Department of Climate Change, Energy, the Environment and Water

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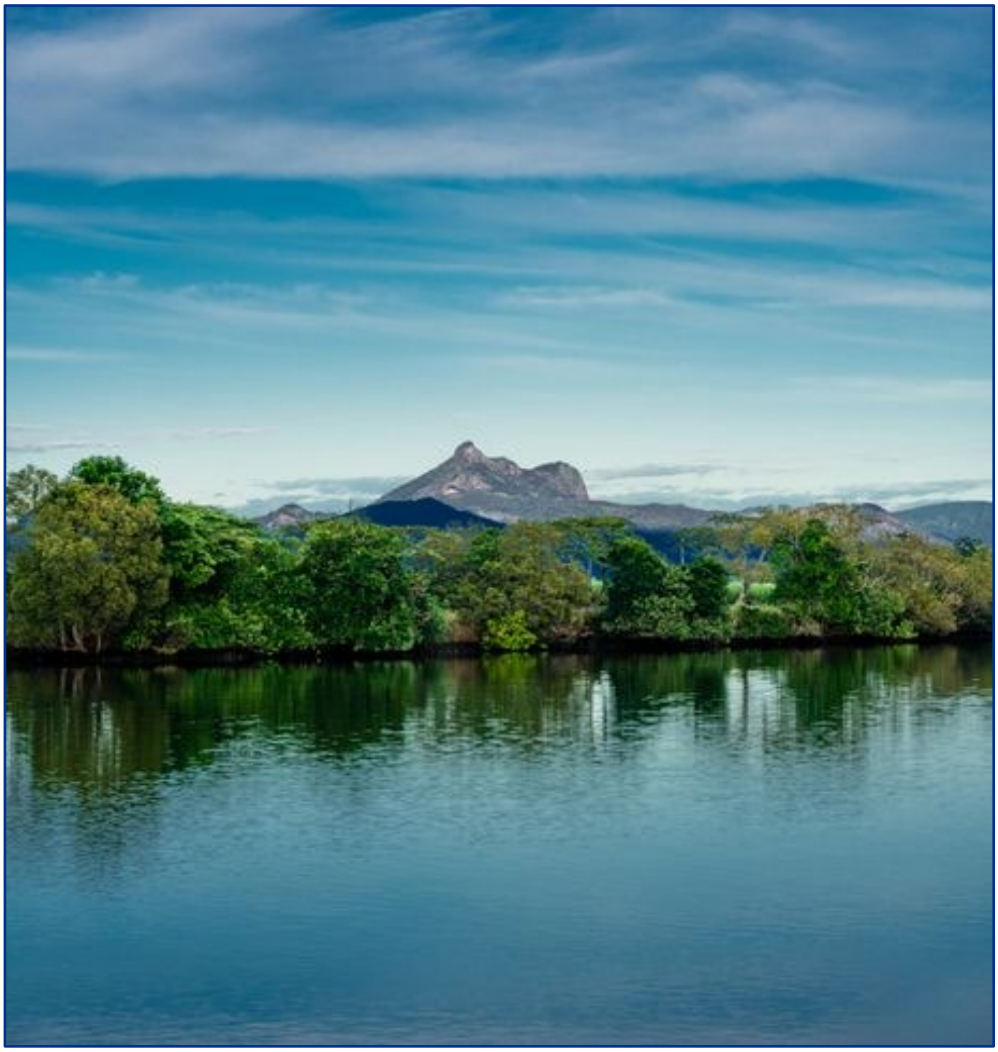
Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023

Background and changes

July 2023



Acknowledgement of Country

The Department Climate Change, Energy, the Environment and Water acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Contents

Glossary and abbreviations

Term	Definition
Aquifer	An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. The volume of water stored in an aquifer, the rate at which water can recharge, the volume of water extracted from it, and the rate at which water can move through the aquifer are all controlled by the geologic nature of the aquifer.
AWD	Available water determination
BLR	Basic landholder right
Cenozoic sediments	The system of rocks and other materials deposited during the latest geological era, the Cenozoic era.
CFA	Coastal floodplain alluvial
DCCEEW	The NSW Department of Climate Change, Energy, the Environment and Water, formerly known as Department of Planning and Environment.
EMU	Extraction management unit. A group of water sources; defined for the purpose of managing long-term annual average extraction.
GDE	Groundwater-dependant ecosystem These are ecosystems that rely on groundwater for their species composition and their natural ecological processes
ICOLLs	Intermittently closed and open lakes and lagoons

Term	Definition
LTAAEL	Long-term average annual extraction limit The long-term average annual volume of water in an extraction management unit available to be lawfully extracted or otherwise taken under access licences and basic landholder right requirements.
MER	Monitoring, evaluation and reporting
NRC	Natural Resources Commission
NRAR	Natural Resource Access Regulator
NSW	New South Wales
Reach scale	A length of river as determined by the difference in geomorphological characteristics that separates that length from others on the same waterway.
Share component	An entitlement to a given number of shares of the available water in a specified water source. The share component on an access licence certificate is expressed as a unit share. The share component of a specific-purpose access licence (for example, local water utility, major water utility and domestic and stock) is expressed in megalitres/year.
Third-order or higher streams	'Stream order' is used to describe the hierarchy of streams from the top to the bottom of a catchment. To determine the stream order of a stream the Strahler system must be applied to streams shown in the hydro line spatial data: https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data
Tweed 2010 plan	*The Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010*
Tweed 2023 plan	*The Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023*
WM Act	*Water Management Act 2000*

Term	Definition
WSP	Water sharing plan Generalised term used for any water sharing plan, not specific to a certain one.

1 Introduction

Water sharing plans were developed for rivers and groundwater systems across New South Wales following the introduction of the *Water Management Act 2000* (WM Act). These plans protect the health of our rivers and groundwater while giving water users perpetual access licences, sustainable resource management, equitable water sharing arrangements, and increased opportunities to trade water.

NSW water sharing plans are valid for 10 years from their start date. The NSW Department of Climate Change, Energy, the Environment and Water (the department) amends water sharing plans throughout their life to ensure they comply with changing legislation and to help carry them out. However, near the end of a plan's 10-year term, the Natural Resources Commission (NRC) formally reviews it to identify any changes that are necessary to deliver better outcomes for all water users, including the environment.

Water in the Tweed River Area has been managed through the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010* (the Tweed 2010 plan). This plan expired on 30 June 2023 and was replaced by the ***Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023*** (referred to from now on as the "Tweed 2023 plan").

This document gives high-level background information on the planning process as well as details of changes to management arrangements in the Tweed 2023 plan.

The Tweed 2023 plan covers 32 water sources: those defined by the Tweed 2010 plan, plus one new water source, the Tweed River Area Coastal Floodplain Alluvial Groundwater Source.

You can find links to the plan, maps and rule summary sheets on the Tweed 2023 plan pages of the department's website.

The resources in 'Appendix 1 – References and supporting documents' give more details of the plan area, its water resources and resource management.

2 Purpose of water sharing plans

Expansion of water extraction across NSW since the 20th century has seen increasing competition between water users (towns, farmers, industries, and irrigators) for access to water. This has placed pressure on the health and biological diversity of our rivers and aquifers.

In December 2000, the parliament of NSW passed the WM Act, which has the overall objective to

> 'provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations'

Water sharing plans play a major role in achieving this objective by providing a legal basis for sharing water between the environment and consumptive water users.

Water sharing plans are the primary legal framework for managing water access and sharing in NSW. They protect the basic rights of landholders to extract water and seek to balance the sustainable use of water for both economic and environmental outcomes.

3 Legislation, policy, and planning framework

3.1 Water Management Act 2000

The WM Act is the guiding legislation for water management in NSW. The WM Act allows for the sustainable and integrated management of water sources. It considers ecologically sustainable development, the protection and enhancement of the environment, and social and economic benefits.

The WM Act sets a maximum initial lifespan of 10 years for water sharing plans, at which point they need to be reviewed and replaced or extended. When deciding whether to extend or replace a water sharing plan, the responsible minister must consider:

- the most recent audit of the water sharing plan conducted under section 44 of the WM Act
- a report from the NRC that reviews (within the previous 5 years) if the water sharing provisions have significantly helped to achieve, or have failed to achieve, environmental, social and economic outcomes, and if those provisions should change.

Under the WM Act, a water sharing plan may be extended for up to 2 years past the expiry date to allow the department to prepare a replacement plan.

You can review the *NSW Water Management Act 2000* on the NSW Legislation website.

3.2 Water sharing plans

A water sharing plan sets out locally appropriate rules and management arrangements for specific water sources that align with the principles of the WM Act.

Key elements of water sharing plans include:

- providing water for the environment by protecting a proportion of the water available for fundamental ecosystem health
- protecting the water required to meet basic landholder rights

- setting annual limits on water extractions that ensures security for water users and the environment
- giving water users a clear picture of when and how water will be available for extraction
- giving licence holders flexibility in the way they can manage their water accounts
- specifying rules in groundwater plans to minimise effects on other groundwater users, groundwater-dependent ecosystems (GDEs), culturally significant sites, water quality and the stability of the aquifer
- specifying the rules for water trading/dealings
- setting the mandatory conditions that apply to licence holders.

You can view the current Tweed 2023 plan on the department's website.

3.3 NSW water policy

We are continuously evolving and improving water-related policy and decision-making processes that carry out the legislative framework to ensure effective delivery of our water resource management objectives. We develop plans in line with the principles of the WM Act and the National Water Initiative.

You can find more information on the National Water Initiative on the Commonwealth Department of Climate Change, Energy, the Environment and Water website.

3.4 Changes to policy for harvestable rights in coastal areas

In May 2022 the limit for uptake of harvestable rights water in coastal catchments was raised from 10% to 30%. As of 27 September 2023, the harvestable rights limit for coastal NSW has been returned to the previous limit of 10%, to allow sustainable levels of extraction to be determined prior to any increases in harvestable rights. The department has been in contact with the small number of customers who have registered to increase their harvestable rights storage capacity during this time and is working with the individuals to find suitable solutions.

The 2022 plan includes an amendment to assess uptake of harvestable rights within 3 years of the plan commencement to determine if there has been any increase in uptake of water due to the increase to 30%. The amendment also includes the ability to modify access rules in Parts 6 to 8 of the plan in response to any significant increases of uptake to protect critical environmental needs and basic landholder rights.

Due to the small number of instances where landholders have registered their intent to increase harvestable rights uptake the department does not expect any significant changes to rules in the plan as a result of an increased uptake of harvestable rights. For more information on the specific changes to harvestable rights please visit the department's frequently asked questions webpage or for general information, the harvestable rights webpage.

4 Water sharing plan review and replacement process

Under the WM Act, water sharing plans have a 10-year duration.

During the life of the plan, it will undergo an independent review at least twice, as follows:

- The **implementation of the plan** will be audited in the first 5 years of the plan under Section 44 of the WM Act
- The **performance of the plan** will be reviewed in the last 5 years of the plan under Section 43A of the WM Act.

The NSW NRC is the independent body that audits and reviews water sharing plans. The section 44 audits aim to identify where improvements are necessary to apply the plan rules. The section 43A review is to determine if the plan is achieving the intended environmental, social and economic outcomes.

The NRC reports the findings of the audits and reviews to the NSW minister responsible for water, who decides whether to extend a plan for another 10 years or to replace it. If the NRC recommends replacing it, the department considers the commission's recommendations when developing the replacement plan.

More information and links to the review of the Tweed 2010 plan are in Appendix 1 of this document.

The minister responsible for water at the time adopted the NRC's recommendation to replace the Tweed 2010 plan.

To allow time to review and replace the plan, the duration of the plan was extended by 2 years.

You can find more information on the water sharing plan review and replacement process in the Replacement Water Sharing Plan Manual (PDF 1.28 MB).

5 Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023

5.1 Overview

The Tweed 2023 plan comprises the Tweed River catchment and the adjoining smaller coastal catchments of Cudgen, Cudgera, Clothiers, Christies, Crabbes, Burringbar, Sheens and Mooball Creeks. It contains 31 water sources that are grouped into 3 extraction management units (EMUs) and one groundwater only source that is contained within its own EMU. The plan area includes the major towns of Tweed Heads and Murwillumbah and the coastal villages of Kingscliff, Hastings Point and Pottsville (Figure 1). Bordered by Queensland to its north, it is the most northerly of the NSW catchments and is located wholly within the Tweed Shire encompassing an area of approximately 1,325 square kilometres.

The Tweed catchment is bounded by a caldera escarpment (or volcanic rim), comprising the MacPherson Range (NSW – Qld Border) to the north, which generally exceeds 900 metres altitude, the Tweed Range to the west and the Nightcap and Burringbar Ranges in the south and south-east. A large portion of these elevated areas are protected as part of the Border Ranges, Mount Warning, and Nightcap national parks which, are part of the Tweed Volcano Group, which, in turn form part of the Gondwana Rainforest of Australia, a group of nature reserves given world heritage status. Additionally, in the Tweed catchment the Upper Rous River, Hopping Dicks Creek, Brays Creek and Upper Oxley River have been identified as possessing wilderness values (Metzler and Scott, 1988) while Cudgen Lake, Terranora Broadwater, Cobaki Creek, Broadwater Area, Mooball Creek, Clothiers Creek and the Tweed Estuary water sources contain land protected under the *State Environmental Planning Policy (Resilience and Hazards) 2021*, providing habitat for a high diversity of water dependent flora and fauna species.

Upstream of Murwillumbah, the Tweed and Oxley rivers drain the rugged and compact caldera that encircles Mt Warning/Wollumbin, which was previously the main volcanic vent. Below Murwillumbah, the Tweed River weaves across an extensive floodplain and is joined by the Rous River, which drains the moderately dissected mid north areas of the catchment, at Tumbulgum. The shallow, tidal waters at Terranora and Cobaki, which are fed by Bilambil,

Duroby, Piggabeen and Cobaki Creeks, join the river near its mouth via the Terranora Inlet before the river discharges to the ocean at Point Danger, immediately south of the NSW-Queensland border.

Tidal influence penetrates up the Tweed River to the Bray Park Weir approximately 5 kilometres upstream of Murwillumbah and dominates the river levels except during flood events. The major infrastructure that impacts on flows in the Tweed River system are Clarrie Hall Dam (16,000 ML) and the Bray Park Weir (approx. 520 ML). Extraction primarily for town water supply occurs from the Bray Park Weir pool which is supplied by both the Tweed and Oxley Rivers. Releases are made from Clarrie Hall Dam to top up the Bray Park Weir pool.

The small coastal catchments of Cudgen, Cudgera and Mooball Creeks, situated south of the Tweed River mouth are typical of many small coastal estuarine creeks along the northern NSW coast. They flow northwards behind coastal sand barriers and have dynamic, generally constricted entrances that largely control their tidal and morphological characteristics. As a result, these catchments can be subject to a wide range of water levels and discharges, together with a variable salinity caused by the mixing of ocean water with freshwater runoff from the land.

Significant primary industries in the water sharing plan area include agriculture, which accounts for 36 percent of land use, with sugarcane production being a significant industry.

Major population centres include Tweed Heads and Murwillumbah. The population of these towns increases several-fold during holidays, creating a significant demand on town water supplies. There are also several smaller coastal towns in the plan area such as Kingscliff, Hastings Point and Pottsville.

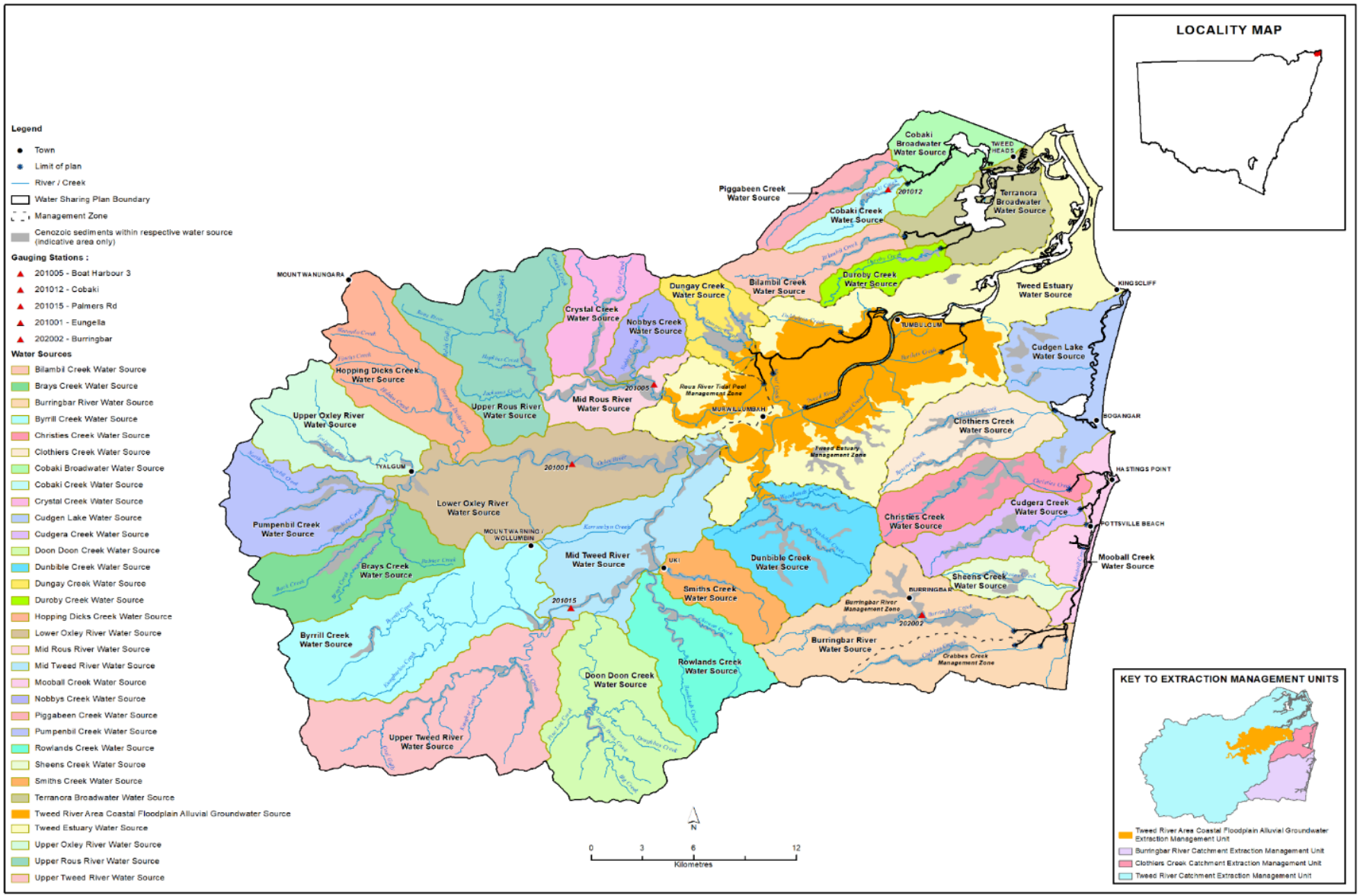

Figure 1. *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023* plan area

Total licensed entitlement for the plan area is approximately 35,346 ML a year. This entitlement represents average annual *potential* extraction. Reliable estimates of actual water usage across the plan area will not be possible until major extraction works are metered when required by the NSW non-urban metering policy.

In addition to licensed extraction, water is also required to meet basic landholder rights (BLR).

Table 1. Estimated requirements for water in the Tweed 2023 Plan - Basic Landholder Rights

Extraction type	Potential extraction (ML/year)
Domestic and stock	2,516
Native title	Zero at plan commencement
Harvestable rights	8,037

Table 2. Estimated requirements for water in the Tweed 2023 Plan - licensed extraction

Licenced extraction subcategory	Potential extraction (ML/year)
Domestic and stock	177
Local water utility	27,613
Unregulated river	7,106
Aquifer	450

The Tweed 2023 plan covers 32 water sources, including the new Tweed River Area Coastal Floodplain Alluvial Groundwater Source.

The extraction management units (EMUs) and water sources that are managed under the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023* are:

- **Clothiers Creek Catchment Extraction Management Unit**
  - Clothiers Creek Water Source
  - Cudgen Lake Water Source
- **Tweed River Area Coastal Floodplain Alluvial Groundwater Extraction Management Unit**
  - Tweed River Area Coastal Floodplain Alluvial Groundwater Source
- **Burringbar River Catchment Extraction Management Unit**

- Burringbar River Water Source
- Christies Creek Water Source
- Cudgera Creek Water Source
- Mooball Creek Water Source
- Sheens Creek Water Source

- **Tweed River Catchment Extraction Management Unit**
  - Bilambil Creek Water Source
  - Byrrill Creek Water Source
  - Cobaki Creek Water Source
  - Doon Doon Creek Water Source
  - Dungay Creek Water Source
  - Hopping Dicks Creek Water Source
  - Mid Rous River Water Source
  - Nobbys Creek Water Source
  - Pumpenbil Creek Water Source
  - Smith's Creek Water Source
  - Tweed Estuary Water Source
  - Upper Rous River Water Source
  - Brays Creek Water Source
  - Cobaki Broadwater Water Source
  - Crystal Creek Water Source
  - Dunbible Creek Water Source
  - Duroby Creek Water Source
  - Lower Oxley River Water Source
  - Mid Tweed River Water Source
  - Piggabeen Creek Water Source
  - Rowlands Creek Water Source
  - Terranora Broadwater Water Source
  - Upper Oxley River Water Source
  - Upper Tweed River Water Source

5.2 Previous Tweed 2010 plans

Water in the Tweed River Area was previously managed through:

- the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010*

Further information on the Tweed 2010 plan can be found in the:

- Water Sharing Plan Tweed River Area Unregulated and Alluvial Water Sources 2010 Background Document (PDF, 979 KB)

The Tweed 2010 Plan was developed using the macro planning approach and included extensive stakeholder and interagency consultation. Details of the macro-planning approach can be found in the following documents:

- Macro water sharing plans - approach for unregulated rivers (PDF 829KB)
- Macro water sharing plans – access and trading rules for pools (PDF 627 KB)
- Macro water sharing plans - the approach for groundwater (PDF 3.11 MB).

As of 1 July 2023, the water sources of the Tweed River Area are now managed under the Tweed River Area Unregulated and Alluvial Water Sources 2023.

5.3 Developing the Tweed 2023 plan

The processes that the department has used in developing the replacement plan are an update on the previous macro–planning approach.

The development of replacement plans now follows the processes described in the Replacement Water Sharing Plan Manual (PDF 1.32 MB).

We continue to use some methods described in the macro-planning approach. This background document will describe the most recent and specific methods used to prepare the Tweed 2023 plan.

The department is responsible for implementing the WM Act, including developing water sharing plans for NSW water resources. When drafting the Tweed 2023 plan, we considered:

- the section 44 audit of the *Water sharing plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010*
- recommendations from the Natural Resources Commission's 2021 review (PDF 3.5MB) of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources.
- updated data, information and science
- the deliberations across government agencies including: the Water group and Environment and Heritage branch within the department, Department of Primary Industries' Agriculture and Fisheries branches, and the Natural Resource Access Regulator
- changes in policy e.g. change in harvestable rights
- consultation with Tweed Shire Council and water user representatives in 2021 and 2022.

You can find the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023* on the department's website.

Details of the changes from the Tweed 2010 plan to the Tweed 2023 plan are provided in Section 6 of this document.

You can find information on the public exhibition phase of the Tweed 2023 plan in Section 5.5 of this document.

5.4 First Nations consultation

First Nation engagement during plan development was hindered by the COVID 19 pandemic. We consulted with First Nations people in the Tweed area in November 2022 in conjunction with discussions on the Far North Coast Regional Water Strategy. We contacted the Local Aboriginal Land Council prior to the public exhibition period to ask if they were interested in another meeting although they were unable to attend. Consultation will be ongoing throughout the life of the plan.

5.5 Public exhibition and finalising the 2023 plan

The department exhibited the draft replacement Tweed 2023 plan between 31 October and 18 December 2022. We held 2 public information sessions to inform the public and get feedback on the draft water sharing plan. These were in the form of an online webinar on 8 November 2022 and a face-to-face session in Murwillumbah on 15 November 2022.

During the public exhibition period, there were 267 unique hits on the plan's public exhibition website. We had one meeting with Local Aboriginal Land Council representatives and one meeting with a Tweed Shire Council representative.

We received 4 formal submissions. Issues raised in submissions are summarised in the 'What We Heard' document.

In finalising the recommended Tweed 2023 plan, the department considered submissions as well as further deliberations and input from government agencies including the Water Group and Environment & Heritage Branch from the department, the Department of Primary Industries' Agriculture and Fisheries divisions, and the Natural Resources Access Regulator.

Section 6 of this document details changes from the previous plan to the current plan.

6 Changes from the 2010 plan and the 2023 plan

6.1 Overview

Key drivers for the changes in the Tweed 2023 plan were:

- the NRC's review recommendations
- contemporary water resource policy – some changes to the plan align it with current policy to help improve efficiency and consistency in achieving water resource management objectives across the state
- updated data and knowledge improvements
- consultation on the draft plan, feedback and submissions.

Changes to the plan reflect improved understanding and updated data. They aim to modernise and simplify the water sharing plan to make it easier to understand, while ensuring provisions can be implemented and are legally accurate.

Changes were made to:

- the general layout of the plan
- include a new coastal floodplain alluvial groundwater source
- the identification of individual planned environmental water provisions
- the vision, objectives, strategies, and performance indicators
- the definition of the long-term average annual extraction limit
- prohibit in-river dams in some water sources
- the map to reflect the new water source
- flow reference points and access rules
- basic land holder right estimates and access licence share components
- distance rules for groundwater works
- trade provisions
- prohibit water supply works approvals near *State Environment Planning Policy (Resilience and Hazards) 2021* wetlands and potential acid sulfate soils
- adaptive management and amendment provisions
- add the high-priority Groundwater Dependent Ecosystem (GDE) map and to remove the schedule to reflect updated information

- Aboriginal Community Development Licences and High Flow Conversions, and
- metering provisions to account for non-urban metering.

Appendix 2 - Substantive changes made between the draft and final water sharing plan, includes information about substantive changes made between the draft and final water sharing plans, and if a change was in response to submission received.

For a summary of all issues raised in submissions, regardless of whether they led to a change, please refer to the Outcomes of public exhibition section of the department's website and the What we heard document.

Rules Summary Sheets for each water source are available on the department's website. These detail the relevant rules that apply to each water source in the Tweed 2023 plan.

6.2 General layout changes

There are several structural layout changes in the Tweed 2023 plan. We have moved or reworded clauses, but their intent is the same. Such changes reflect current template styles and provide a more standard and consistent layout across the state's water sharing plans, as well as making the water sharing plan easier to understand.

For example, we have removed unnecessary notes as well as moving and consolidating amendment provisions to the amendment part of the plan.

6.3 Inclusion of a coastal floodplain alluvial groundwater source

Not all groundwater in alluvial sediments downstream of the tidal limits was included in the prior water sharing plans. The Tweed 2023 plan establishes a new water source, Tweed Coastal Floodplain Alluvial Groundwater Source, to manage groundwater extractions from alluvial deposits downstream of the tidal limits. The extent of the water source captures alluvial deposits that are less connected to the overlying surface water than upriver alluvial sediments.

The boundaries of the new water source are shown on the map in Figure 1. You can find a high-resolution map of the Tweed 2023 water sharing plan area on the department's website.

Existing WM Act groundwater licences within the new alluvial groundwater source area will be amended to reflect the new water source. The establishment of the new alluvial groundwater source does not result in tangible changes for existing water users taking from the water source or affect water availability for these users.

Water sources managed under a water sharing plan are subject to long-term average annual extraction limits (LTAAELs). The new coastal floodplain alluvium (CFA) groundwater source has an LTAAEL of 725 megalitres/year. This volume caters for current and estimated future demand and is equivalent to 25% of the average annual recharge for the water source.

In determining the limit, the department considered the principles set out in Macro water sharing plans – the approach for groundwater (PDF, 2,414.13 KB).

Unlike other water sources in the Tweed 2023 plan area, more licence shares may be granted in the CFA water source through a controlled allocation process. This is because the sum of current entitlement and BLR is well below the LTAAEL.

Aboriginal community development and Aboriginal cultural specific purpose access licences may be granted in this water source.

Trading into the CFA water source is prohibited as it is not hydrologically highly connected to any other water sources.

The Minister for Water makes available water determinations (AWDs) each year to allot a volume of water for each water allocation account. The Tweed 2023 plan sets out the rules for how those accounts are to be managed.

We also use AWDs to return extraction in a water source to the LTAAEL if it is exceeded. This is unlikely in the case of this CFA as the proposed extraction limit is much higher than combined current entitlement and BLR use.

6.4 Change to the map

The plan defines its limit and this is shown on the plan map. The updated Tweed 2023 plan map is included here as Figure 1. The relevant changes to the Tweed 2023 plan map are:

- the inclusion of the new coastal floodplain alluvial groundwater source discussed in Section 6.3
- the replacement of the term ‘alluvial sediments’ with ‘Cenozoic sediments’ as this better defines the sediments being described (see glossary for definition), and
- the inclusion of the Burringbar River gauging station.

6.5 Vision, objectives, strategies and performance indicators

Part 2 of the plan describes the vision and objectives. The plan vision encompasses the overall aim of the plan. The vision of the plan is to provide for the:

- health of the water sources and their dependent ecosystems
- continuing productive extraction of water for economic benefit
- spiritual, social, customary and economic benefits of water to Aboriginal communities
- social and cultural benefits to urban and rural communities.

The objectives are arranged into 4 categories: environmental, economic, Aboriginal cultural, and social and cultural. They are to:

- protect and where possible enhance and restore the condition of the water sources and their water-dependent ecosystems
- maintain and where possible improve access to water to optimise economic benefits for agriculture, water-dependent industries and local economies
- maintain and where possible improve the spiritual, social, customary and economic values and uses of water by Aboriginal people
- provide access to water to support water-dependent social and cultural values.
- help prevent structural damage to aquifers resulting from groundwater extraction.

We will include more detailed and SMART (specific measurable, achievable, realistic and timely) objectives in the relevant MER plan. These will clearly link objectives, strategies and performance indicators. This addresses the NRC's recommendation to strengthen MER of the plan outcomes.

The vision, objectives, strategies and performance indicators that will form part of and guide the MER plan are in Appendix 3.

6.6 Identification of planned environmental water provisions

Planned environmental water (PEW) is a key component of water sharing plans. The Tweed 2010 plan had a section on PEW that pointed to other parts of the plan to identify where water is reserved for the environment. This included access rules.

Instead of having a separate section on planned environmental water, the Tweed 2023 plan includes the rules associated with PEW in the relevant sections. Wherever a clause or section of the plan relates to PEW, a note is included, pointing to the relevant section of the WM Act.

6.7 Updated basic landholder rights estimates and licence share components

The Tweed 2023 plan updates the estimate of extraction of water under basic land holder rights (BLR). The water access licence share components (water entitlements for each water source) have also been updated to reflect total share components for each water source at the commencement of the Tweed 2023 plan. The new figures are in Part 3 of the Tweed 2023 plan.

Since the development of the first water sharing plans, which began before 2003, numerous methods have been followed to estimate water requirements for domestic and stock BLR. These methods were superseded by a standard NSW approach to support the development of surface and groundwater macro sharing plans in 2010.

In 2020, we adopted the method used in the development of macro water sharing plans to estimate the requirements of domestic and stock basic landholder rights. This method can be found in Appendix 5 of the Replacement Water Sharing Plan Manual (PDF 1.28 MB).

The estimates in the Tweed 2023 plan may differ from estimates in the Tweed 2010 plan due to changes in land use, population density and the availability of more accurate spatial data.

An estimate was made for the annual volume of water used from harvestable rights dams. This involved identifying dams that were not located in third order or larger streams and determining the annual volume of water that could be taken from those dams for each water source. For more detail, please see Appendix 4.

The water access licence share components (water entitlements for each water source) are listed in Part 3 of the Tweed 2023 plan. They reflect total share components in each water source, as per Water NSW Water Licencing Systems database at the time of the review.

6.8 Aboriginal Community Development Licences

The NSW Government is committed to providing Aboriginal people with opportunities to become involved in water-related businesses. Therefore, the water sharing plans allow for Aboriginal Community Development Licences (ACDLs). These licences can be used for

commercial activities owned/operated by Aboriginal people and could include such activities as:

- irrigation cropping
- horticulture, such as fruit, vegetables, flowers or ornamental plants
- aquaculture, such as oyster growing or prawn farms
- non-agricultural activities, such as manufacturing or crafts.

The situations where the licences can be granted must recognise the need to protect our rivers and aquifers from increased extraction. In our coastal rivers, higher and more reliable flows are common and provide an opportunity for licences to be granted for Aboriginal commercial activities, provided this additional extraction would not negatively impact on ecological values that are dependent on high flows. For this reason, ACDLs in unregulated rivers may only be issued which allow water to be extracted from rivers during the higher flows and stored in farm dams or tanks, to be used as needed.

It should be noted that if an unregulated river water source does not have a gauging station within it, ACDLs will not be permitted due to not having any way to measure or determine when the waterways within the water source are in high flows.

The ability to grant ACDLs has been removed from the Lower Oxley River and Upper Tweed River water sources because the ecological risk assessment completed for the plan determined high or very high for ecological value in these water sources.

The ability to grant ACDLs has been added to the Crystal Creek and Nobbys Creek water sources in the Tweed 2023 plan. Aboriginal Community Development Licences can also be granted in the Tweed River Area Coastal Floodplain Alluvial Groundwater Source.

Table 3. Changes to water sources and limits where ACDLs are permitted

Tweed 2010 Plan	Tweed 2023 Plan
Hopping Dicks Creek - 143 ML/year	Hopping Dicks Creek - 72 ML/year
Lower Oxley River - 500 ML/year	n/a
Mid Rous River - 297 ML/year	Mid Rous River - 30 ML/year
Upper Rous River - 209 ML/year	Upper Rous River - 68 ML/year
Upper Tweed River - 121 ML/year	n/a

Tweed 2010 Plan	Tweed 2023 Plan
n/a	Tweed Coastal Floodplain Alluvial Groundwater Source - 500 ML/year Crystal Creek - 33 ML/year Nobbys Creek - 18 ML/year

6.9 Updated definition of extraction limit

The extraction limits restrict total extractions from an extraction management unit over the long term or annually.

The NRC recommended that we establish and publish sustainable, fixed, numeric LTAAELs. In response, we have split the LTAAEL into 2 components:

1. The **Standard LTAAEL** applies to take from all flows (excluding take from licences that can access high flows only) and includes all BLR extraction (including harvestable rights). This is a fixed volume.
2. The annual **Higher-Flow extraction limit** applies to extraction that can only occur from high flows. This volume can vary as licences can be converted to high-flow licences or if licences are granted for specific purposes in high flows, such as high flow licences, licences for initial fills of dams and Aboriginal community development licences.

Fixing the standard LTAAEL and including maximum harvestable rights – as at the start of the first plan –allows us to manage any growth in water extraction. If the 3-year average extraction increases to more than 5% above the standard LTAAEL (from licensed take plus BLR take, including harvestable rights), then we may announce a reduced AWD to bring extractions back to the extraction limit. The AWD can only be applied to licensed water users.

The standard LTAAELs for extraction management units (EMUs) covered by the Tweed 2023 plan are:

- Burringbar River Catchment EMU – 5,355 ML/year
- Clothiers Creek Catchment EMU – 2,409 ML/year
- Tweed River catchment EMU – 56,936 ML/year
- Tweed River Area CFA Alluvial Groundwater Source EMU - 725 ML/year

The annual higher flow limit applies to the Burringbar River, Clothiers Creek and Tweed River EMUs only and is defined as:

- the largest sum of the share components of all higher flow extraction licences within the extraction management unit occurring within a water year.

6.10 Updates to flow reference points and access rules

Based on a review of access rules, there have been several changes (refer to Table 3). The access rules are found in Part 6 and Schedule 1 of the Tweed 2023 plan.

For the water sources which reference the Cobaki gauge (201012), (**Bilambil Creek, Cobaki Broadwater, Cobaki Creek, Duroby Creek and Piggabeen Creek Water Sources**) a new pumping restriction has been included for when the flow drops below 1 ML/day. This will help slow down reaching the cease to pump level of 0.5ML/day and should enable access for longer before the cease to pump is triggered.

For the first time the **Burringbar River Management Zone** will use a flow level of ≤ 1.1ML/day at the Burringbar gauge (202002) as the cease to pump, as it has recorded over 10 years of flow data. We analysed the flow data and found that 1.1ML/day:

- provides protection for fish migration, tadpole survival of water dependent endangered frog species and other flow dependent fauna,
- protects against cease-to-flow and maintains connectivity for downstream wetlands and estuary water sources before flows reach critical levels,
- prevents ingress of salinity into Mooball Creek estuary,

The Tweed 2023 plan also includes a new pumping restriction in the Burringbar River Management Zone for when the flow drops below 1.5ML/day. This will help slow down reaching the cease to pump level and should enable access for longer before the cease to pump is triggered.

The **Crystal Creek and Nobbys Creek water sources** cease to pump level has been increased slightly from 6 ML/day to 6.8ML/day at the Boat Harbour 3 gauge (201005). The increased cease to pump level will protect critical low flows and maintain connectivity for longer along the water courses.

For the three other water sources which reference the Boat Harbour 3 gauge, **Upper Rous, Mid Rous and Tweed Estuary water sources** we changed the cease to pump level to be more consistent with the percentile flows for other water sources within the Tweed River catchment.

For the **Oxley River catchment area**, the cease to pump flow level was changed to 8 ML/day at the Eungella gauge (201001). for the following reasons:

- provides improved protection for macroinvertebrate communities and threatened frog species, and
- provides some protection for minimum flow depth required for movement and dispersal by large-bodied fish.

The **Upper Tweed River, Byrrill Creek, Doon Doon Creek, Mid Tweed River, Rowlands Creek, and Smiths Creek water sources** used the Eungella gauging station in the adjacent catchment as the flow reference point in the Tweed 2010 plan. In the Tweed 2023 plan we have changed the flow reference point to a flow level as the Palmers Road gauge (201015) as it has recorded over 10 years of flow data. We analysed the flow data and found that a cease to pump of 4ML/day:

- protects minimum flow depth requirements for large-bodied fish movement, and
- provide improved connectivity within the water source and with downstream water sources and estuaries.

Water sources in the Oxley River catchment (**Brays Creek, Hopping Dicks Creek, Lower Oxley River, Pumpenbil Creek and Upper Oxley River water sources**) are subject to an access rule where water must not be accessed when flows are equal to or greater than 125ML/day and less than or equal to 795ML/day. A similar rule applies to water sources in the Tweed River Catchment (The **Upper Tweed River, Byrrill Creek, Doon Doon Creek, Mid Tweed River, Rowlands Creek, and Smiths Creek water sources**) where water cannot be accessed when flows are equal to or greater than 45ML/day and less than or equal to 147ML/day. These rules protect flows required to trigger spawning migrations and facilitate movement through Bray Park weir fishway for large-bodied fish.

Table 4. Changes to access rules and flow reference points in the Tweed 2023 plan

Note:

- *VLF stands for Very Low Flow and is the flow at which extraction of water must cease*
- *all flow measurements are in megalitres per day, displayed as ML/d*
- *CTP stands for Cease to Pump, and*
- *MZ stands for management zone.*

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
Cobaki gauge (201012)	Bilambil Creek Cobaki Broadwater Cobaki Creek Duroby Creek Piggabeen Creek	Cease to pump (CTP) ≤ 0.5ML/day VLF: ≤ 0.5ML/day A Class: > 0.5 ML/day	Cease to pump (CTP) ≤ 0.5ML/day VLF: ≤ 0.5ML/day A Class: > 0.5 ML/day 6 hrs pumping/day when flow is 0.5 – 1 ML/day
2010 Plan Burringbar staff gauge in Burringbar River pool under Pacific Highway bridge **2023 Plan Burringbar gauge (202002)**	Burringbar River – Burringbar River MZ	Cease to pump (CTP) when no visible flow at Burringbar staff gauge in Burringbar River pool under Pacific Highway bridge	Cease to pump (CTP) ≤ 1.1ML/day VLF: ≤ 1.1ML/day A Class: > 1.1 ML/day 6 hrs pumping/day when flow is 1.1 – 1.5 ML/day Flow reference point is Burringbar gauge (202002).

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
Boat Harbour 3 gauge (201005)	Mid Rous River Upper Rous River	Cease to pump (CTP) ≤ 1ML/day VLF: ≤ 1ML/day A Class: > 1ML/day≤28ML/day B Class >28 ML/day	Cease to pump (CTP) ≤ 2ML/day VLF: ≤2ML/day A Class: > 2ML/day ≤28ML/day B Class: > 28ML/day
Boat Harbour 3 gauge (201005)	Crystal Creek Nobbys Creek	Cease to pump (CTP) ≤ 6ML/day VLF: ≤ 6ML/day A Class: > 6ML/day ≤ 28ML/day B Class: > 28ML/day* *B Class applied only to Crystal Creek water source in the Tweed 2010 plan.	Cease to pump (CTP) ≤ 6.8ML/day VLF: ≤ 6.8ML/day A Class: > 6.8ML/day ≤ 28ML/day B Class: > 28ML/day
Boat Harbour 3 gauge (201005)	Tweed Estuary – Rous River tidal pool MZ	Cease to pump (CTP) ≤ 1ML/day VLF: ≤ 1ML/day A Class: > 1ML/day	Cease to pump (CTP) ≤ 2ML/day VLF: ≤ 2ML/day A Class: > 2ML/day

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
Eungella gauge (201001)	Upper Oxley River	Cease to pump (CTP) ≤ 3ML/day VLF: ≤ 3ML/day A Class: > 3ML/day 6 hrs pumping/day when flow is 3 – 5 ML/day	Cease to pump (CTP) ≤ 8ML/day VLF: ≤ 8ML/day A Class: > 8ML/day 6 hrs pumping/day when flow is 8 – 13 ML/day First Flush rule - No pumping when the flow at the Eungella Gauge (201001) is between 125 – 795 ML/day
Eungella gauge (201001)	Brays Creek Hopping Dicks Creek Lower Oxley River Pumpenbil Creek	Cease to pump (CTP) ≤ 3ML/day VLF: ≤3ML/day A Class: > 3ML/day ≤43ML/day B Class: > 43ML/day 6 hrs pumping/day when flow is 3 – 5 ML/day	Cease to pump (CTP) ≤ 8ML/day VLF: ≤8ML/day A Class: > 8ML/day ≤43ML/day B Class: > 43ML/day 6 hrs pumping/day when flow is 8 – 13 ML/day First Flush rule - No pumping when the flow at the Eungella Gauge (201001) is between 125 – 795 ML/day

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
2010 Plan **Eungella gauge (201001)** **2023 Plan** **Palmers Road gauge (201015)**	Upper Tweed River	Cease to pump (CTP) ≤ 3ML/day VLF: ≤3ML/day A Class: > 3ML/day ≤43ML/day B Class: > 43ML/day 6 hrs pumping/day when flow is 3 – 5ML/day at the Eungella gauge	Cease to pump (CTP) ≤ 4ML/day VLF: ≤4ML/day A Class: > 4ML/day ≤43ML/day B Class: > 43ML/day 6 hrs pumping/day when flow is 4 – 6 ML/day First Flush rule - No pumping when the flow at the Palmers Road Gauge (201015) is between 45 – 147 ML/day. Flow reference point is Palmers Road gauge (201015)

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
2010 Plan **Eungella gauge (201001)** 2023 Plan **Palmers Road gauge (201015)**	Byrrill Creek Doon Doon Creek Mid Tweed River	Cease to pump (CTP) ≤ 3ML/day VLF: ≤3ML/day A Class: > 3ML/day 6 hrs pumping/day when flow is 3 – 5ML/day at the Eungella gauge	Cease to pump (CTP) ≤ 4ML/day VLF: ≤4ML/day A Class: > 4ML/day 6 hrs pumping/day when flow is 4 – 6 ML/day First Flush rule - No pumping when the flow at the Palmers Road Gauge (201015) is between 45 – 147 ML/day. Flow reference point is Palmers Road gauge (201015)

Flow Reference Point	Water Sources	Previous access rules (Tweed 2010 plan)	Current access rules (Tweed 2023 plan)
2010 Plan Eungella gauge (201001) 2023 Plan Palmers Road gauge (201015)	Rowlands Creek Smiths Creek	Cease to pump (CTP) ≤ 3ML/day VLF: ≤3ML/day A Class: > 3ML/day	Cease to pump (CTP) ≤ 4ML/day) VLF: ≤4ML/day A Class: > 4ML/day 6 hrs pumping/day when flow is 4 – 6 ML/day First Flush rule - No pumping when the flow at the Palmers Road Gauge (201015) is between 45 – 147 ML/day. Flow reference point is Palmers Road gauge (201015)

Table 5. Changes to access rules for take of water from pools in the Tweed 2023 plan

Pool Type	Previous Access Rules (Tweed 2010 Plan)	Current Access Rules (Tweed 2023 plan)
In-river dam pool	As per work approval conditions	As per work approval conditions as long as work approval references the in-river dam.
In-river natural pool	No visible flow in the pool and when flows are in the very low flow class Pumping hour restrictions apply	No permitted when pool is below full capacity and flow is in the very low flow class Pumping hour restrictions apply

Pool Type	Previous Access Rules (Tweed 2010 Plan)	Current Access Rules (Tweed 2023 plan)
Off-river pools	No visible flow in the pool and when flows are in the very low flow class Pumping hour restrictions apply	Not permitted when pool is below full capacity unless otherwise stated in the conditions of the licence or work approval.

6.11 Total daily extraction limits

The Tweed 2010 plan establishes TDELs. These have been removed from the Tweed 2023 plan as monitoring, infrastructure and management frameworks are not currently to the level required to implement them.

6.12 Prohibition of in-river dams

Construction of licensed dams on third order or higher stream has been identified as a key threatening process for catchment and marine environments.

In-river dams on streams of third-order or higher are generally banned in water sources where:

- we have identified it in our risk assessment as having high ecological value, or
- such a prohibition was already in place in the Tweed 2010 plan.

For the Tweed 2023 plan in-river dams on streams of third-order or higher, based on the Strahler stream order system, are prohibited in the following water sources:

- Brays Creek
- Burringbar River – Burringbar River Management Zone
- Byrrill Creek
- Doon Doon Creek
- Lower Oxley River
- Mid Tweed River
- Mooball Creek
- Pumpenbil Creek
- Terranora Broadwater

- Upper Oxley River
- Upper Tweed River

The Tweed 2023 plan also includes an exemption to this rule for the purposes of Town Water Supply, except for in the Byrrill Creek water source.

These rules can be found in Part 7 Division 2 of the Tweed 2023 plan.

6.13 Changed distance rules for groundwater works

The Tweed 2023 plan includes standard distance rules for groundwater works. A detailed description of all current rules is available in the 'Rules Summary Sheet for Groundwater Works Approvals' on the department's website.

These include rules for:

- minimising interference between water supply works
- water supply works located near contamination sources
- water supply works located near high-priority, GDEs
- water supply works located near potential acid sulfate soils
- water supply works located near groundwater-dependent, culturally significant areas
- water supply works used solely for BLR
- replacement groundwater works.

New or amended water supply works near **contaminated sources** will not be granted:

- within 500 metres of a contamination site identified by the plan
- within 250 metres from the edge of a contamination plume and an onsite sewage system
- between 250 metres and 500 metres of the edge of a contamination plume where drawdown will occur within 250 metres of the edge of the contamination plume.

The Tweed 2023 plan includes a new rule that new works to take groundwater must be a minimum of 200 metres (100m for a BLR only work) from a **high-priority GDE** identified on the GDE map if we have confirmed there is high probability of groundwater dependence.

Additionally, a water supply work approval must not be granted or constructed within 200m of a wetland or spring and 500m of a karst system in any water source unless the minister's opinion is that there will be no more than minimal harm to the water source and its associated ecosystems and ecological processes, high priority groundwater-dependent ecosystem, wetland, karst or spring concerned.

These restrictions in relation to GDEs do not apply if:

- it is a replacement groundwater work
- the work is for monitoring environmental remediation activities or emergency services
- in the Minister's opinion, the location of the water supply work is likely to cause no more than minimal harm to the water source and its associated ecosystems and ecological processes, high priority groundwater-dependent ecosystem, wetland, karst or spring concerned.

Rules now prohibit construction of new bores in an area classed as having a high probability of the occurrence of **acid sulfate soils** if there is significant risk of acidification of the water sources. There is a map available on the department's SEED information portal to determine where there is a high probability of acid sulfate soils in coastal areas of NSW.

Rules are also included for the minimum distance between a groundwater bore and a **groundwater-dependent, culturally significant site**. We will not grant new water supply works within the following distances of a groundwater-dependent, culturally significant site:

- 100 metres, if the bore is for BLR bores
- 200 metres, for all other bores.

Unless in the Minister's opinion, the location of the water supply work at a lesser distance would result in no more than minimal harm to a groundwaterdependent culturally significant area.

Distance rules for new bores near existing ones on neighbouring properties have also changed to prevent **effects on bores on neighbouring properties**. A new bore must be a minimum of:

- 200 metres from a bore on a neighbouring property (whether it is used solely for BLR or licensed extraction)
- 100 metres from the boundary of another property that has a bore, unless the licence holder of the bore on the neighbouring property has given written consent.

Unless in the Minister's opinion, the location of the water supply work from an existing water supply work at a lesser distance than the distance would result in no more than a minimal detrimental effect on the water available for take using the existing water supply work.

Before a groundwater water supply work is approved, the application goes through an assessment process to make sure the work would not have impacts to connected surface water, the aquifer, neighbouring bores or GDEs. More information on groundwater assessments is found on the departments website.

6.14 Changes to trade provisions

Trade rules form Part 8 of the Tweed 2023 plan.

Trade of entitlement is not permitted:

- between water sources that are not hydrologically connected (that is, the water sources do not drain into each other), or
- into water sources that have high ecological value
- where there are no references points/gauges.

We have changed the trade rules in the Tweed 2023 plan to maintain opportunities for trade while complying with the above limitations.

Tables 6 and 7 list the changes to trade rules for the Tweed 2023 plan. Some water sources that permitted trade in the Tweed 2010 plan no longer permit trade into them because the risk assessment completed using High Ecological Values Aquatic Ecosystems data and hydrological stress ratings identified these water source have high or very high ecological values.

Table 6. Changes to rules for trading into water sources

Tweed 2010 plan	Tweed 2023 plan
Trade into the following water sources is permitted: • Bilambil Creek (no net increase in entitlement) • Brays Creek (+170ML) • Clothiers Creek (only from Cudgen Lake) • Cobaki Creek (no net increase in entitlement) • Crystal Creek (no net increase in entitlement) • Cudgen Lake (only from Clothiers Creek) • Dunbible Creek (no net increase in entitlement). • Dungay Creek (no net increase in entitlement) • Duroby Creek (no net increase in entitlement) • Hopping Dicks Creek (+ 94ML) • Lower Oxley River (+663ML) • Mid Rous River (no net increase in entitlement) • Mid Tweed River • Nobbys Creek (no net increase in entitlement) • Piggabeen Creek (no net increase in entitlement) • Pumpenbil Creek (no net increase in entitlement) • Rowlands Creek (+ 1,871ML) • Smiths Creek (+ 23ML) • Tweed Estuary (no net increase of entitlement in the Rous Tidal Pool Management Zone) • Upper Oxley River (+418ML) • Upper Tweed River (no net increase in entitlement) • Upper Rous River (+385ML)	Trade into the following water sources is permitted: • Bilambil Creek (only from Duroby Creek) • Clothiers Creek (only from Cudgen Lake) • Cobaki Creek (only from Piggabeen Creek) • Crystal Creek • Cudgen Lake (only from Clothiers Creek) • Dunbible Creek • Dungay Creek • Duroby Creek (only from Bilambil Creek) • Lower Oxley River (only from Upper Oxley River, Pumpenbil Creek, Brays Creek, and Hopping Dicks Creek water sources) • Mid Rous River • Mid Tweed River • Nobbys Creek • Piggabeen Creek (only from Cobaki Creek) • Rowlands Creek (capped at 1903 unit shares) • Smiths Creek (capped at 28 unit shares) • Tweed Estuary • Upper Rous River (capped at 429 unit shares)

Tweed 2010 plan	Tweed 2023 plan
Trade into the following water sources is prohibited: • Burringbar River • Byrrill Creek • Christies Creek • Cobaki Broadwater • Cudgera Creek • Doon Doon Creek • Mooball Creek • Sheens Creek • Terranora Broadwater	Trade into the following water sources is prohibited: • Brays Creek • Burringbar River • Byrrill Creek • Christies Creek • Cobaki Broadwater • Cudgera Creek • Doon Doon Creek • Hopping Dicks Creek • Mooball Creek • Pumpenbil Creek • Sheens Creek • Terranora Broadwater • Upper Oxley River • Upper Tweed River • Tweed Coastal Floodplain Alluvial

Coastal unregulated rivers often suffer severe competition for water during extended periods of low flow when water users compete most strongly for access to dwindling water levels. By converting unregulated river licences to specific purpose High Flow Access Licences, over time, streams may become less stressed and river conditions improve. Prior to granting high flow licences, an assessment is undertaken (at the water source level) to ensure that this additional water being extracted is within a sustainable management framework and demonstrates an overall environmental benefit. The purpose of allowing High Flow Conversions is to reduce stress on low flows in coastal unregulated river systems.

It should be noted that if a water source does not have a gauging station within it, High Flow Conversions will not be permitted due to not having any way to measure or determine when the waterways within the water source are in high flows.

Table 7. Rules for high flow conversion within the water source

Water source	Tweed 2010 plan	Tweed 2023 plan
Crystal Creek	Permitted up to 88 high flow unit shares	Prohibited - not high extraction pressure at low flows
Mid Rous River	Permitted up to 629 high flow unit shares	Prohibited - not high extraction pressure at low flows
Pumpenbil Creek	Permitted up to 176 high flow unit shares	Permitted up to 391 high flow unit shares
Upper Tweed River	Permitted up to 238 high flow unit shares	Permitted up to 271 high flow unit shares
Brays Creek	Prohibited	Permitted up to 183 high flow unit shares
Lower Oxley River	Prohibited	Permitted up to 240 high flow unit shares

The high flow conversion factor remains unchanged at a rate of 1 ML of entitlement with access to A and B Class flows being able to be converted to 2.5 ML of entitlement that can only be taken from B Class flows. The conversion factor is listed in the Access Licence Dealing Principles Order 2004.

6.15 Prohibit work approvals near SEPP wetlands and potential acid sulphate soils

The Tweed 2023 plan prohibits the construction of water supply work approvals that take water from sources where it will cause more than a minimal impact on Ramsar wetlands and wetlands listed under the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP).

The NSW *Coastal Management Act 2016* and Resilience and Hazards SEPP specifies how developments within the coastal zone should be assessed. The Resilience and Hazards SEPP identifies wetlands to protect their ecological values. Coastal water sharing plans must recognise these same wetlands to ensure protection and align regulatory objectives.

Part 7 of the Tweed 2023 plan prohibits the granting of approvals for surface water or groundwater works if it would result in more than minimal harm to a wetland mapped under the Resilience and Hazards SEPP.

You can find more information about the Resilience and Hazards SEPP on the Coastal management page of the department's website.

The Tweed 2023 plan includes rules to prevent water sources from becoming acidic through drainage of potential acid sulfate soils. The rule bans the construction of a water supply work that takes groundwater, such as a bore, from within an area classed as having a high probability of containing acid sulfate soils. It should be noted that much of the Tweed Coastal Floodplain Alluvial Groundwater Source contains areas of potential acid sulfate soils.

6.16 Adaptive management and amendment provisions

Adaptive management means changing things in response to new information. During the life of a water sharing plan, this information may come from data collection and monitoring or some other improvement in understanding. Such information could include difficulty in implementing rules, socio-economic studies, hydrological modelling, ecological studies and information about Aboriginal cultural sites.

Adaptive management is a requirement of both the WM Act and the National Water Initiative. The WM Act allows for changes to a water sharing plan during its life. The public would be consulted before making any changes that could affect water users or the environment's access to water. Part 10 of the plan includes updated amendment provisions.

Examples of adaptive environmental water provisions in the Tweed 2023 plan include the ability to amend:

- access and trade rules in the water sharing plan if we find there has been increased capture of rainfall run-off in harvestable rights dams above 10 % of rainfall run off –any such review would consider the effect the increased harvestable rights capture has on river flows, given the change in policy around harvestable rights in the coastal areas this is unlikely to be triggered
- LTAAELs to base them on a proportion of flow if more information becomes available
- the plan if we find climate change is affecting water quantity or quality.

6.17 Inclusion of map of high-priority, groundwater-dependent ecosystems

The Tweed 2023 plan includes a map of GDEs. High-priority GDEs used to be in a schedule in the plan. We have removed this and replaced it with a map.

GDEs are those ecosystems that need access to groundwater to maintain their plant and animal communities and ecological processes. The previous plans allowed for the protection of GDEs by specifying minimum distance rules for new groundwater works (bores), which vary depending on the annual extraction limits to be associated with a groundwater works.

The Tweed 2023 plan replaced the GDE schedule that listed the GDEs with a map showing GDEs. The mapped GDEs are the result of a departmental program to identify and prioritise GDEs in NSW. The identification method incorporated existing vegetation community mapping and remote sensing to identify vegetation communities. The method includes analysing monitoring-bore data to identify potential groundwater dependence of the vegetation communities and identifying vegetation communities as terrestrial GDEs overlying alluvial resources.

The mapping was supported by field-based verification in sample areas representing different land cover types. Sites were selected from almost all major catchments distributed across NSW. This was done to ensure that each area had a representative geographic sample that reflected the diverse environmental conditions and management practices.

The high-priority GDEs identified in the plan map are vegetation ecosystems that have a high probability of being groundwater dependent and are of very high or high ecological value. As it is not certain (only highly probable) that the vegetation community is groundwater dependent, the water sharing plan includes a provision that ensures distance rules do not apply unless the department has confirmed the high probability of groundwater dependence of the ecosystem.

For further information on methods we employed to identify GDEs see the paper Methods for the identification of high probability groundwater dependent vegetation ecosystems (PDF 8.6 MB).

The GDE map included in the plan is shown in Figure 2. You can view a high-resolution version of the high-priority GDE map on the department's web page

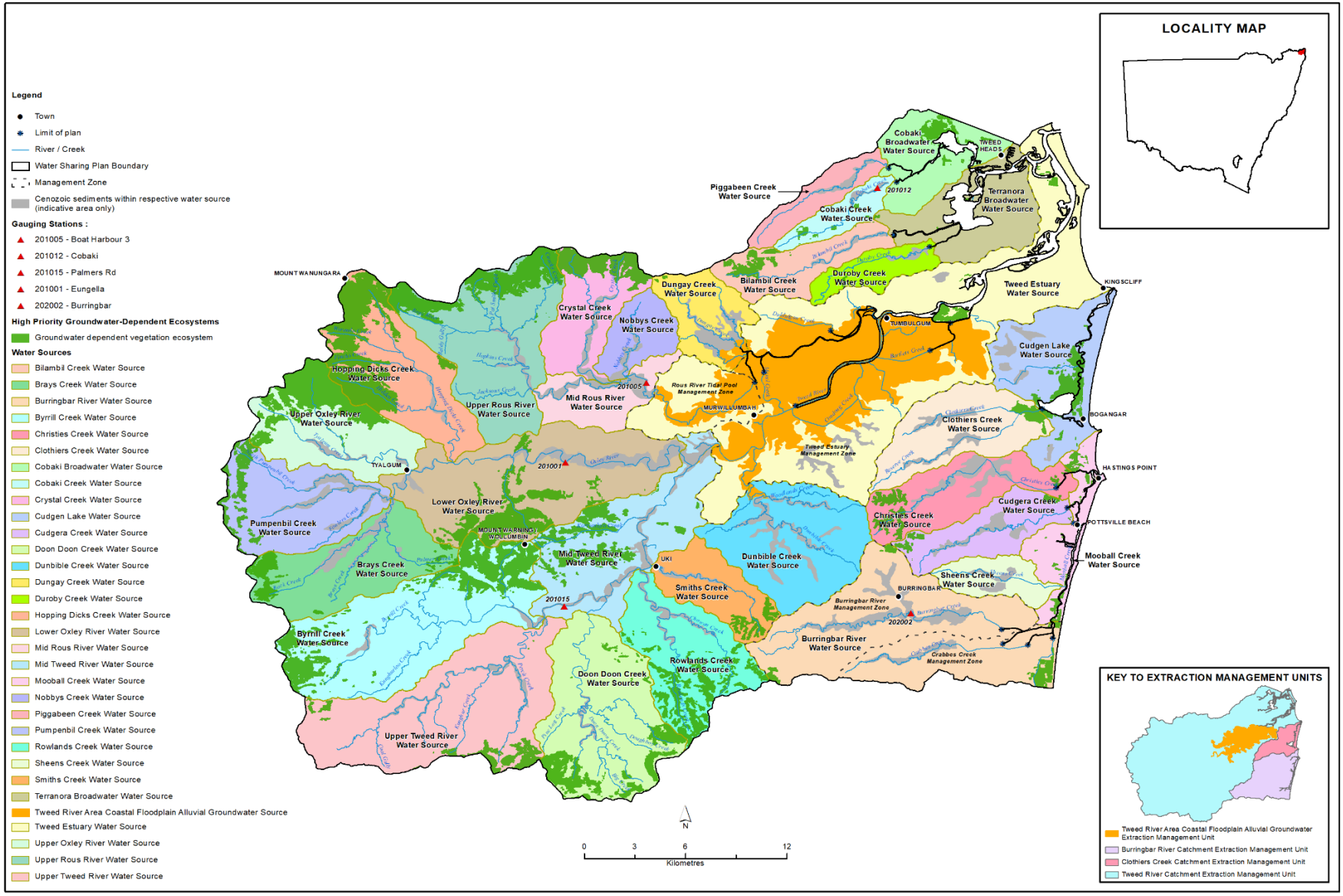

Figure 2 High priority groundwater-dependent ecosystem map

6.18 Metering provisions to account for non-urban metering framework

The Tweed 2010 plan includes a condition for all water supply works to have a meter. That requirement is retained in the Tweed 2023 plan so that existing works required to have a meter will need to continue metering. Water supply works approval holders will see this requirement as a mandatory condition on their approval.

The new plan has rules relating to the NSW non-urban metering policy. This policy is being rolled out across the state. In coastal NSW, the new metering requirements require existing works to continue to meter, for metering for certain sized works and log-keeping for water extracted for smaller works. For more information see the NSW non-urban water metering framework pages on the department's website.

Works that currently meter will need to ensure those meters adhere to the AS4747 metering standards. Any new works constructed will need to adhere to requirements under the non-urban metering policy.

7 Monitoring, evaluation and reporting

Monitoring, evaluation and reporting (MER) are key components to adaptive management. They ensure water sharing plans are effective in meeting their objectives.

Comprehensive MER programs are resource intensive and long term. We must prioritise areas where there is a high risk of water extraction impacting on environmental assets or where the demand for water is greater than the volume of water available.

The department is working on a project that will prioritise water sources for MER activities, based on risk in areas that have high levels of extraction, ecological value, or stakeholder needs.

The MER plan will be a framework specifically designed for water sharing plans. It will follow established guidelines and include both freshwater and estuarine ecosystems.

8 Areas for further work

8.1 Determining flow requirements for key assets and functions

Several government agencies such as Department of Primary Industries – Fisheries and the department's Environment and Heritage division are working on flow requirements for key assets and ecosystem functions. As these become available and there is sufficient flow data, we can use this information in making water-sharing decisions.

8.2 Metering and record keeping

The NSW Non-urban water metering program is being rolled out across the state. In coastal NSW, the new metering requirements, which require metering for works of a certain size and log-bookkeeping for water extracted for smaller works, will begin in December 2024. For more information, see the NSW non-urban water metering framework pages on the department's website.

8.3 Cultural flows and improving the involvement of first nations people in water management

The department will work toward priorities in the State Water Strategy. Priority 2 of the State Water Strategy is to Recognise First Nations/Aboriginal People's rights and values and increase access to and ownership of water for cultural and economic purposes.

The NSW Government recognises First Nations/Aboriginal People's rights to water and our aim is to secure a future where water for First Nations/Aboriginal People is embedded within the water planning and management regime in NSW, delivering cultural, spiritual, social, environmental and economic benefit to communities.

Actions under the State Water Strategy include:

- Strengthening the role of First Nations/Aboriginal People in water planning and management
- Developing a state-wide Aboriginal water strategy

- Providing for Aboriginal ownership of and access to water for cultural and economic purposes
- Working with First Nations/Aboriginal People to improve shared water knowledge
- Working with First Nations/Aboriginal People to maintain and preserve water-related cultural sites and landscapes

The department is committed to providing greater opportunities for Aboriginal water management and participation in water sharing. A new Aboriginal water directorate has been established within the department and work is progressing on an Aboriginal Water Strategy which will identify the ways in which we can achieve the priorities under the State Water Strategy. The department is also in the process of establishing Regional Aboriginal Water Advisory Committees in each of the NSW water regions and piloting some cultural watering plans in various parts of NSW.

8.4 Stormwater harvesting

The department is developing a stormwater harvesting policy to determine the best way to manage stormwater extraction to maximise the benefits of re-using stormwater and reducing erosion of water ways while ensuring adequate water is available for the environment and water users who rely on it.

8.5 Sustainable long-term average annual extraction limits

The NRC has recommended that LTAAELs on the coast should be set at a sustainable level. The department is considering ways of doing this.

The plan sets a numerical and fixed LTAAELs to cover all flows and a separate, specific annual limit for just high-flows. This will limit take from low-flows to that which was generally provided for at the start of the first water sharing plan.

8.6 Climate change

Australia has a highly variable climate, and rainfall is especially variable. This makes it vital that we understand as much as we can about our climate so we can work out how we manage our water supplies. The frequency and duration of wet and dry events determines how much water we have available.

NSW is already experiencing trends of higher average temperatures and reduced cool season rainfall. There are indications from climate models that drought conditions may become more frequent and severe, and last longer.

Higher demand from a growing population, alongside reductions in supply, will increase water scarcity, putting more pressure on all users, including the environment (Productivity Commission, National Water Reform Issues Paper, May 2020, p.2). We must collectively improve our understanding of these risks to better manage water supply and ensure that our operational, planning and future development decisions take future water reliability and security into account.

The department is developing river models that incorporate stochastic long-term data to help guide regional water strategies. We can use these models to inform water sharing decisions as they are developed across the state. For example, as we develop the sustainable LTAAELs, we will consider the future effects of climate change. Rising sea level models will also be incorporated into future water sharing decisions where they are available.

Priority 4 of the State Water Strategy is to increase resilience to changes in water availability (variability and climate change). The 2021/22 action plan looks to improve and apply our understanding of climate variability and change. This includes work to determine a methodology and progressively incorporate climate risk data into water sharing plan and environmental water management decision making.

The department is developing river models that incorporate stochastic long-term data to help guide regional water strategies. These models can be used to inform water sharing decisions as they are developed across the state. For example, as we develop the sustainable long-term average annual extraction limits we will consider future impacts of climate change. Rising sea level models will also be incorporated into future water sharing decisions.

Appendix 1 – References and supporting documents

- The Tweed 2023 plan, maps and rule summary sheets can be found on the department's Far North Coast region water sharing plans web page by selecting the relevant links under the Tweed River area.
- NSW Legislation website contains NSW legislation, including the WM Act
- National Water Initiative
- *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010*
- The background document for the Tweed River Area 2010 plan (PDF 679 KB)
- Details of the macro planning approach:
  - Macro water sharing plans - approach for unregulated rivers (PDF 829KB)
  - Macro water sharing plans – access and trading rules for pools (PDF 627 KB)
  - Macro water sharing plans - the approach for groundwater (PDF 3.11 MB)
- The Natural Resources Commission's Natural Resources Commission Review of the Richmond and Tweed Areas water sharing plans 2021 (PDF, 3.55 MB)
- 2019 Audit of the Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010 (PDF 3.7 MB)

Appendix 2 – Substantive changes made between the draft and final water sharing plan

Table 8 explains the substantive changes made between the publicly exhibited draft and final versions of the Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023.

Table 8. Provisions which changed post public exhibition and reasoning

Provisions in the publicly exhibited draft replacement plan	Final Tweed 2023 plan provision	Reason for change
The estimated volumes for, current uptake of harvestable rights within the Tweed WSP area, were not included in the draft plan.	The estimated volumes for current uptake of harvestable rights within the Tweed WSP area have been determined. This volume is included in Part 3 of the plan.	Inclusion of harvestable rights figures in the plan enable us to monitor any increased uptake of harvestable rights and ensures harvestable rights take is considered in the water sharing arrangements.

Provisions in the publicly exhibited draft replacement plan	Final Tweed 2023 plan provision	Reason for change
The Long Term Average Annual Extraction Limit (LTAAEL) for unregulated rivers has been split into two components: • a Standard LTAAEL, and • a Higher flow LTAAEL The Standard LTAAEL has been fixed and includes estimated Basic Landholder Rights at the commencement of the first water sharing plan and entitlements at commencement of the replacement plan. The Higher flow LTAAEL can increase in limited circumstances such as high flow conversions and where Aboriginal Community Development Licences are granted. Higher flow LTAAELS are to be specified as the largest sum of the share components of all higher flow extraction licences within each extraction management unit occurring within a water year.	The Standard LTAAEL numerical representation has been calculated and included in the draft Tweed WSP.	NRC recommendations included setting a fixed and numeric LTAAEL. This is the Standard LTAAEL. This ensures that extraction from low flow will be no more than could occur at the commencement of the first water sharing plan. While the Higher flow LTAAEL can increase, this is to enable the implementation of high flow conversions where a larger volume of water can be taken at higher flows than at lower flows in order reduce the stress on lower flows and granting of specific purpose access licences such as ACDLs etc. There are no higher flow extraction licences currently in the Tweed 2023 plan.

Provisions in the publicly exhibited draft replacement plan	Final Tweed 2023 plan provision	Reason for change
Access rules for the following water sources • Brays Creek • Byrrill Creek • Doon Creek • Hopping Dicks • Lower Oxley River • Mid Tweed River • Pumpenbil Creek • Rowlands Creek • Smiths Creek • Upper Oxley River • Upper Tweed River included a cease to pump rule when combined flows at the Eungella gauge (201001) and the Palmers Road gauge (201015) were between 170 - 940 ML/day.	The combined catchment flow rule of 170 - 940 ML/day will be split into catchment-based rules. The Tweed Catchment cease to pump rule is now when flows are between 45 – 147 ML/day at the Palmers Road gauge (201015) for these water sources: • Byrrill Creek • Doon Doon Creek • Mid Tweed River • Rowlands Creek • Smiths Creek • Upper Tweed River The Oxley Catchment cease to pump rule is now when flows are between 125 – 795 ML/day at the Eungella gauge (201001) for these water sources: • Brays Creek • Hopping Dicks • Lower Oxley River • Pumpenbil Creek • Upper Oxley River Certain specific purpose access licences, such as domestic and stock and local water utility, will be exempt from this access rule.	This is in recognition that each catchment can behave very differently and contribute significantly different volumes of flow.

Provisions in the publicly exhibited draft replacement plan	Final Tweed 2023 plan provision	Reason for change
Construction of new in-river dams is proposed to be prohibited on third order and above streams in the following water sources: • Brays Creek • Burringbar River • Doon Doon Creek • Lower Oxley River • Mooball Creek • Pumpenbil Creek • Terranora Broadwater • Upper Oxley River • Upper Tweed River	There is now an exemption to this rule for the purposes of town water supply under a local water utility access licence, except for the Byrrill Creek water source.	New in river dams for the purpose of town water supply will still need to meet the "no more than minimal harm" provisions of the WM Act. It is more appropriate that augmentation processes can occur and be assessed on a case-by-case basis rather than be subject to a blanket prohibition. This approach is adopted in most coastal plans. This will allow for the amendment of Bray Park Weir and Clarrie Hall Dam to increase security of town water supply.
Part 12 of the draft plan did not include mandatory metering requirements.	This section has now been amended to maintain the metering requirements that existed in the previous Tweed 2010 plan.	The previous Tweed 2010 plan had mandatory conditions requiring metering, and this aligns with requirements under the departments non-urban metering reforms that come into effect in coastal areas in December 2023.

Appendix 3 – Vision, objectives, strategies and performance indicators

Vision statement

The vision for the *Tweed River Area Unregulated and Alluvial Water Sharing Plan 2023* is to provide for the following:

(a) the health and enhancement of the water sources and their dependent ecosystems

(b) the continuing productive extraction of water for economic benefit

(c) the spiritual, social, customary and economic benefits of water to Aboriginal communities

(d) the social and cultural benefits to urban and rural communities that result from water.

10 Environmental objectives

(1) The broad environmental objective of this plan is to protect, and where possible enhance and restore, the condition of the water sources and their water-dependent ecosystems.
Note: The water-dependent ecosystems of the water sources include in-stream, riparian and floodplain ecosystems, and groundwater-dependent ecosystems

(2) The targeted environmental objectives of this plan are:

(a) to protect, and where possible, enhance and restore, the following over the term of this plan:

(i) the recorded distribution or extent of target ecological populations including native fish and native vegetation

(ii) the population structure of target ecological populations including native fish, native vegetation, low-flow macroinvertebrate communities and high-priority groundwater-dependent ecosystems

(iii) the connectivity between and within water sources, including to support surface and groundwater exchange and downstream processes including priority fish passages

(iv) connectivity between tidal pools, connected estuaries and connected upstream water sources

(v) water quality within target ranges to support water-dependent ecosystems and ecosystem functions

(vi) flows that support ecosystem values and processes within connected estuaries

(b) to contribute to the prevention of structural damage to aquifers of the water sources resulting from groundwater extraction.

(3) The strategies for reaching the targeted environmental objectives of this plan are as follows:

(a) reserve all water volume in excess of each long-term average annual extraction limit for the environment

(b) reserve a portion of natural flows to partially mitigate alterations to natural flow regimes in the water sources

(c) restrict the take of water from an in-river pool or off-river pool when the volume of water in the pool is less than the volume of water that can be held by the pool when at full capacity

(d) restrict or prevent water supply work approvals on third-order or higher streams within specified water sources

(e) reserve a portion of natural flows to maintain hydrological connectivity between the water sources and other connected water sources, including connectivity between tidal pools and estuaries

(f) manage the construction and use of water supply works to minimise impacts on in-stream ecosystems, high-priority groundwater-dependent ecosystems and groundwater quality.

(4) The performance indicator used to measure the success of the strategies for reaching the broad environmental objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted environmental objectives in subclause (2) are the changes or trends in the ecological condition of the water sources during the term of this plan as assessed using one or more of the following:

(a) the recorded range or extent of target populations including native fish, native turtles, native vegetation communities and high-priority groundwater-dependent ecosystems

(b) the recorded condition of target populations of native fish, native vegetation, low-flow macroinvertebrate communities and high-priority groundwater-dependent ecosystems

(c) measurements of fish movements through priority fish passage areas

(d) measurements of flows through tidal pools and into connected estuaries

(e) the recorded values of water quality measurements including salinity, turbidity, total nitrogen, total phosphorous, pH, water temperature and dissolved oxygen

(f) the recorded values of groundwater levels

(g) the extent to which the strategies have provided flow conditions of sufficient magnitude, frequency, duration, timing and water quality to achieve the targeted environmental objectives

(h) the extent to which the strategies have provided flow conditions of sufficient magnitude, frequency and timing to tidal pool management zones with designated estuary flow requirements.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this plan have been implemented and complied with

(b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this plan

(c) the extent to which the strategies in subclause (3) support achievement of the environmental objectives

(d) the extent to which external influences on the water sources and their dependent ecosystems during the term of this plan have affected progress toward achieving the environmental objectives

11 Economic objectives

(1) The broad economic objective of this plan is to maintain, and where possible improve, access to water to optimise economic benefits for agriculture, water-dependent industries and local economies

(2) The targeted economic objectives of this plan are as follows:

(a) to maintain, and where possible improve, water trading opportunities for water-dependent businesses

(b) to maintain, and where possible improve, access to water up to the long-term average annual extraction limits for agriculture, water-dependent businesses and landholders

(c) to protect, and where possible, improve connectivity to provide flows that support economic activities in connected estuaries

(d) to contribute to maintaining water quality within target ranges for agriculture, water-dependent businesses and landholders.

(3) The strategies for reaching the targeted economic objectives of this plan are as follows:

(a) provide for trade of water allocations and share components subject to environmental constraints and local impacts

(b) provide a stable and predictable framework for sharing water among water users

(c) provide for flexibility of access to water

(d) manage extractions to the long-term average annual extraction limits

(e) reserve a portion of natural flows to maintain connectivity between tidal pools and connected estuaries.

(4) The performance indicator used to measure the success of the strategies for reaching the broad economic objective in subclause (1) is an evaluation of the extent to which the

combined outcomes of the targeted economic objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted economic objectives in subclause (2) are the changes or trends in economic benefits during the term of this plan, as assessed using one or more of the following:

(a) the economic benefits of water extraction and use

(b) the economic benefits of water trading as demonstrated by:

(i) the annual number or volume of share components of access licences transferred or assigned

(ii) the weighted average unit price of share components of access licences transferred or assigned

(iii) the annual volume of water allocations assigned

(iv) the weighted average unit price of water allocations assigned

(c) the recorded values of water quality measurements including salinity, sodium adsorption ratio, harmful algal blooms, total nitrogen, total phosphorus, pH and dissolved oxygen

(d) the recorded values of groundwater levels.

(6) In evaluating the effectiveness of the strategies in meeting the objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this plan have been implemented and complied with

(b) the extent to which the changes in the economic benefits of water extraction and use can be attributed to the strategies in subclause (3) and provisions in this plan

(c) the extent to which the strategies in subclause (3) support achievement of the economic objectives

(d) the extent to which external influences on water-dependent businesses have affected progress towards achieving the economic objectives.

12 Aboriginal cultural objectives

(1) The broad Aboriginal cultural objective of this plan is to maintain, and where possible improve, the spiritual, social, customary and economic values and uses of water by Aboriginal people.

(2) The targeted Aboriginal cultural objectives of this plan are as follows:

(a) to provide access to water in the exercise of native title rights

(b) to provide access to water for Aboriginal cultural use and community development, including fishing

(c) to protect, and where possible improve, identified water-dependent culturally significant areas, including important riparian vegetation communities

(d) to protect, and where possible improve, connectivity to provide flows that support Aboriginal cultural activities within connected estuaries

(e) to contribute to the maintenance of water quality within target ranges to ensure suitability of water for Aboriginal cultural use and community development.

(3) The strategies for reaching the targeted Aboriginal cultural objectives of this plan are as follows:

(a) manage access to water consistently with the exercise of native title rights

(b) provide for water associated with Aboriginal cultural values and uses, and community development

(c) manage extractions under access licences and basic landholder rights within the long-term average annual extraction limits

(d) reserve a portion of natural flows to mitigate alterations to natural flow regimes in the water sources

(e) restrict the take of water from an in-river pool or off-river pool when the volume of water in the pool is less than the volume of water that can be held by the pool when at full capacity

(f) reserve a portion of natural flows to maintain hydrological connectivity between the water sources and other connected water sources, including between tidal pools and estuaries

(g) manage the construction and use of water supply works to minimise impacts on groundwater quality and groundwater-dependent culturally significant areas.

(4) The performance indicator used to measure the success of the strategies for reaching the broad Aboriginal cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted Aboriginal cultural objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted Aboriginal cultural objectives in subclause (2) are the changes or trends in Aboriginal cultural benefits during the term of this plan as assessed using one or more of the following:

(a) the use of water by Aboriginal people, by measuring factors including:

(i) the extent to which native title rights can be exercised, consistently with any determination of native title or Indigenous land-use agreement

(ii) the extent to which access to water has contributed to achieving Aboriginal cultural and community development outcomes

(b) the recorded range or extent of target ecological populations including native fish, native vegetation communities and high-priority groundwater-dependent ecosystems

(c) the recorded condition of target ecological populations of native fish, native vegetation, low-flow macroinvertebrate communities and high-priority groundwater-dependent ecosystems

(d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, and dissolved oxygen

(e) the extent to which the strategies have provided flow conditions of sufficient magnitude, frequency and timing to tidal pool management zones with designated estuary flow requirements

(f) the recorded values of groundwater levels.

(6) In evaluating the effectiveness of the strategies in meeting the Aboriginal cultural objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this plan have been implemented and complied with

(b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this plan

(c) the extent to which the strategies in subclause (3) support achievement of the Aboriginal cultural objectives

(d) the water made available for Aboriginal cultural values and uses during the term of this plan through available water determinations and the granting of new access licences

(e) the extent to which external influences on the water-dependent Aboriginal cultural activities have affected progress toward achieving the Aboriginal cultural objectives.

13 Social and cultural objectives

(1) The broad social and cultural objective of this plan is to provide access to water to support water-dependent social and cultural values.

(2) The targeted social and cultural objectives of this plan are to maintain, and where possible, improve the following:

(a) access to water for basic landholder rights, town water supply and licensed domestic and stock purposes

(b) access to water for water-dependent cultural, heritage and recreational uses, including recreational fishing

(c) flows that support cultural, heritage and recreational activities within connected estuaries

(d) water quality within target ranges for basic landholder rights, town water supply, domestic and stock purposes and surface water-dependent cultural, heritage and recreational uses, including recreational fishing.

(3) The strategies for reaching the targeted social and cultural objectives of this plan are as follows:

(a) provide water access for basic landholder rights, town water supply and licensed domestic and stock purposes

(b) reserve all water in excess of each long-term average annual extraction limit for the environment

(c) reserve a portion of natural flows to partially mitigate alterations to natural flow regimes in the water sources

(d) restrict the take of water from an in-river pool or off-river pool when the volume of water in the pool is less than the volume of water that can be held by the pool when at full capacity

(e) reserve a portion of natural flows to maintain hydrological connectivity between the water sources and other connected water sources, including between tidal pool management zones and connected estuaries

(f) manage the construction and use of water supply works to minimise impacts on groundwater quality, basic landholder rights, and town water supply.

(4) The performance indicator used to measure the success of the strategies for reaching the broad social and cultural objective in subclause (1) is an evaluation of the extent to which the combined outcomes of the targeted social and cultural objectives in subclause (2) have contributed to achieving the broad objective.

(5) The performance indicators used to measure the success of the strategies for reaching the targeted social and cultural objectives in subclause (2) are the changes or trends in social and cultural benefits during the term of this plan as assessed using one or more of the following:

(a) the social and cultural uses of water during the term of this plan, by measuring factors including:

(i) the extent to which basic landholder rights and licensed domestic and stock requirements have been met

(ii) the extent to which local water utility access licence requirements have been met

(b) the recorded range or extent of target populations of native fish that are important for recreational fishing

(c) the recorded takes of native fish that are important for recreational fishing within legal age and size classes

(d) the recorded values of water quality measurements including salinity, harmful algal blooms, total nitrogen, total phosphorus, pH, and dissolved oxygen

(e) the extent to which the strategies have provided flow conditions of sufficient magnitude, frequency and timing to tidal pool management zones with designated estuary flow requirements

(f) the recorded values of groundwater levels.

(6) In evaluating the effectiveness of the strategies in meeting the social and cultural objectives in this clause, the following will be relevant:

(a) the extent to which the strategies in subclause (3) and provisions in this plan have been implemented and complied with

(b) the extent to which changes in the performance indicators can be attributed to the strategies in subclause (3) and provisions in this plan

(c) the extent to which the strategies in subclause (3) support achievement of the social and cultural objectives

the extent to which external influences on social and cultural activities dependent on the water sources during the term of this plan have affected progress toward achieving the social and cultural objectives

Appendix 4 – Estimate of annual extraction from harvestable rights dams

Part 3 of the Tweed River Area 2023 plan includes the requirements for water to satisfy harvestable rights. This figure has been estimated using the process below.

1. Remote sensing was used to identify dams in each water source on relevant land and water courses smaller than third order streams. Land types such as National Parks, state forests, named waterbodies and heavily developed areas were excluded as there is a low likelihood of harvestable rights dams being present on these types of land.
2. The estimated volume of each dam was determined based on its surface area.
3. Each dam was then assessed for aspect ratio (length of long side/length of short side). With this calculation a number close to 1 indicates a square (or round) body which indicates a higher likelihood of a man made structure. A very large number such as 50 would indicate a very long thin body (such as a river) and is more likely to be a natural waterbody. Based on previous similar work, it was determined that an aspect ratio of <9.0 was the most suitable threshold for harvestable rights dams. If a dam had an aspect ratio <9.0 it was automatically assumed to be a harvestable rights dam.
4. Harvestable rights dams with a capacity greater than 100 ML on the coast are unusual and the dam is likely to exist for a different purpose such as town water supply or the result of an old quarry. Dams less than 100 ML were automatically included as harvestable rights dams.
5. All dams above the volumetric or aspect ratio limits were investigated individually and either included or excluded as harvestable rights dams. Examples of excluded dams were quarries and licenced dams.
6. The total dam capacity of all dams considered to be harvestable rights dams was then calculated per water source.

The dam capacity is not an annual volume. A dam with the same capacity would produce a smaller annual harvestable rights volume in an area with less rainfall runoff than the same dam in an area with more rainfall runoff.

The department holds a series of contours that reflect the annual runoff across NSW. These contours are called the "Harvestable Rights Multiplier". Generally, the dryer the area the lower the Harvestable Rights Multiplier and the larger a dam must be to capture the same volume of water. This relationship is expressed numerically as a 'Dam Reliability Factor' (DRF) found in Table 9.

Table 9. Relationship between the Harvestable Rights multiplier and the Dam Reliability Factor

Harvestable rights multiplier	Corresponding Dam Reliability Factor
0.050	2.5
0.051	2.32
0.052	2.17
0.056	2.04
0.054	1.93
0.055	1.83
0.056	1.75
0.057	1.68
0.058	1.61
0.059	1.55
0.060	1.5
0.062	1.41
0.064	1.33
0.066	1.27
0.068	1.21
0.070	1.17
0.075	1.07
0.080	1
0.090	0.9
0.100	0.83
0.110	0.79
0.120	0.75
0.130	0.72
0.140	0.7
0.150	0.68
0.160	0.67
0.170	0.65

Harvestable rights multiplier	Corresponding Dam Reliability Factor
0.180	0.64
0.190	0.63

A geographic information system was used to determine the average harvestable rights multiplier per water source based on the rainfall runoff contours. Table 9 was then used to determine the corresponding Dam Reliability Factor per water source.

7. To determine the estimated annual volume of harvestable rights the total volume held in harvestable rights dams for each water source (as calculated in step 6) was then divided by the Dam Reliability Factor for that water source.