requirements have been met	Social
10(f) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	12(h) change in economic benefits derived from water extraction and use	Economic
10(g) provide sufficient flexibility in water account management to encourage responsible use of available water	12(h) change in economic benefits derived from water extraction and use	Economic
10(h) adaptively manage these water sources		All

⁵ DPIE-Water advised that equitable sharing between users relates to the appropriate prioritisation of different licences classes under the Act (personal communication, DPIE-Water, 27 March 2019).

2 Plan context

2.1 The Plan area and its water sources

The Plan area covers 156,000 hectares and is shown in **Figure 2**. This area is separated into two main river systems that are divided by the Hunter Range:

- The smaller north-eastern river system flows into Tuggerah Lakes, with major tributaries being the Wyong River, Ourimbah and Jilliby Jilliby creeks.
- The larger western river system flows into the Hawkesbury River, with main tributaries being the Mangrove and Mooney Mooney creeks.⁶

The Plan comprises seven individual water sources managed under two extraction management units (Tuggerah Lakes and Gosford), as detailed in **Table 4**. As specified in Clause 4 of the Plan, the Plan's water sources include all surface waters within the water source boundaries as well as rivers, lakes, wetlands and all the alluvial sediments in the seven water source boundaries (see **Figure 2**). It does not include water in coastal sands, any fractured or porous rocks (such as the Kulnura Mangrove Mountain Aquifer) or land below the mangrove limit, except for the Wamberal Lagoon, Avoca Lake and Cockrone Lake in the Brisbane Water water source.



Figure 2: Plan area

⁶ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 12. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

Table 4: Water sources and extraction management units in the Plan area

Water source	Extraction management unit (estimated system flows) ⁷
Brisbane Water	Gosford (243,100 ML per year)
Mooney Mooney Creek	
Mangrove Creek	
Jilliby Jilliby Creek	Tuggerah Lakes (183,000 ML per year)
Ourimbah Creek	
Tuggerah Lakes	
Wyong River	

2.2 Water use overview

Water in the Plan area is primarily used by the local utility for town water supply, with approximately 80 percent of licenced entitlement allocated for this purpose. Between 2016 and 2019, water entitlement by licenced categories comprised approximately:^{8,9}

- 105,865 ML per year for local water utility access licences
- 14,012 ML per year for unregulated river access licences¹⁰
- 235 ML per year for stock and domestic access licences
- 3 ML per year for aquifer access licences¹¹
- 0 ML per year for major utility licences.

In addition, there is 297 ML per year estimated for the provision of stock and domestic unlicensed allowance of take under basic landholder rights.¹²

⁷ Calculated from data from DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 13. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

⁸ *Ibid.* p. 15.

⁹ WaterNSW's water register indicates that this is approximately the same as in 2019 (219 ML per year for stock and domestic and 14,269 ML per year) (WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>).

¹⁰ Includes irrigation, industry mining, recreation and general farming (DoI-Water (2013) *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW*, p. 4. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/549411/wsp_overview_coastal_unreg_and-alluvial_water_sharing_plans.pdf).

¹¹ Only one aquifer licence has been granted in the Wyong River, for 3 ML per year in 2016-17.

¹² Clause 22(1) of the Plan.

Central Coast Council is the third largest water utility in NSW after the Sydney and Hunter water corporations. It supplies about 93 percent of water used by Central Coast Council residents,¹³ with demand comprising 70 percent domestic and 30 percent non-domestic users.¹⁴

Central Coast Council operates several on-river dams and weirs, with Mangrove Creek Dam having the largest capacity at 190,000 ML (94 percent of the total storage capacity in the Plan area).¹⁵

2.3 Climate is variable

The Central Coast catchments are relatively small and steep, which makes them susceptible to droughts and floods. The eastern coastal area has a higher rainfall (over 1,250 millimetres per year) than the western area at Kulnura (around 1,150 millimetres per year), making the Mangrove Creek catchment drier than the other catchments. The wettest months occur between January and May.¹⁶

Climate change creates uncertainty for the region. For the Central Coast region, average temperatures are projected to increase in all seasons.¹⁷

Detailed datasets derived from numerous models sit behind various publicly available information regarding climate change projections. Two information sets are presented below, which provide an indication of both the extremes and the average rainfall projections in the region. The detailed datasets behind these high-level indicators should be taken into account in developing the catchment model and making decisions regarding flows in the replacement Plan.

The bioregional assessment for the Hunter subregion provides indicative impacts on rainfall, potential evapotranspiration and runoff for the Intergovernmental Panel on Climate Change scenario for a 1-degree Celsius temperature rise by 2030 (compared to the global mean temperature in 1990).¹⁸ Results for 2030 for the Macquarie-Tuggerah Lakes Catchment indicate:

- a 9 percent and 2 percent decline in rainfall for the projected dry extreme and median respectively, and a 4 percent increase for the wet extreme¹⁹

¹³ DoI (2018) *Greater Hunter regional water strategy – Securing the future needs of the Hunter, Central Coast and Mid-Coast areas*, p. 22. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

¹⁴ Gosford City Council and Wyong Shire Council (2007) *WaterPlan 2050: A long-term strategy for the Central Coast*, p. 2. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/WaterPlan-2050.pdf>.

¹⁵ Central Coast Council (2019) *Water Supply Services*. Available at: <https://www.centralcoast.nsw.gov.au/residents/roads-and-water/water-supply-services>.

¹⁶ *Ibid.* p. 14.

¹⁷ DPIE-EES (n.d.) *Central Coast Rainfall 2020-2039*. Available at: <https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Central-Coast-Climate-Change-Downloads>.

¹⁸ The bioregional assessment for the Hunter subregion presents an assessment based on 15 global climate models from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007). Data by Post et al. (2012) in Australian Government (2015) *Context Statement for the Hunter subregion. Production 1.1 for the Hunter subregion from the Northern Sydney Basin Bioregional Assessment. Bioregional Assessments*. p. 48. Available at: <http://data.bioregionalassessments.gov.au/doc/BA-NSB-HUN-110-ContextStatements-20150428.pdf>.

¹⁹ *Ibid.* p. 48.

- a 22 percent and 6 percent decline in runoff for the projected dry extreme and median respectively, and a 6 percent increase for the wet extreme.²⁰

Note that these runoff projections include a limited assessment of evapotranspiration that excludes consideration of wind speed. This impacts runoff projections as evapotranspiration is declining due to declining wind speeds in all months despite increasing air temperatures.²¹

The Central Coast currently experiences considerable rainfall variability from year to year. The NSW Government climate change projections presented by the former OEH shows the Central Coast region's annual average rainfall for 2030 ranging from a decrease of 15 percent to an increase of 16 percent, with variability continuing to 2070. Average rainfall is expected to decrease in winter and spring and increase in autumn and summer.²² Central Coast rainfall projections for spring and summer are shown in **Figure 3** and **Figure 4** below. These maps show that – despite the predicted overall increase in summer rainfall between 2020-2039 – most of this increase is within 10 kilometres of the coast, while average rainfall is predicted to decrease further inland.

Data presented on the Adapt NSW website show that runoff is predicted to increase on average across the Central Coast region in all seasons between 0 and 20 millimetres.²³ Given this data is averaged it is unclear when the majority of this runoff will occur and how changes in surface runoff will affect flows into major storage dams operated by Central Coast Council and into farm dams. Underlying datasets would need to be analysed to understand the impacts, extremes and seasonality projections in more detail.

²⁰ *Ibid*, p. 48.

²¹ *Ibid*, p. 46.

²² DPIE- EES (n.d.) *Central Coast Climate Change Snapshot*. Available at: <https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Regional-Downloads/Climate-Change-Snapshots/CentralCoastSnapshot.pdf?la=en&hash=2791FB42A22B49EE7155B1CEE9E58268CB62E06A>

²³ DPIE-EES (n.d.) *Hydrology Climate Change Impact Snapshot*. Available at: <https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Climate-Change-Impact-Reports/Hydrology-Climate-Change-Impact-Snapshot.pdf>

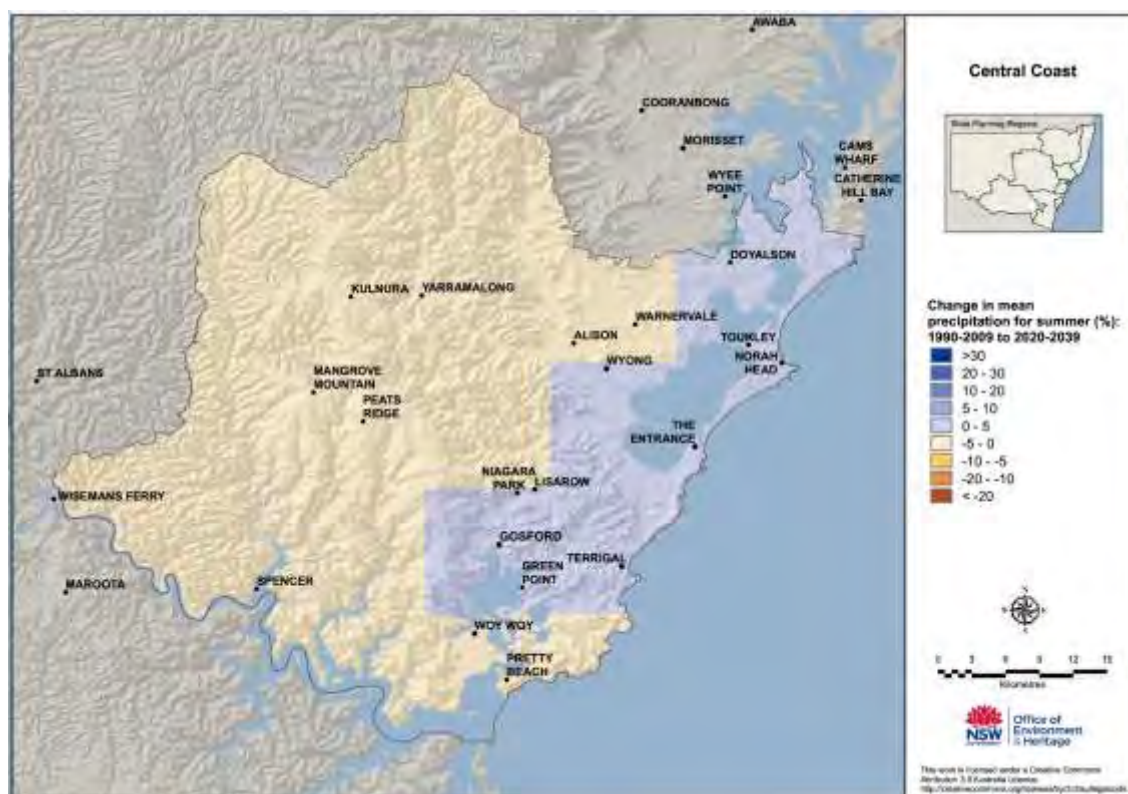


Figure 3: Change in mean precipitation for summer, 1990-2009 to 2020-2039²⁴

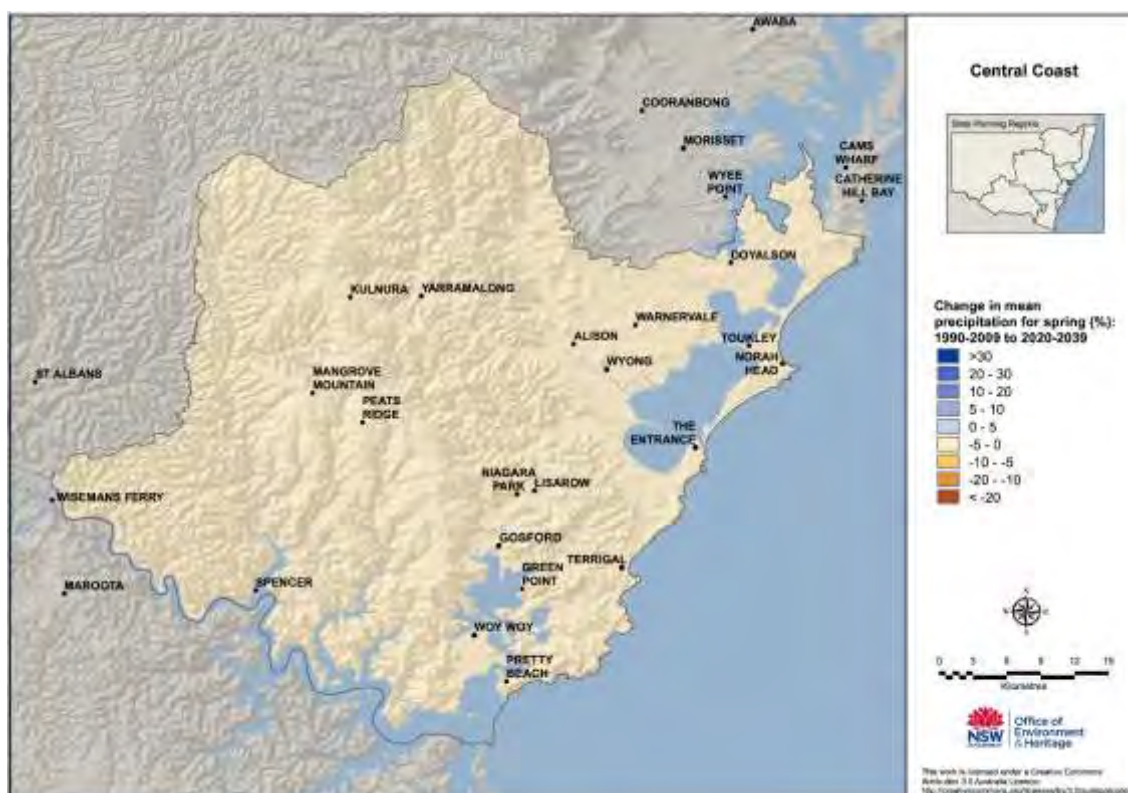


Figure 4: Change in mean precipitation for spring, 1990-2009 to 2020-2039²⁵

²⁴ DPIE-EES (n.d.) *Central Coast Rainfall 2020-2039*. Available at: <https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Central-Coast-Climate-Change-Downloads>.

²⁵ *Ibid.*

2.4 Environmental context

The rivers and streams in the Plan area are part of the Sydney Basin Sandstone Landscape, which have a high degree of uniqueness in terms of the riverine landscapes of NSW. They are important areas of biodiversity and geodiversity in NSW.²⁶

The natural environment, including national parks, state forests, waterways and beaches, covers 50 percent of the region and has underpinned its development.²⁷ There has been significant clearing of native vegetation for urbanisation and agricultural activities, which has impacted catchments. In addition, streams around Tuggerah Lake and Brisbane Water have been highly modified with infrastructure such as dams and weirs.²⁸

National parks in the Plan area include the Jilliby, Tuggerah and Munmorah state conservation areas, the Tuggerah Nature Reserve, and the Wyrribalong, Colongra, Palm Grove, Popran, Dharug, Brisbane Water, Wambina, Cockle Bay and Bouddi national parks.

Significant wetland habitats, estuaries and riparian forests are dependent on the Plan water sources.²⁹ There are approximately 870 hectares of mangroves, 190 hectares of saltmarsh and 1,780 hectares of seagrass in the region. Wetlands in the region support a range of wildlife, including waterbirds, fish, frogs and invertebrates, with many listed as threatened species. They also support a range of sedges, rushes and ecological communities.³⁰

Whilst there are no Ramsar-listed wetlands in the Plan area, there are several nationally important wetlands. These include Avoca Lagoon, Budgewoi Lake Sand Mass, Cockrone Lagoon, Colongra Swamp, Terrigal Lagoon, Wamberal Lagoon and Wyong Racecourse Swamp.³¹ While not technically in the Plan area, the Brisbane Water Estuary and Tuggerah Lake are also listed as nationally important wetlands.

Water sources in the Plan area are connected to several estuaries, including coastal lagoons and Intermittently Closed and Open Lake or Lagoons (ICOLLs), which contain important and unique ecosystems, and are sensitive to human interaction.^{32,33,34} Estuaries provide important

²⁶ Young, R.W., Nanson, G.C., (1983) Aspects of Australian sandstone landscapes. Australian and New Zealand Geomorphology Group, Wollongong NSW, p. 126.

²⁷ Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p. 29. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>.

²⁸ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 15. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

²⁹ *Ibid.* p. 11.

³⁰ Central Coast Council (2019) *Estuaries, lagoons and wetlands*. Available at: <https://www.centralcoast.nsw.gov.au/environment/coastlines/estuaries-lagoons-and-wetlands>.

³¹ Department of the Environment and Energy (n.d.) *Protected Matters Search Tool. Report by Region - Central Coast LGA*. Available at: <https://www.environment.gov.au/epbc/protected-matters-search-tool>.

³² Central Coast Council (2019) *Estuaries, lagoons and wetlands*. Available at: <https://www.centralcoast.nsw.gov.au/environment/coastlines/estuaries-lagoons-and-wetlands>.

³³ NSW Government (2010) *State of the catchments 2010: Estuaries and coastal lakes Hunter-Central Rivers region*. Available at: <https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCEstuarine.pdf>.

³⁴ Haines, P.E., Tomlinson, R.B. and Thom, B.G. (2006) 'Morphometric assessment of intermittently open/closed coastal lagoons in New South Wales, Australia', *Estuarine Coastal and Shelf Science*, 67, p. 323.

nesting, breeding and feeding habitat to support a diversity of species, including fish, shellfish, aquatic plants and animals.³⁵

Plan estuaries include Wamberal and Avoca lagoons and Cockrone Lake. While the Hawkesbury River, Brisbane Waters, Tuggerah Lake, Lake Budgewoi and Lake Munmorah are connected to the Plan's water sources, they are excluded in Clause 4 of the Plan (where water sources are described) and are shown as specific exclusions on the Plan map. Terrigal Lagoon is also excluded, although it is an important estuary identified in the Plan's background document and identified as a groundwater dependant ecosystem in Schedule 5 of the Plan.

Estuary sensitivity to freshwater inflows is variable depending on their size, shape and freshwater inflow volume. Small estuaries are more likely to be highly sensitive to inflows, while long and narrow estuaries are less sensitive to changes in inflows. The Plan's background document outlines inflow sensitivity for the following estuaries:

- Wamberal Lagoon, Terrigal Lagoon, Avoca Lagoon and Cockrone Lake ICOLL are highly sensitive to low and high flow inflows
- Tuggerah Lakes ICOLL has a low sensitivity to low and high flow inflows
- Brisbane Waters and Hawkesbury River have low sensitivity to low and high flow inflows.³⁶

Three values were considered to determine the instream value for the Plan's water sources; ecological (intrinsic), economic (non-extractive use) and cultural (place).³⁷ The Plan's background document identifies high instream values in six of the seven water sources in the Plan area. These include the Wyong River, Ourimbah Creek, Jiliby Jiliby Creek, Mangrove Creek, Mooney Mooney Creek and Brisbane Water water sources. Water sources with high instream values tend to include those where threatened species were present. The Tuggerah Lakes water source is classified as having moderate instream value. Other high ecological values include platypus, species diversity, waterbird habitat, instream condition and recreation value.³⁸ Instream values are an important consideration when setting flow sharing rules (see **Section 4.2**).

The threatened flora and fauna species that occur within one or more of the Plan's water sources include the Adams Emerald Dragonfly, Giant Barred Frog, Giant Burrowing Frog, Green and Golden Bell Frog, Green-thighed Frog, Littlejohns Frog, Red-crowned Toadlet, Stuttering Frog, Wallum Froglet, Australasian Bittern, Black Bittern, Black-necked Stork, Comb-crested Jacana, Magpie Goose, Southern Swamp Orchid, and *Maundia triglochinos*.³⁹

³⁵ NSW Government (2018) *Why estuaries are important*. Available at: <https://www.environment.nsw.gov.au/topics/water/estuaries/about-estuaries/why-estuaries-are-important>.

³⁶ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 20. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

³⁷ Office of Water (2011) *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*, p. 7. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf.

³⁸ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 11. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

³⁹ *Ibid*, pp. 41-42.

The Plan identifies three groundwater dependent ecosystems; Terrigal Lagoon South, Terrigal Lagoon North and Porters Creek Wetland. These are all classified as being high-priority groundwater dependent ecosystems.⁴⁰

2.5 Social and cultural context

The Central Coast is the third largest residential region in NSW, with a population in 2019 of 346,459, centred around Gosford and Wyong.^{41,42} The region's population has grown over the Plan period, from over 300,000 in 2008 to 346,459 in 2019 (15 percent), and is expected to reach 415,000 in 2036 (a further 20 percent growth).^{43,44}

Water sources in the Plan support a range of amenity uses, including recreational fishing, boating, visual amenity and foreshore recreation. There are several active recreational fishing clubs on the Central Coast, with most fishing and boating activities occurring in the estuarine areas and lakes, rather than in the freshwater tributaries. However, the lower Wyong River is popular for recreational fishing and is the location for an annual power boat race that attracts competitors from outside the local area.⁴⁵

The region has an Aboriginal population of 11,985.⁴⁶ The Plan area overlaps primarily with the traditional lands of the Darkinjung, Guringai, and Daruk people. The Darkinjung Local Aboriginal Land Council is the largest non-government landholder on the Central Coast.⁴⁷

There are currently no specific water-dependent Aboriginal cultural sites in the Plan area. Plans of management for the region's national parks and other reserves refer to various culturally significant sites, which include rock engravings, axe grinding groove sites, middens, stone arrangements, camp sites, rock shelters containing art and shells, and other archaeological material.⁴⁸

2.6 Economic context

Four of the Plan's water sources are classified as having high economic significance due to the community's dependence on commercial extraction (utility and irrigation). These include

⁴⁰ Schedule 5 of the Plan.

⁴¹ .id Demographic Resource Centre (2018) *Central Coast area population forecast*. Available at: <https://forecast.id.com.au/central-coast-nsw>.

⁴² Department of Industry and Investment (n.d.) *The Central Coast of NSW: A Sustainable, Smart and Connected Region – Regional Economic Development and Employment Strategy*, p. 4. Available at: https://rdacc.org.au/wp-content/uploads/2018/10/regional_economic_development_and_employment_strategy_document.pdf.

⁴³ Department of Planning (2008) *Central Coast Regional Strategy 2006-2031*, p. 3. Available at: https://rdacc.org.au/wp-content/uploads/2018/10/central_coast_regional_strategy_dep_planning_infrastructure.pdf.

⁴⁴ Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p. 1. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>.

⁴⁵ Dickinson, T., Roberts, D. and Williams, B. (2007) *Wyong River/ Tuggerah Lakes Estuary Values and Sensitivities Assessment*, prepared for Gosford Wyong Council Water Authority, Bio-Analysis, Narara.

⁴⁶ .id Demographic Resource Centre (n.d.) *Central Coast Council area. Aboriginal and Torres Strait Islander profile*. Available at: <https://profile.id.com.au/central-coast-nsw/indigenous-keystatistics>.

⁴⁷ Department of Planning and Environment (n.d.) *Central Coast Region. Darkinjung Delivery Framework*. Available at: <https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Central-Coast>.

⁴⁸ Plans of management are published by NSW National Parks and Wildlife Service for national parks, state conservation areas and nature reserves. They can be viewed at: <https://www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/park-management/parks-plans-of-management>.

Ourimbah, Mangrove and Mooney Mooney creeks, and the Wyong River.⁴⁹ The Central Coast had a gross regional product of \$13.5 billion in 2018, representing 2.4 percent of the gross state product of NSW.⁵⁰ Gosford is one of six regional cities contributing significantly to NSW's economic growth.⁵¹

Rental, hiring and real estate is the largest contributor to the economy, followed by manufacturing, construction, and health care and social assistance (with outputs of approximately \$4.4 billion, \$3 billion, \$2.6 billion, and \$2 billion respectively in 2017-18).⁵² In addition, tourism and hospitality contributed \$0.8 billion to the regional economy in 2016-17, much of which was based on access to the natural environment, including waterways.^{53,54}

The Somersby Plateau is a major source of quarried fine- to medium-grain sand and the northern area of the Plan contains several viable coal extraction sites.^{55,56} Mines use surface water, primarily for minerals processing and dust control.⁵⁷ Mining contributed a total value-add⁵⁸ of approximately \$139 million in 2017-18, with resources including sand, sandstone, gravel, clay, hard rock and coal deposits.^{59, 60}

Agriculture, forestry and fishing industries in the Central Coast local government area had a total value add of approximately \$112 million in 2017-18, with agriculture being the primary industry (91 percent).⁶¹ The main agricultural products in 2015-16 were livestock (primarily poultry, with a total value of \$102 million) and irrigated horticulture (total value of \$53 million including nurseries and cut flowers (approximately \$36 million), turf growing, vegetables (approximately \$10 million) and fruit (approximately \$6 million).^{62, 63}

⁴⁹ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 10. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

⁵⁰ .id Demographic Resource Centre (2019) *Central Coast Council area Gross Regional Product*. Available at: <https://economy.id.com.au/central-coast-nsw/gross-regional-product?BMID=52>.

⁵¹ Department of Planning (2008) *Central Coast Regional Strategy 2006-2031*, p. 1. Available at: https://rdacc.org.au/wp-content/uploads/2018/10/central_coast_regional_strategy_dep_planning_infrastructure.pdf.

⁵² .id Demographic Resource Centre (2018) *Central Coast Council area – economic profile*. Available at: <https://economy.id.com.au/central-coast-nsw/output-by-industry>.

⁵³ .id Demographic Resource Centre (n.d.) *Central Coast Council area, Tourism and hospitality value*. Available at: <https://economy.id.com.au/central-coast-nsw/tourism-value>.

⁵⁴ Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p. 15. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>.

⁵⁵ Department of Planning (2008) *Central Coast Regional Strategy 2006-2031*, p. 34. Available at: https://rdacc.org.au/wp-content/uploads/2018/10/central_coast_regional_strategy_dep_planning_infrastructure.pdf.

⁵⁶ Wallarah 2 Coal Project (n.d.) *Walarah 2 Coal project*. Available at: <http://www.walarah.com.au/>.

⁵⁷ NSW Mining (2013) *Water*. Available at: <http://www.nswmining.com.au/environment/water>.

⁵⁸ Value add by industry is an indicator of business productivity in the Central Coast Council area. It shows how productive each industry sector is at increasing the value of its inputs.

⁵⁹ .id Demographic Resource Centre (n.d.) *Central Coast Council area. Value added*. Available at: <https://economy.id.com.au/central-coast-nsw/value-add-by-industry>.

⁶⁰ Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p.29. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>.

⁶¹ .id Demographic Resource Centre (2018) *Central Coast Council area – employment by industry*. Available at: <https://economy.id.com.au/central-coast-nsw/employment-by-industry-fte>.

⁶² Value refers to the total gross value of value of agricultural commodities.

⁶³ .id Demographic Resource Centre (2018) *Central Coast Council area - agriculture*. Available at: <https://economy.id.com.au/central-coast-nsw/value-of-agriculture>.

3 The Plan should be revised to support sustainable town water supply

This chapter focuses on issues relating to town water supply.

The Commission's review found that the requirements of current local water utility access licences have been met in the Plan period.⁶⁴ However, predicted population growth presents a significant risk to future utility supply. Regional planning processes are underway to determine these risks and the Plan should be revised to consider these once they are completed.

Any action to increase utility supply to meet future needs should only be considered after water management improvement practices – such as efficiency measures and behaviour change initiatives – have been implemented,^{65,66} and environmental needs are adequately measured and provided for.

3.1 Current utility needs are met but future risks should be managed

While local water utility needs have been met under the Plan, the major future risk is from predicted population growth.

3.1.1 Town water supply needs have been met during the plan period

Approximately 80 percent of water allocated under the Plan is for utility supply. The Plan permits Central Coast Council to extract up to 105,865 ML from Plan water sources in any particular year for storage through dam replenishment, although the LTAAELs and flow management rules (see **Section 4.2**) must still be met, and only 36,750 ML can be diverted from these water sources to the urban reticulated network.

This means that the Plan provides:

- the opportunity to refill storages after drought periods (which aims to provide a high level of security)
- constraints on the overall amount of long-term take (which aims to provide environmental protection and encourage urban water use efficiency).⁶⁷

Demand in 2018 was 24 percent higher than in 2009, with 31,389 ML per year in 2018 compared with 25,112 in 2009. However, demand has fluctuated over the Plan period and there has not been a steady year-on-year growth trend. For example, the lowest and highest annual demands during the Plan period were 25,033 ML in 2012, and 31,389 ML during 2018, respectively.⁶⁸ The trend in overall growth in demand is strongly related to a growing population.

⁶⁴ There are currently no major water utility licences in the Plan area, only local water utility licences.

⁶⁵ Department of Water & Energy (2007) *Best-Practice Management of Water Supply and Sewerage Guidelines*. Available at:

http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/554489/town_planning_water_utilities_best-practice_management_of_water_supply_and_sewerage_guidelines_2007.pdf

⁶⁶ Water Services Association of Australia (2019) *Water Efficient Australia*. Available at:

<https://www.wsaa.asn.au/sites/default/files/publication/download/water%20efficient%20aust%20screen.pdf>.

⁶⁷ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 15. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

⁶⁸ Based on internal documents provided to the Commission during consultation from Central Coast Council.

Despite the overall growth:

- demand has remained within the licensed entitlement of 36,750 ML per year, with a small amount of room for growth – this meets Clause 38(4) of the Plan which requires utility extraction not to exceed the LTAAEL over an average of 10 consecutive water years⁶⁹
- average residential water use on the Central Coast peaked at about 215,000 litres per year in 2001-02, reducing to a low of 140,000 litres per year in 2006-07. The reduction was due to a combination of water restrictions, practical demand management measures and community awareness and cooperation.⁷⁰ Water use is unlikely to return to pre-drought levels due to improved community awareness and installation of water saving devices.
- Current average residential water use in the Central Coast Council local government area is 155,000 litres per year, below the NSW state median of 162,000 litres per year.⁷¹

3.1.2 Population growth is a key risk

Population in the region increased by 15 percent between 2008 and 2019 and growth is expected to continue. The 2050 demand projection for the Central Coast town water supply is 47,300 ML per year,⁷² which is approximately 29 percent higher than the current utility LTAAEL of 36,750 ML per year. Central Coast Council projects that annual average demand will be 41,534 ML per year by mid-2050, based on the Integrated Supply Demand Model, this is slightly lower than the Plan suggests for 2050.⁷³ Council demand projections shown in **Table 5** are approaching the current LTAAEL and will exceed it by June 2041.

⁶⁹ Based on internal documents provided to the Commission during consultation from Central Coast Council.

⁷⁰ Central Coast Council (2018) *Central Coast Council Water and Sewer Strategic Business Plan*. p. 28. Available at: https://cdn.centralcoast.nsw.gov.au/sites/default/files/Water_and_Sewer_Strategic_Business_Plan.pdf.

⁷¹ DPI-Water (2017) *2015-16 NSW Water Supply and Sewerage Performance Monitoring Report*. Available at: http://www.water.nsw.gov.au/_data/assets/pdf_file/0007/716146/2015-16-nsw-water-supply-and-sewerage-performance-monitoring-report.pdf.

⁷² Parliament of NSW (2009) *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009*. Available at: <https://www.legislation.nsw.gov.au/#/view/regulation/2009/346>.

⁷³ The Central Coast Council uses the Integrated Supply Demand Model for its demand forecast. The model was first developed by the Institute for Sustainable Futures, part of the University of Technology Sydney, for Sydney Water Corporation in the late 1990s. This included both the development of a detailed demand forecast and development of a broad range of demand management and supply options. The model was subsequently modified by Sydney Water Corporation and later released in 2003 as the Water Services Association of Australia end use model. The model has been further developed by the Institute of Sustainable Futures and CSIRO and applied to numerous cities across Australia. The model is currently used as a planning tool by various large water service providers including Hunter Water Corporation for long-term water resources planning (Central Coast Council (2019) *Central Coast Water Supply Headworks Development Servicing Plan 2019*, pp. 4-5. Available at: <https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/pricing-reviews-water-services-metro-water-prices-for-central-coast-council-from-1-july-2019/legislative-requirements-prices-for-central-coast-council-from-1-july-2019/northern-region-water-supply-and-sewerage-dsp-2019-appendices.pdf>).

Table 5: Projected Water Demand for Central Coast Council⁷⁴

Water year	Population projection	Annual average demand (ML per year)	Average day demand ML per day	Peak day demand ML per day
Year ending June 2021	173,178	31,397	86	193
Year ending June 2031	204,810	34,443	94	212
Year ending June 2041	237,551	37,978	104	234
Year ending June 2051	268,976 (at 30 June 2050)	41,534	114	256

Forecasted water demand is increasing. To meet these demands a combination of increased supply (yield), efficiency and infrastructure measures are needed. **Figure 5** shows the result of the forecast increased yield in relation to increasing demand.

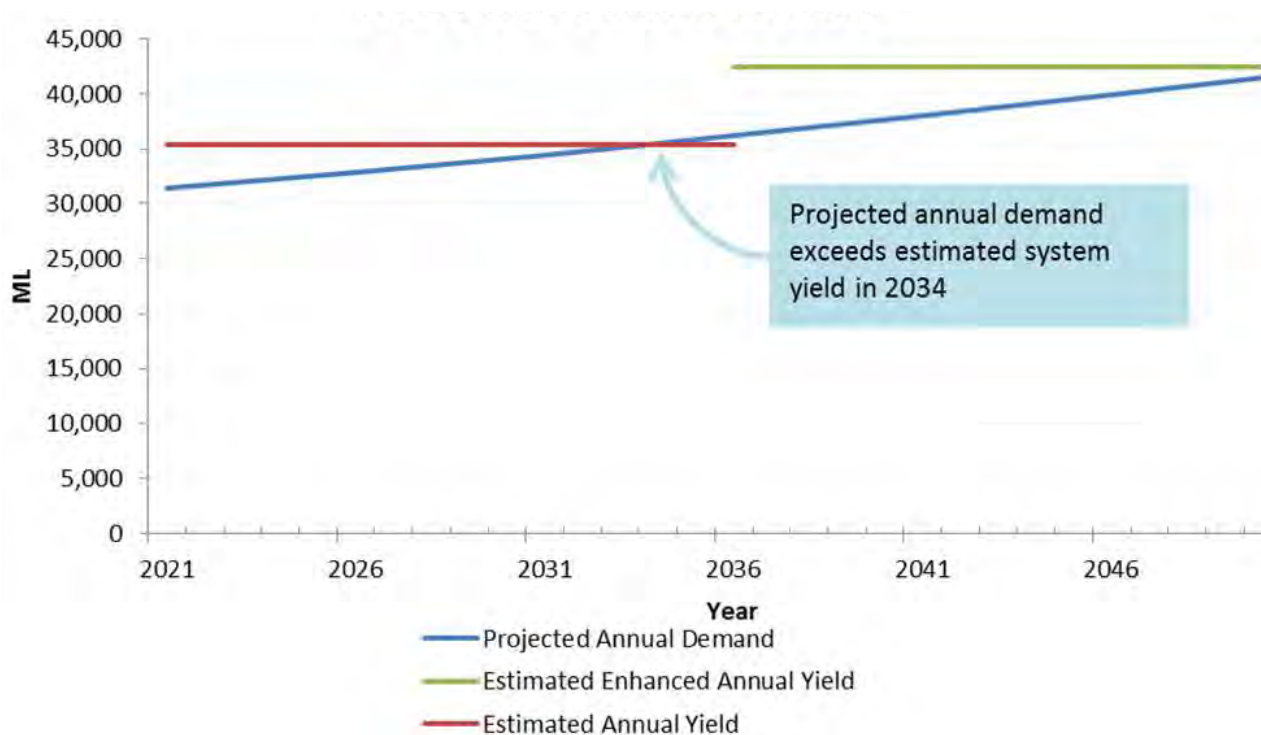


Figure 5: Forecast demand versus system yield⁷⁵

⁷⁴ *Ibid.* p. 5.

⁷⁵ *Ibid.* p. 6.

3.2 Regional planning activities should inform the revised Plan

The Plan should be revised to ensure risks to town water utility are adequately managed, while ensuring that environmental needs are met. The Plan includes provisions for town water supply through local water utility access licences. Growth in use provisions, pursuant to sections 66(3) and 66(4) of the Act, allow for a local water utility's share component to be reviewed in response to population growth. However, any action to increase utility supply to meet future needs should only be considered as part of an integrated approach to water management.

First, water management improvement practices such as efficiency measures and behaviour change initiatives should be implemented. Second, environmental water requirements should be defined to ensure the minimum requirements for the future sustainability of the river ecosystem are met, taking into consideration future climate change and population growth.

Central Coast Council has been working with authorities in the Hunter region regarding water supply issues and several infrastructure improvements to address security of supply have taken place since Plan development. The needs of a growing population are also being assessed as part of regional water planning processes that will likely introduce a range of supply side and demand management measures.

The Plan replacement process should occur concurrently with regional planning processes to allow for information exchange between the various planning teams, particularly of information on future risks to water resources and environmental water requirements.

3.2.1 Current planning activities

Central Coast Council is currently developing a new *Integrated Water Resource Plan* for the Central Coast in parallel with DPIE-Water and Hunter Water Corporation's work on the revision of *Lower Hunter Water Plan*. These planning processes are expected to provide an assessment of the most appropriate infrastructure to improve regional drought resilience and meet future population growth demands. They are also expected to incorporate updated climate change projections, catchment modelling, supply risks, regional sharing options, and alternative infrastructure and operational options in the context of a growing population.

It is anticipated that these plans will be completed in 2021. This may include supply augmentation initiatives within the Central Coast such as urban stormwater harvesting and alternative water transfer arrangements with the Hunter region. This work is an essential component for consideration as part of any replacement plan design regarding compatibility and sustainable water management.⁷⁶

The Commission notes that these plans sit within the broader context of a *Greater Hunter Regional Water Strategy*. This strategy aims to improve water security across the Greater Hunter including the Central Coast and is currently in draft.⁷⁷ This strategy covers the broader Hunter region including seven water sharing plans. It outlines key risks to water security for the region. It also highlights several strategic actions aimed at improving drought security, promoting economic growth and better protecting environmental assets. It is intended to be a tool for

⁷⁶ Submission: Central Coast Council, received 8 January 2019.

⁷⁷ DoI (2018) *Greater Hunter regional water strategy – Securing the future needs of the Hunter, Central Coast and Mid-Coast areas*, p. 1. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

ongoing conversation between governments, utilities and communities regarding the direction of water management in the region.⁷⁸ These strategies and actions include:

- reviews of water trading and water sharing arrangements
- infrastructure including water recycling
- improving reliability for users through agreements between water utilities and providers
- the development of business cases for new infrastructure
- the development of a drought contingency plan.⁷⁹

Flow on effects from proposed changes to the Plan to other water sharing plans in the region should be considered. For example, the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* refers to water transfer arrangements between the Central Coast and Hunter regions (see **Section 3.2.2**).

DPIE-Water should consult with stakeholders in the Hunter region to identify and address potential opportunities or impacts arising from the replacement plan in relation to the Hunter region. This may include concurrent timing for the replacement plan design and any changes if warranted to the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

3.2.2 Infrastructure improvements during the Plan period

The early 2000s drought prompted infrastructure planning to maintain a secure town water supply, and the former Gosford and Wyong councils finalised a new strategy in 2007 – the *WaterPlan 2050*.⁸⁰ The councils and the Australian Government invested over \$100 million to improve the security of the Central Coast’s water supplies and increase drought resilience.

In 2006, a two-way pipeline (known as the Hunter Connection) was constructed to improve security of supply when supplies are low. This was accompanied by a commercial agreement between Hunter Water Corporation and Central Coast Council that was signed in 2006 to transfer water between the regions. In 2007, the Hunter storages were relatively full and therefore able to supply water to the Central Coast to help maintain supplies through that extreme drought.⁸¹

Modelling indicated that there are different scenarios where each region could help the other. Transferring water between the Hunter and Central Coast has helped to make better use of the combined water in existing storages, so both regions are better able to cope during a dry period.⁸²

The pipeline initially had a capacity that allowed 33 ML of drinking water per day to flow to the Central Coast, and 13 ML of water per day to be transferred to the Hunter, with the daily transfer rates depending on the storage levels in each region. The pipeline is being upgraded so that up to 30 ML a day of water could be transferred north to the Hunter region in accordance

⁷⁸ *Ibid*, p. 2.

⁷⁹ *Ibid*, pp. 3-4.

⁸⁰ Gosford City Council and Wyong Shire Council (2007) *WaterPlan 2050: A long-term strategy for the Central Coast*, p. 3. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/WaterPlan-2050.pdf>.

⁸¹ Department of Finance and Services (2014) *Lower Hunter Water Plan*, p. 19. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-mgmt-strategies/lower-hunter-water-plan>.

⁸² *Ibid*, p. 21.

with the existing water transfer agreement (this was to be completed in 2017 but has been delayed).⁸³

A later critical investment in infrastructure included the new Mardi-Mangrove link pipeline project that enabled more water to be taken from Wyong River and Ourimbah Creek during high flow periods and transferred into Mangrove Creek Dam for storage. This work also included a high and low flow fish way and was completed in 2012. This project aimed to help boost dam storage levels, improve drought recovery and improve security of town water supply against periods of below average rainfall.⁸⁴

3.3 Recommendations

To support a sustainable town water supply in the future, the Commission recommends that the Plan be extended for two years until regional planning activities are completed in 2021. Following this, the Plan should be replaced, with consideration of updated modelling, planning and other operational considerations.

An extension of this duration is permissible under Section 43A(6) of the Act, which in this case means that a replacement management plan must be in place before 1 July 2022.

Recommendations

- 1 The Plan should be:
 - a) **extended for a further two years until June 2022** to allow for information exchange between the Plan replacement process and Central Coast Council's *Integrated Water Resource Plan* and revised *Lower Hunter Water Plan* (both due for completion in 2021)
 - b) **replaced by June 2022** addressing the recommendations in this report and incorporating relevant considerations in Central Coast Council's *Integrated Water Resource Plan* and the revised *Lower Hunter Water Plan* – in the case that this additional information is not available in time for the replacement Plan, include a clause that the Plan must be amended to integrate this information within 6 months of it becoming available.

Suggested actions

- A DPIE-Water should consult with stakeholders in the Greater Hunter region to identify and address potential opportunities or impacts arising from the replacement of other plans in this region, particularly the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. This may include concurrent timing for the development of replacement plans with similar expiry timeframes and changes (if warranted) to other plans.

⁸³ *Ibid*, p. 20.

⁸⁴ Gosford City Council and Wyong Shire Council (2011) *Mardi-Mangrove Link Pipeline*. pp. 6-21. Available at: https://cdn.centralcoast.nsw.gov.au/sites/default/files/Mardi_Mangrove_Link_Commemorative_Booklet.pdf.

4 Environmental outcomes

In addition to environmental objectives, the Plan's overall vision set out in Clause 9(1) is to 'provide sustainable and integrated management of these water sources for the benefit of both present and future generations'. Environmental outcomes are prioritised under the Act as they underpin all other outcomes, including social and economic outcomes.

The Plan must protect the water source and its dependent ecosystems as a priority. The share of water reserved for the environment under the Plan is intended to sustain aquatic fauna and flora.⁸⁵ The Plan has two main sets of provisions to manage diversions and protect environmental values; LTAAELs and flow sharing rules.

The Commission has not found any evidence that these rules were set with due consideration of key water dependent assets. These key water dependent assets have not been clearly defined or identified in any of the supporting material to the Plan. There is no demonstration of if and how these assets might be stressed and what the most appropriate flow regimes are for these water sources to support these environmental assets.

In addition, the Commission's review of Plan provisions relating to the delivery of environmental objectives found that:

- river condition across the catchment is on balance moderate but the catchment is under stress
- LTAAELs and flow management rules have not been set with consideration of key water dependent assets and what the most appropriate flow regimes are for these water sources
- the current provisions protect groundwater dependent ecosystems through rules for granting or amending water supply works approvals near sensitive environmental areas - however, there are some opportunities to improve these in terms of defining groundwater dependent ecosystems and ensuring setback distances are consistent with the *Aquifer Interference Policy*.

The Commission has been unable to assess the Plan's contribution to environmental outcomes because of limited and/or poor-quality data on:

- the variability of water availability
- ecological assets and their water needs
- the key hydrological character of the flow regime in the Plan area.

This chapter also notes future pressures and threats raised by stakeholders, which are outside the scope of the Plan but that should be considered where relevant to inform adaptive management.

⁸⁵ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p.10. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

4.1 River condition is moderate and the catchment is under stress

An assessment of river condition across Australia has been undertaken on a regular basis since 2002.⁸⁶ Reporting on river condition in Australia has relied on existing data that has often been collected from different projects that are brought together to describe riverine systems.^{87,88} Standard methods have been developed to assess the health of Australian river ecosystems.⁸⁹

Indicators used to measure river condition have varied according to the availability of consistent data sets in the areas or regions being assessed.⁹⁰ However, approaches and data to assess river condition have become more standardised over time. The NSW River Condition Index was developed to combine multiple indices into a single condition score for reporting, planning and management needs at required scales.⁹¹

Physical and biological methods to assess river condition are an industry standard.⁹² This is because the end point of environmental degradation and pollution of rivers is usually the physical and biotic character. Several legislative and practical developments have also served to heighten the importance of biota, and ecological and physical values, and have provided the methods for assessment.⁹³ Consequently the protection of rivers has shifted from setting guidelines for largely chemical measures (on the assumption that acceptable river condition would be achieved if these were met) to include biological and physical measures.

The State of the Environment reporting uses the River Condition Index as the primary long-term reporting tool for assessing change in riverine condition.⁹⁴ The River Condition Index is based on five component indexes: riparian vegetation cover, hydrological stress, biodiversity condition, geomorphic condition and catchment disturbance.⁹⁵

⁸⁶ Natural Heritage Trust (2002) *Australian Catchment, River and Estuary Assessment*. Available at: <http://lwa.gov.au/products/pr020282>.

⁸⁷ NSW Office of Water (2012) *River Condition Index in New South Wales: method development and application*, p. 9. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/151173/River-Condition-Index-in-NSW.pdf.

⁸⁸ Natural Heritage Trust (2002) *Australian Catchment, River and Estuary Assessment*. Available at: <http://lwa.gov.au/products/pr020282>.

⁸⁹ Parsons, M.E., Thoms, M.C. and Norris, R.H. (2004) *Development of a standardized approach to river habitat assessment in Australia. Environmental Assessment and Monitoring*, 98, pp. 109-130.

⁹⁰ *Ibid*, p. 8.

⁹¹ *Ibid*, p. 9.

⁹² Karr, J.R. (1991) 'Biological integrity: a long-neglected aspect of water resource management'. *Ecological Applications* 1, pp. 66-84; Norris, R.H. and Norris, K.H. (1995) 'The need for biological assessment of water quality: Australian perspective'. *Australian Journal of Ecology*, 20, pp. 1-6; Wright J.F. (1995) 'Development and use of a system for predicting macroinvertebrates in flowing waters'. *Australian Journal of Ecology*, 20, pp. 181-197; Resh V.H., Myers M.J. and Hannaford, M.J. (1996) 'Macroinvertebrates as biotic indicators of environmental quality'. pp. 647-667. In Hauer, F.R. and Lamberti, G.A., (eds.) *Methods in stream ecology*. Academic Press, San Diego, p. 674.

⁹³ For example, River Invertebrate Prediction and Classification System (RIVPACS) – see Wright, J.F. (1995) 'Development and use of a system for predicting macroinvertebrates in flowing waters'. *Australian Journal of Ecology*, 20, pp. 181-197; and the Index of Biotic Integrity (IBI) – see Karr, J.R. (1991) 'Biological integrity: a long-neglected aspect of water resource management'. *Ecological Applications* 1, pp. 66-84.

⁹⁴ DPIE-Water (n.d.) *NSW River Condition Index*, p. 3. Available at: <https://www.industry.nsw.gov.au/water/science/surface-water/monitoring/river-health/river-condition-index>.

⁹⁵ NSW Environment Protection Authority (2015) *New South Wales State of the Environment*, p. 154. Available at: <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/soe2015/20150817soe-2015.pdf?la=en&hash=A42B0E4B0817D63CC0CF7FCC845E783DB630D7F7>.

The State of the Environment reports have been using the River Condition Index since 2012. The results for 2015 and 2018 indicate that the river condition is in moderate to good (0.6 - 0.7) on a scale of very poor to very good (0 - 1) in both years for the Macquarie and Tuggerah Lakes catchment.^{96,97} More granular data for the Central Coast region has not been obtained to inform this review.

Results presented for a pilot study in 2010 by the Hunter-Central Rivers Catchment Management Authority show that the Central Coast catchment disturbance is below moderate, riparian vegetation condition, river biodiversity condition is moderate, and river styles geomorphic condition is just above moderate.⁹⁸

In addition, one study in 2016 found that macroinvertebrates were generally resilient to pollution in the upper catchment where there is good quality habitat and riparian zones.⁹⁹

The State of the Catchment report in 2010 indicates that the Hunter-Central Rivers have good macroinvertebrate and fish condition.¹⁰⁰ It classifies the central coast as having poor hydrology condition. Although there was no hydrology model, this classification was based on a relatively high urban water supply in relation to flow in dry years.¹⁰¹

The Central Coast is subject to increasing urbanisation and rural subdivision pressure. The increasing population associated with this will place additional pressure on water resources. Council-driven water restrictions were in place for urban water supply users from February 2002 to May 2012, and 'water wise rules' have been in place after that period.¹⁰²

The water level in the main storage - Mangrove Creek Dam - dropped to around 10 percent in early 2007 due to 15 years of below-average rainfall.¹⁰³ Level 4 water restrictions were enforced at that time, which prohibited any outdoor water use.¹⁰⁴ The average stream flows also reduced by about half compared to the 100-year long term average of 177,000 ML.¹⁰⁵ This prompted a range of infrastructure investments (see **Section 3.2.2**).

⁹⁶ *Ibid*, p. 155.

⁹⁷ NSW Environment Protection Authority (2018) *New South Wales State of the Environment - River Health*. Available at: <https://www.soe.epa.nsw.gov.au/all-themes/water-and-marine/river-health>.

⁹⁸ NSW Office of Water (2012) *River Condition Index in New South Wales: method development and application*, pp. 18-29. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/151173/River-Condition-Index-in-NSW.pdf.

⁹⁹ Miller, J. (2016) *Central Coast Council Creek Monitoring Evaluating and Reporting Project*.

¹⁰⁰ NSW Government (2010) *Riverine ecosystems Hunter - Central Rivers region*, pp. 10-11. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/State-of-the-catchments-2010/Hunter-central-rivers/state-of-the-catchments-2010-hunter-central-rivers-region-riverine-ecosystems-100436.pdf?la=en&hash=128EDACC68F3FF9E6258673BF22F2074272D80BB>.

¹⁰¹ *Ibid*, p. 12.

¹⁰² Bureau of Meteorology (2019) *Water Restrictions*. Available at: <http://www.bom.gov.au/water/restrictions/index.php?restrictionArea=15470>.

¹⁰³ Gosford City Council and Wyong Shire Council (2007) *WaterPlan 2050: A long-term strategy for the Central Coast*, p. 3. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/WaterPlan-2050.pdf>.

¹⁰⁴ Gosford City Council and Wyong Shire Council (2011) *Mardi-Mangrove Link Pipeline*, p. 5. Available at: https://cdn.centralcoast.nsw.gov.au/sites/default/files/Mardi_Mangrove_Link_Commemorative_Booklet.pdf.

¹⁰⁵ Gosford City Council and Wyong Shire Council (2007) *WaterPlan 2050: A long-term strategy for the Central Coast*, p. 3. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/WaterPlan-2050.pdf>.

Storage levels have improved over the Plan period. However, since a peak in 2017, levels have declined once more (**Figure 6**).¹⁰⁶ Mangrove Creek Dam is currently at 53.7 percent capacity.¹⁰⁷ Level 1 water restrictions will be implemented if levels drop to 50 percent.¹⁰⁸

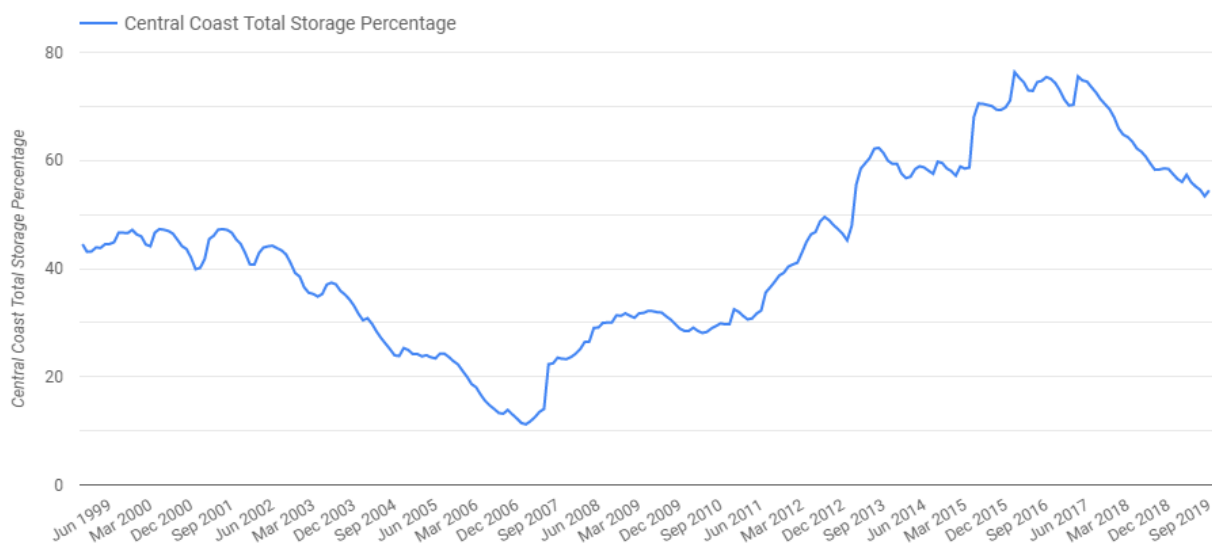


Figure 6: Central Coast total storage percentage between 1999 and 2019¹⁰⁹

The *State of the Catchment Report 2010* indicated that entitlements for urban water supply in Central Coast catchments was relatively high in relation to flow in dry years, compared with other catchments in the Hunter-Central Rivers region, leading to a poor hydrology condition assessment result.¹¹⁰

Three of the five available report cards indicate that Mangrove, Mooney Mooney Creek and Wyong River are under high hydrologic stress, specifically that peak extraction demand exceeds available flows in December 80 percent of the time.^{111,112}

¹⁰⁶ Central Coast Council (2019) *Water Supply Services*. Available at: <https://www.centralcoast.nsw.gov.au/residents/roads-and-water/water-supply-services>.

¹⁰⁷ As at 5 October 2019.

¹⁰⁸ Central Coast Council (2019) *Dam levels are falling - are you WaterWise?* Available at: <https://www.centralcoast.nsw.gov.au/council/news/media-releases/dam-levels-are-falling-are-you-water-wise>.

¹⁰⁹ *Ibid.*

¹¹⁰ NSW Government (2009) *Riverine ecosystems, Hunter-Central Rivers region, State of the Catchments 2010*, p. 12. Available at:

<https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10436HUNTCENriver.pdf>.

¹¹¹ Department of Water and Energy (2009) *Report card for Wyong River water source*. Available at: http://archive.water.nsw.gov.au/__data/assets/pdf_file/0010/548398/wsp_central_coast_summary_rules_wyong_river.pdf; Department of Water and Energy (2009) *Report card for Mooney Mooney Creek water source*. Available at:

http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548662/wsp_central_coast_report_card_moon_ey_mooney_creek.pdf; Department of Water and Energy (2009) *Report card for Mangrove Creek water source*.

Available at:

http://archive.water.nsw.gov.au/__data/assets/pdf_file/0009/549081/wsp_central_coast_report_card_mangrove_creek.pdf.

¹¹² DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 24. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

Given the peak demand for extraction is in December,¹¹³ the climate change projections for decreased average rainfall over the spring (shown in **Figure 3**) means that the catchment may already be under stress going into December. During the summer, while average overall rainfall is predicted to increase, the majority of this is set to fall within 10 kilometres of the coast. Further inland areas (shown in **Figure 4**) are likely to experience a decrease in average rainfall. However, runoff is predicted to increase over all seasons, which is likely to further increase hydrologic stress under business as usual extraction.

Central Coast Council has updated its Rainfall Runoff Model for Central Coast water catchments with latest Scientific Information for Land Owners (owned by Queensland Government) climate data using an eSource platform. The rainfall runoff modelling has resulted in lower stream flows than predicted by the previous studies.¹¹⁴

The Commission recognises there are several factors outside of flows managed under the Plan that influence river condition, including climate, land use, invasive species and recreational uses. Integrated catchment management in the Plan area is essential to river condition and requires a coordinated and consistent approach to planning, implementation and MER.

The Plan followed the macro sharing approach to inform its flow sharing and trading rules. This used a combination of instream values and hydrological stress but the process did not allow for changing instream values along various reaches of a water source.¹¹⁵ The development of the River Condition Index aims to address this issue by updating the data used in the macro sharing approach and by spatially representing value and risk at the reach scale.¹¹⁶ The Commission understands that DPIE-Water intends to use the River Condition Index together with High Ecological Value Aquatic Ecosystems mapping that is currently being updated rather than the macro sharing approach to identify instream values and setting flow sharing rules. The Commission encourages this approach for the remake of the Plan.

4.2 Long term annual average extraction limits should be reviewed

An LTAAEL is the target limit on extractions calculated on an average annual basis over a specified time period. The LTAAELs set overall volumetric limits on water extraction for a system, whereby all water above these limits is available for environmental purposes.¹¹⁷

Current LTAAELs must be viewed with caution as they do not consider natural climate variability or changes to this variability that can impact of water allocations. Secular climatic variations result in annual changes in flow. In the Sydney Basin, the maximum secular rainfall variation for the period 1901 to 2006 was 23 percent lower than the long-term mean.¹¹⁸ The appropriateness of the LTAAEL should be reviewed, and secular climatic variability that occurs over a 20- to 50-year period should be considered at a minimum.¹¹⁹ Planning for future variations in flow is essential.

¹¹³ *Ibid.*

¹¹⁴ Central Coast Council (2019) *Draft Central Coast Water Supply Headworks Development Servicing Plan 2019*, p. 5. Available at: <https://www.yourvoiceourcoast.com/48684/documents/114235>.

¹¹⁵ NSW Office of Water (2012) *River Condition Index in New South Wales: method development and application*. p. 4. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/151173/River-Condition-Index-in-NSW.pdf.

¹¹⁶ *Ibid.*

¹¹⁷ Clause 19 of the Plan.

¹¹⁸ Warner, R. (2009) 'Secular Regime Shifts, Global Warming and Sydney's Water Supply'. *Geographical Research* 47(3), pp. 227–241.

¹¹⁹ *Ibid.*

The Plan includes a local water utility LTAAEL, which is based on demand and forecast urban growth at the start of the plan period (36,750 ML per year for both the Gosford and Tuggerah extraction management units). It also includes LTAAELs for each of the two extraction management units. These are for all other licence categories plus basic landholder rights (estimated at 297 ML per year), excluding utility take. The LTAAEL for the Tuggerah Extraction Management Unit is 7,650 ML per year (15 percent of the total LTAAEL) and for the Gosford Extraction Management Unit it is 6,893 ML per year (13 percent of the total LTAAEL). Thus, the total LTAAEL for the system is 51,293 ML per year.¹²⁰

Environmental water requirements are defined in Clause 19 of the Plan as water volume in excess of the LTAAEL, and water remaining in the water source after taking water to meet basic landholder rights and for access licences. LTAAELs are based on known and estimated water use. Total annual flows required for the environment have not been considered in setting the LTAAEL.¹²¹

This is further emphasised by Clause 75(2) of the Plan, which specifies that any changes to flow sharing provisions should not benefit the environment at the expense of the projected 2050 local water utilities water supply needs of 47,300 ML per year.

The Commission understands this was a common approach for the development of water sharing plans in coastal NSW at the time. However, this approach and associated provisions do not adequately define environment needs as the priority and are therefore not in line with the water management principles of the Act (see **Section 1.1.1**).

It is questionable whether LTAAEL is the right hydrological indicator to best manage these water sources for the benefit of the key ecological assets. The appropriateness of the LTAAEL should be reviewed, and secular climatic variability that occurs over a 20- to 50-year period should be considered at a minimum.¹²²

The replacement Plan should update these provisions so that environmental needs are identified and prioritised.

4.3 Flow sharing rules should be reviewed

As mentioned previously, the Plan's flow sharing rules are an important mechanism. These rules should aim to protect environmental values under the Plan, particularly to ensure that adequate environmental water is maintained during low flow periods.

The Plan's flow sharing rules have been developed for each water source, with very weak evidence to support for each set of rules. The Plan is based on limited hydrological and environmental data. There is an urgent need to improve the method used to determine the environmental water allocations as a basis for the Plan and the scientific studies that support this method. An ecosystem approach for determining environmental water allocation is strongly recommended.

¹²⁰ Note: This is a calculated number and does not include basic landholder rights, based on LTAAELs stated in Division 1 of the Plan.

¹²¹ Note: The *Water Supply (Critical Needs) Bill 2019* was passed by NSW Parliament and received assent on 21 November 2019. The purpose is to facilitate the delivery of emergency water supplies to certain towns and localities; to declare certain development relating to dams to be critical State significant infrastructure; and for related purposes. This temporary measure may impact some water sharing plans.

¹²² Warner, R. (2009) 'Secular Regime Shifts, Global Warming and Sydney's Water Supply'. *Geographical Research*, 47(3), p. 227.

According to the Plan's background document, three of the seven water sources did not have adequate information to provide certainty that the water sharing rules would manage risks to instream values or protect community dependencies when the Plan commenced.¹²³

As such, the Plan lists several amendment provisions to incorporate new information, including to amend flow classes, system operation, share components and daily extraction limits for the Wyong River if any monitoring or investigations indicate that this would be beneficial.

DPIE-Water's unpublished audit report (2014) indicates that:

- 'real time hydrometric stations have been established for all of the flow reference points which specify numeric flow conditions. The plan's flow reference points were considered suitable during the first five years of its operation. The hydrologic studies and changes to flow reference points referred to in this clause have not been required'
- 'a number of water sources which specify the maintenance of visible flow at defined location do not have operational gauges. These locations would rely on an active water user association to report whether there is a visible flow or not'.¹²⁴

Flow sharing rules govern the spatial and temporal impacts of water extraction and should ensure that adequate environmental water is maintained during low flow periods, which is critical to delivering environmental outcomes. The Plan includes:

- **Cease to pump rules** – which are a typical feature of unregulated river and alluvial water sharing plans. They contribute to environmental objectives by providing protection for fish and other aquatic species during dry times, recognising that demand for water in unregulated systems typically occurs at times of low flow. Low flows are important as they maintain water quality and provide drought refuge for fish and other fauna by providing passage over physical bottlenecks between refugia. They also maintain parts of aquatic ecosystems that are most productive such as riffle areas between pools that can contain the highest abundance and diversity of aquatic fauna.¹²⁵ These rules effectively place a ban on pumping when the river flow falls below a specified level at either the pump site or a flow reference point.
- **Total daily extraction limits (TDELS)** – these set daily limits on how much water can be taken from each flow class.¹²⁶

Most extraction from the system is from the local water utility taken from Mangrove Creek, Mooney Mooney Creek, Ourimbah Creek and the Wyong River.¹²⁷ More provisions are included in the Plan for Wyong River and Ourimbah Creek than for Mooney Mooney and Mangrove

¹²³ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 34. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

¹²⁴ DPI-Water (2014) *Audit of Implementation – Central Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (internal document)

¹²⁵ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 10. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

¹²⁶ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 32. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

¹²⁷ Central Coast Council (2017) *Central Coast Water Supply System*. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/ccs-water-supply-brochure.pdf>.

creeks. The sections below include discussion of the level of protection provisions in the Plan relating to these water sources.

To support the implementation of flow sharing rules, three gauging stations provide flow reference points for the Wyong River, and Ourimbah and Jilliby Jiliby creeks. Flow monitoring data are maintained and reported publicly by WaterNSW. Reported measures include stream discharge rates and level. Temperature and rainfall are monitored at some sites.¹²⁸ These data can inform flow related pumping decisions for different flow classes.¹²⁹

The Commission notes that the 2014 audit of Plan implementation found that licence conditions required for adherence to cease to pump conditions for very low flow classes had not been implemented.¹³⁰ DPIE-Water indicated that the audit findings relating to licences have since been addressed.¹³¹

As part of the replacement Plan, all monitoring data should be reviewed, and investigations be undertaken to determine appropriate surface water levels and flow reference points to determine whether these flow regimes need adjustment. This should form part of the MER framework (see **Chapter 7**).

The replacement Plan is an opportunity to undertake an assessment of the effectiveness of the flow management provisions and any changes that may be warranted. The replacement Plan design should include additional flow measurement infrastructure to support implementation of flow sharing rules and or improved hydrological models for the Plan area. Should infrastructure be deemed practical and warranted, this would increase information coverage across water sources and support the MER program (see **Chapter 7**).

Many environmental flow approaches – including Plan provisions – use a set of a priori hydrological indicators with no justification of these indicators. For example, preservation of the first flush or no flow threshold.

Hydrological processes operate at various time scales and vary at geographic scales. These differences in hydrological behaviour drive biodiversity in river systems. Information on the natural and altered hydrological behaviour of river systems in NSW should be used to inform flow sharing and extraction limit provisions of the replacement Plan.

In order to minimise the impact of extraction on aquatic ecosystem structure and function, the following steps should be incorporated into the replacement Plan process:

- Assess what key aquatic habitats are present, their location and status and associated ecosystem functions using the High Ecological Value Aquatic Ecosystem data base. The Commission understands that DPIE-Water has commenced using the High Ecological Value Aquatic Ecosystem process and will expand into NSW coastal regions by mid-

¹²⁸ WaterNSW (2019) *Realtime data- Rivers and Streams*. Available at: https://realtimedata.watarnsw.com.au/water.stm?ppbm=211009&rs&1&rs&scf_org (including datasets 211009 Wyong River at Gracemere; 211010 Jilliby Creek U/S Wyong; 211015 Ourimbah Creek D/S Bang)

¹²⁹ Flow classes are included in the Plan, which establish a range of daily flow rates in a river and provide the framework for sharing water on a daily basis.

¹³⁰ DPI-Water (2014) *Audit of Implementation – Central Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (internal document).

¹³¹ Personal communication, DPIE -Water, 14 January 2019.

2020.¹³² Aquatic habitats should be linked to ecological communities and a complete inventory of water dependent communities in each river network developed.

- Determine flows that maintain key habitats and perform other key ecological processes. Processes like fish passage, sediment initiation or flushing flows. Flows associated with these key habitats and processes are the flow signatures of a river network. This is an important knowledge gap for many rivers in NSW including those on the Central Coast.
- Identify key hydrological signatures of the river and determine the impact of water resource planning on these signatures. This requires developing fit for purpose hydrological models that can accommodate flow variability at a range of scales. Present hydrological models do not because they do not account for natural secular variations in rainfall, runoff and rainfall-runoff that have implications for future sharing of water. In addition, the actual character of the flow regime for each river network must be established. This must focus on the identification of the key hydrological attributes of the flow regime of each river that would deliver environmental outcomes.

At this point, there remains insufficient knowledge of the system to assess whether the amount and timing of water extraction across all water sources is environmentally sustainable, and if alternative LTAAELs or flow management rules are needed. If current limits are found to be unsustainable, this may negatively impact all environmental, social and economic outcomes over the long term.

At a minimum, environmental water needs should be defined for all water sources identified as having high ecological values and prioritised in line with the water management principles in the Act. More data should be collected to assess the suitability and sustainability of the LTAAELs and flow management rules, and to inform sustainable actions to address future increases in utility supply needs. This should consider future climate change scenarios, secular climate variability and their potential impact on inflows.

DPIE-Water has advised the Commission that it is developing methods to better understand and address climatic risk to water management outcomes across NSW.¹³³ DPIE-Water is working on methods to incorporate climate change information based on DPIE-EES' NARClIM climate modelling project.¹³⁴ The project includes a more comprehensive representation of natural variability and integrates climate change projections, especially of increased evaporative demand.¹³⁵ The project extends climate information to 10,000 years of data using statistical techniques. It is important to note that the readily available NARClIM maps referred to in this report present the multi-model mean, which may understate the change and misrepresent the direction of change. It is possible to further interrogate the NARClIM datasets for example to further understand the extreme cases, however this has not been explored for this review.

¹³² DPIE-Water recently undertook studies using High Ecological Value Aquatic Ecosystem analysis across some water sharing plans in the basin to identify high-priority, groundwater dependent ecosystems. The High Ecological Value Aquatic Ecosystem methods provide a derived ecological value dataset for identified groundwater dependent vegetation that is used to inform the planning and policy decisions in NSW. These decisions are required to manage and mitigate current and future risks caused by groundwater extraction (Personal communication, DPIE-Water, 29 November 2019).

¹³³ Personal communication, DPIE-Water, via email 28 August 2019.

¹³⁴ The NARClIM (NSW/ACT Regional Climate Modelling) project is developing regional climate projections for south-east Australia to span the range of likely future changes in climate. It is a collaboration between NSW and ACT governments and the University of NSW Climate Change Research Centre and will be subjected to an independent expert review, see: <http://www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/About-NARClIM>.

¹³⁵ Personal communication, DPIE-Water, via email 28 August 2019.

Most current information should be utilised in remaking the Plan. The Commission understands that High Ecological Value Aquatic Ecosystem mapping is being undertaken by DPIE-Water and that the River Condition Index is being revised. This should form a good basis for establishing appropriate flow regimes for the water sources in the replacement Plan.

The Commission understands it may not be realistic to obtain the appropriate environmental information in time to inform rules in the replacement plan. Instead of a 'plan-by-plan' approach to this issue, DPIE-Water should consider more strategic LTAAEL and flow sharing rule investigations, across a small number of representative coastal water sources, covering different stream types and locations, so that over time, a more robust picture may emerge around sustainability issues for setting unregulated LTAAEL and flow sharing provisions in all of the coastal rivers. Collecting this information should occur under the replacement plan's ongoing MER framework, which is covered in detail in **Section 7**.

4.3.1 Flow sharing rules for Wyong River

Background

The management of water extractions from the Wyong River was a focus area during Plan development. Extraction from Wyong River is split between local water utility (89 percent) and irrigators (primarily turf farmers, 11 percent).¹³⁶

Drought and population growth have increased pressure on town water supply. This led to Central Coast Council implementing numerous system upgrades and efficiency measures (see **Section 3.2**), one of which involved increasing extractions from the Lower Wyong Weir pool from 95 ML per day to 125 ML per day. Extractions at this rate had the potential to increase the cease to flow downstream of the Lower Wyong Weir for more than 75 percent of the time.¹³⁷ Extended periods of low flows had the potential to reduce the effectiveness of the fishway and reducing water quality downstream of the weir.¹³⁸ Fish studies undertaken indicated the need for environmental flows to maintain connectivity allowing fish to migrate upstream and downstream of the weir. The importance of this connectivity was highlighted by the presence of high recruitment of bass, presence of herring downstream of the weir and presence of estuary perch upstream of the weir, particularly during September to December.¹³⁹

In addition, while upstream irrigators pump limited water from the system, the timing of pumping was an issue with most pumping occurring during the summer months when natural flows are generally lower as a result of reduced rainfall during the summer months.

The *Wyong River Environmental Flows Study* was completed in 2008 and recommended:

- major modifications to the Wyong Weir fishway to enable enough velocity for native fishes to navigate through it at low flows¹⁴⁰

¹³⁶ Department of Water and Energy (2009) *Report card for Wyong River water source*. Available at: http://archive.water.nsw.gov.au/__data/assets/pdf_file/0010/548398/wsp_central_coast_summary_rules_wyong_river.pdf and confirmed by WaterNSW's Water Register (WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watarnsw.com.au/water-register-frame>).

¹³⁷ SKM (2008) *Wyong River environmental flows study: river flow objectives and environmental flow scenarios*, pp. 1 – 3, prepared for Wyong Shire Council, SKM, Sydney.

¹³⁸ *Ibid*, p. 64.

¹³⁹ *Ibid*, pp. 52-55.

¹⁴⁰ *Ibid*, p. 66.

- a flow regime incorporating translucent and transparent flows that met environmental water requirements,¹⁴¹ to protect fish migration and water quality.¹⁴²

Infrastructure was upgraded as part of the Mardi-Mangrove Link project in 2011.¹⁴³ This included:

- an upgrade of the Lower Wyong River weir and fishway to enable fish passage and breeding even at low flows
- pipeline and pumping enhancements enabling transfer of water between Wyong River and Mangrove Creek Dam for storage during high flows and wet periods for use during dry periods increasing security of supply
- pipeline for water transferred from Mangrove Dam to Wyong River avoiding the injection of cold flows released from Mangrove Dam into the Wyong River
- pest strainers to screen raw water transferred between Mardi Dam and Mangrove Creek Dam to avoid impacts of transferring pest species between catchments.

Flow sharing rules

Wyong River is assessed as having high instream values, being under high hydrologic stress, with high economic dependence, and has high risks to instream values from extraction.¹⁴⁴ This warrants the application of stricter access controls.¹⁴⁵ In addition, the *Stressed Rivers Assessment* identifies the Lower Wyong as having a highly stressed hydrology rating and the upper Wyong as having a medium hydrology stress rating.¹⁴⁶

An *Environmental Flows Study*¹⁴⁷ was undertaken for the Wyong River, which informed flow related Plan provisions for the Wyong River. The Commission notes that the recommendations made in the *Environmental Flows Study* should be treated with caution, as it contains a degree of uncertainty. The study does not provide an adequate evidence base to support the recommended flow regime for the Wyong River, in that:

- the study focuses on the nine kilometres of the Lower Wyong River only
- the study report does not provide any comment or study of the natural assets or the flow regime required to maintain these assets in the weir pool immediately upstream of the Lower Wyong Weir or in the river network further upstream of the weir pool, despite the importance of catadromous fish species in the river
- The study does not provide discussion of the flows required to maintain the refugia pools of the lower Wyong River, a key natural asset. These deep pools present permanent flow refugia that are vital for the upstream migration of catadromous fish species. It is well

¹⁴¹ Transparent flows are flows that are fully protected from extraction. Translucent environmental flows are medium to high flows for which a percentage of flow is protected from extraction.

¹⁴² SKM (2008) *Wyong River Environmental Flows Study*, Prepared for Wyong Shire Council, SKM, Sydney.

¹⁴³ Australian Government, Gosford City Council and Wyong Shire Council (2011) *The Mardi-Mangrove Link Pipeline The largest water infrastructure project on the Central Coast in 25 years 2009-2011*. Available at: https://cdn.centralcoast.nsw.gov.au/sites/default/files/Mardi_Mangrove_Link_Commemorative_Booklet.pdf.

¹⁴⁴ Department of Water and Energy (2009) *Report card for Wyong River water source*. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0010/548470/wsp_central_coast_report_card_wyong_river.pdf

¹⁴⁵ Office of Water (2011) *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*. Available at:

http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf

¹⁴⁶ NSW Department of Land and Water Conservation (1998) *Stressed Rivers Assessment Report*. p. 41. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0003/547527/stressedrivers.pdf

¹⁴⁷ SKM (2008) *Wyong River Environmental Flows Study*, prepared for Wyong Shire Council, Sydney

known that changes to natural patterns of connection and disconnection, flow within refugial waterholes, and the quality of refugia owing to water-resource development or climate change, will threaten their persistence and diminish their functional capacity to act as aquatic refugia.¹⁴⁸

- There are limitations to the hydrological model used in this study. Some of these that were noted in the study report include the accuracy of the stream gauging and rainfall information, water extractions in the river network upstream of the weir pool, changing population pressures and future climate change.¹⁴⁹ Key limitations are outlined below:¹⁵⁰
 - The model is based on the entire period of available flow data. This may introduce inaccuracies in the calibration of the hydrologic model if periods of low rating curve accuracy have been used.¹⁵¹ Rating curves used to obtain the flow record can be unstable, resulting in a low accuracy of flows, especially during periods of low flow.¹⁵² Based on an Australian study, errors in the estimates of low flows can be up to 200 percent, errors are higher when gravel and sand beds form the control.¹⁵³ The Commission notes that over thirty years of high-quality flow data are required to estimate the flow regime of Australian river systems.¹⁵⁴
 - The model does not account for secular variations in rainfall and runoff (flows), a feature of the flow regime in much of eastern NSW including the Plan area.¹⁵⁵ Only one rainfall/runoff coefficient in the model was used to derive the long term flow record, this would have contributed to error in the long term natural flow scenario for the Wyong River.
 - It is not clear whether daily or monthly flow data were used in the development of the hydrological model.¹⁵⁶
 - Ecological consequences to river flows are based on little or inappropriate data. Biological sampling was undertaken over a limited period (several months) and for a limited section of the river. This study relied on water quality data collected from the lower river. Water quality indicators are inappropriate for determining flow objectives in river systems.^{157,158} The assessment of river water quality in the study has been based solely on the measurement of physical, chemical and some biological measures. These indicators are not useful as a means for assessing whether river ecosystems are being protected or respond to river flows in the long

¹⁴⁸ Sheldon, F., Bunn, S.E., Hughes, J.M., Arthington, A.H., Balcombe, S.R. and Fellows, C.S., (2010) 'Ecological roles and threats to aquatic refugia in arid landscapes: dryland river waterholes'. *Marine and Freshwater Research*, 61, pp. 885-895.

¹⁴⁹ SKM (2008) *Wyong River Environmental Flows Study*, prepared for Wyong Shire Council, p. 97, Sydney.

¹⁵⁰ *Ibid.*

¹⁵¹ Tomkins, K.M. (2014) Uncertainty in streamflow rating curves: methods, controls and consequences. *Hydrological Processes*, 28, pp. 464-481.

¹⁵² *Ibid.*

¹⁵³ *Ibid.*

¹⁵⁴ McMahon, T.A. and Finlayson, B.L. (2003) Droughts and anti-droughts: the hydrology of Australian rivers. *Freshwater Biology*, 48, pp. 1147-1160.

¹⁵⁵ Vivès, B. and Jones, R.N. (2005) *Detection of abrupt changes in Australian decadal rainfall (1890-1989)* CSIRO Atmospheric Research Technical Paper 73.

¹⁵⁶ SKM (2008) *Wyong River environmental flows study: river flow objectives and environmental flow scenarios*, pp. 91-110, prepared for Wyong Shire Council, SKM, Sydney. Appendix F suggests monthly flow data were used. However, model outputs, as noted in the identification of the flow components, river flow objectives and flow scenarios, are in daily flows. This is confirmed in Figure 6.4, where the average daily flow by month is provided.

¹⁵⁷ Norris, R.N. and Thoms, M.C., (1999) 'What is river health?', *Freshwater Biology*, 41, pp. 197-209.

¹⁵⁸ Bunn, S.E., Kennard, M.J., Bond, N.R., Ward, D.P., Tews, K., Sims, N.C. and Peterson, E.E. (2014). Flow regimes and ecological assets. A technical report from the Ecological Responses to Altered Flow Regimes Flagship Research Cluster (SubProject 2).

term. Biota and physical character are the accepted standard measure of ecosystem structural/functional integrity (see **Section 4.1**).

- Seasonality is a primary feature of the flow regime of the Wyong River.¹⁵⁹ However, there is no specific recommendation about conserving this aspect of flow regime to meet river flow objectives in the river, despite the importance of this seasonality for catadromous fish movement. This is especially significant for environmental flow management for the period September to December. A period of lower than average annual flows and a period when most catadromous fish migrate upstream.¹⁶⁰

Given the uncertainties about the hydrological model, the quality of the actual flow record, and the limited information on flow-ecology relationships for the Plan area, caution in adopting the recommendations should be taken when developing the replacement Plan. For example, a safety factor could be employed until more accurate and precise hydrological data and flow ecology information is provided to inform the setting of flow thresholds for the replacement Plan.

The Commission understands that DPIE-Water does not hold a model for the Central Coast and relies on Central Coast Council and Hunter Water Corporation modelling as part of the Lower Hunter plan.

The Commission understands that DPIE-Water is updating its High Ecological Value Aquatic Ecosystem mapping, which includes consideration of River Condition Index data for both condition and risk. However, this update will not include consideration of flow dependent ecosystems and the flow regimes required to protect these ecosystems.¹⁶¹

The maximum secular rainfall variation for the period 1901 to 2006 in the Sydney Basin was 23 percent lower than the long-term mean.¹⁶² The Sydney Basin is currently in a drought-dominated rainfall regime, which commenced in 1991.¹⁶³ Based on the previous drought-dominated regime (1901 to 1948), the current pattern could continue until 2039 and reduce reservoir long-term inflows in the Sydney Basin to about 25 percent of the inflows that occurred in the preceding flood dominated regime.¹⁶⁴

Increasing all flow thresholds by adding a buffer to account for uncertainty in flow estimates and secular climate variability during the period September to December would reduce risks with associated with maintaining upstream migration of native catadromous fish (a critical environmental asset of the river¹⁶⁵) and potentially other ecological assets and processes. This is important given the uncertainty in the hydrological model and the determination of the low flow threshold of 4 ML per day, and its significance for fish passage across the weir and through the weir pool of the lower Wyong River.

TDELs apply to A, B and C flow classes for Wyong River Water Source. They are determined for each flow class by combined amount of water in town water storages. This is not consistent

¹⁵⁹ SKM (2008) *Wyong River environmental flows study: river flow objectives and environmental flow scenarios*, pp. 38-47, prepared for Wyong Shire Council, SKM, Sydney.

¹⁶⁰ SKM (2008) *Wyong River environmental flows study: river flow objectives and environmental flow scenarios*, pp. 47-52, prepared for Wyong Shire Council, SKM, Sydney.

¹⁶¹ Personal communication, DPIE-Water, 29 November 2019.

¹⁶² Warner, R. (2009) 'Secular Regime Shifts, Global Warming and Sydney's Water Supply'. *Geographical Research* 47(3), pp. 227-241.

¹⁶³ *Ibid.*

¹⁶⁴ *Ibid.*

¹⁶⁵ SKM (2008) *Wyong River environmental flows study: river flow objectives and environmental flow scenarios*, pp. 47-52, prepared for Wyong Shire Council, SKM, Sydney.

with the *Environmental Flows Study*, which recommended a 40 percent translucent environmental flow rule for flows greater than the 95th percentile flow, rather than the amount remaining in storage. Either way, these rules are not supported by an assessment of flow regimes required to support key environmental assets and should be revised.

These TDELs should be reviewed using best available modelling and monitoring data and further studies if required to ensure they remain current and incorporate consideration of environmental needs.

The Plan adopted the flow sharing rules across licence flow classes including very low flow, A, B and C class licence classes. The very low flow class cease to pump rule corresponds to the 95th percentile flow (4 ML per day) that has been adopted in the Plan. This is consistent with the recommendation in the *Environmental Flows Study*.¹⁶⁶

It is not clear why the flow class percentiles in the Plan are established based on all days per flow rather than all days of record, which would be more in line with the approach taken in other water sharing plans.¹⁶⁷ This approach for any given percentile is likely to provide additional environmental protection, it may avoid some confusion for users of the Plan if the percentiles were presented per standard practice taking into account all days on record when setting and presenting percentiles.

The *Environmental Flows Study* recommended an adaptive management framework be adopted to monitor flows, effects of first flush, fish communities, thermal and salinity structure of the estuary downstream of the Lower Wyong Weir.¹⁶⁸ The Commission understands this has not been implemented and no monitoring information was provided to the Commission to inform this review.

The cease to pump rules for very low flow class is not based on any scientific data or studies. The flow regimes to protect the environmental assets have not been defined. The cease to pump thresholds should be revised to protect key environmental assets. Should this not be possible prior to plan remake, the current uncertainty associated with these low flow thresholds should be temporarily buffered with a safety factor over the summer months when there are lower flows coinciding with fish migration.

4.3.2 Flow sharing rules for Jilliby Jilliby Creek and Ourimbah Creek

Updated report cards were not available for Jilliby Jilliby Creek or Ourimbah Creek, and the Plan's background document does not provide an assessment of hydrologic stress for these water sources. While the rules summary is available, this does not provide information regarding hydrologic stress.¹⁶⁹ However, the *Stressed Rivers Assessment Report* identifies Jilliby Jilliby and Ourimbah creeks as having high hydrology stress ratings and a high and medium environmental stress rating respectively.¹⁷⁰ Given Ourimbah Creek is classified as having high

¹⁶⁶ SKM (2008) *Wyong River Environmental Flows Study*, prepared for Wyong Shire Council, p. 67, Sydney.

¹⁶⁷ DoI-Water (2013) *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW*, p. 4. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/549411/wsp_overview_coastal_unreg_and-alluvial_water_sharing_plans.pdf.

¹⁶⁸ SKM (2008) *Wyong River Environmental Flows Study*, pp. 67-68, prepared for Wyong Shire Council, SKM, Sydney.

¹⁶⁹ NSW Department of Water and Energy (2009) *Commenced Water Sharing Plan for the Central Coast unregulated water sources- Rules Summary*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/148983/Central-Coast-Rules.pdf.

¹⁷⁰ NSW Department of Land and Water Conservation (1998). *Stressed Rivers Assessment Report*, p. 41. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0003/547527/stressedrivers.pdf.

economic dependence and both water sources are classified as having high instream values, stricter access controls are deemed warranted in these water sources.¹⁷¹

The Plan does not include TDELS for the Jilliby Jilliby Creek Water Source. The reason for not including TDELS was due to inadequate infrastructure to manage a daily limit.¹⁷²

TDELS apply to B, C and D flow classes for the Ourimbah Creek Water Source. The Ourimbah Creek TDELS were based on an historic TDEL.¹⁷³ These TDELS should be reviewed using best available modelling and monitoring data and further studies if required to ensure they remain current and incorporate consideration of environmental needs.

For all access licence holders, the cease to pump rule is when there is no visible flow in the vicinity of the pump site or when there is no visible inflow or outflow to or from the pool.

Cease to pump rules for Jilliby Jilliby Creek and Ourimbah Creek water sources apply for a range of flow classes. These rules were based on available gauging data:

- For Ourimbah Creek the cease to pump rule for the very low flow class is below 4 ML per day per gauge flow measurement at gauge 211015. This corresponds to the 89th percentile of all days with flow based on data from gauge 211015.
- For Jilliby Jilliby the cease to pump rule for the very low flow class is below 1 ML per day per flow measurements at gauge 211010. This corresponds to the 78th percentile of all days with flow based on data from gauge 211010 up to October 2014.¹⁷⁴

It is not clear why the percentiles are established based on all days per flow rather than all days of record, which would be more in line with the approach taken in other water sharing plans.¹⁷⁵ This approach for any given percentile is likely to provide additional environmental protection, it may avoid some confusion for users of the Plan if the percentiles were presented per standard practice taking into account all days on record when setting and presenting percentiles.

The cease to pump rules for very low flow class is not based on any scientific data or studies. The flow regimes to protect the environmental assets have not been defined. The cease to pump thresholds should be revised to protect key environmental assets. Should this not be possible prior to plan remake, the current uncertainty associated with these low flow thresholds should be temporarily buffered with a safety factor over the summer months when there are lower flows coinciding with fish migration.

¹⁷¹ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, pp. 10-11. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

¹⁷² *Ibid*, p.32

¹⁷³ *Ibid*.

¹⁷⁴ *Ibid*, p. 31.

¹⁷⁵ DoI-Water (2013) *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW*, p. 4. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/549411/wsp_overview_coastal_unreg_and-alluvial_water_sharing_plans.pdf.

4.3.3 Flow sharing rules for Mangrove Creek and Mooney Mooney Creek

TDELs were not included for the Mangrove Creek and Mooney Mooney Creek water sources, due to the difficulty in accessing the end of system and a lack of infrastructure required for flow measurement. This was not aligned with standard process for Plan development at the time.¹⁷⁶

Including a daily extraction limit should be considered for Mangrove Creek and Mooney Mooney Creek as part of the replacement Plan, given they are major water sources for utility take, are under high hydrological stress and have high instream values. To support this, the quality of flow data should be improved, either through additional flow measurement devices at Mooney Mooney Creek and Mangrove Creek or an improved hydrological model for these water sources (assuming the same limitations apply as presented in Wyong River flows study). Practicality of implementing provisions should be considered as only local utility extraction is currently measurable, though if end of system is inaccessible, there may be other opportunities for placement of infrastructure that are more appropriate within the system.

Mooney Mooney and Mangrove Creek are not listed along with the other water sources in the Plan area under Clause 19(3)(c) in the Plan, which sets the visible flow cease to pump rule. Nor have flow classes have been established for Mooney Mooney Creek or Mangrove Creek.

Instead, Clause 19(9) Plan identifies a Plan amendment after year five of the Plan to establish no visible flow rules for Mangrove Creek and Mooney Mooney Creek. Flow sharing rules were not initially adopted in line with the standard classification process due to difficulty in access the end of system and that infrastructure was not in place at these locations.¹⁷⁷

Following standard process would have resulted in these water sources having stricter access controls applied because these water sources had been assessed as:

- being under high hydrological stress¹⁷⁸
- having high instream values
- having high relative economic dependence for the local community
- being at medium risk to instream values from extraction.¹⁷⁹

The Plan notes that further investigations would be undertaken to determine an appropriate cease to pump for introduction at year six of the plan.¹⁸⁰ This did not occur. In addition, Plan amendment provisions in Clause 75(1) of the Plan contemplate inclusion of flow sharing rules

¹⁷⁶ Department of Water and Energy (2009) *Report card for Mooney Mooney Creek water source*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548662/wsp_central_coast_report_card_moon_ey_mooney_creek.pdf; Department of Water and Energy (2009) *Report card for Mangrove Creek water source*.

Available at:

http://archive.water.nsw.gov.au/__data/assets/pdf_file/0009/549081/wsp_central_coast_report_card_mangrove_creek.pdf.

¹⁷⁷ Department of Water and Energy (2009) *Report card for Mooney Mooney Creek water source*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548662/wsp_central_coast_report_card_moon_ey_mooney_creek.pdf; Department of Water and Energy (2009) *Report card for Mangrove Creek water source*.

Available at:

http://archive.water.nsw.gov.au/__data/assets/pdf_file/0009/549081/wsp_central_coast_report_card_mangrove_creek.pdf.

¹⁷⁸ *Ibid.* Note: These report cards define hydrological stress as 'peak extraction exceeds available flows in December'.

¹⁷⁹ *Ibid.* Note: These report cards define hydrological stress as 'peak extraction exceeds available flows in December'.

¹⁸⁰ As noted in the Plan after clauses 17(1)(ii)(d) and (e).

for these water sources based on investigations. These amendment provisions were not implemented.

Flow sharing rules should be set up that consider the key environmental assets and required flow regimes to protect these assets. Flow data should be improved and infrastructure requirements (for example, gauges) should be considered in the replacement Plan for Mangrove Creek and Mooney Mooney Creek. This is important as they are two of the major sources of utility extraction and have high economic dependence, and are assessed as having high hydrological stress, high flow classes, and high instream values at medium risk of extraction.

4.3.4 Flow sharing rules for Tuggerah Lakes and Brisbane Waters

Flow sharing rules were not included for the Brisbane Water and Tuggerah Lakes water sources. This was because investment in infrastructure was not considered warranted at the time given the limited number of users and licensed entitlement.¹⁸¹ These two water sources are classified as having low economic dependence, low hydrological stress and medium to high instream values at low to medium risk from extraction for Tuggerah Lake and Brisbane Water respectively.

Cease to pump rules for Tuggerah Lakes, Brisbane Waters are no visible flows into or out of the pumping pool and no visible inflow to, or outflow from, the pumping pool, with a flow reference point of riffles upstream and downstream of the pump.

4.3.5 No visible flow rules

Subject to various exemptions Clause 19(3)(c) of the plan states that water cannot be taken under an access licence if there is no visible flow in the water source at the location at which water is proposed to be taken or where water is being taken from a pool, if there is no visible inflow or outflow from the pool. The 'no visible flow' rule applies to all water sources, as does a number of other existing access arrangements as described in the sections above (see **Sections 4.3.1 to 4.3.4**). The 'no visible flow' rule is based on the NSW Government's River Flow Objective 1 which is to 'protect natural water levels in pools of creeks and rivers and wetlands during periods of no flow'.¹⁸² It is designed to give full protection to the natural water level of pools during no flow events. Under these 'no visible flow' rules, it is presumed that the pumping pool is maintained at or near its natural water level.

Where a pool is taken below this level, either by continued extraction or extended periods without replenishing flows, physical changes occur which may negatively impact the survival, growth and reproduction of pool biota. A reduction in pool volume reduces habitat availability and creates crowding, in turn impacting predator-prey interactions introducing competitive pressures which may result in the loss of some taxa. If the pool becomes isolated, longitudinal connectivity is severed and biota are unable to disperse to other suitable sites.¹⁸³

¹⁸¹ Department of Water and Energy (2009) *Report card for Brisbane Water water source*. Available at: http://archive.water.nsw.gov.au/__data/assets/pdf_file/0009/549207/wsp_central_coast_report_card_brisbane_water.pdf; Department of Water and Energy (2009) *Report card for Tuggerah Lakes water source*. Available at: http://archive.water.nsw.gov.au/__data/assets/pdf_file/0012/548877/wsp_central_coast_report_card_tuggerah_lakes.pdf.

¹⁸² NSW Government (n.d.) *River flow objectives*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/environmental-rules/river-flow-objectives>.

¹⁸³ Lake, P.M (2011) *Drought and Aquatic Ecosystems: Effects and Responses*. Wiley-Blackwell.

While existing cease to pump rules aim to prevent the continued drawdown of pools, they do not provide protection for shallower habitats such as riffles. Where no flow is visible immediately downstream of the pump site, it is likely that the downstream riffle is already severely impacted or even desiccated. The loss of riffles is proportionally greater than the loss of pools in drought scenarios.¹⁸⁴

Riffles provide dispersal routes between pools, are an important habitat for macroinvertebrate fauna and are significant points of oxygenation and nutrient exchange between surface and groundwater systems via hyporheic flow paths. Existing extraction rules aim to protect the in-stream value of pools as refugia, but do not adequately protect the riffle environment which is important in supporting healthy ecosystem function along the entire stream length.

It is natural for rainfall-dependent streams to stop flowing in dry times and resident biota are generally adapted to periods of low or no flow. However, the extraction of water for human use frequently fails to mimic natural seasonal variation and increased frequency and duration of drying or disconnection events can negatively impact ecosystem health.

Some of the streams in the Plan area drain to intermittently closed or open estuarine water bodies. These lakes and lagoons support a complex, and often endemic suite of flora and fauna adapted to periodic connection with the ocean. Where freshwater inflows are reduced, volume and therefore available habitat area may be reduced, frequency of 'breakouts' or connection events drop and water quality may be impacted, which can make the habitat unsuitable for species which rely on it.

There is no scientific evidence to support visible flow rules as a means of protection of environmental assets within the Plan area.

4.3.6 First flush rules

First flush rules following extended periods of low flow were recommended for further investigation as part of the *Wyang River Environmental Flows Study*¹⁸⁵ and are earmarked as an option in the Plan for Mangrove Creek, Mooney Mooney Creek and Wyong River (Clause 19(4)).

There is no scientific basis to support first flushes as environmentally beneficial in coastal systems. If future studies of NSW coastal systems show these to be beneficial this could be considered, however inland studies are not comparable and therefore not deemed a suitable evidence base for establishing commence to pump rules in coastal systems.

4.4 The Plan provides protection for groundwater dependent ecosystems

The inclusion of alluvial aquifers during the Plan merger and update in 2016 meant that groundwater dependent ecosystems were introduced into the Plan. While the Plan does not explicitly include groundwater dependent ecosystems in its objectives, it does implicitly include them as 'river flow dependent ecosystems' in Clause 10(a). The Plan also identifies three high-

¹⁸⁴ Hakala, J.P and Hartman, K.J, (2004) 'Drought effect on stream morphology and brook trout populations in forested headwater streams'. *Hydrobiologia*, 515, pp. 203-213.

¹⁸⁵ SKM (2008) *Wyang River Environmental Flows Study*, pp. 2-3, prepared for Wyong Shire Council, SKM, Sydney.

priority groundwater dependent ecosystems (Schedule 5)¹⁸⁶ and provides conditions required on works undertaken in the vicinity of groundwater dependent ecosystems.¹⁸⁷ groundwater dependent ecosystems are also protected through rules for groundwater access and consideration of impacts to surface water-groundwater connectivity.

In general, the current provisions protect groundwater dependent ecosystems through rules for granting or amending water supply works approvals near sensitive environmental areas. However, there are some opportunities to improve these in the replacement Plan. These are discussed in the following sections.

4.4.1 Groundwater dependent ecosystems need to be better defined

Groundwater dependent ecosystems are classified according to the ecosystems they support (Table 6). All ecosystem classifications can be impacted by reduced groundwater quantity (flow or level) or an alteration to existing groundwater quality. However, different groundwater dependent ecosystems vary in their level of water dependence. For example, types 2 and 3 may be obligate (need groundwater to survive) or facultative (opportunistically use groundwater when available). They also have differing risk profiles, with Type 3 likely to be more tolerant to changes in groundwater than Type 2, which are in turn more tolerant than Type 1.

Table 6: Classification of groundwater dependent ecosystems¹⁸⁸

Type 1	Ecosystems living in an aquifer - for example, stygofauna, which are fauna found in groundwater systems such as caves ¹⁸⁹
Type 2	Ecosystems supported by discharging groundwater to the surface - for example, wetlands, seeps, springs and river baseflow
Type 3	Ecosystems supported by the subsurface presence of groundwater - for example, terrestrial vegetation

Varying dependencies and risk profiles mean different groundwater dependent ecosystem types require different management considerations. Water sharing plans currently do not distinguish between the types of groundwater dependent ecosystems, although the Plan appears to focus on groundwater use by Type 2. The Plan should be updated to clarify which types of groundwater dependent ecosystems the plan aims to protect and indicate the risk tolerance for each type. This should be linked to specific objectives and strategies for groundwater dependent ecosystems.

Groundwater dependent ecosystems are protected in the Plan only by rules applying to groundwater access and considering impacts to surface water-groundwater connectivity. Further, the rules in the Plan only apply to high priority groundwater dependent ecosystems, which neglects low and medium priority groundwater dependent ecosystems considered in

¹⁸⁶ The Plan notes that, in addition to the three identified high priority groundwater dependent ecosystems, all potential groundwater dependent ecosystems are identified on the departmental groundwater dependent ecosystems register and will be considered as part of any supply works approvals.

¹⁸⁷ Clause 71D of the Plan provides 'rules for water supply works located near groundwater dependent ecosystems'.

¹⁸⁸ SKM (2011) *Australian groundwater-dependent ecosystem toolbox part 1: assessment framework – Waterlines*. Available at: http://www.bom.gov.au/water/groundwater/gde/GDETtoolbox_PartOne_Assessment-Framework.pdf.

¹⁸⁹ The Commission notes that DPIE-Water are researching stygofauna watering requirements. These requirements are largely unknown, making rule development difficult.

other legislation, such as the *Environmental Planning and Assessment Act 1979*. Any intended protection or consideration of these ecosystems should be clarified.

4.4.2 High-priority groundwater dependent ecosystems need protection

Water sharing plans are required to reserve water for the overall health of groundwater dependent ecosystems. Clause 71D in the Plan includes provisions specifically to protect high priority groundwater dependent ecosystems. The Plan currently does not specify which actions or considerations are required regarding potential impacts on low or medium priority groundwater dependent ecosystems. This should be updated and reflected in the Plan.

Groundwater dependent ecosystem mapping is an ongoing process. The *Bureau of Meteorology Groundwater Dependent Ecosystems Atlas* (the Atlas) is generally regarded as the best available reference point for mapping of these assets but only small areas under the Plan have actually been surveyed and further on-ground assessment is needed.^{190,191} The Atlas contains both national and regional datasets. Currently it does not identify any 'known' groundwater dependent ecosystems, only potential ecosystems in the area. Mapping information - while a useful starting point - should be accompanied by on-ground studies to confirm the presence of groundwater dependent ecosystems.

The Commission notes that the information currently held in the Atlas stems from a DPIE-Water and EES dataset. DPIE-Water and EES are currently working together to provide updated information for the Central Coast, which should be available prior to 2021. DPIE-Water's proposed approach in formulating plan rules is to take Atlas information and undertake an additional analysis to identify the ecological value of the groundwater dependent ecosystems, which is currently not presented in the Atlas.¹⁹²

Schedule 5 in the Plan identifies three groundwater dependent ecosystems. These are Terrigal Lagoon- South, Terrigal Lagoon- North and Porters Creek Wetland. No new groundwater dependent ecosystems have been included in the Plan since its commencement, despite a note in Schedule 5 stating that any new high priority groundwater dependent ecosystems would be included in Schedule 5 to include new information relating to groundwater dependent ecosystems.¹⁹³ The Plan should be updated to identify an updated list of groundwater dependent ecosystems in the Plan area and clarify the process for ongoing identification of groundwater dependent ecosystems.

4.4.3 Setback distances for works should be consistent across policies

The Plan includes a range of setback distances for work in the vicinity of groundwater dependent ecosystems. Setback distances aim to minimise potential impacts from groundwater extraction to environmental features, such as groundwater dependent ecosystems. The *NSW Aquifer Interference Policy* holistically protects groundwater dependent ecosystems, considering

¹⁹⁰ Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas*. Available at: <http://www.bom.gov.au/water/groundwater/gde/>.

¹⁹¹ The Bureau of Meteorology's *Groundwater Dependent Ecosystems Atlas* is the only national database of potential groundwater dependent ecosystems and is used Australia-wide as a first step to identify groundwater dependent ecosystems.

¹⁹² Personal communication, DPIE-Water, 27 March 2019.

¹⁹³ Note to Schedule 5 in the Plan states that the full list of potential groundwater dependent ecosystems will be identified on the departmental groundwater dependent ecosystems register and as a precautionary approach will be considered by staff in the assessment of any application for a water supply work approval within the area of this Plan. If it becomes verified as a high priority groundwater dependent ecosystems, this Schedule will be amended to include the groundwater dependent ecosystems.

potential water level and quality impacts.¹⁹⁴ The policy also proposes the method for assessing set back distance and provides a reporting framework.

The Commission recommends that the Plan setback distances be aligned to the *NSW Aquifer Interference Policy*.¹⁹⁵ This policy is conservative and therefore is likely to strengthen default controls for the protection of groundwater dependent ecosystems, given groundwater dependent ecosystem status uncertainty in general.

Under the policy, the onus is placed on the water access licence applicant to determine the safety margin of the development. In the interests of consistency and transparency, set back distance rules should be consolidated across all water sharing plans and aligned with the policy. Caveats currently in the Plan enable the Minister to use discretion to vary these distances following adequate studies and these should be retained.¹⁹⁶

It is noted that DPIE-Water has undertaken considerable work to standardise set back distances in inland areas as part of the implementation of the *Basin Plan 2012*. DPIE-Water's intention is to use the distances set for inland for coastal systems, although local modifications may still occur based on consultation feedback.¹⁹⁷

4.5 Release Rules should be reviewed

Release rules are included in the Clause 72 of the Plan for Mangrove Creek and Mooney Mooney Creek local water utility storages. The Plan notes that these releases are to more closely reflect natural flow conditions to support the operation of natural ecological processes. The Plan includes amendment provisions to allow any findings from studies to inform these rules, noting that the studies were not undertaken due to dry weather conditions and dam storages not being above 60 percent capacity. These rules should be reviewed as part of Plan remake to ensure environmental requirements are met.

4.6 Additional stakeholder concerns

Stakeholders also raised concerns relating to:

- stormwater runoff from commercial developments impacting wetlands, particularly the natural drying cycles of Porter's Creek Wetlands
- contamination from solid waste landfill at Mangrove Mountain and associated groundwater take
- potential impacts to Jilliby Jilliby Creek flows from the Wallarah 2 coal mine.

While most of these environmental concerns are largely beyond the scope of the Plan, the Commission recommends that mining activities are considered as part of the replacement Plan to reflect relevant requirements for mitigation of water take, particularly the recent determinations by NSW Planning Assessment Commission around the impacts of mining operations on groundwater drawdown, and how this effects other water users and the

¹⁹⁴ DPI-Office of Water (2012) *NSW Aquifer Interference Policy: NSW policy for the licensing and assessment of aquifer interference activities*. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549175/nsw_aquifer_interference_policy.pdf.

¹⁹⁵ DPI-Water (2012) *NSW Aquifer Interference Policy*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549175/nsw_aquifer_interference_policy.pdf

¹⁹⁶ Clauses 71D(3), 71D(4) and 71D(5) of the Plan.

¹⁹⁷ Personal Communication, DPIE-Water, 27 March 2019.

environment.¹⁹⁸ Under a determination for the Wallarah 2 Coal Project on the Central Coast NSW, it was required that all projected loss should be accounted for at all times, rather than as part of annual accounts, and that this take is then fully compensated. In this case, potential loss to the water availability from the aquifer of water supply would be compensated by the applicant by providing 300 ML per year of treated water to the catchment, based on modelled take.¹⁹⁹

The replacement Plan should consider the impact of future mining activities on the Plan water sources and include requirements such that all future active mines in the area are required to fully mitigate groundwater drawdown take and DPIE-Water should account for any mitigation annually (within the LTAAEL, see **Chapter 4.2**) and daily (the timescale at which cease to pump rules operate).

For other key issues identified by stakeholders, DPIE-Water should consider any cumulative impacts to inform strategic adaptive management. Control of these activities takes place under relevant legislation and associated policy and guidelines governing developments via consent conditions.

Cross-agency communication is important for these types of issues so that relevant aspects of development consent controls support the Plan objectives, and associated monitoring data feeds into the monitoring, evaluation and reporting arrangements.

4.7 Recommendations

To ensure that flow management rules adequately protect environmental values and to strengthen environmental values the Commission recommends the following:

Recommendations

- 2 In developing the replacement Plan, DPIE-Water should assess whether LTAAEL is the best hydrological indicator to manage these water sources. LTAAELs and flow sharing rules at a minimum should be reviewed and revised to incorporate best available information on population growth projections and ensure the Plan functions appropriately under a range of climate change scenarios – the Plan should also allow for Plan amendments to address longer-term water availability.
- 3 In the next two years during replacement Plan development, collect (as required) and report (reviewed in year four at a minimum) to:
 - a) describe the natural flow regime
 - b) map and ground-truth the presence and extent of water dependent environmental assets including estuarine and coastal ecosystems
 - c) identify key assets and classify high priority ecosystems and high ecological value aquatic ecosystems using the High Ecological Value Aquatic Ecosystem framework, including those assets identified in (b)
 - d) define the flow requirements of key assets

¹⁹⁸ NSW Independent Planning Commission (2018) *Walarah 2 Coal Project*. Available at: <https://www.ipcn.nsw.gov.au/projects/2017/09/walarah-2-coal-project>.

¹⁹⁹ NSW Independent Planning Commission (2018) *Walarah 2 Coal Project*. Available at: <https://www.ipcn.nsw.gov.au/projects/2017/09/walarah-2-coal-project>.

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- e) determine the impact of the Plan on the flow regime identified in (a) and the flow requirements of key assets identified in (d).
-
- 4 To strengthen environmental water sharing rules, DPIE-Water should:
- a) define water sharing rules – including flow class provisions – in the replacement Plan – this should be based on environmental water requirements and prioritise the protection of water sources and their dependent ecosystems based on continuing risk assessments of coastal water sharing plans
 - b) build on existing hydrological flow studies and assess estuarine flow requirements, adequate flows to support fish passage and other key species
 - c) revise ‘no visible flow’ rules so that flow sharing rules are based on best available evidence and key environmental assets are protected, particularly in water sources with high ecological values
 - d) revise flow reference points for suitability, this may include additional reference points to support measured cease to pump rules rather than ‘no visible flow’ access rules
 - e) revise flow sharing rules for the Wyong River
 - f) revise total daily extraction limits (TDELs) for Ourimbah Creek and Wyong River
 - g) include flow sharing provisions for Mangrove Creek and Mooney Mooney Creek
 - h) until better information is available to support implementation of a) to g), incorporate a suitable buffer factor in cease to pump rules to allow for uncertainty.
-
- 5 In developing the replacement Plan, DPIE-Water should review groundwater dependent ecosystem requirements to build on groundwater assessment processes used for other recent water sharing plans, specifically to:
- a) clearly define groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type - connectivity should include both discharge of groundwater to surface water and surface water recharge to groundwater systems
 - b) confirm the presence, classification and extent of groundwater dependent ecosystems across the Plan area to reflect current knowledge obtained through on-ground studies and allow for plan amendments as studies progress
 - c) define if any action is required regarding potential impacts on low- or medium-priority groundwater dependent ecosystems
 - d) continue the review of setback distances for work near identified groundwater dependent ecosystems and standardise these based on the *NSW Aquifer Interference Policy 2012*.
-
- 6 Consider future mining activities and their potential impacts to water sources as part of the replacement Plan:
- a) at a minimum, the Plan should require full mitigation of groundwater drawdown take from mining operations
 - b) DPIE-Water should account for any mitigation annually (within the LTAAEL, see **Section 4.2**) and daily (the timescale at which cease to pump rules operate).
-

Suggested actions

- B DPE-Water should work with WaterNSW to improve the quality of the flow record of each water source. At a minimum, DPE-Water should:
- a) work with WaterNSW to install flow measurement infrastructure at Mangrove Creek and Mooney Mooney Creek
 - b) ensure flow data record is reliable
 - c) ensure models account for secular flow variations to inform flow sharing provisions in the replacement Plan.
-

5 Social outcomes

The Plan's social objectives relate to Aboriginal cultural outcomes, basic landholder rights and the security of town water supply.

The Commission identified significant risks to the security of town water supply and discusses these in **Chapter 3**.

In addition, the Commission's review of Plan provisions relating to the delivery of social objectives found that:

- provisions adequately provide for basic landholder rights, which are relatively small in comparison to licenced entitlement by volume
- provisions to allocate water for Aboriginal cultural purposes are in line with other water sharing plans. These provisions have not been used to date. While there were no significant issues raised regarding these provisions in submissions, other water sharing plan reviews highlight the inadequacies of support for Aboriginal water rights and interests across NSW.

5.1 The Plan provides for basic landholder rights

There are three types of basic landholder rights in NSW under the Act (sections 52-55):

- **Domestic and stock rights** – owners or occupiers of land which is overlaying an aquifer or has river, estuary or lake frontage can take water without a licence for domestic (household) purposes or to water stock.
- **Harvestable rights (dams)** – harvestable right water allows landholders in most rural areas to collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size.
- **Native title rights** – individuals who hold native title with respect to water, as determined under the *Commonwealth Native Title Act 1993*, can take and use water for a range of personal, domestic and non-commercial purpose (see **Section 5.2.1**).

These extractions do not require a water access licence and may be accessed subject to water availability. Consistent with the Act, the Plan gives priority of access for basic landholder rights.

The Commission did not receive any data that report specifically against this objective. Stakeholders did not identify any concerns related to basic landholder rights being met during the consultation process.

When the Plan commenced, the potential use of domestic and stock rights within these water sources was estimated at 297 ML per year in 2016 (approximately 0.2 percent of total licenced extraction of the system).²⁰⁰

²⁰⁰ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 15. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

To supplement stock, domestic and irrigation water demand, the background document to the Plan indicates that approximately 900 constructed small dams exist along the spring-fed streams of the Kulnura Mangrove Mountain Plateau.²⁰¹

With no requirement for a licence or metering equipment for basic landholder rights, it is difficult to quantify what impact these extractions are having on a water source or may have with changes in land use.

The NSW Water Renewal Taskforce and DPIE-Water planned to introduce reasonable use guidelines for stock and domestic consumption as part of the NSW Government's *Water Reform Action Plan*. It was expected that this process would involve a stakeholder consultation process in 2019.²⁰² However, the Commission has been informed that the NSW Government may no longer be committed to this process.

The Commission recommends that this process is resumed by DPIE-Water so that reasonable use guidelines are developed and implemented across NSW by the end of 2020, to provide clarification and consistency regarding domestic and stock rights. It would also reduce misunderstanding, distrust and promote responsible practices among water users.²⁰³ Once these guidelines are established, DPIE-Water will need to update estimates and modelling for the replacement Plan or subsequent updates to reflect these guidelines.

Agricultural stakeholders have requested a review of the harvestable rights provision for coastal water users to allow an increase from the current allowance of 10 percent of average annual regional rainfall run-off to 30 percent.^{204,205} They suggest that this would alleviate some pressures generated from trade restrictions and increase the ability to store and trade water across valleys.

The Plan has provided for the harvestable rights component of basic landholder rights as defined by the harvestable rights order under Section 54 of the Act. Consideration of any changes to harvestable rights allowance specified by this order is not considered as part of this review as it is not related to a Plan provision and impacts of any proposed changes to harvestable rights would need to be considered across all coastal catchments. However, the Commission cautions any increase to harvestable rights, as such a large increase in on farm storage would likely substantially undermine reliability for all other users, including environment and utilities

²⁰¹ *Ibid.*

²⁰² DoI (2018) *NSW Non-Urban Water Metering Policy*, p. 5. Available at: www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

²⁰³ Submissions: NSW Irrigators Council, received 25 October 2019; Congewai Valley Landcare, received 21 October 2019.

²⁰⁴ Harvestable rights are part of the Basic Landholder Rights allowances in the Plan that do not require a water licence. Harvestable rights allow rural landholders to build dams on minor streams to capture a percentage of the average regional rainfall run-off on their land. The allowance for harvestable rights is made under Section 54 of the Act and published from time to time in the NSW Government Gazette. The allowance for coastal regions in NSW is currently 10 percent.

²⁰⁵ DoI (n.d.) *Harvestable rights- dams*. Available at: <https://www.industry.nsw.gov.au/water/licensing-trade/landholder-rights/harvestable-rights-dams>.

5.2 The Plan can strengthen Aboriginal outcomes

Aboriginal community well-being is entwined with the health of the environment and ability to access land, water and associated natural resources.²⁰⁶ It is important for the Plan to support Aboriginal water values through provisions that recognise land and water rights and interests, and processes that support the identification of Aboriginal objectives, water values and uses, and ongoing engagement and involvement in water management.

In addition to the Plan objectives, Aboriginal cultural values are recognised as part of the vision in Clause 9(2) of the Plan, which states that:

‘Life-giving water is of extreme significance to Aboriginal culture for its domestic, traditional and spiritual values, and whilst water supplied for the environment will provide protection for native flora and fauna, water for fishing, food gathering and recreational activities, it is important that the community respects the spiritual significance of water to the Aboriginal people’.

In addition, Clause 9A of the Plan recognises Aboriginal people as the first natural resource managers of the Plan water sources. The Commission has not received any data that reports against these provisions and there do not appear to be clear strategies to achieve the stated vision or associated objectives.

Key findings regarding the Plan’s contribution to Aboriginal cultural outcomes include:

- The Plan provides for native title rights, although these provisions could be strengthened.
- The Plan provides Aboriginal cultural licences but these have not been accessed and require simplification.
- The Plan does not provide for Aboriginal community development licences, limiting the Plan’s contribution to social and economic outcomes.
- The Plan provides for protection from culturally significant groundwater dependent sites but sites have not been identified.

There were also a range of broader concerns identified by Aboriginal stakeholders as part of the Commission’s consultation process, many of which relate to issues around lack of engagement and the need to identify cultural values, uses and flows to better support Aboriginal water values.

5.2.1 Native title rights

Native title rights are considered a basic landholder right alongside domestic and stock, and harvestable rights. A native title holder is entitled to take and use water without an access licence, water supply work approval or water use approval under Section 55(1) of the Act and Clause 23 of the Plan.

While one of the Plan’s performance indicators is the ‘extent to which native title requirements have been met’, there are currently no native title determinations or claims in the Plan area.²⁰⁷

²⁰⁶ Department of Environment, Climate Change and Water (2010) *State of the Catchments 2010: Economic sustainability and social well-being – Northern Rivers region*. Available at: <https://www.environment.nsw.gov.au/resources/soc/northernrivers/10429NRIVERSecosus.pdf>.

²⁰⁷ National Native Title Tribunal (n.d.) *Maps*. Available at: <http://www.nntt.gov.au/assistance/Geospatial/Pages/Maps.aspx>.

However, this does not preclude future native title claims and determinations and these need to be proactively planned for and accommodated in the Plan.

Under Clause 79(5), the Plan may be amended following the granting of a native title claim to give effect to these rights. Despite similar amendment provisions across water sharing plans, the Commission's recent review of the *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012* found that determined native title rights were not implemented in amendments in a timely manner.²⁰⁸

To address this issue, the Commission recommends that a timeframe of three months is adopted in the Plan to undertake initial amendments, and enough time is provided to undertake detailed engagement, determine water allocations, and make final amendments to the Plan.²⁰⁹

It is also recommended that Indigenous Land Use Agreements or other agreements²¹⁰ be used proactively wherever possible to prevent issues related to the long timeframes of native title claims and extended periods of inaction that often follow final determinations.

5.2.2 Aboriginal water access licences

Aboriginal water access licences are the primary mechanism to enable Aboriginal water access and use under the Act.²¹¹ While the Act provides for three different types of licences, these are not available across all water sharing plans.²¹²

In this Plan, an Aboriginal cultural licence is available for less than or equal to 10 ML per year (as is standard across water sharing plans).²¹³ These licences can be used for 'drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, cultural

²⁰⁸ Natural Resources Commission (2019) *Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Available at: https://www.nrc.nsw.gov.au/_literature_251193/Final.

²⁰⁹ The Commission's considers that a volumetric or proportional allocation is preferable as it helps to clarify what is achievable within the native title entitlement. However, this does vary with some native title rights providing an entitlement without a specific allocation. In addition, some stakeholders have advised the Commission that the focus on an allocation may detract from the process of recognising cultural entitlements due to the lengthy and complex processes involved in determining an allocation.

²¹⁰ There are several agreements that can be made under relevant NSW and Commonwealth legislation. For example, Indigenous Land Use Agreements or a Section 31 Deed can be used successfully to resolve native title claims proactively. These are legally binding and may include rights in relation to employment, economic development, freehold land and compensation. Aboriginal Land Agreements can also be used as an alternative to the land claims process under the *Aboriginal Land Rights Act 1983 (NSW)* and provide a broad scope for negotiating claims. Indigenous Protected Areas are also effective, encompassing areas of land and sea country owned or managed by Indigenous groups which are voluntarily managed as a protected area for biodiversity conservation through an agreement with the Australian Government as part of the National Reserve System.

²¹¹ The *Water Management Act 2000* includes a broad objective to 'recognise and foster the significant social and economic benefits . . . to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water' (Section 3). Provisions are included to help meet this objective, including:

- The Minister can establish multi-stakeholder catchment-level water management committees of at least 12 but no more than 20 members, of whom at least two are Aboriginal persons (Section 13).
- Specific Purpose Aboriginal Licences include, which include Aboriginal cultural access licences, Aboriginal community development access licences and supplementary (Aboriginal environmental) water access licences.
- Native title rights are recognised.

²¹² Aboriginal cultural access licences (available in all surface water and groundwater management areas); Aboriginal community development access licences (only available in catchments where water extraction is not yet over allocated); and supplementary (Aboriginal environmental) water access licence (only available in the Barwon-Darling area).

²¹³ See Clause 32(7) of the Plan.

teaching, hunting, fishing, gathering and for recreational, cultural and ceremonial purposes'.²¹⁴ Although some coastal river water sources also provide Aboriginal community development access licences, the Plan area was not considered able to support this extraction as it is already fully allocated.²¹⁵

The Commission has not been provided with any evidence that water has been accessed under Aboriginal cultural licence provisions or that water has been reserved for use under these entitlements. Further, DPIE-Water does not appear to have a clear policy or application process for Aboriginal-specific water licences, with sources describing the process as 'laborious'.²¹⁶

There has also been ineffective engagement with Aboriginal stakeholders regarding these available entitlements, resulting in a reported lack of awareness amongst stakeholders about these access licences. The Commission's consultation with Aboriginal stakeholders indicated that they were either unaware or unsure of the process for granting and receiving water licences and were not involved at the time of Plan development. Indeed, there are a range of barriers to water access and use in NSW that are relevant in the context of this Plan, including:²¹⁷

- limits to volumetric entitlements
- restrictions on uses of water to narrow 'cultural purpose' definitions
- exclusion of economic and commercial uses of water
- complexity of water licence governance and application processes
- limited awareness and capability around water policy and governance
- reliance on lengthy and complex land rights processes for accessing water
- restricted physical access to land and water, for example private lands, fencing, poorly maintained land and banks
- lack of infrastructure to use water, for example pumps and dams.

DPIE-Water should help to address the significant barriers to Aboriginal people accessing and using water. Actions to simplify Aboriginal water licences need to be considered – this may include the simplification of licence categories and removal of unnecessary restrictions on the purpose of water use.²¹⁸ Any attempts to address Aboriginal water access through these means

²¹⁴ Clause 32(8) of the Plan.

²¹⁵ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 26. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

²¹⁶ Hartwig, L.D., Jackson, S. and Osborne, N. (2018) 'Recognition of Barkandji Water Rights in Australian Settler-Colonial Water Regimes', *Resources*, 7(1), pp. 16-32; Tan, P.L. and Jackson, S. (2013) 'Impossible dreaming – Does Australia's water law and policy fulfil Indigenous aspirations?', *Environment and Planning Law Journal*, 30, pp. 132-149; Moggridge, B.J., Betteridge, L. and Thompson, R.M. (2019) 'Integrating Aboriginal cultural values into water planning: a case study from New South Wales, Australia', *Australasian Journal of Environmental Management*, 26(3), pp. 273-286.

²¹⁷ Jackson, S. and Moggridge, B. (2019) 'Indigenous water management', *Australasian Journal of Environmental Management*, 26(3), pp. 193-196; Moggridge, B.J., Betteridge, L. and Thompson, R.M. (2019) 'Integrating Aboriginal cultural values into water planning: a case study from New South Wales, Australia', *Australasian Journal of Environmental Management*, 26(3), pp. 273-286; Mooney, W. and Woods, R. (2019) 'Pathways to water sovereignty: cultural flows and first nations' water rights', paper submitted to Legalwise: 10th Water Symposium, 19 October.

²¹⁸ The restrictions on the purposes and dealings of licences held by Aboriginal peoples are unnecessary and need to be removed. No other category or sub-category of licence is subject to the specification of the purpose of take.

needs to be part of the co-designed, state-wide Aboriginal Water Framework (discussed in **Section 5.2.4**).

5.2.3 Cultural values

The Plan includes an objective ‘to protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of the water sources’. However, the Commission has not received any information or data on this objective or associated performance indicator.

In addition, Clause 71E of the Plan includes rules for water supply works located near groundwater dependent culturally significant sites. No groundwater dependent culturally significant sites were identified in the Plan. The Plan provides amendment opportunities to protect water dependent cultural assets and refers to the Aboriginal Water Initiative to identify groundwater dependent culturally significant sites.^{219,220,221} However, Aboriginal Water Initiative was disbanded in 2017, prior to this work being undertaken.

The Commission has found that the lack of any specified water values makes assessment of the outcomes relating to the recognition and protection of Aboriginal water values difficult. There is a lack of clear links between the vision, objectives, strategies and performance indicators that makes it difficult to monitor and assess Aboriginal outcomes of the Plan.

The Plan needs to better identify and support Aboriginal cultural and heritage values and uses, objectives and outcomes in line with relevant legislation. Both state and national water legislation and policy integrate Aboriginal cultural and heritage values and uses of water.²²²

There have been significant efforts to provide guidance on how to undertake effective engagement with Aboriginal stakeholders to identify cultural water values²²³, including Aboriginal waterways assessments²²⁴ and cultural flows assessments.²²⁵ There are also a number of other sources of information on cultural sites and values in the area that can be drawn on initially to help inform these engagement processes, such as the Aboriginal Heritage

²¹⁹ Clause 79(6) of the Plan allows it to be amended to protect ‘water-dependent Aboriginal cultural assets’, to ‘(a) identify water dependent cultural assets, (b) restrict the granting and amending of water supply work approvals to protect water-dependent Aboriginal cultural assets, (c) amend the dealing rules to protect water dependent Aboriginal cultural assets’.

²²⁰ The Aboriginal Water Initiative was established by the then Office of Water in 2012 to engage Aboriginal communities in water planning and identifying cultural values.

²²¹ Clause 71E of the Plan refers to the Aboriginal Water Initiative System as holding a full list of ‘potential groundwater dependent culturally significant sites’ will be identified in the AWIS’ for consideration as part of any water supply work application.

²²² In NSW, the Act notably includes a broad objective to ‘recognise and foster the significant social and economic benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water’ (Section 3) and associated provisions. The National Water Initiative acknowledges that ‘native title should not be solely relied upon to deliver Indigenous peoples the access and rights to their traditional waters. Water planners should consider other mechanisms for giving access and rights to water to Indigenous peoples’.

²²³ Including additional modules for the *National Water Initiative* and the *Basin Plan*, and as part of the *National Cultural Flows* project.

²²⁴ The purpose of the Aboriginal Waterways Assessment Program was to develop a tool that consistently measures and prioritises river and wetland health so that Traditional Owners can more effectively participate in water planning and management in the Basin. (Murray-Darling Basin Authority (2017) *Aboriginal Waterways Assessment Program*. Available at: <https://www.mdba.gov.au/publications/mdba-reports/aboriginal-waterways-assessment-program>).

²²⁵ The National Cultural Flows Research Project is a project driven by and for Aboriginal people, sought to establish a national framework for cultural flows. The framework, released in 2018, provides the first guide and method for future planning, delivery, and assessment of cultural flows (Murray-Darling Basin Authority (2019) *Cultural Flows*. Available at: <https://www.mdba.gov.au/discover-basin/water/cultural-flows>).

Information Management System (AHIMS).²²⁶ Although these sources of information have limitations, they provide a foundation for understanding cultural values and uses and involving Aboriginal peoples meaningfully in water planning and management.

DPIE-Water should draw on these established guidelines and processes to begin to better understand, value and support the values of Aboriginal people in the Plan area. The Commission notes the recent efforts of DPIE-Water in Aboriginal involvement as part of the water resource planning process for the Murray-Darling Basin. DPIE-Water should expand these engagement efforts across NSW and use the process to identify values, develop objectives and outcomes, and determine required cultural flows to support these values with a range of Aboriginal stakeholders.

5.2.4 Consultation and engagement

Consistent and ongoing engagement is needed to achieve the Act's outcomes and Plan objectives for Aboriginal stakeholders. Overall, stakeholder feedback indicated that there is a clear need to better engage with the Aboriginal community to identify and support cultural water requirements and assist all interested parties in better understanding the Plan.

The Hunter Aboriginal Community and Environment Network was engaged during the initial development of the Plan. The network indicated that water sharing rules should protect natural instream values and entitlements for commercial priorities should not be at the expense of water for the environment. Natural flows and healthy aquatic diversity were also highlighted as priorities.²²⁷

During consultation for this review, some Aboriginal stakeholders requested that Aboriginal people be formally recognised in the water sharing plan for their long-held water management expertise. In addition, they expressed a willingness to share knowledge through engagement. Such knowledge sharing could improve the planning process and ongoing management of water for the benefit of all, leading to broader social, environmental and economic outcomes in the Plan area.

Concerns raised through consultation with participating Aboriginal stakeholders included:

- the minimal engagement with the Aboriginal community on water sharing plans by responsible government agencies
- concerns relating to water quality due to run-off and a general concern for the health of the riparian zone

²²⁶ AHIMS is a database that contains detailed information on over 93,000 recorded sites and over 13,500 archaeological and cultural heritage assessment reports (DPIE (2018) *Aboriginal Heritage Information Management System*. Available at: <https://www.environment.nsw.gov.au/topics/aboriginal-cultural-heritage/protect-and-manage/aboriginal-heritage-information-management-system>). In 2012, there were over 7,000 registered Aboriginal sites located within the Darkinjung Local Aboriginal Land Council boundaries. Stakeholders have cautioned that AHIMS may not be comprehensive and should only be used in conjunction with Aboriginal engagement.

²²⁷ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 14. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

- concerns relating to handling of information in the public domain regarding cultural assets and vandalism of cultural sites²²⁸ (see **Section 5.2.3**)
- lack of acknowledgement of the extensive cultural knowledge and long held expertise in water management.

The Commission considers that many of the issues raised can be addressed through improved engagement between responsible agencies and the Aboriginal community as part of the replacement Plan process.

The Commission recommends that DPIE-Water increases and expands its current engagement efforts in the basin to enable an inclusive and culturally appropriate approach to cultural water across NSW. This includes offering similar engagement opportunities in non-basin areas, including the central coast, and involving a range of other Aboriginal stakeholders not currently captured in the nation-based process, including Traditional Owners, Nation groups, Local Aboriginal Land Councils and other representative groups.²²⁹ These engagement activities must also be better resourced to provide the time and expertise needed to undertake culturally-sensitive engagement.²³⁰

Across all water sharing plan reviews, there is consistent evidence and feedback that significant efforts are needed to redress Aboriginal values and uses, objectives and outcomes across NSW. This needs to be undertaken using a state-wide approach that is consistent and transparent, led, with supporting governance, staff and resources. In previous reviews, the Commission has identified valuable examples of such approaches.²³¹

The Commission have been made aware that DPIE-Water are making significant progress on this state-wide framework in consultation with the NSW Peak Aboriginal Bodies group.²³² The

²²⁸ National Parks and Wildlife Service plans of management relevant to the Plan area also raise concerns regarding vandalism to sites if their locations are revealed.

²²⁹ Engagement should include as a minimum, the Darkinjung Local Aboriginal Land Council, the Metropolitan Local Aboriginal Land Council and the Guringai Tribal Link Aboriginal Corporation.

²³⁰ The Commission is aware that additional staff have been appointed within DPIE-Water to support these efforts but recommends that further resources will be required to undertake appropriate consultation.

²³¹ Examples include:

- Recent reforms in Victoria as part of the Water and Catchment Legislation Amendment Bill 2019 which formalised obligations for Victorian water and catchment management agencies to engage with and support opportunities for Aboriginal involvement as part of the 'Water for Victoria Plan'. This sets out the process for documenting water-dependent values, collaborating with water management agencies and pursuing economic development opportunities through access to water.
- The *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017*, which combines Traditional Owner knowledge with modern river management expertise and treats the Yarra as one integrated living natural entity to be protected. It also gives an independent voice to the river through the Birrarung Council, a statutory advisory body which must have at least two Traditional Owner representatives on it.
- Whole-of-Country planning and management such Gunaikurnai Land and Waters Aboriginal Corporation and Native Title Services Victoria (2015) *Gunaikurnai Whole-of-Country Plan*. Available at: www.glawac.com.au; Dja Wurrung Clans Aboriginal Corporation (2014) *Dja Wurrung Country Plan 2014-34*. Available at: www.djadawurrung.com.au; and Barengi Gadjin Land Council (2017) *Country Plan: Growing What Is Good*. Available at: www.bglc.com.au.
- Dedicated Aboriginal roles in water management (for example, Aboriginal rangers and water officers for monitoring and compliance).
- Aboriginal Water and Land Holder and an associated Trust Account.
- Cultural Flows Projects and officers.
- Economic development opportunities through Aboriginal-led programs and business ownership such as aquaculture businesses (University of Technology Sydney (2016) *Social and Economic Evaluation of NSW Coastal Aquaculture*. Available at: www.uts.edu.au/sites/default/files/fass-report-social-economic-evaluation-nsw-coastal-aquaculture.pdf).

²³² Interview: Principal Aboriginal Policy and Legislation Officer - Water Policy & Legislation, DPIE-Water, 28 February 2020.

Commission strongly supports these efforts and recommends that DPIE-Water continue to drive the state-wide changes required to adequately address Aboriginal water issues comprehensively across legislation, policy, programs and processes by the end of 2020. Any efforts need a consistent policy framework and associated funding to support ongoing Aboriginal involvement and leadership in water management in NSW, beyond the water sharing plan processes.

5.3 Recommendations

To strengthen outcomes for Aboriginal peoples and social outcomes more broadly, the Commission recommends the following:

Recommendations

- 7* Continue work to improve Aboriginal engagement and outcomes, including work to:
- a) strengthen and expand the nation-by-nation engagement developed as part of the inland water resource plan process to coastal areas and to other representative Aboriginal groups
 - b) use the strengthened engagement process to identify Aboriginal values and uses, objectives and outcomes, and flow allocations in the Plan area, then link these to strategies, performance indicators and measuring and reporting requirements.
 - c) simplify licence categories or co-design other water access mechanisms in consultation with Aboriginal peoples that can support identified Aboriginal water values, rights and uses.
 - d) include a timeframe of three months to initially amend the Plan to acknowledge any native title determinations and Indigenous Land Use Agreements and allocate enough time to undertake detailed engagement with stakeholders on the final Plan amendment and allocation process.

Suggested actions

- C* Continue to develop the NSW Aboriginal Water Framework by end-2020 to provide consistent and transparent guidelines and resourcing for Aboriginal water access and involvement in water planning and management. At a minimum, the framework should consider:
- a) relevant guidelines and legislation, including any need for legislative reforms
 - b) Aboriginal water values and its uses
 - c) processes for allocating water for Aboriginal interests including cultural, environmental, social and economic purposes
 - d) processes for improving Aboriginal water access and use, through simplified licencing or other identified mechanisms
 - e) clear requirements for including native title determinations and proactive processes for undertaking other land/water use agreements
 - f) strengthened Aboriginal engagement processes across the state to expand on the basin engagement process, broaden the stakeholder base (to include Traditional Owners, Nations, Local Aboriginal Land Councils and other relevant groups), and increase Aboriginal staff with capacity to lead and maintain engagement.
 - g) appropriate Aboriginal-led governance and decision-making arrangements, such as an Aboriginal Water Holder
 - h) adequate resources including dedicated Aboriginal staff with capability in water planning and management, and funding, such as an Aboriginal Water Trust.
-

6 Economic outcomes

There has been positive economic growth in the Central Coast Council area of approximately 15 percent over the Plan period.²³³ No further data was provided by DPIE-Water around changes in the economic benefits derived from water extraction and use (Clause 12(h)).

Regarding other economic objectives, the Commission found that:

- the Plan provides for trade, although this has not been extensive
- some stakeholders have expressed interest in undertaking more trading - any changes to these provisions should consider environmental requirements
- the Plan provides flexibility to encourage responsible water use, which has enabled environmental, social and economic outcomes – however, it is not clear if environmental needs have been prioritised.

6.1 The Plan provides for trade but it has not been extensive

Trading within the Plan area is governed by the Plan's trading rules. These rules were set up to consider hydrological constraints and other potential impacts, primarily related to ecosystem health.²³⁴ Allocation assignment (or 'temporary') trades within the Plan area has been restricted due to the lack of metering (beyond the local water utility extraction), to facilitate management of water users' account balances.^{235,236}

The number of water trades in the Plan area could potentially be influenced by:

- a relatively small number of licence holders and water available for productive uses
- lack of awareness and understanding of the trade rules amongst licence holders²³⁷
- challenges in identifying trading partners
- lack of system infrastructure available to support storage and release of water on demand
- 100 percent allocation of available water every year over the period of the Plan, reducing water scarcity.²³⁸

Water markets in unregulated river systems in NSW are based on a 'cap and trade' approach, which is like regulated systems and consistent with the principles of the National Water Initiative. Water trading is intended to encourage the movement of water licences to high value

²³³ From approximately \$9,040 million in 2009-10 to \$10,380 million in 2017-18 (value add) (.id Demographic Resource Centre (n.d.) *Central Coast Council area Value added*. Available at: <https://economy.id.com.au/central-coast-nsw/value-add-by-industry?sEndYear=2010>).

²³⁴ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 17. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

²³⁵ Water allocation assignment trades were previously known as 'temporary trades'. These dealings involve the trade or assignment of a volume of water from the water allocation account of one water access licence to another.

²³⁶ DPI-Water (2014) *Audit of Implementation – Central Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (internal document).

²³⁷ Submission: NSW Farmers Central Coast Branch, received 25 January 2019.

²³⁸ WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watarnsw.com.au/water-register-frame>.

uses.²³⁹ The trade of water access rights or associated shares generally occurs on a permanent basis, while the trade of annual allocations allows for trade on a temporary basis.

Trade data were accessed from the publicly available Water Register and provided by DPIE-Water. Several discrepancies were found between the two data sources, particularly in relation to reported prices. The data indicate that there have been 174 water licence transfers (71M, a change in ownership of the licence from one person to another)²⁴⁰ and four share assignment trades (71Q, a permanent trade of all or part of the share component of the licence)²⁴¹ recorded over the period of the Plan.²⁴² This represents a total of 7,572.5 unit shares between 2007 and 2018, with 80 percent of trades occurring since 2012. Over the Plan period, 161 trades were between unregulated river licences and 17 were between stock and domestic users (totalling 66 unit shares). There is no record of allocation trades (71T, the trade of a volume of water from the water account of one licence to another) for the Plan area.

Table 7 shows trades by water source. Tuggerah Lakes had no trades of any kind, although trades within the source are permitted subject to assessment by DPIE-Water.²⁴³ Of the water sources classified as having a high economic dependence, only Mangrove Creek had no share assignment trades. Wyong River had the most share assignment trades (2) and was identified as having high-value industry (such as turf), as well as regional urban water supply extractions.

Table 7: Summary of water access licence dealings by water source²⁴⁴

Water source	Dealing type	Number of dealings	Units dealt
Brisbane Water	Transfer (71M)	4	89
Jilliby Jilliby Creek	Transfer (71M)	22	1,129.5
Mangrove Creek*	Transfer (71M)	47	1,596
Mooney Mooney Creek*	Share assignment ('permanent') trade (71Q)	1	34
	Transfer (71M)	19	844
Ourimbah Creek*	Share assignment ('permanent') trade (71Q)	1	25
	Transfer (71M)	38	1,044
Wyong River*	Share assignment ('permanent') trade (71Q)	2	93
	Transfer (71M)	44	2,718
Total		178	7,572.5

* Water sources identified as having a high economic dependence on water extraction.

²³⁹ Commonwealth of Australia (2018) *National Water Initiative*. Available at: <http://www.agriculture.gov.au/water/policy/nwi>.

²⁴⁰ Licence transfer trades involve the selling or transfer of a water access licence or a holding in a water access licence from one holder to another. A water access licence or a holding in a water access licence can be sold or transferred from one holder to another under section 71M of the Act.

²⁴¹ Share assignment trades were previously known as 'permanent trades'. These dealings involve the trade or assignment of the whole or part of the share component of a water access licence (i.e. entitlement to water) from one access licence to another. The share component of an access licence can be sold or traded from one water access licence to another under section 71Q of the Act.

²⁴² WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>.

²⁴³ Department of Water and Energy (2009) *Commenced Water Sharing Plan for the Central Coast unregulated water sources – Rules Summary*, NSW Government, Sydney.

²⁴⁴ WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>.

Very few trades (6 percent) have prices recorded against them. While this is not uncommon,²⁴⁵ it limits the availability of information to the market, which in turn impacts on the effectiveness and efficiency of the water market.

Prices were only reported for eight of the 178 dealings. One share assignment ('permanent') trade had a reported price of \$1,000 per ML. Seven other transfer trades with reported prices ranged from \$0.25 per ML to \$5,500 per ML.²⁴⁶ It is likely that prices do not reflect the value of water entitlements in the region. In some cases, there are legitimate reasons for trades appearing with zero dollars recorded against them, such as transfers between related entities or family businesses but that they may also reflect a reluctance for price disclosure by the water holders.

Other reasons for price variation or absence may be due to prices being recorded incorrectly due to data entry errors, confusion about form requirements or because the price included other assets, such as land. The Commission understands that WaterNSW has recently updated their trade application form to require price be included. These efforts to improve price reporting need to be supported to ensure these changes are implemented consistently.²⁴⁷

Despite these factors, unregulated licence holders expressed an interest in the Plan providing for increased flexibility for water trade within catchments and between interconnected streams.

Drivers for increased trade in the future may include growth in water utility demand due to population growth (see **Section 3.1.2**), growth in agricultural demand, an increase in industries such as mining or new commercial developments.²⁴⁸

Agricultural stakeholders considered that licences and water sharing plans should be consistent and unambiguous in their expression of trading rules, and associated requirements and opportunities.

The Commission notes that the current trade rules were developed by the respective regional panel in line with the guidelines and processes documented at the time and consistent with the macro planning approach used in many unregulated river and groundwater systems in NSW. Any changes to the flexibility of trade rules would be challenging to implement given:

- the current lack of metering, and therefore usage data
- lack of baseline data to inform impacts associated with trades, including environmental impacts.

Any processes to change the rules allowing trade between water sources would need to consider hydrological connectivity and include broad stakeholder consultation. This would raise an appropriate level of awareness and understanding of the rules and assist in identifying any perverse or unintended outcomes.

²⁴⁵ In its 2016-17 Australian Water Markets Report, ABARES reported that 74 percent of entitlement trade transactions in unregulated surface water systems outside the Murray Darling Basin record a \$0 transaction, while all allocation trade transactions in unregulated surface water systems outside the Murray Darling Basin record a \$0 transaction.

²⁴⁶ WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>.

²⁴⁷ Personal communication, DPIE-Water via email, received 27 February 2020.

²⁴⁸ This could occur due to growth in the Asian economy (Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p. 29. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>).

6.2 Encouraging responsible water use

The Commission found that the Plan provisions contribute appropriately to economic outcomes, given utility entitlement, and the drive to use water responsibly. The following provisions have been identified as being particularly relevant to this objective:

- LTAAELs and flow sharing rules
- carry over rules
- account management rules
- cease to pump rules.

First, the LTAAELs for each extraction management unit are based on demand and forecast urban growth at the start of the plan period. This method of allowance, while the environmental needs are uncertain, is likely to have resulted in minimal short term social and economic impacts on implementing the Plan. This is because water users retained their existing level of access. TDELs and flow sharing rules enable water to be shared between different users in water sources where there is competition for water. For the duration of the Plan's operation, the annual Available Water Determination Order has determined that 100 percent of share components is available for extraction for all active licence categories.²⁴⁹

Second, the Plan establishes carry over rules, which can assist in meeting the objective of providing enough flexibility in water account management and encouraging responsible use of available water. Clause 45(7) of the Plan entitles the local water utility to carry over in its account 30 percent of its access licence share component for the Wyong River water source, allowing a further 10,400 ML extraction per year.

The Plan's background document outlines that this provision was updated as a result of the public exhibition process. The provision was based on refined modelling undertaken by the water utility indicating rare circumstances might occur where volumes in excess of those specified in the Plan could be extracted. This was required to achieve the desired recovery and augmentation in dam levels post drought.²⁵⁰ This provision should be reviewed against best available evidence in the replacement Plan process to ensure environmental requirements are considered. Due to the lack of water use information for unregulated licences, the extent to which these rules can be implemented is limited.²⁵¹

Third, account management rules in the Plan should be reviewed. These rules have not been implemented beyond the local water utility.²⁵² These rules are difficult to implement without appropriate infrastructure or processes to facilitate their implementation. DPIE-Water and Water NSW should collaborate to determine a fit for purpose system for responsible use that can be implemented.

Finally, cease to pump rules apply during seasonal low flows (see **Section 4.2**). This restricts take by both utility and agricultural stakeholders. Utility demands have been met under current

²⁴⁹ WaterNSW (2018) *Water Register*. Available at: <https://waterregister.watarnsw.com.au/water-register-frame>.

²⁵⁰ DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*, p. 58. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

²⁵¹ DPI-Water (2014) *Audit of Implementation – Central Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (internal document).

²⁵² DPI-Water (2014) *Audit of Implementation – Central Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014* (internal document).

Plan rules due to their flexibility in allowing adequate take during high flows and storage capacity to provide supply during drier periods. However, landholders have indicated that these rules can create restrictions in small coastal catchments, given the requirement to stop pumping often applies at the same time as water is needed to support irrigation and production needs. This feedback indicates that these rules potentially limit economic outcomes. It also indicates the need for responsible water use in drier months.

This could be addressed through including pricing signals during the summer months to further encourage responsible water use. The Commission has received no economic data or detailed feedback to ascertain the extent of this impact. Any economic impact needs to also be considered in light of responsible water use in line with the water management principles of the Act. Any proposed changes should be supported by strong evidence demonstrating no adverse social or environmental impacts.

6.3 Recommendations

The Commission does not have any recommendations in relation to economic outcomes but suggests the following:

Suggested actions

- D* DPIE-Water should continue to implement their program to improve all trade information, including coordination with agencies to:
- a) ensure consistent data sets exist across agencies, so that trade data are consistent
 - b) support improvements to price reporting by licence holders
 - c) ensure account management rules are fit for purpose and implementable
 - d) consider environmental and industry impacts as part of any review of trade rules.

7 Monitoring, evaluation and reporting arrangements

An appropriate MER framework is important to:

- inform timely decision making, for example around environmental water provisions
- determine the contribution of the Plan to achieving environmental, social and economic outcomes against clearly defined benchmarks
- provide a framework for measuring progress against objectives
- provide clarity of roles and responsibilities where multiple parties are involved
- support ongoing strategic adaptive management
- provide transparency for stakeholders.

The Commission found that, although metering of the Plan area is relatively comprehensive, the Plan does not set out a clear MER framework and limited information has been generated during the period of Plan implementation.

Apart from ongoing metering for Central Coast Council and river gauges, MER activities that have been undertaken have been limited and irregular:

- Hydrologic information exists for some water sources and a large proportion of the take is metered. This information could be used to make decisions regarding more specific monitoring requirements.
- A monitoring framework was developed by DPIE-Water prior to the Plan being developed but this has not been translated into a Plan-specific MER framework.
- An assessment of the ecological and socioeconomic performance of water sharing plans for the Hunter Valley, Central and Lower North Coast was undertaken in 2009-10 and the results were publicly reported.²⁵³ This process did not continue after this first round of public reporting.
- Riverine condition of creeks and rivers within the Plan area has been assessed at various spatial and temporal scales but data is not readily available for the water sources at the level of detail required for this review (see **Section 4.1**).²⁵⁴
- The Plan's background document recognised that its provisions were based on available data but that integrated hydrological and ecological studies and socio-economic models were required to better assess trade-offs.²⁵⁵ The Commission understands that these studies have not taken place. As discussed in **Chapter 3**, there are key data gaps around the system's environmental watering requirements.

²⁵³ DPI-Office of Water (2011) *Environmental flow response and socio-economic monitoring. Hunter Valley, Central and Lower North Coast- progress report 2010*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/146284/EFR-socio-economic-monitoring-hunter-valley-central-lower-north-coast-rpt-2010.pdf.

²⁵⁴ Examples of monitoring data include: NSW Government (2010) *State of the catchments 2010*. Available at: <https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCEstuarine.pdf>; Hitchenson, L. (2015) *Health of Gosford Waterways Report 2015*, p. 5. Available at: <https://cdn.centralcoast.nsw.gov.au/sites/default/files/final-gosford-waters-2015-annual-water-quality-report.pdf>; Miller, J. (2016) *Central Coast Council Creek Monitoring Evaluating and Reporting Project*, OEH, p. 5; OEH (2018) *Tuggerah Lakes Water Quality Monitoring Program 2017 – 2018. Final Summary Report*, OEH, Sydney, p. 7.

²⁵⁵ *Ibid.* p. 34.

- Aboriginal cultural values and Wyong River estuary hydraulics and economics were identified as specific research opportunities in the background document to the Plan. The Commission understands that further research has not been undertaken in these areas.

The lack of quality MER is a significant and recurring issue across NSW that has been repeatedly highlighted in previous Commission reviews, as well as by the National Water Commission.²⁵⁶

The MER framework should be supported by adequate resources.

7.1 A relatively high proportion of extraction is metered

Consistent metering is important to facilitate compliance and trade and to inform the MER framework. Relative to other regions, this Plan area has a high proportion of water extraction that is metered as part of its allocation to the local water utility (approximately 80 percent entitlement by volume and 70 percent of the long term annual average extraction limit).²⁵⁷

The Commission notes that the NSW Government has established a new metering framework for non-urban water meters in NSW, which commenced on 1 December 2018. The new Plan should be consistent with this framework.

Delivered in a staged process, this framework will improve the standard and coverage of non-urban water meters. Coastal regions are required to comply by 1 December 2023.²⁵⁸ Data provided by WaterNSW indicate that, of the installed pumps in the Plan area, only 15 percent of pumps (by pump count) are 100 millimetres or larger and therefore likely to be impacted by these metering reforms.²⁵⁹

The policy outlines that, users not required to have meters will be subject to new mandatory conditions requiring them to keep certain records about their water take.²⁶⁰ In considering additional controls, it is important to balance the cost of implementation to government and existing users with the risk to the resource of over extraction.

7.2 Outcomes should be clearly defined and aligned with water management principles

Clearly defined outcomes and links between outcomes, objectives, strategies and indicators are the foundation of robust MER frameworks. The Plan does not clearly specify environmental,

²⁵⁶ National Water Commission (2014) *The National Water Planning Report Card 2013*, p. 11. Available at: <http://www.agriculture.gov.au/SiteCollectionDocuments/water/2013-national-water-planning-report-card.pdf>.

²⁵⁷ Data taken from the *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009* and DPI-Water (2016) *Water Sharing Plan for the Central Coast Unregulated Water Source 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166840/central-coast-unreg-background.pdf.

²⁵⁸ Except for pumps 500 millimetres or larger, which are required to comply by 1 December 2019. However, there are no pumps of this size in the Plan area according to WaterNSW. Source: Department of Industry – Water (2018) *NSW non-urban water metering framework*, p. 1 and p. 16. Available at: <https://www.industry.nsw.gov.au/water-reform/metering-framework>.

²⁵⁹ Information provided by WaterNSW on pump capacity data for the Plan area, received via email 7 February 2019.

²⁶⁰ DPIE-Water (2018) *NSW Non-Urban Water Metering Policy*, p. 17. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf

social and economic outcomes that are prioritised in line with the Act. It also does not provide suitable, well-defined objectives, strategies and performance indicators in line with best-practice approaches or present a clear logical flow between objectives, strategies and performance indicators.

The Plan's stated objectives reflect most of the water management principles listed in Section 5(2) of the Act, with the following exceptions not being addressed:

- Water quality of the water sources within the Plan area (Section 5(2)(c) of the Act), despite this objective being a feature of some water sharing plans.²⁶¹
- Cumulative impacts (Section 5(2)(d) of the Act).
- Groundwater dependent ecosystems (Section 5(2)(a) of the Act). Noting that Clause 10(a) of the Plan implicitly includes Type 2 groundwater dependent ecosystems as 'river flow dependent ecosystems' but this could be more explicit to include all groundwater dependent ecosystems, so that the three types are included: ecosystems supported physically within an aquifer (Type 1); ecosystems supported by discharging groundwater to the surface (Type 2) and ecosystems supported by the subsurface presence of groundwater (Type 3).

To support delivery of outcomes, the replacement Plan should include objectives, strategies and performance indicators that are SMART and that reflect and appropriately prioritise the full range of water management principles listed in the Act (outlined in **Section 1.1.1**). This would better align with the Act, particularly sections 20(2)(f) and 21(e) which refer to the water management principles.

The replacement Plan should also demonstrate the clear, logical relationship between objectives, strategies, performance indicators, and the Plan rules which have the potential to influence environmental, social and economic outcomes.

DPIE-Water is currently improving objectives in water sharing plans as part of the water resource planning process under the Australian Government's *Basin Plan*. The Commission understands that a similar approach will be taken to improve the coastal unregulated water sharing plans in future. Arrangements would need to be tailored to reflect the nature and scale of the Central Coast, but these programs could provide a suitable reference point in making a new MER framework for the replacement Plan.

Development of Plan objectives could also be informed by the *Central Coast Regional Plan 2036*, published in 2016, which identifies several regional goals and priorities.²⁶²

7.3 The replacement Plan should better support strategic adaptive management

The Plan includes provisions for adaptive management, including amending water sources and administrative boundaries, flow classes,²⁶³ record keeping requirements and Plan schedules.

²⁶¹ Section 21(d) of the Act includes a provision that enables water sharing plans to include 'water sharing measures for the protection and enhancement of the quality of water in the water sources in the area or for the restoration or rehabilitation of water sources or their dependent ecosystems'.

²⁶² Department of Planning and Environment (2016) *Central Coast Regional Plan 2036*, p. 29. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/central-coast-regional-plan-2036-2016-10-18.pdf>.

²⁶³ DPI-Water's 2014 unpublished audit report identifies that the Minister has not exercised the discretion to update changes to flow classes provided for in the Plan. (DPI-Water (2014) *Audit of Implementation – Central*

These provisions were intended to allow the Plan to be improved over time and incorporate new information, such as updated mapping and modelling.

During consultation, agricultural stakeholders indicated that they desired flexibility for the Plan to be improved as new information becomes available. None of these adaptive management provisions have been implemented.

Continually improving the Plan with new information is important due to the limitations in the evidence base when the Plan rules were set.

Existing monitoring data across water sources have not been used as part of an adaptive management program more broadly to:

- assess whether the adopted flow regime has been successful in positively contributing to environmental outcomes
- inform environmental protection decisions
- assess whether changes to Plan provisions are warranted.

The replacement Plan should better support strategic adaptive management in response to new information being generated. The types of information that could be used in replacement plan design and incorporated into an adaptive MER framework could include current and updated:

- climate change and climate variability modelling
- environmental and flow studies relevant to the catchment
- High Ecological Value Aquatic Ecosystems Assessment mapping undertaken by DPIE-Water and High Ecological Value mapping undertaken by the former OEH
- Groundwater dependent ecosystem mapping in the Bureau of Meteorology's *Groundwater Dependent Ecosystems Atlas*²⁶⁴
- land-use data including current infrastructure to inform modelling
- updated policies for example reasonable use guidelines
- current hydrological datasets
- ecological datasets and modelling (for example, SEED Portal²⁶⁵, *Directory of Important Wetlands*,²⁶⁶ listed threatened species, monitoring of vulnerable habitats, fish sampling)
- riverine and estuarine condition studies (some data is already available which should be built upon, AusRivers database, Land and Water Audit database)
- Saving our Species program threatened species data²⁶⁷
- targeted research projects to fill knowledge gaps and inform ongoing decision making

Coast Unregulated Water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014 (internal document).

²⁶⁴ Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas*. Available at: <http://www.bom.gov.au/water/groundwater/gde/>.

²⁶⁵ NSW Government (n.d.) *SEED Sharing and Enabling Environmental Data*. Available at: <https://www.seed.nsw.gov.au/edphome/home.aspx>.

²⁶⁶ Department of the Environment and Energy (n.d.) *Directory of Important Wetlands*. Available at: <http://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands>.

²⁶⁷ OEH (n.d.) *Saving our Species program*. Available at: <https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program>.

- socio-economic modelling.

7.4 Recommendations

In order to strengthen MER frameworks for the Plan, the Commission recommends the following:

Recommendations

- 8 DPIE-Water should include the following in the replacement Plan:
 - a) SMART objectives, strategies and performance indicators that align with the water management principles in the Act and clearly address the prioritisation of environmental, social (including native title) and economic outcomes
 - b) clear logical links demonstrated between the objectives, strategies, performance indicators and rules.
- 9 Finalise the MER framework for coastal water sharing plans by 2020, and include the following as part of the replacement Plan:
 - a) plan-specific MER requirements following the established framework
 - b) clear governance arrangements for MER, including roles and responsibilities
 - c) timely public reporting of the results of monitoring and evaluation activities to support transparency, public awareness and active compliance
 - d) appropriate governance arrangements and timeframes for adaptation and improvement, particularly in response to new information such as climate change
 - e) metering and record keeping provisions consistent with the NSW Government's new framework for measurement and metering of water take.

Suggested actions

- E* DPIE-Water should identify Plan-specific and state-wide research needs and knowledge gaps across all water sharing plans and seek to address these gaps in collaboration with other organisations and research institutions.
- F* DPIE-Water should make all monitoring, modelling and research publicly available to improve accountability and transparency.

8 Plan updates and implementation

8.1 Plan provisions should be updated

The Plan reflects some out of date references that should be updated in the replacement Plan, including:

- references to infrastructure that was not installed, such as Tillegra Dam
- redundant governance arrangements, such as the Wyong Shire and Gosford City councils
- programs which are no longer operating, such as the Aboriginal Water Initiative.

Confirmation of water source boundaries should be part of the replacement Plan, especially in the lower parts of the Plan area around estuaries and ICOLLs. All surface and alluvial groundwater sources should be within the Plan boundary, so that all extraction can be managed under the *Water Management Act 2000*. Using the mangrove limit as the Plan boundary may mean that some alluvial groundwater sources are not included. In addition, it is currently not clear why Terrigal Lagoon is not included in Clause 4 of the Plan.

During consultation, stakeholders raised issues around ambiguous provisions within the Plan, for example:

- different types of groundwater sources are not explicitly identified
- there may be inconsistencies between the Plan and licence conditions
- groundwater dependent ecosystems are not well defined.

These should be addressed in the replacement Plan in the interest of clarity for stakeholders.

8.2 Plan should be easy to understand and implement

During consultation, it was clear to the Commission that knowledge and understanding of the Plan is limited. The general lack of knowledge about the Plan and uncertainty around the rules is likely to cause unintentional non-compliance.

During this review, stakeholders commented that the complexity and legalese in the Plan and licences makes it difficult to understand requirements. While recognising that the Plan is a legal document, the replacement Plan needs to be accessible and easily understood. Guidance and background documents as well as replacement Plan rules should be simple, concise and written with a broad range of stakeholders in mind. This is likely to facilitate broader understanding of the Plan, improve clarity and transparency and avoid unintentional non-compliance.

Stakeholders have raised the issue that there has historically been a lack of communication regarding water sharing plan requirements to assist users understand their rights and obligations, and upcoming policy changes or emerging issues.

Stakeholder consultation generated anecdotal evidence of potential compliance issues, which could impact equitable water sharing, modelling and setting of sustainable limits. These primarily include extraction above licence limits, and licences not being up to date for installed infrastructure, including many unlicensed dams. The Commission considers that non-compliance presents a relatively low risk to Plan implementation given a high proportion of extraction is by the local water utility and metered.

Clarity and compliance could be addressed through ongoing community engagement and education sessions, education of various government departments who interact with landholders, and increasing the promotion of the National Resource Access Regulator.

Strengthening the overarching stakeholder engagement strategy developed as part of the water reform action plan²⁶⁸ would be useful to target DPIE-Water's efforts, particularly in coastal areas, to effectively use resources and maximise the benefits of stakeholder engagement. This needs to include a stakeholder engagement plan for the Plan area that specifies appropriate forums for engagement, for example, a stakeholder advisory panel. These activities should take place during plan development and on an ongoing basis to refresh and capture new users and community members.

8.3 Recommendations

To improve the implementation of the Plan, the Commission recommends the following:

Recommendations

- 10 DPIE-Water should revise provisions in the replacement Plan to:
 - a) reflect current governance and infrastructure arrangements
 - b) revisit the Plan boundary so that all alluvial groundwater sources are included
 - c) improve the clarity of language.

Suggested actions

- G* Adopt processes that support the replacement and implementation of the Plan:
 - a) enhance communication of the Plan through active, simple, and consistent language and modes of communication
 - b) improve implementation and enforcement of the Plan using clear and consistent governance, roles and responsibilities
 - c) strengthen existing processes for stakeholder engagement developed as part of the water reform action plan, and include an area-specific stakeholder engagement plan – this needs to specify appropriate forums for engagement, such as a stakeholder advisory panel, which includes a range of stakeholders with diverse interests and localised knowledge of water. Better communicate the current balance of water sharing and include a relevant performance indicator.

²⁶⁸ DoI-Water (2018) *Water Stakeholder and Community Engagement Policy*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/148529/IND-I-245-Water-Stakeholder-and-Engagement-Policy.pdf.