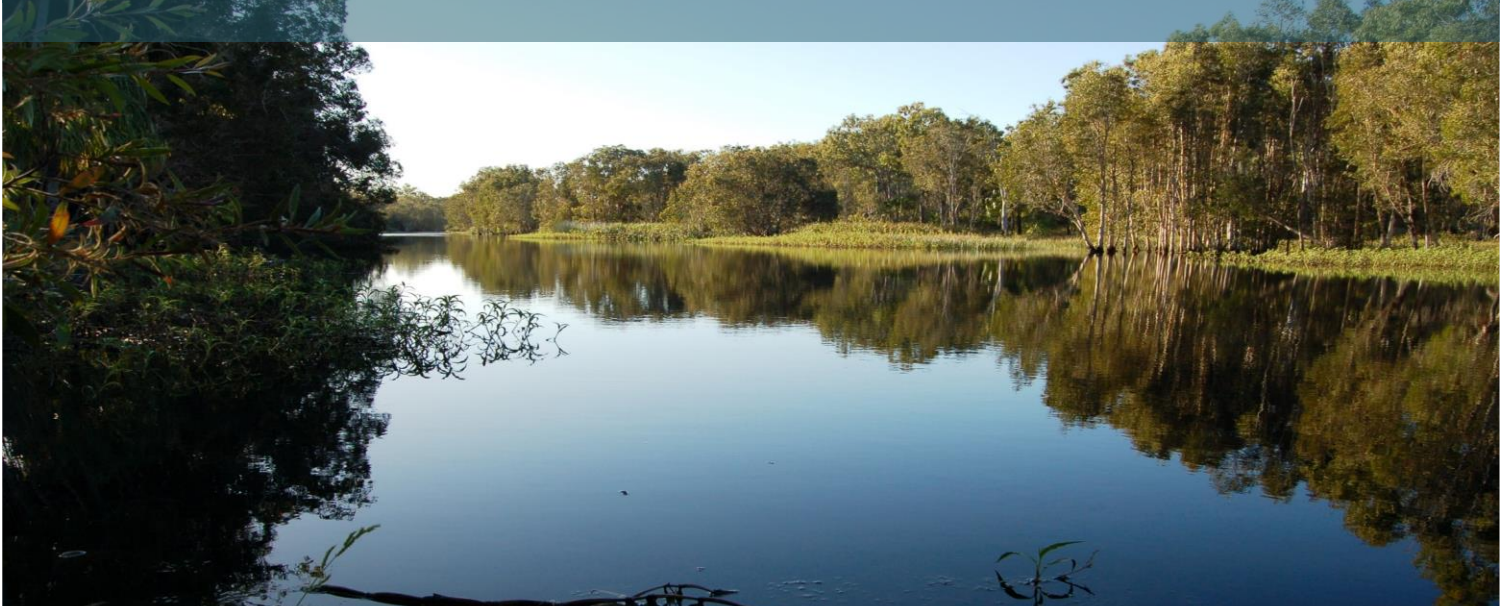




**Queensland
Government**

Department of Regional Development,
Manufacturing and Water



Minister's Performance Assessment Report

Water Plan (Baffle Creek Basin) 2010

February 2024

Acknowledgement of Traditional Owners

We respectfully acknowledge the Aboriginal and Torres Strait Islander peoples as the Traditional Owners and Custodians of this Country – the lands and seas on which we meet, live, learn, work and play. We acknowledge those of the past, the Ancestors whose strength has nurtured this land and its people, and we recognise their connection to land, sea and community. We pay our respects to them, their culture and to their Elders past and present.

This publication has been compiled by South Region, Water Planning and Science, Water Resource Management, Department of Regional Development, Manufacturing and Water.

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Minister's foreword

I am pleased to publish this report which provides an update of the implementation of the Water Plan (Baffle Creek Basin) 2010 (the water plan) and summarises the findings of the assessments undertaken since the last Minister's report published in 2019.

In December 2019, a public notice was released postponing the expiry date of the water plan to 1 September 2030.

This report confirms the water plan is working to strike the balance between water for use and water for the environment in the Baffle Creek Basin. A risk assessment undertaken to support this review indicated that the water plan's strategies were achieving the desired outcomes.

The latest monitoring information of streamflow records shows that annual recorded flows were above average over the last 15 years. Since the water plan commenced, five new groundwater monitoring bores and one new stream gauging station have been installed in the water plan area. Additional monitoring provides improved data coverage to support ongoing science and assessment of outcomes for the water plan.

The water plan continues to successfully support horticulture (fruit trees and nut trees) and irrigated cropping, including sugar cane, hay and silage. It also continues to support potential growth by allocating sufficient reserves of unallocated water to provide for population growth as well as growth in industries, including agriculture and other emerging industries.

The Baffle Creek Basin is widely recognised for its high conservation values, its nationally important wetland environments and unimpeded watercourses from headwaters to estuary, with many parts of the water plan area in a near natural condition.

While the potential risks to water users and the environment were assessed as low, the assessment did highlight some opportunities and emerging issues to consider when the water plan is reviewed, including contemporary outcomes, climate change considerations, improved understanding of water-related cultural values, new science, and groundwater to surface water connectivity.

The water plan will expire in 2030 and must be replaced prior to expiry. The review and replacement process will take into account the findings of this report. I encourage anyone with an interest in the management of water resources in the Baffle Creek Basin area to read this report.

Hon. Glenn Butcher MP

Minister for Regional Development and Manufacturing

Minister for Water

Executive summary

Under the *Water Act 2000* (Water Act), a report on each water plan must be prepared at least every five years to assess the effectiveness of the plan and its implementation. The Water Regulation 2016 (Water Regulation) states the matters to be addressed in this report. This report provides an assessment of the performance of the Water Plan (Baffle Creek Basin) 2010 (water plan) against these matters. Table 1 provides a concise summary of the assessment.

This report also outlines historic climate trends and potential climate change projections for temperature, rainfall and evaporation, and consideration of the water-related effects of climate change on water availability.

The assessment shows the water plan is fit for purpose and is contributing to the sustainable management of water. There is no indication to expect any adverse impacts on water entitlement holders or natural ecosystems in the water plan area. All water plan outcomes were assessed as low risk, except one outcome that could not be assessed due to an identified need to re-engage with Aboriginal peoples and Torres Strait Islanders to better understand and report on cultural values for the next water plan review.

Opportunities and emerging matters for future consideration in the Baffle Creek Basin water plan area include:



- developing more contemporary social, economic, environmental, and cultural outcomes including improved understanding of water-related cultural values
- considering the impact of climate change and climate variability on water availability
- developing improved understanding of the groundwater resource, and any potential connectivity to surface water
- incorporating the best available science to support new hydrologic, environmental, socioeconomic, cultural and technical assessments.

The water plan is due to expire on 1 September 2030. The water plan must be replaced before expiry and as part of the review and replacement process and these opportunities and emerging matters will need to be taken into account.



Table 1: Summary of the performance assessment of the Water Plan (Baffle Creek Basin) 2010

Matters to be addressed	Comment	Section of the report	Status
Effectiveness of the water plan in advancing the sustainable management of Queensland’s water resources	Overall, this assessment indicates that the water plan is achieving the purposes of the Water Act. The water plan continues to advance the sustainable management of water.	Section 3	On track
Effectiveness of the implementation of the water plan in achieving the plan outcomes	A risk assessment found that most water plan outcomes are being achieved. However, the need to re-engage with Aboriginal and Torres Strait Islander peoples to improve our understanding of water-related cultural values in the water plan area was identified. Previous reports prepared about the water plan did not highlight any significant issues with water plan implementation.	Section 4	Insufficient information available
Summary of water usage and entitlements including those taken or interfered with under statutory authorisations	Water users in the water plan area have access to the take of water under a water licence, using authorised overland flow (OLF) works, or under a statutory authorisation through the Water Act (e.g. stock and domestic purposes or prescribed activities). There are currently no metered entitlement areas (Water Regulation 2016) in the water plan area to measure water usage. Appendix A shows the water plan area water entitlements and authorisations.	Section 5	On track
Summary of research and monitoring findings	Data from the installation of five new groundwater monitoring bores and one new gauging station in the Baffle Creek catchment since commencement of the water plan has contributed to the department’s hydrological understanding for the water plan area. Monitoring and assessment of ecological assets including species and ecological functions is being conducted over the life of the water plan. Findings show the water plan is sustainably managing the water resources.	Section 6	On track
Summary of amendments to the water plan since its commencement	In 2019, the water plan’s expiry was postponed to 1 September 2030. While some minor and consequential amendments have been made to the water plan since its commencement there have no substantive amendments made.	Section 7	On track
Summary of identified risks to water plan outcomes	A risk assessment process has not identified any risks to the water plan outcomes.	Section 8 and 9	On track
Summary of non-compliances under a water entitlement or other authorisation in the water plan area	For the five-year period 2018 to 2023 there have been seven investigations into compliance matters under a water entitlement or other authorisations in the water plan area. The investigations found there were four instances of non-compliance. Appendix E provides an overview of non-compliance issues.	Section 10	On track
Overall status and recommendation for the water plan	The water plan is performing well and should continue without change to 2030.	Section 11	On track

Colour legend:

 Completed
 Some major issues

 On track
 Not achieved

 Some issues
 Insufficient information available

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1. Purpose of the report

Under the Queensland [Water Act \(2000\)](#), section 49 requires the Minister to prepare reports for each water plan to ensure their implementation and effectiveness is regularly reviewed and evaluated as part of an adaptive management cycle of planning, implementation, monitoring and reporting. The [Water Regulation \(2016\)](#) requires these reports to be prepared at five-year intervals and address a range of matters relevant to the ongoing sustainable management of Queensland's water resources including:

- a) whether or not the water plan is advancing the sustainable management of Queensland's water resources
- b) an assessment of the effectiveness of the implementation of the water plan in achieving its outcomes
- c) information on water use and authorisations in the water plan area, including:
 - i. water entitlements
 - ii. water taken or interfered with under statutory authorisations
- d) a summary of the findings of research and monitoring for the water plan
- e) any identified risks to the water plan's outcomes
- f) what amendments, if any, have been made to the water plan since its commencement
- g) any non-compliance under a water entitlement or other authorisation in the water plan area.

This report provides an overview of the above for the Water Plan (Baffle Creek Basin) 2010 (water plan) and evaluates its implementation to date, with an emphasis on progress since the previous report was prepared in 2018.

2. Water plan area

The [Baffle Creek Basin water plan area](#) is located on the Central Queensland coast and covers approximately 4,100km². It includes the catchments of Littabella, Baffle, Broadwater, Eurimbula and Worthington creeks (Figure 1) and receives a mean annual rainfall of approximately 1,100mm. The economy of the water plan area is mainly generated from the agriculture, forestry and fishing industry, construction, and the accommodation and food services industry. There are relatively low levels of water use in the water plan area, with the majority of water used by irrigated perennial horticulture (including fruit trees and nut trees), irrigated cropping (including sugar cane, hay and silage). All water usage is unsupplemented, with the water plan managing the take of water from watercourses, lakes, springs and overland flow.



Figure 1: Map of the Baffle Creek Basin water plan area

3. How the water plan advances the sustainable management of Queensland's water resources

The water plan advances the sustainable management of Queensland's water resources by establishing a framework for the allocation and management of water resources in the Baffle Creek Basin area for the economic, physical, and social wellbeing of the people of Queensland. The water plan provides outcomes and strategies to advance the sustainable management of ecosystems, water quality, water-dependent ecological processes and biological diversity associated with watercourses, lakes, springs, aquifers, and other natural water systems. The allocation and management of water within the water plan area must be in accordance with the rules in the water management protocol. For a more detailed summary of the linkages between plan outcomes, strategies and rules see Appendix A.

The below information provides a summary of the water planning framework and how the water plan advances sustainable management of water in the Baffle Creek Basin.

3.1 Ecologically sustainable development

The water plan was developed with the support of hydrologic science and model with long-term simulation period to better understand patterns of water use and availability for both consumptive and non-consumptive purposes.

The hydrological model is also used to assess the consistency of future water management decisions (e.g. unallocated water) made under the water plan against the stated environmental flow objectives, to ensure plan outcomes are met.

Targeted monitoring and research have improved our understanding and management of environmental flow requirements for aquatic ecosystems.

When granting unallocated water for future development, the water plan provides for consideration of environmental flows to maintain the ecological integrity of the river systems, with specific ecological outcomes for particular areas, as well as limitations on the additional take of water from lakes. Unallocated water has been released from the general reserve (2,900ML) in the Littabella Creek catchment area.

In the Baffle, Eurimbula and Worthington Creek catchments the water plan includes a strategy that aims to protect these near-natural environments by limiting the construction of new in-stream storages. The water plan also includes outcomes and strategies that aim to encourage the efficient use of water while ensuring the security of supply for towns and other water users.

3.2 Allocation and use of water resources for economic, physical, and social wellbeing of the people of Queensland

The water plan has outcomes that provide a framework for the allocation and use of water resources in the plan area for the economic, physical and social wellbeing of the people of Queensland.

Implementation of the water plan's strategies have provided certainty for water users to promote economic development. Licences have been amended to have improved volumetric specification and defined volumes of unallocated water can be made available for future development. These strategies support population and industry growth, as well as aesthetic and recreational values.

3.3 Sustain the health of ecosystems

The water plan contains general, ecological and specific ecological outcomes which aim to support the ongoing protection of ecological assets and their habitats.

Meeting these outcomes is ensured through implementing the strategies relating to the environmental flow objectives and better specification of water entitlements, for example stating an annual volume that can be taken in a water year and other conditions that limit the extraction of water.

The water plan also requires consideration of water needs of the natural ecosystems when making decisions. Water entitlements granted from unallocated water will include pass flow conditions, limitations on the additional take of water from lakes, and consideration of the environmental values of riffles and refugia associated with waterholes. The existence of waterway features such as riffles and refugia are determined by water flow and are important for maintaining healthy aquatic habitats.

Targeted research and monitoring associated with water plan outcomes will inform the review. See Section 6.1 for a summary of monitoring information for the water plan area. Appendix A provides a summary of each outcome and how the outcomes are being achieved through plan implementation.

3.4 Recognise the interests of Aboriginal peoples and Torres Strait Islanders

The Water Act allows Aboriginal peoples or Torres Strait Islanders, to take or interfere with water for traditional activities or cultural purposes without an entitlement. The Water Act now requires new water plans to state cultural outcomes to recognise the importance of water resources to Aboriginal peoples and Torres Strait Islanders, including their strong spiritual connection to water.

Cultural outcomes will be included as part of the water plan review. Consultation with Aboriginal peoples and Torres Strait Islanders will be undertaken to fill important knowledge gaps as part of the process to review and replace the water plan. The water plan must be replaced prior to its expiry. The water plan expires in 2030. All Traditional Owner groups will be invited to have input in the water plan review process to identify cultural values and develop meaningful outcomes and strategies.

3.5 Enable water resources to be obtained through fair, transparent, and orderly processes

Opportunities to access water in the water plan area exist through access to the unallocated water reserves as well as the purchase of land when there is a water licence attached to the land. The water plan defines the available unallocated water reserves and the process for release is stated in the protocol.

The water plan provides strategic and general reserves of unallocated water. Since the last Minister's report (2019), 2,900ML of unallocated water was released from the general reserve under a process described in the Water Regulation 2016 for the proponent of an irrigation development in the Littabella Creek catchment area.

An expression of interest for unallocated water was received for general reserve in the Baffle Creek catchment area in 2023, however this was subsequently withdrawn.

Unallocated water reserve volumes remain available for future potential development.

3.6 Build confidence regarding availability, security and value of water entitlements and authorisations

The water plan states outcomes which aim to provide, protect and improve access to available water resources. The water plan provides for the continued use of existing water entitlements and other authorisations to take or interfere with water, including replacing a number of historical authorities to take water with volumetric water licences, and better specification of water entitlements. Defined volumes of unallocated water for future development make water available to support towns,

communities, industrial and agricultural growth while providing a level of security for current water users.

In addition, the water plan does not allow a decision regarding the allocation or management of water that would increase the average volume of water allowed to be taken, excluding unallocated water. This strategy provides a level of protection for existing water entitlements by setting an upper limit on total extraction.

3.7 Promote efficient use of water through water markets, allocation, risk assessments and community education

There are no water trading rules in the water plan. Water efficiency practices are considered when granting water entitlements from unallocated water reserves. When the state makes unallocated water available for use, a price is set, encouraging the recognition of water as a valuable resource and promoting its highest value and efficient use.

There is no water trading market (including seasonal water assignment of water licences) in the water plan area. All entitlements are water licences attached to land. Water demand is low and to date, there have been no requests to the department for water trading in the water plan area.

Over the years, general community education about water saving practices has helped to promote efficient use of water. Self-regulation due to factors outside of the water plan control (i.e., power costs, different crop requirements) also helps to encourage efficient use of water.

3.8 Facilitate community involvement in planning for the management and allocation of water

The Water Act outlines the community consultation and engagement requirements when developing and finalising a water plan. Community consultation will occur when the plan is reviewed and replaced prior to its expiry. The water plan expires in 2030. The department will invite interested parties to participate in future water planning activities.

4. Assessment of the effectiveness of the implementation of the water plan in achieving its outcomes

The water plan was released in 2010. Since 2019, a Minister's performance assessment report confirmed that the water plan was achieving its outcomes and there were no adverse impacts on water users or the environment. Consequently, the water plan expiry was extended until 1 September 2030.

The Department of Regional Development, Manufacturing and Water (the department) monitors the implementation of each water plan to make sure it is achieving its outcomes. Key achievements in implementing this water plan include:

- dealing with outstanding licence applications and granting stated water licences
- amending area-based water licences to have a volumetric entitlement, rate of take and conditions
- the release of the general unallocated water reserves
- management of the take of overland flow water.

In 2018, a change to the Water Act made it a requirement for new water plans to state cultural outcomes to recognise the importance of water resources to Aboriginal peoples and Torres Strait

Islanders, including their strong spiritual connection to water. To implement this requirement there will be a need to re-engage with Aboriginal peoples and Torres Strait Islanders to improve our understanding of water-related cultural values in the water plan area and develop meaningful cultural outcomes.

There are strategies in the water plan that provide for this outcome including limitations on drawdown at major waterholes and lakes, as well as considering impacts on aquatic ecosystems processes when granting water entitlements from unallocated water. There are also Water Act provisions which allow Aboriginal peoples and Torres Strait Islanders from the area to take or interfere with water for traditional activities or cultural purposes without an entitlement.

Further engagement with Aboriginal peoples and Torres Strait Islanders as part of the future review of the water plan will be undertaken. The department is committed to improving the understanding of cultural values, aspirations and uses of water and associated water requirements.

Appendix A provides a comprehensive assessment of the effectiveness of the implementation of the water plan in achieving its outcomes since 2019. The assessment shows that the water plan is achieving its outcomes.

5. Information on water use and authorisations in the water plan area

Water users have access to water taken under a water entitlement (e.g. water licence) or under a statutory authorisation through the *Water Act 2000* (e.g. stock and domestic purposes or prescribed activities). Unallocated water is reserved and can be made available for future use with consideration given to protecting existing entitlements and the environment.

5.1 Information on water entitlements and water use

Water entitlements within the water plan area exist in three of the five catchments—Littabella, Baffle and Broadwater—and consist of water licences. There is no water resource development in the Eurimbula and Worthington catchments. The majority of water resource development is in the Baffle Creek catchment area, both in number of water entitlements and total volume. Appendix B provides further detail.

There are no metered entitlement areas (Water Regulation 2016) in the water plan area to measure water usage. Australian land use and management mapping¹ (October 2016) for the Baffle Creek Basin catchment shows that the vast majority of the water plan area is native vegetation with:

- 66% production from relatively natural environments
- 21% conservation and natural environments
- 6% intensive uses
- 5% water (wetlands, rivers, lakes and dams)
- 1% production from irrigated agriculture and plantations
- 1% production from dryland agriculture and plantations.

The requirement for licences to state a volume of water that can be taken in a water year is an important step towards accounting for water use across the water plan area in the future. Based on available information, water usage across the water plan area is estimated to be low.

¹ [Australian land use and management mapping](#)

5.1.1 Entitlements granted from the unallocated water reserves

The water plan provides 11,600ML of general reserve and 3,000ML of strategic reserve of unallocated water. In June 2013, water in the general reserves from each catchment was made available for tender. Further processes to make unallocated water available from the general reserves in the Littabella Creek catchment occurred in 2018 and 2021. To date, 790ML of overland flow water and 2,900ML of watercourse water has been granted from the Littabella Creek catchment area general reserves.

Significant unallocated water reserve volumes (7,910ML) remain held in the water plan area for future demand.

5.1.2 Water taken or interfered with under statutory authorisations

The Water Act and Water Regulation provisions provide statutory authorisations for the taking of water for certain purposes without the need for a water entitlement.

Examples of such take in the water plan area include take of water for stock or domestic purposes by riparian landowners. Stock purposes is defined as watering stock of a number that would normally be depastured on the land on which the water is, or is to be, used. Domestic purposes limits take to household purposes, the watering of animals kept as pets, and for watering a garden where the size of the garden must not exceed an area of 0.5ha. Other examples include the take of some overland flow water, take of underground water, take of water for prescribed activities, and take of water by entities such as regional councils and the Department of Transport and Main Roads for road construction.

The take of water for road construction purposes by prescribed entities is estimated to be less than 200ML/annum across the water plan area. Such take is reported to and recorded by the department.

The department has assessed the trends in the take of underground water and overland flow water to inform this report and future planning priorities. See sections 6.4 and 6.5 for more detail.

5.1.3 Future water demand

Underground water sources used for water supply for the expanding towns of Agnes Water and 1770 have been supplemented by the construction of a seawater desalination plant, which has been operational since 2013. This supplemental water supply is not managed under the water plan as it is manufactured water and not surface water or overland flow water.

Data shows that councils have a high confidence that water demands for the water plan area townships of Bororen, Miriam Vale and Agnes Water and 1770 will be met over the next 5 years².

No expressions of interest for unallocated water have been received for reserves in the Broadwater, Eurimbula and Worthington Creek catchment areas. An expression of interest for unallocated water from the general reserve in the Baffle Creek catchment area was received in 2023, however this was subsequently withdrawn. In May 2022, a renewable energy company announced their intention to develop a hydropower project near Miriam Vale. Information sourced from the proponents outline the project is planned to begin development of works—subject to approval processes—within the next 5 years³.

6. Research and monitoring findings for the water plan

The water planning framework is supported by water monitoring activities that include water quantity and quality of surface freshwater and underground water systems across Queensland. Together with targeted ecological monitoring for water plans, this information is vital for the continued improvement of water planning.

The Environmental Flows Assessment Program (EFAP) undertakes ecological monitoring to assist in assessing the ecological performance of each water plan in meeting its stated ecological outcomes.

² [Home | Queensland's Urban Water Explorer](#) (accessed 6 November 2023)

³ <https://www.flavian.sunshinehydro.com/>

Ecological assets with critical links to flow that represent the plan ecological outcomes, and the various aspects of the flow regime, are selected as indicators of the broader ecosystem for monitoring.

6.1 Summary of ecological monitoring

Monitoring and research projects conducted under EFAP includes the collection of ecological knowledge on the flow requirements of ecological assets (species, communities, places, functions) to develop environmental thresholds that link the requirements of ecological assets with aspects of the flow regime—ecohydrologic rules. This information informs the development of ecological models and decision tools which are used in the environmental assessment of the water plan. The full details of the monitoring programs that have been undertaken can be found in the ‘Summary of Environmental Monitoring Water Plan (Baffle Creek) 2010’⁴.

This section identifies research and monitoring projects that inform water plan performance and future water plan reviews.

6.1.1 Waterholes

The water plan contains specific ecological outcomes associated with minimising changes to water levels and low flows that maintain persistence and refugia of waterholes. Low level risk has been identified to instream waterholes due to low levels of extraction. Any potential ecological risks in accessing the water plan’s unallocated water reserves from waterholes may be mitigated with conditions to take water on any granted water licence.

Waterhole monitoring aims to identify key waterholes that provide essential habitat to native plants and animals within the Baffle Creek system. Surveys were undertaken at two waterholes—Baffle Creek at Mimdale and Granite Creek at Korenan—to determine the volume and surface area. Depth and temperature dataloggers were also installed to understand rates of connectivity for native aquatic animals into and out of waterholes. The project has found that the waterhole in Baffle Creek at Mimdale is of sufficient volume and depth to provide refuge for aquatic plants and animals through extended dry periods. The waterhole in Granite Creek at Korenan is comparably smaller in volume, although does have one deep section with a maximum depth of 2.2m. River connectivity in the plan area is largely influenced by the prevailing climatic conditions given the low levels of water resource development.

Modelling the persistence of waterholes will be undertaken during the future review and replacement of the water plan to assess risk to these important habitats.

6.1.2 Broadwater Creek catchment barrages

Two barrages within the Broadwater Creek catchment limit the connectivity between the freshwater reaches and the estuary. This catchment is also considered to have high environmental values. There are several water licences for the take of water in the Broadwater Creek catchment and an emerging risk associated with the increased interest in unallocated water. The water plan contains a specific ecological outcome to minimise changes to flows that maintain existing brackish habitat downstream of barrages in the Broadwater Creek catchment area. This project was implemented to improve understanding of the existing connectivity between the freshwater and the estuary and to address a knowledge gap regarding the flows required to provide this connectivity.

This monitoring aims to measure the frequency and duration of events where freshwater flows over the top of the barrages. These ‘overtopping’ events are measured through the installation of depth/temperature dataloggers at each barrage and will investigate how this relates to the current level of water take by water entitlement holders. Surveys were undertaken at the two barrages to determine the current volume and surface area, and to assess the change in these parameters from previous surveys undertaken in 2008.

⁴ [Search - DES, DoR and DRDMW - Liberty \(softlinkhosting.com.au\)](https://www.softlinkhosting.com.au)

6.1.3 Surface water-underground water interactions

Groundwater extraction is currently not managed within the Baffle catchment. Groundwater contribution to surface waters remains relatively unknown, consequently there is potential risk to the sustainability of waterholes and fringing riparian vegetation if groundwater extraction increases.

The aim of this monitoring was to identify whether groundwater contributes to surface waters by measuring and comparing the concentrations of radon-222 and radium-226 in groundwater monitoring bores and surface water sites along Baffle Creek and major tributaries.

Radon-222 and radium-226 are chemical traces found naturally in groundwater at much higher concentrations than in surface water. They therefore are commonly used to determine connectivity between groundwater and surface water.

The monitoring found low concentrations detected in stream samples of both radon-222 and radium-226. This suggests Baffle Creek and the major tributaries are not receiving significant groundwater input under current climatic conditions. Conversely, the elevated concentrations detected in the bore sites provide no evidence for surface water infiltration into the groundwater under current climatic conditions. Rather, the recharge source is more likely to be diffuse rainfall infiltration.

Groundwater Dependent Ecosystems (GDE's) are mapped with high confidence in the Broadwater Creek catchment around Deepwater Creek and within Deepwater National Park. Potential for underground water surface water interaction within the Deepwater Creek area is not well understood and further investigations, including water chemistry analysis using radon-222 and radium-226, will be undertaken to inform the future water plan review and replacement.

6.1.4 Water quality

The Baffle Creek catchment is recognised for its relatively intact wetland environments and unimpeded watercourse from headwaters to estuary. Water quality samples collected at Baffle Creek at Mimdale (upstream of most of the water licences) indicate water quality in the catchment is generally satisfactory and within both the Queensland Water Quality Guidelines and the Australian and New Zealand Environment Conservation Council water quality guidelines⁵. This is particularly important as the Baffle Creek Basin contains catchments that discharge into the Great Barrier Reef waters.

The Department of Environment and Science continues to collect water quality data for the Baffle Creek estuary via a datalogger located at the Ferry Crossing, immediately downstream of the Euleilah Creek junction with Baffle Creek. The data from the water quality logger between mid-2019 and early 2021 shows that brackish conditions are found in the Baffle Creek estuary after stream flows in both 2020 and 2021. As there are no instream water storages upstream of the estuary, medium and higher flow events naturally reach the estuary to provide brackish habitat.

6.2 Summary of water monitoring

The stream gauging station network is operated by trained hydrographic staff within a quality management framework under [International Organisation for Standardisation ISO 9001:2015](#) accreditation. Measurements taken at stream gauging stations show that the water plan area is characterised by highly variable river flows, both within and between years. Average annual rainfall varies between 980mm to 1,500mm, with higher rainfall generally over the more elevated ranges and near the coast between Winfield and Bustard Head. The area of highest rainfall and runoff is around the junction of the Many Peaks, Bobby and Dawes Ranges.

Streamflow discharge data from two gauging stations within the catchment demonstrating the variability in discharge is presented in Appendix C, Figure C1 and Figure C2.

The highest peak discharges recorded since commencement of the plan occurred during January 2013 and October 2017. Further data associated with streamflows in the water plan area can be found in the [Water Monitoring Information Portal](#).

⁵ Australian and New Zealand Environment Conservation Council water quality guidelines

Five groundwater monitoring bores were drilled in the water plan area in mid-2011. Data from these bores helps improve scientific understanding, particularly about recharge behaviours and potential surface water interaction. Two bores were drilled in the Agnes Water Volcanics formation adjacent to Deepwater Creek (Broadwater Creek catchment), another three were drilled in fractured granite near extractive bores at Bororen (Baffle Creek catchment).

Groundwater levels have been monitored routinely, highlighting seasonal fluctuations in water levels due to rainfall and recharge patterns (Appendix C, Figure C3 and Figure C4). The underlying geology and sparse nature of extractive bores reflects the small, localised groundwater aquifer formations present in the water plan area.

6.3 Other monitoring programs

Freshwater quality data for Baffle Creek continues to be collected by the department's [Ambient Monitoring program](#). For estuarine waterways downstream, water quality data is collected by Department of Environment and Science. Several sites in Baffle Creek were used as reference sites to develop the [Queensland Water Quality Guidelines 2009](#). More detail on water quality results in the water plan area can be found in the 'Summary of Environmental Monitoring Water Plan (Baffle Creek) 2010'.

6.4 Assessment of low-risk aquifers

The water plan does not manage groundwater resources due to the low yields and the limited ability to extract the resource.

Overall, groundwater availability and usage in the Baffle Creek Basin is considered minimal. Development of new bores during the life of the water plan have primarily been in peri-urban areas near Agnes Water and other smaller coastal communities and are generally only considered suitable for stock and/or domestic purposes.

Over the life of the water plan, new bores were developed at an average rate of 32 per annum. In 2019, more than 100 bores were developed following three years of below average rainfall. The majority of new bores are low-yielding (i.e. less than three litres per second), with highly variable water quality.

Assessments have shown that there is only limited potential for development of small and localised underground water resources. However, new underground water developments will continue to be monitored to ensure water plan outcomes continue to be met.

6.5 Assessment of overland flow (OLF) development

The plan authorises the take of OLF water for:

- stock and domestic purposes
- any purpose from a storage up to 20ML in capacity
- meeting the requirements of an environmental authority
- contaminated agricultural run-off
- notified works and under water licences.

When the water plan commenced, owners of land with existing OLF works with a capacity of more than 20ML were required to give notice about the works in the approved form. Landowners who notified the department of their OLF works received acknowledgement and an assigned works reference number. There were 119 OLF works notified through this process.

Since plan commencement, only three water licences have been granted to take OLF in the Littabella catchment totalling 790ML. All were associated with the release of unallocated water.

A desktop assessment was carried out using a combination of high-resolution satellite imagery and Geographical Information System (GIS) methodologies to assess OLF storage development over the

life of the water plan. The results of this assessment identified no new OLF storages greater than 20ML. Any new OLF development was limited to a small number of stock and domestic storages.

The take of water associated with new OLF development is considered to pose a low risk of impacting existing water users or the environment. Overland flow storage development will continue to be monitored to ensure water plan outcomes continue to be met.

6.6 Social and economic assessment

The water plan supports growth in population and industries and aims to maintain flows that support water-related economic values in the area. The Australian Bureau of Statistics (ABS) census data was used to inform whether the water plan was achieving its social and economic outcomes. This information was generated using the Queensland Government Statisticians Office reporting tool based on relevant statistical areas.

6.6.1 Population information

The estimated population for the Baffle Creek Basin region was 7,164 persons⁶ (as at 30 June 2022). The average annual population growth rate for the last five years is 3%. From 2021 to 2046, the population for the Baffle Creek Basin region is projected to increase to approximately 7,700 persons. This represents a projected increase of 0.5% per year over 25 years.

A desalination plant commissioned by the Gladstone Regional Council has supplemented town water supplies since 2013.

The water plan has reserves of unallocated water sufficient to provide for population growth as well as growth in industries, including agriculture.

6.6.2 Employment by industry

The top four industries by employment numbers in the Baffle Creek Basin region are:

- construction (13.1%)
- accommodation and food services (12.6%)
- retail trade (9.2%)
- agriculture, forestry and fishing (8.5%).

Surface water irrigation use in the Baffle Creek catchment area is predominately for irrigated perennial horticulture (including fruit trees and nut trees) and irrigated cropping (including sugar cane, hay and silage).

There are irrigated macadamia plantations in the Deepwater and Blackwater creek subcatchments (Broadwater Creek catchment), and some irrigated sugar cane and horticulture in the Littabella Creek catchment area.

All water usage is unsupplemented, with the water plan managing the take of water from watercourses, lakes, springs and overland flow. The water plan supports potential growth in irrigated agriculture by providing access to unallocated water reserves.

6.6.3 Water trading and water prices

There is no trade of water in the water plan area. All water entitlements, including those granted from unallocated water, are water licences attached to land and are not tradeable.

6.7 Climate assessment

The Queensland Government is committed to incorporating the best available science on climate change into water planning activities. The department aims to build a shared understanding with the

⁶ Agnes Water - Miriam Vale Statistical Area Level 2 (SA2) (ASGS 2021), Queensland Government Statistician's Office

community of the risk that climate change may pose to future availability of water resources, helping water users and businesses better manage the risk from an increasingly variable and extreme climate.

6.7.1 Recent climate variation in the Baffle Creek Basin

The Baffle Creek Basin is less developed than other catchments in Queensland and does not have any major water storages. Since the release of the water plan in 2010, the basin has experienced some very wet years followed by recent quite dry years. A review of the recent hydrology of the Baffle Creek Basin shows the catchment rainfall over the past 4 years was below average, consistent with the extended drought experienced in Central Queensland (Figure 2).

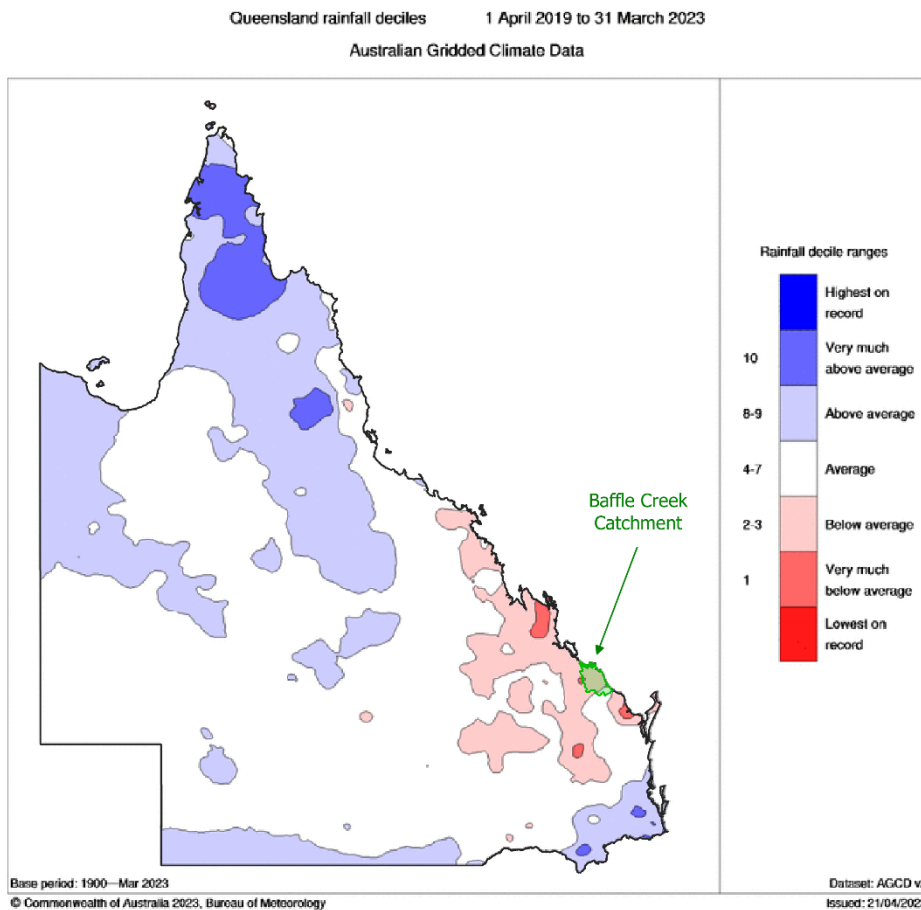


Figure 2: Catchment rainfall over the past 4 years (Source: Bureau of Meteorology.)

Analysis of streamflow records for the period since 2007—when the hydrological model for the water plan was developed—shows that the annual flows recorded at the Baffle Creek at Mimdale streamflow gauge (134001B) were above average in the last 15 years. The recent period contains the lowest annual streamflow on record—in the 2018/19 water year, as well as the second and third highest annual streamflows in the 2010/11 and 2012/13 water years. Figure 3 demonstrates the variability in annual streamflow in this catchment.

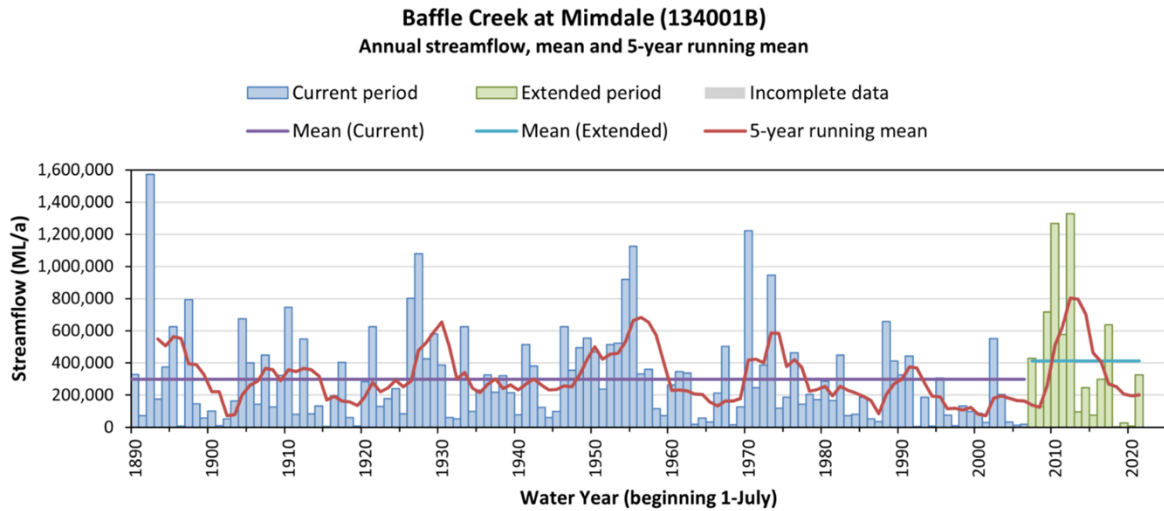


Figure 3: Annual streamflow at Baffle Creek at Mimdale (134001B)

Prior to considering possible future climate change, it is useful to look at what has occurred climatically in the past, especially since the 2007 hydrological model period. Figures 4, 5 and 6 show the average daily temperature, annual potential evapotranspiration and annual rainfall for the Baffle Creek Basin. The temperature shows a marked increase since 1980, whereas the evapotranspiration shows a minor decrease between the periods and the rainfall is slightly drier recently. The temperature increase emerges in the mid-1980s, whereas the evapotranspiration and rainfall changes show no significant difference.

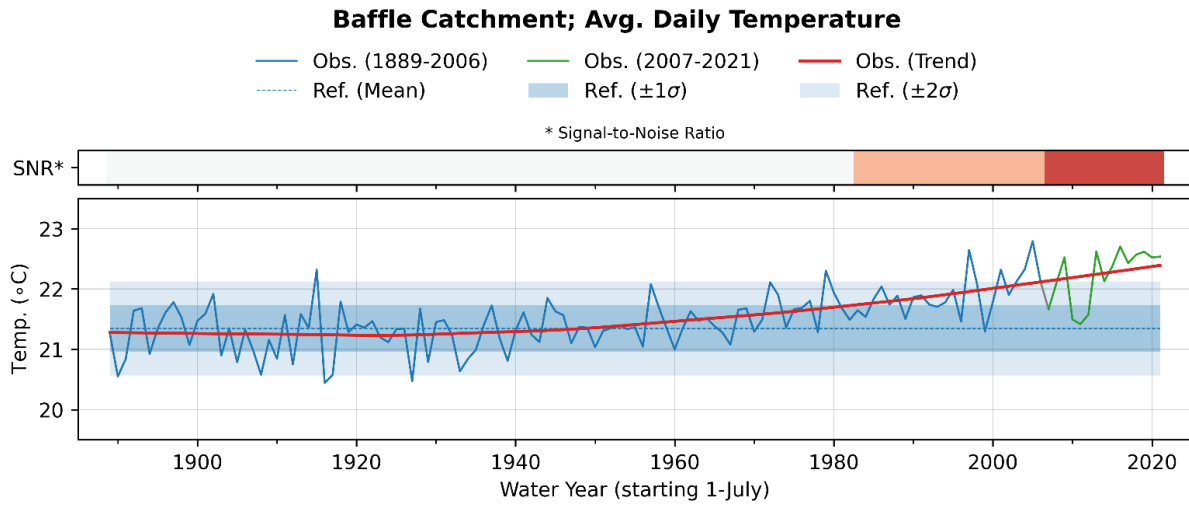


Figure 4: Observed trends in catchment average annual climate: average daily temperature

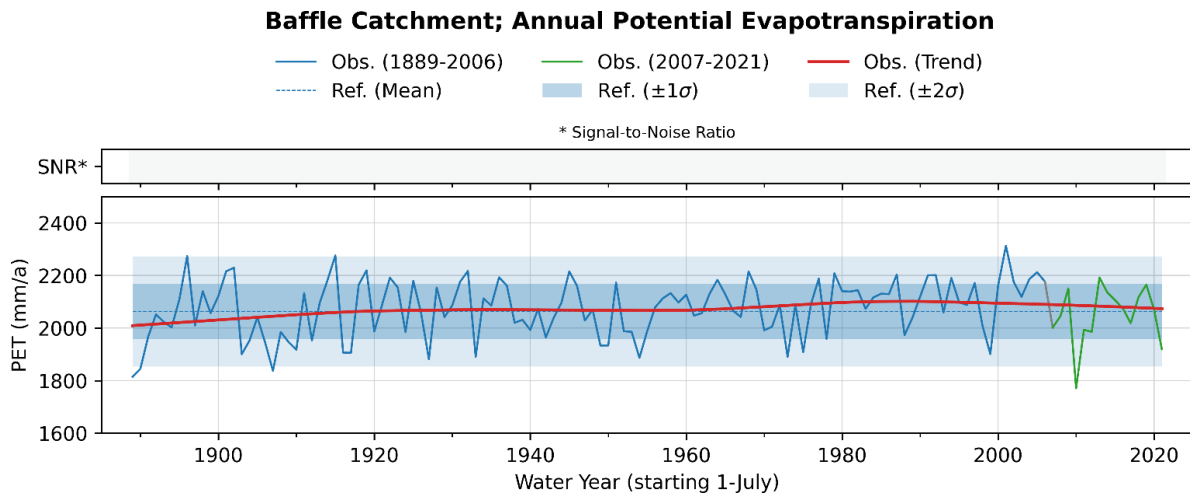


Figure 5: Observed trends in catchment average annual climate: potential evapotranspiration

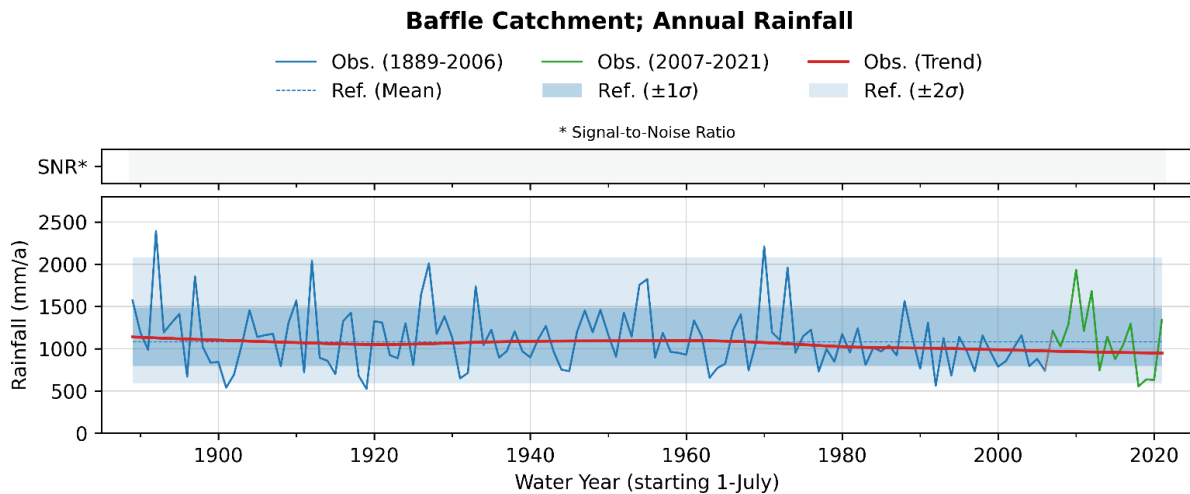


Figure 6: Observed trends in catchment average annual climate: rainfall

6.7.2 Climate change predictions for the Baffle Creek Basin

6.7.2.1 Overview of assessment approach

An assessment of the climate change predictions for the Baffle Creek Basin was undertaken to inform this report. It is important to note that climate models are predictive models that simulate possible future outcomes. As such, these models are not perfect replicas of reality, but ‘what if’ representations of real-life systems.

All models have some degree of scientific uncertainty, with uncertainty associated with both the projected emissions scenarios and the global circulation models. As such, the results from a range of General Circulation Models (GCMs) from the Intergovernmental Panel on Climate Change (IPCC)’s AR5 (Assessment Report 5) CMIP5 (Coupled Model Intercomparison Project Phase 5) are presented. The GCMs that gave the best reproduction of the observed climate in Queensland were selected. The GCMs consider a trajectory of greenhouse gas emissions using numerous scenarios. Emission scenarios chosen in this assessment are Representative Concentration Pathway (RCP) 4.5 and RCP 8.5, which provide a reasonably expected envelope for the future emissions trends. RCP 8.5 represents approximate carbon emissions associated with limited climate change mitigation actions, whereas RCP 4.5 represents a future scenario with considerably more action on climate change and therefore lower projected temperature increases (see Figure 7).

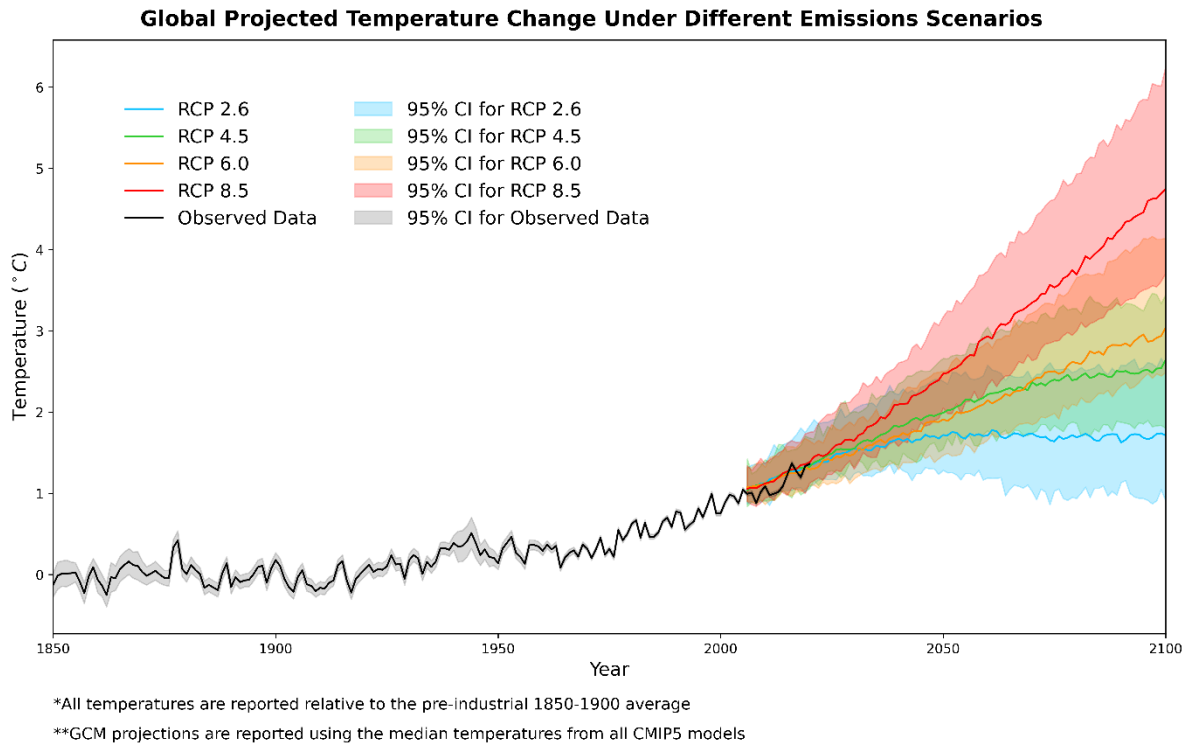


Figure 7: Global projected temperature change from pre-industrial level for IPCC AR5 emissions scenarios

Due to the uncertainty associated with the models, the range of results from the different GCMs are shown, as well as the ‘median prediction’ to give an indication of possible trends in temperature, evaporation and rainfall into the future. This analysis provides a high-level overview of the hydrological variables for the basin, showing current and potential trends in average temperature, potential evapotranspiration and rainfall. As such, projections are not applicable at the farm-scale as the climatic variables have been averaged across the whole basin and the climate change models exhibit a high range of uncertainty, with some models predicting wetter futures and some models predicting drier futures.

6.7.2.2 Overview of predicted changes

All projections show a general warming across the state. In line with the temperature, the potential evapotranspiration is projected to increase in most areas. On average, the rainfall is projected to increase in the western regions and decrease in the northern coastal areas. The Baffle Creek Basin is projected to have little change to annual rainfall.

Figures 8 and 9 show the spread of GCM outputs as at 2030 for the 10th, 50th and 90th percentile projections of annual rainfall and annual evapotranspiration, respectively. There is less uncertainty in the temperature and potential evapotranspiration projections; however, there is large uncertainty in the rainfall projections.

The temperature and potential evapotranspiration projections broadly show increases for all months. The monthly rainfall has more variability, but it is trending towards a small increase in summer months for both projections and decreases in the spring months. In summary, there is evidence that climate change is occurring in the Baffle Creek Basin. The average catchment temperature shows increases from the 1980s, whereas the evapotranspiration shows minor increases and the rainfall a slight decrease. The last 10 years contained two very high rainfall years and a historically low rainfall year. However, the Baffle Creek Basin exhibits quite variable rainfall compared to other basins, and as such the rainfall and streamflow experienced recently are not considered significantly different to this trend. The information presented represents the best understanding at this time and will be updated as new science becomes available.

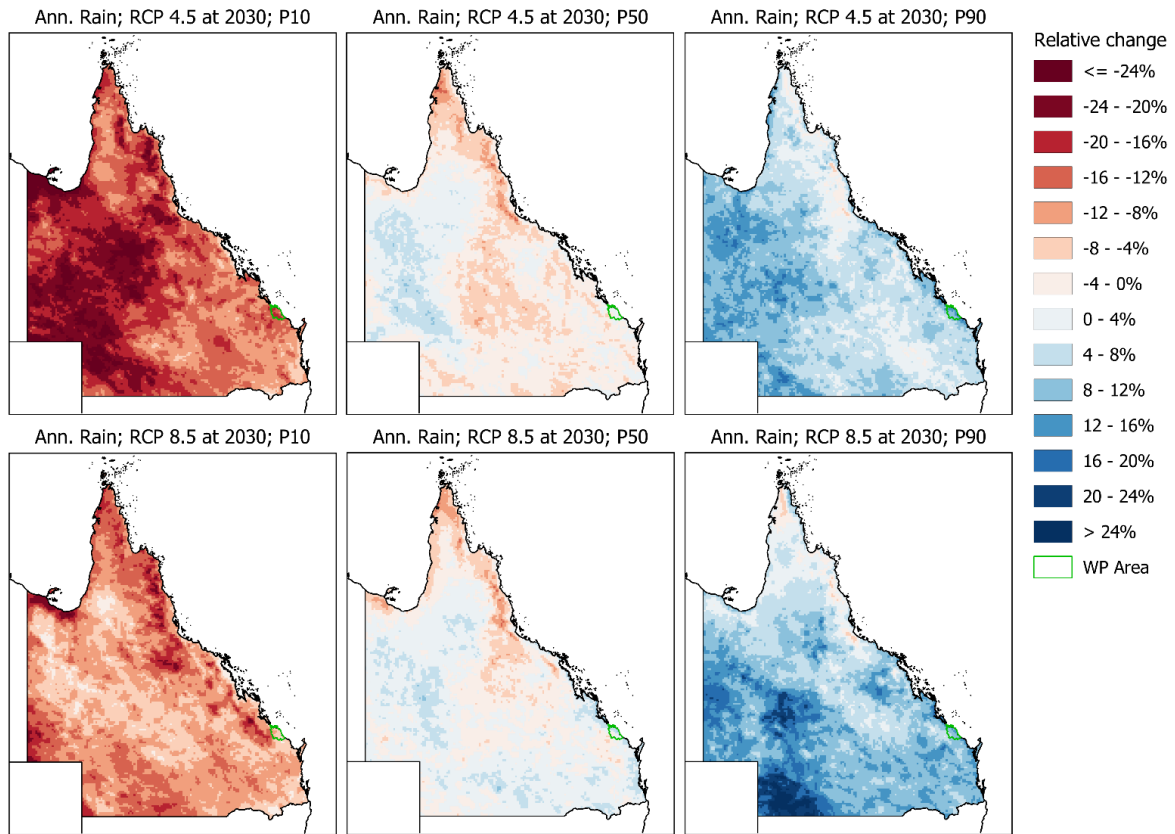


Figure 8: 10th, 50th and 90th percentile projections of annual rainfall for RCPs 4.5 and 8.5 at projection year 2030

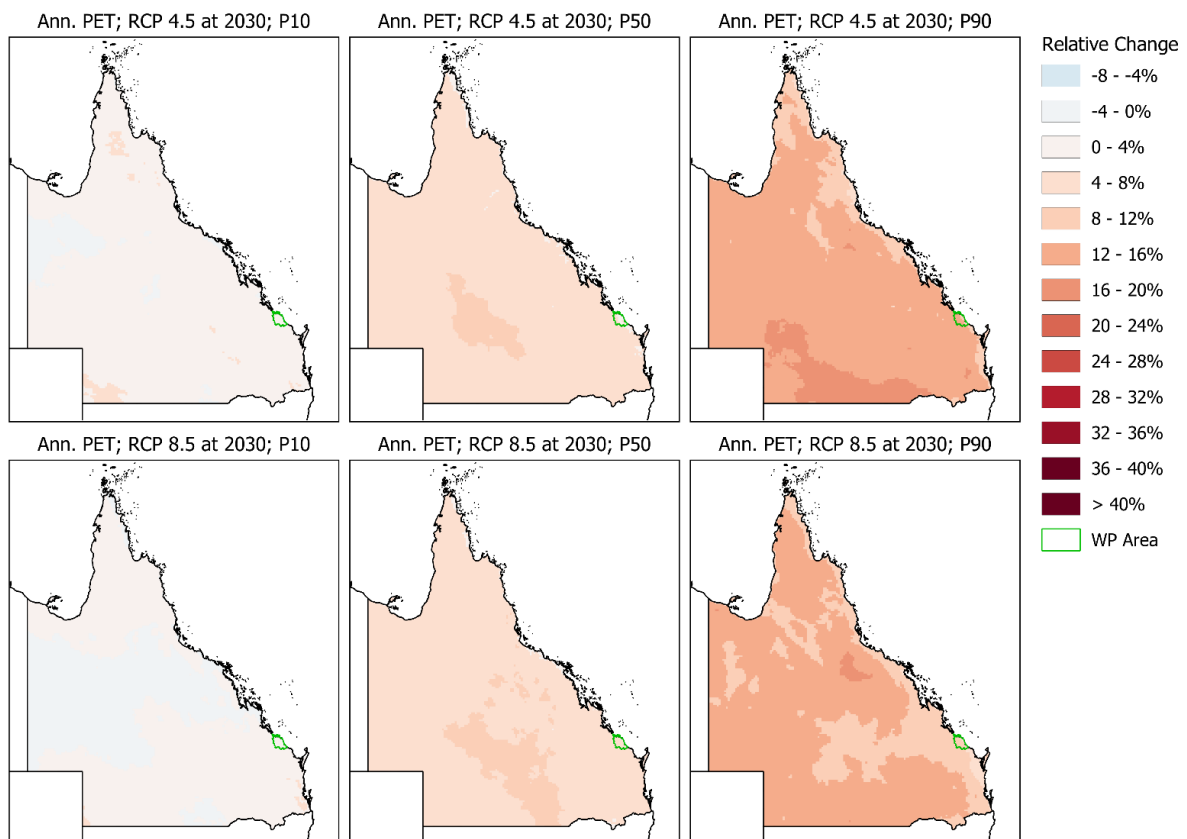


Figure 9: 10th, 50th and 90th percentile projections of annual evapotranspiration for RCPs 4.5 and 8.5 at projection year 2030

7. Water plan amendments and previous reports

There have been no significant amendments to the water plan since its commencement in 2010. After the last Minister's report in 2019, the water plan expiry was postponed until 1 September 2030.

The milestones since the water plan commenced are detailed in Appendix D.

8. Identification of potential risks to the water plan's outcomes

Risk assessments were completed in July and September 2023 to identify any potential risks to the water plan's outcomes that could emerge before it expires in September 2030. An analysis of changes in the water plan area and any future water demands beyond the life of the plan was used to identify any potential risks and emerging matters.

Data and expert opinion were used to rank the likelihood and consequence of risk from a standardised list of threats, and the risk level and rationale for this ranking were documented. Under this assessment framework, the level of risk, along with other factors, such as a water plan's ability to achieve its general and ecological outcomes were considered in proposing an applicable course of action. The assessment found that all potential risks to plan outcomes are low, however one outcome was not assessed due to insufficient information. Further detail is provided in Appendix A.

9. Emerging issues

The review and replacement of the water plan must occur prior to the water plan's expiry. The water plan expires in 2030. The review and replacement process will address identified and potential future emerging issues. The replacement water plan will include the following opportunities and matters:

- Develop more contemporary social, economic, environmental, and cultural outcomes.
- Consider the impact of climate change and climate variability on water availability in the water plan area.
- Re-engage with Aboriginal peoples and Torres Strait Islanders to improve understanding of water-related cultural values in the water plan area.
- Incorporate the latest available scientific data to support the technical assessments (hydrologic, environmental, socioeconomic, and cultural).
- Understand the groundwater resource, particularly connectivity to surface water.

Climate change projections for 2030 and beyond show impacts on evaporation and/or rainfall in the water plan area. The department reviews the water plan for Minister's reporting every five years to track any changes, however because there are low entitlements as compared to water available this is considered low risk to water security.

There are unmetered volumetric entitlements in the water plan area. The department continues to undertake compliance activities and investigations in the water plan area. Any growth in non-compliance activity is considered in identifying priority areas for metering.

There was only one streamflow gauging station operating in the water plan area when the plan was developed. A second streamflow gauging station was installed in late 2011 and five new groundwater monitoring bores were installed since the water plan commenced. Future hydrological modelling will incorporate any new information from these data sources.

10. Any non-compliance under a water entitlement or other authorisation in the water plan area

In the last five years, the department investigated seven non-compliance matters under a water entitlement or other authorisations in the water plan area. The investigations found there were four instances of non-compliance. See Appendix E for more information.

The department uses a range of methods to identify non-compliance including field and desktop audits, and third-party notification. These activities support public confidence in how water is managed and protects the rights of all entitlement holders and the broader community.

The department's [Compliance Plan 2023–2024](#) identifies activities that support department's compliance approach, including compliance outcomes, performance measures, focus areas, activities, targets and measures. The water plan supports the department to take a risk-based, transparent and consistent approach to how we regulate Queensland's water resources.

11. Way forward

This assessment has highlighted how the monitoring undertaken over the life of the water plan has improved data coverage for the area, supporting ongoing science and assessment of its outcomes. Water monitoring, including the monitoring of development trends, and ecological monitoring activities, will continue to provide vital information that will inform water plan performance and future water plan reviews.

Improving our understanding of water-related cultural values and use will be addressed as part of the water plan review and replacement to ensure continued effectiveness into the future.

Overall, the current implementation of the water plan continues to advance the sustainable management of water resources. Most outcomes are being achieved and implementation will continue until the water plan is reviewed and replaced prior to its expiry. The water plan expires 1 September 2030.

Appendix A Assessment of water plan outcomes

Table A.1: General outcomes

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Qualitative risk ranking and preliminary assessment of outcome
11) Each of the following is a general outcome for water in the plan area			
(a) to provide for the use of all existing water entitlements and other authorisations to take or interfere with water	The plan provided for the use of existing water licences by requiring licences to state a volume, purpose, rate of take and any conditions. The plan also replaced a number of historical authorities to take water with volumetric water licences	<ul style="list-style-type: none"> water licences amended to include volumetric limits granting volumetric water licences to replace authorities to take water monitoring of water taken 	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan provides ongoing access to water under existing and new water entitlements.</p>
(b) to provide for the continued use of all existing overland flow works	The plan authorises the take of water by existing overland flow works	<ul style="list-style-type: none"> management of overland flow water 	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>Overland flow works analysis found no storages greater than 20ML developed from 2017 – 2023.</p>
(c) to make water available to support— (i) population growth in towns and communities dependent on surface water resources in the plan area; and (ii) growth in industries, including agriculture and aquaculture, dependent on surface water resources in the plan area; and (iii) stock or domestic purposes in the plan area	The plan provides for unallocated water as strategic and general reserves. The plan also provides for new overland flow works to take water for stock and domestic purposes and storages up to 20ML for any purpose	<ul style="list-style-type: none"> process for making available and dealing with unallocated water management of overland flow water 	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan provides ongoing access to water under existing and new water entitlements.</p> <p>Population growth is expected to be modest, and a desalination plant contributes urban supplies for the towns of Agnes Water and 1770.</p>
(d) to maintain flows that support water related aesthetic, economic and recreational values in the plan area, including, for example, tourism	The plan outlines the volumes of unallocated water that may be accessed, as well as pass flow conditions for new water licences. Environmental flow objectives are used to assess the consistency of water management decisions.	<ul style="list-style-type: none"> amendment of existing water licences to include, for example, volumetric limits process for making available and dealing with unallocated water 	<p>LOW risk</p> <p>This outcome is currently being achieved.</p> <p>The plan provides the framework for the management of the water resource. The volume of unallocated water and the restrictions on the</p>

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Qualitative risk ranking and preliminary assessment of outcome
	<p>The plan also limits the level of interference to stock and domestic, pumping pools for existing entitlements and unallocated water. No new interference is allowed on Baffle Creek or in the Eurimbula or Worthington Creek catchment areas</p> <p>Overland flow water is managed.</p>	<ul style="list-style-type: none"> management of overland flow water natural ecosystem monitoring. 	<p>access conditions for the unallocated water provide for this outcome.</p>
(e) to support, as far as practicable, surface water and groundwater interactions	<p>The plan requires water and ecosystems monitoring. Groundwater and surface water impacts are considerations in dealing with unallocated water.</p>	<ul style="list-style-type: none"> monitoring of the construction of new bores considered in process for making available and dealing with unallocated water 	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>Additional monitoring bores were drilled after the commencement of the plan and will continue to provide additional information on surface water and groundwater interaction.</p> <p>Aquatic ecology data indicates minimal underground water/surface water interaction.</p>
(f) to encourage continual improvement in the efficient use of water	<p>The plan requires water licences to state a volume, purpose, rate of take and any conditions. The efficient use of water is also a consideration in dealing with unallocated water</p>	<ul style="list-style-type: none"> monitoring of water taken amendment of existing water licences to include volumetric limits efficiency of use is considered when unallocated water is granted. 	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan provides ongoing access to water under existing and new water entitlements.</p>
(g) to support water-related cultural values in the plan area, including the values of the traditional owners of the plan area	<p>The plan requires that cultural values are considered in the process for dealing with unallocated water, which include limitations on new take from lakes.</p>	<ul style="list-style-type: none"> natural ecosystem monitoring requirement for flow conditions on all new water licences process for making available and dealing with unallocated water includes consideration of cultural values. 	<p>Not assessed</p> <p>The need to re-engage with Aboriginal peoples and Torres Strait Islanders to improve our understanding of water-related cultural values in the plan area was identified.</p> <p>Consultation with Aboriginal peoples and Torres Strait Islanders will be undertaken as part of the plan review process prior to its expiry to fill important knowledge gaps. The water plan expires in 2030.</p> <p>The assessment criteria for an unallocated water release process under the plan and protocol include consideration of water related cultural values.</p>

Table A.2: General ecological outcomes

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
12) Each of the following is an ecological outcome for water in the plan area					
(a) to minimise changes to the natural variability of flows that support aquatic ecosystems;	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<ul style="list-style-type: none"> • management of overland flow water • requirement for flow conditions on all new water licences • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements. 	<ul style="list-style-type: none"> • waterholes • riffles • mangrove jack • brackish estuarine habitat • regional ecosystems supports by high flows • fluvial geomorphology and river forming processes. 	<p>Stream water level and estuarine water quality monitoring highlight the near-natural stream hydrology of Baffle Creek.</p> <p>Brackish conditions were provided by freshwater flow for the Baffle Creek estuary in the water plan implementation years 2010-2021.</p> <p>As there are no upstream instream storages, medium and higher flow events naturally reach the estuary to provide brackish habitat.</p>	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan manages overland flow and surface water. Environmental flow objectives protect stream flows.</p>
(b) to provide for the continued capability of one part of an aquatic system to be connected to another, including by maintaining flows that—	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p>	<ul style="list-style-type: none"> • management of overland flow water • requirement for flow conditions on all new water licences 	<ul style="list-style-type: none"> • waterholes • riffles • mangrove jack • brackish estuarine habitat 	<p>There has been limited specific monitoring in the plan area however water use is low and unallocated water has only been granted in the Littabella catchment.</p> <p>Brackish conditions were provided by freshwater flow for the Baffle Creek</p>	<p>LOW risk</p> <p>This outcome is currently being achieved. The plan has set maximum unallocated water reserves.</p> <p>The plan also manages overland flow, restricts</p>

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
<p>(i) allow for the movement of native aquatic species between riverine, floodplain, wetland, estuarine and marine environments; and</p> <p>(ii) support natural processes such as breeding, growth and migration in riverine, floodplain, wetland, estuarine and marine environments; and</p> <p>(iii) support river-forming processes;</p>	<p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<ul style="list-style-type: none"> • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements 	<ul style="list-style-type: none"> • regional ecosystems supports by high flows • fluvial geomorphology and river forming processes. 	<p>estuary in all years of the water plan implementation (2010-2023). These conditions provide favourable conditions for fish breeding and growth.</p> <p>Water level monitoring has commenced in the Broadwater catchment to measure connectivity between freshwater and estuarine habitats.</p> <p>See also 12 (c).</p>	<p>interference in particular streams and requires flow conditions on any new licences.</p>
<p>(c) to minimise changes to natural variability in water levels to support natural ecological processes, including maintaining refugia associated with waterholes and lakes;</p>	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p>	<ul style="list-style-type: none"> • monitoring of water taken • management of overland flow water • requirement for flow conditions on all new water licences • amendment of existing water licences to include volumetric limits • limits to the areas where interference 	<ul style="list-style-type: none"> • waterholes • riffles • brackish estuarine habitat • regional ecosystems supports by high flows • fluvial geomorphology and river forming processes. 	<p>Desktop assessment of flows events that provided connectivity between Baffle Creek and three key lagoons have been conducted by the department. These lagoons were identified in technical studies prior to the commencement of the plan. Over the life of the plan there have been a number of high flow events that have provided suitable connectivity between lagoons and Baffle Creek.</p> <p>Waterhole monitoring has commenced in Baffle Creek and Granite Creek.</p>	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan manages overland flow and surface water. Environmental flow objectives protect stream flows.</p> <p>The plan also prohibits the granting of unallocated water from lakes as well as establishing drawdown limits for specific lakes to maintain refugia.</p>

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
	<p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<p>by impoundment is allowed</p> <ul style="list-style-type: none"> • water and natural ecosystem monitoring requirements • drawdown conditions on specific licences in waterholes. 			
(d) to minimise adverse impacts on aquatic ecosystems immediately downstream of new water resource development;	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p>	<ul style="list-style-type: none"> • monitoring of water taken • requirement for flow conditions on all new water licences • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements 	<ul style="list-style-type: none"> • waterholes • riffles • mangrove jack • brackish estuarine habitat • regional ecosystems supports by high flows • fluvial geomorphology and river forming processes. 	<p>There has been no significant water resource development since plan commencement.</p>	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The water plan sets environmental flow objectives and specific pass flow conditions for taking of unallocated water to provide for downstream ecosystems.</p>

Water plan outcome	Water plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
	<p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>				
<p>(e) to improve understanding of the matters affecting flow ecology responses of ecosystems within the plan area.</p>	<p>There are monitoring and reporting requirements in the plan. The minister reports on matters affecting the environment and water users in the Minister's report on the plan.</p>	<p>The performance of the plan will be assessed using monitoring to determine if outcomes are being achieved.</p>	<ul style="list-style-type: none"> • all. 	<p>The details of the department's monitoring and other monitoring conducted within the plan area have been summarised in this report (Section 6) and are used as a tool to assess the achievement of the ecological outcomes.</p>	<p>LOW risk</p> <p>The outcome is being achieved.</p> <p>All ecosystem monitoring data is published in the departmental library and is visible to all stakeholders.</p> <p>The addition of five new groundwater monitoring bores and one new gauging station since the plan commenced provide additional data for future assessments. This data is available on the departmental water portal.</p>

Table A.3: Specific ecological outcomes

Plan outcome	Plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
13) Each of the following is a specific ecological outcome for water in the plan area					
(a) to maintain the near-natural flow regime that supports waterholes and estuarine ecosystems in the Eurimbula Creek catchment area and Worthington Creek catchment area;	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<ul style="list-style-type: none"> • monitoring of water taken • management of overland flow water • requirement for flow conditions on all new water licences • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements. 	<ul style="list-style-type: none"> • waterholes • riffles • mangrove jack • brackish estuarine habitat • regional ecosystems supports by high flows • fluvial geomorphology and river forming processes 	<p>There has been no specific monitoring in these catchments, however water use is low and there has been no grant of unallocated water in these catchments due to lack of demand.</p>	<p>LOW risk</p> <p>The outcome is being achieved.</p> <p>Water use is low and there has been no grant of unallocated water in these catchments.</p>
(b) to minimise changes to flows that maintain existing brackish habitat downstream of barrages in the Broadwater Creek catchment area;	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed</p>	<ul style="list-style-type: none"> • monitoring of water taken • management of overland flow water • requirement for flow conditions on all new water licences 	<ul style="list-style-type: none"> • mangrove jack • brackish estuarine habitat • regional ecosystems supports by high flows • fluvial geomorphology 	<p>Water use is low and there has been no grant of unallocated water in these catchments due to lack of demand.</p> <p>Monitoring of the relationship between groundwater and the water level and water</p>	<p>LOW risk</p> <p>The outcome is being achieved.</p> <p>Water use is low and there has been no grant of unallocated water in these catchments.</p>

Plan outcome	Plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
	<p>on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p>	<ul style="list-style-type: none"> • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements. 	<p>and river forming processes.</p>	<p>chemistry in the barrages has commenced.</p>	
<p>(c) in the Baffle Creek catchment area—</p> <p>(i) to maintain connectivity between Baffle Creek and its adjacent floodplain system including lakes; and</p> <p>(ii) to maintain the near-natural flow regime that provides for intermittent brackish habitat through the entire length of the Baffle Creek estuary; and</p> <p>(iii) to minimise changes to the low flow regime that provides for riffle habitat and maintains waterholes; and</p> <p>(iv) to minimise changes to the persistence of Waterholes.</p>	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<ul style="list-style-type: none"> • monitoring of water taken • management of overland flow water • requirement for flow conditions on all new water licences • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements • drawdown conditions on specific licences in waterholes 	<ul style="list-style-type: none"> • waterholes • riffles • mangrove jack • brackish estuarine habitat • regional ecosystems supported by high flows • fluvial geomorphology and river forming processes. 	<p>See 12 (c).</p> <p>Brackish conditions were provided by freshwater flow for the Baffle Creek estuary for the years 2010 through to 2023.</p> <p>Estuarine water quality in Baffle Creek has natural fluctuations in brackish conditions—influenced by the prevailing climatic conditions.</p> <p>A previous desktop assessment of waterhole persistence during a very dry period (2016) revealed that all waterholes persisted during this time.</p> <p>Waterhole monitoring has commenced in Baffle Creek and Granite Creek.</p>	<p>LOW risk</p> <p>This outcome is being achieved.</p> <p>The plan manages overland flow and surface water. Environmental flow objectives have been set and passflow requirements for release of unallocated water protect stream flows are required.</p> <p>The plan also prohibits the granting of unallocated water from lakes as well as establishing drawdown limits for specific lakes to maintain refugia and to limit changes to persistence.</p> <p>There are no impediments to stream flow in Baffle Creek due to restrictions on interference. Estuarine water quality in Baffle Creek has natural fluctuations in brackish conditions.</p>

Plan outcome	Plan strategies to provide outcome	Rules that provide for outcome	Related ecological assets	Summary of monitoring and assessment	Qualitative risk ranking and preliminary assessment of outcome
<p>(d) to minimise changes to the flow regime that maintains brackish habitat in the upper reaches of Littabella Creek estuary.</p>	<p>The plan outlines the volumes of unallocated water that may be accessed as well as providing for the environment through setting of EFOs.</p> <p>The plan allows for restrictions to be placed on new licences regarding the take of water from waterholes or lakes.</p> <p>Water licences are granted from general reserves with flow thresholds.</p> <p>Overland flow is managed by the plan.</p> <p>The plan limits the level of interference to flow through either diversion structures or excavation of the stream bed in parts of the plan area.</p>	<ul style="list-style-type: none"> • monitoring of water taken • management of overland flow water • requirement for flow conditions on all new water licences • amendment of existing water licences to include volumetric limits • limits to the areas where interference by impoundment is allowed • water and natural ecosystem monitoring requirements. 	<ul style="list-style-type: none"> • Littabella estuarine salinity 	<p>There has been no specific monitoring in this catchment, however, there has been development since the grant of unallocated water in this catchment.</p>	<p>LOW risk</p> <p>This outcome is being achieved. The plan sets environmental flow objectives and specific pass flow conditions for taking of unallocated water to provide for downstream ecosystems.</p>

Appendix B Water entitlements and authorisations

Table B.1: Water licences to take water within the Baffle Creek Basin water plan area⁷

Catchment	Watercourse or lake			Overland flow
	Volumetric	Area	Other ⁸	
A – Littabella	3 882ML (6 licences)	-	-	790ML (3 licences)
B – Baffle	7 462ML (44 licences)	50 ha (1 licence) ⁹	2 licences	-
C – Broadwater	3 262.5ML (6 licences)	-	-	-
D – Eurimbula	-	-	-	-
E – Worthington	-	-	-	-
Total	14 606.5ML (56 licences)	50 ha (1 licence)	2 licences	790ML (3 licences)

Table B.2: Water licences to interfere within the Baffle Creek Basin water plan area⁸

Catchment	Water licences to interfere
A – Littabella	3 licences
B – Baffle	3 licences
C – Broadwater	-
D – Eurimbula	-
E – Worthington	-
Total	6 licences

⁷ The details supplied in this table are correct as of 5 October 2023. Any changes that occurred after that date will not be reflected in the table.

⁸ Entitlements without a nominal entitlement or area specified.

⁹ The taking of water under this authorisation is prohibited when the water level in the lake is lower than 2 meters from the full supply level.

Appendix C Surface water monitoring

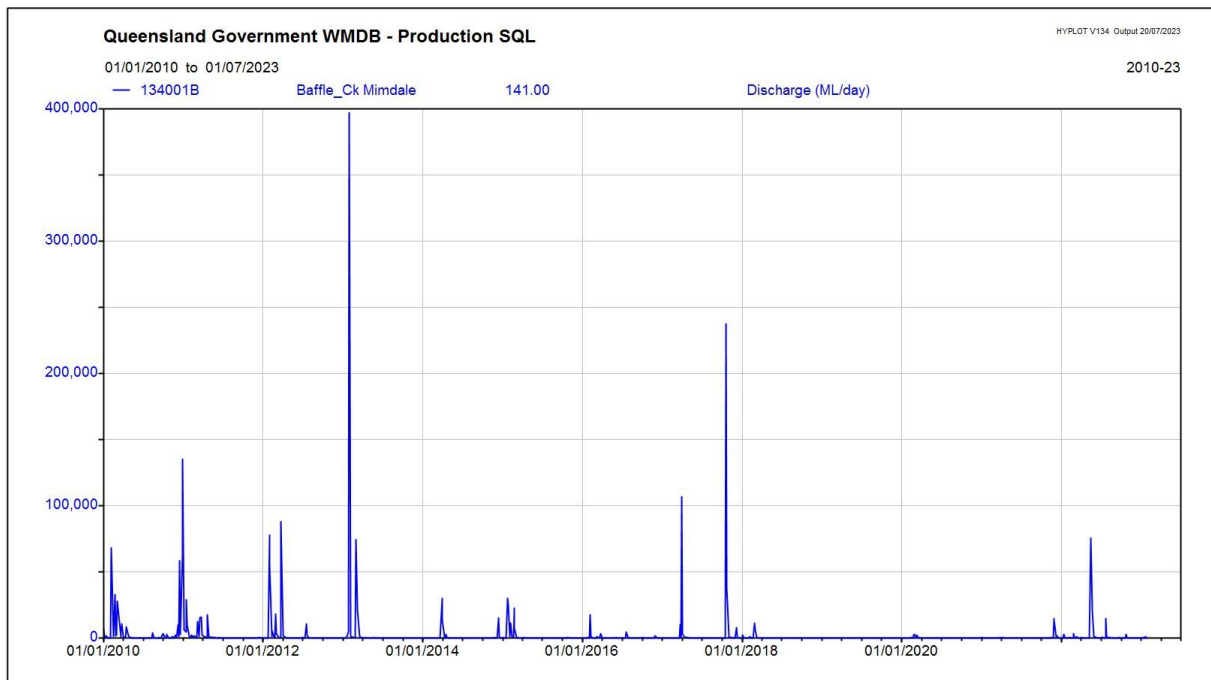


Figure C.1: Daily streamflow records from Baffle Creek at Mimdale since commencement of the water plan

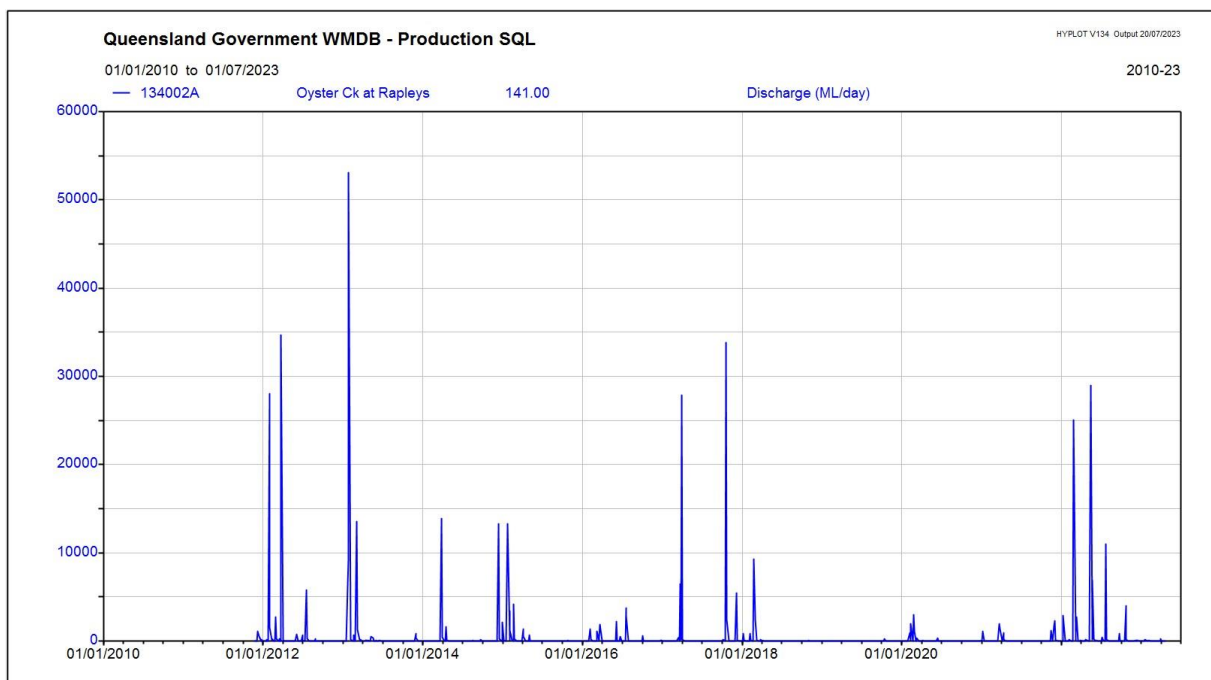


Figure C.2: Daily streamflow records from Oyster Creek at Rapleys since commencement of the water plan

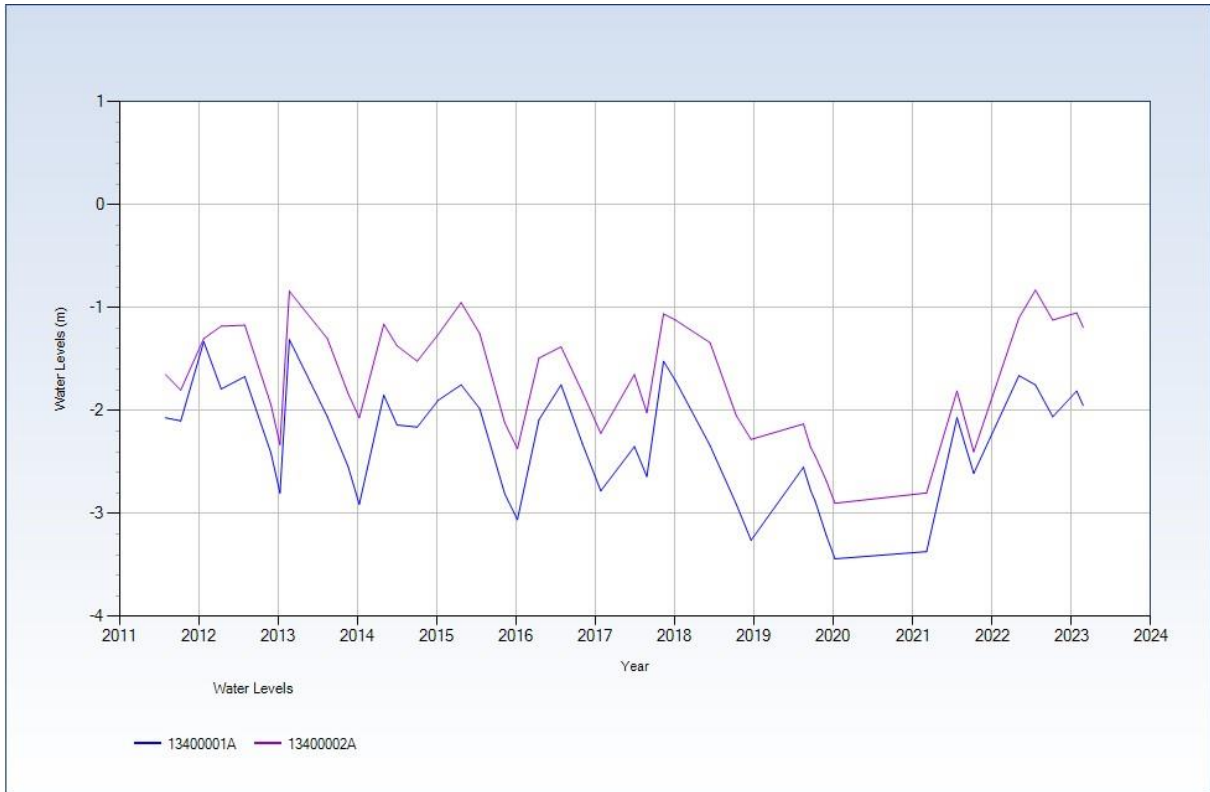


Figure C.3: Bore water level data for monitoring bores located adjacent to Deepwater Creek (in Broadwater Creek catchment)

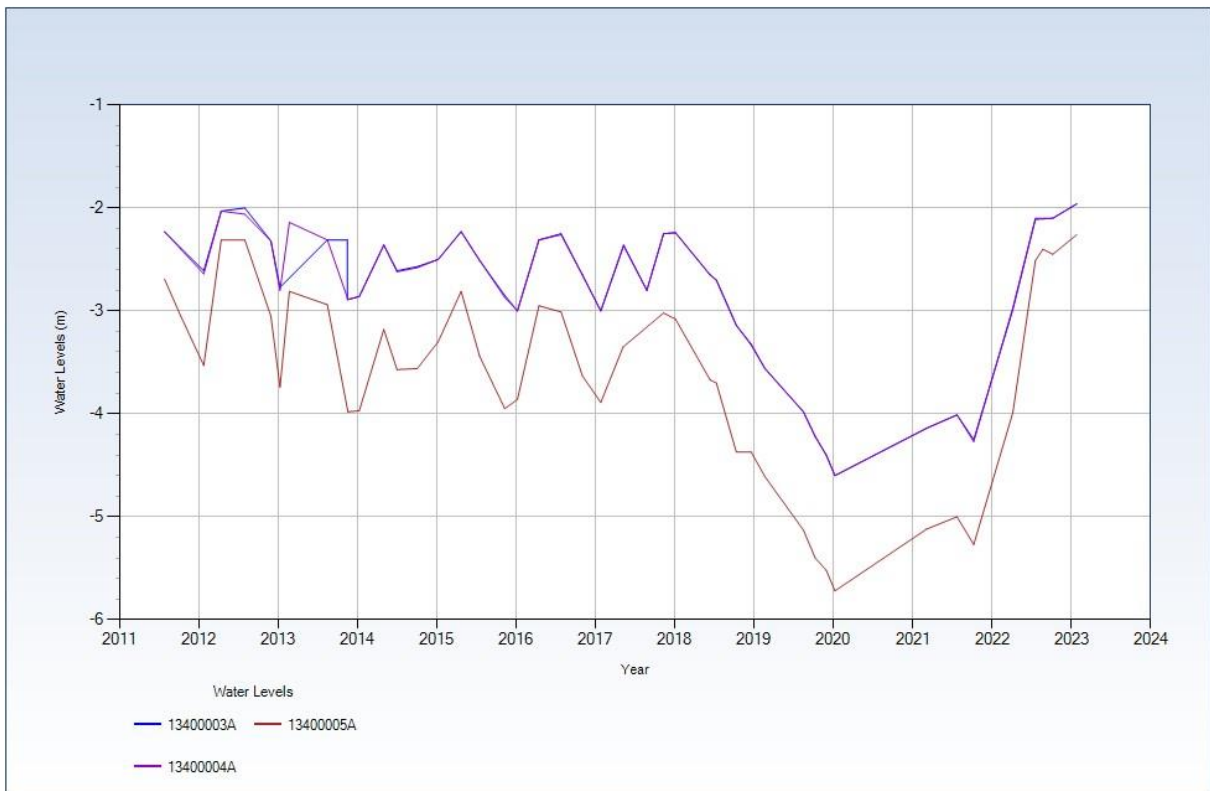


Figure C.4: Bore water level data for monitoring bores located adjacent to Bororen (Baffle Creek catchment)

Appendix D Plan amendments and milestones

Table D.1: Water planning milestones for the Baffle Creek Basin water plan

Effective date	Milestones
5 November 2010	The Water Resource (Baffle Creek Basin) Plan 2010 (and explanatory notes) commenced in November 2010 and applied to surface water and overland flow water. The plan identified general and strategic reserves to provide for future water requirements. The plan allowed continued use of all water entitlements and improved certainty of supply for water entitlement holders. The plan also provided the framework for water for essential supplies and natural ecosystems as well as recognising cultural values important to traditional owners.
1 December 2011	The Baffle Creek Basin Resource Operations Plan (ROP) was released in December 2011, with a consultation report and explanatory notes. The ROP, now the protocol, amended water licences to align with the strategies in the water resource plan, stated a process for the release of unallocated water, dealing with licence applications and overland flow.
27 September 2013	The <i>Land, Water and Other Legislation Amendment Act 2013</i> amended the plan to update a section number cross reference with the <i>Water Act 2000</i> .
27 June 2014	The plan was amended by the <i>Water Reform and Other Legislation Amendment Act 2014</i> , which: <ul style="list-style-type: none"> removed unnecessary prescription while retaining policy intent and standardised, simplified and enhanced the transparency of selected provisions removed redundant provisions and removed duplication with the <i>Water Act 2000</i> and the <i>Water Regulation 2002</i> moved the monitoring and reporting requirements into the protocol changed the Minister's reporting period on the plan to five years.
6 December 2016	The plan was amended by the <i>Water Resource Plans Amendment Plan (No. 1) 2014</i> , to be consistent with wording of the new <i>Water Act 2000</i> , this included the establishment of the new water planning framework which stated the existing Baffle Creek Basin water resource plan and resource operations plan was taken to be a water plan and water management protocol.
20 December 2019	A notice was gazetted to postpone the expiry date of the water plan to 1 September 2030. A summary of the consultation on postponing the expiry was published.

Appendix E Overview of non-compliance issues

Table E.1: Summary of non-compliance by entitlement holders over the past five years

Water year	Number of alleged non-compliances	Type of alleged non-compliance	Outcome
2018/19	3	2 Unauthorised take 1 Unauthorised interfere	1 No offence detected 1 Formal warning 1 Compliance notice
2019/20	-	-	-
2020/21	2	2 Unauthorised interfere	2 No offence detected
2021/22	1	1 Unauthorised interfere	1 Formal warning
2022/23	1	1 Unauthorised take	1 Advisory letter

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