Final Report

Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event

September 2020

Letter of Transmittal

Dear Secretary

We are pleased to submit to you the report of our assessment into the management of the 2020 Northern Basin First Flush event.

Consistent with our Terms of Reference, we approached this assessment by holding a series of interviews with NSW and other agency staff, seeking feedback from the public on two occasions, and obtaining the advice of a group representing the interests of irrigators, local councils, Traditional Owners and Indigenous communities, environmental groups and floodplain harvesters across the NSW section of the Murray-Darling Basin.

We are grateful to the community members, groups and government agencies who took the time to provide their feedback in the interview and public consultation process, and particularly those who provided detailed and thoughtful written submissions. We thank the members of the water user reference group who not only shared their insights with the Panel, but also listened carefully and respectfully to understand and learn about each other's points of view.

There is no doubt that rainfall events in the first half of 2020 led to some wonderful and much needed outcomes for communities and the environment under stress across the Northern Basin, and that the efforts of staff within NSW Government agencies to manage the first flows demonstrated great courage, dedication and commitment to restoring the critical water needs so desperately required in regional communities across the Northern Basin in NSW. It was by no means an easy feat.

However, throughout the course of this assessment, the Panel has heard that what should have been a time of celebration, was instead a deeply stressful and fraught experience for all involved.

There has been recognition by some community members, and other government agencies, that NSW staff did a reasonably good job of managing the event to meet critical water needs, based on the decision-making framework and the information and the tools they had available at the time.

However, many water users in the north, and floodplain harvesters, spoke of the economic and emotional stress caused by drought being exacerbated by the uncertainty resulting from poor communication of water restrictions (and the floodplain harvesting exemption), and the views of some that decision-making was slow and opaque, resulting in biases and missed opportunities.

On the other hand, communities, particularly those in the Lower Darling and southern parts of the Murray-Darling Basin, expressed concern and sometimes outrage, that irrigation interests were put before the needs of the environment and downstream communities, at a time when the environment was most at need and unambiguously of primary importance.

Traditional Owners and Indigenous communities, also under significant emotional and cultural stress caused by seeing their rivers dry, expressed their disappointment at the lack of engagement. They felt frustration that, in their view, irrigation interests were put before the health of the river, and fed up that, once again, their role as custodians was ignored.

Finally, agency staff who managed the event spoke of the exhausting pressure to keep up with the demands required to manage such a critical and dynamic event, trying to make the most of limited and ultimately inadequate resources and uncertain information to maximise the opportunities presented by the rainfall and restore outcomes across the Murray-Darling Basin.

They understood the criticality of the decisions they made and the impact they would have on desperate people within desperate communities, and they carried that burden personally.

In its review of how the event was managed, the Panel found that the decision making framework, while not always perfect with the benefit of hindsight, was reasonably robust and generally used the best available information and tools that decision-makers had at the time. However, those tools and information were incomplete, ultimately inadequate, and the NSW Government was not sufficiently prepared. Decision-makers used their best efforts with the resources available, but the policy and legal framework, and elements of the operational systems, including communication with Queensland about forecasting flows entering NSW from Queensland, required to effectively manage an event as dynamic and critical as the 2020 Northern Basin First Flush event, were inadequate.

When a first flush is required, communities will inevitably be under elevated levels of stress due to drought, heightening the requirement for information, transparency, and clear communication. This demand is even greater at present, as community levels of trust and confidence in NSW water management are extremely low.

A lot has been achieved since the 2017 Matthews Inquiry, but many of the recommended programs are still in the process of being developed or implemented. As a result, to many, there have been a lot of promises, but the results to date are underwhelming. This is particularly challenging and unfair to the public servants who bear the brunt of the community's frustration. They need support and resources to complete and implement their work. The seemingly endless government restructures are a significant distraction to the task of delivering outcomes to the people of NSW.

In particular, the NSW Government needs to progress the delivery of promised outcomes to Traditional Owners and Indigenous communities.

The Panel recognises the resources required to resolve first flush issues, and it will be difficult to balance this against the numerous other areas of water regulation also in need of improvement. But this is not the first time that the NSW Government and NSW communities have been through a first flush experience. First flush management was a novel, complex and difficult experience in the then record drought of 2004. The draft Darling Basin Critical Water Situation Strategy 2004 report provided to the Panel includes a range of observations not dissimilar to this report. This Panel would not like to see the Department in the same position again in another 16 years, in 2036.

It's for these reasons that we have recommended moving towards embedding first flush management into the policy and legal regulatory framework. The work we have suggested can be carried out alongside current work programs to improve connectivity, complete rollout of the floodplain harvesting licensing reforms, undertake improved measurement and monitoring programs, and deliver regional water strategies. Some of the work required to improve first flush management will also yield some real outcomes for identifying, recognising and protecting native title rights and cultural flows.

We wish to express our thanks to the state and federal government agency personnel that supported our assessment. This includes officers of your Department, who were extremely cooperative, responsive to our requests for information and provided frank and constructive reflections and insights. We are particularly grateful to the officers of your Department, Jacyleen

Ong and Susan Macolino, who provided exemplary secretariat services to us and were a delight to work with.

If you think it would be of value, we would be very pleased to brief you about our assessment.

Yours sincerely

Wendy Craik AM

Greg Claydon

7 September 2020

Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Independent Panel acknowledges and pays respect to the Traditional Owners and their Nations of the Murray–Darling Basin who have a deep cultural, social, environmental, spiritual, physical, emotional and economic connection to their lands and waters.

The Panel appreciates the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the Murray-Darling Basin. In particular, the Panel acknowledges and pays its respects to the Barkandji, Bigambul, Budjiti, Euahlayi, Githabul, Gomeroi/Kamilaroi, Guwamu/Kooma, Kambuwal, Kunja, Kwiambul, Maraura, Murrawarri, Ngarabul, Ngemba, Ngiyampaa, Wailwan and the Wiradjuri Nations who are the Traditional Owners of the Barwon-Darling and its tributaries in NSW.

Other acknowledgements

The Independent Panel would like to acknowledge the contributions of and thank all of the people who have dedicated their time and efforts into assisting the Panel to develop this final report. This includes:

- staff of all of the NSW, Commonwealth, Victorian and Queensland agencies for their time, cooperation and frankness in interviews with the Panel,
- members of the public who took the time to complete a survey, attend the public information webinar and/or prepare written submissions as part of the public consultation undertaken for this and the draft report,
- members of the Water User Reference Group, being Darren Raeck, Derek Hardman, Emma Carmody, Greg Hill, Jeff Sowiak, Jim Cush, Joe Robinson, Justin McClure, Kingsley Abdulla, Malcolm Talbot, Rachael Strachan and Uncle Badger Bates, as well as proxies Bileen Nel and David Kirby, who shared both their time and valuable insights with the Panel throughout this process, and
- Jacyleen Ong and Susan Macolino, who provided wonderful and diligent assistance to the Independent Panel throughout the assessment and in the preparation of this report, and who were a pleasure to work with.

Glossary

BoM	Commonwealth Bureau of Meteorology
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
DNRME	Queensland Department of Natural Resources, Mines and Energy
DPIE	New South Wales Department of Planning, Industry and Environment
DPIE Water	New South Wales Department of Planning, Industry and Environment – Water
DPIE-EES	New South Wales Department of Planning, Industry and Environment – Energy, Environment and Science
FPH Policy	New South Wales Government Floodplain Harvesting Policy 2013
GL	gigalitres
IRG	Incident Response Guide
MDBA	Murray-Darling Basin Authority
ML	megalitres
NRAR	New South Wales Natural Resources Access Regulator
SES	New South Wales State Emergency Services
WM Act	*Water Management Act 2000* (NSW)
WNSW	WaterNSW

A note on cultural language

We recognise that language is a concern for both Indigenous and non-Indigenous people. We understand that Indigenous people across Australia are diverse and that there are many different experiences and opinions regarding appropriate terminology for cultural language.

We have chosen to use the terms ‘Traditional Owners’ and ‘Indigenous communities’ throughout the report. We acknowledge that not all Aboriginal and Torres Strait Islander peoples will identify with these terms and that they may instead identify using other terms or with their immediate community or language group.

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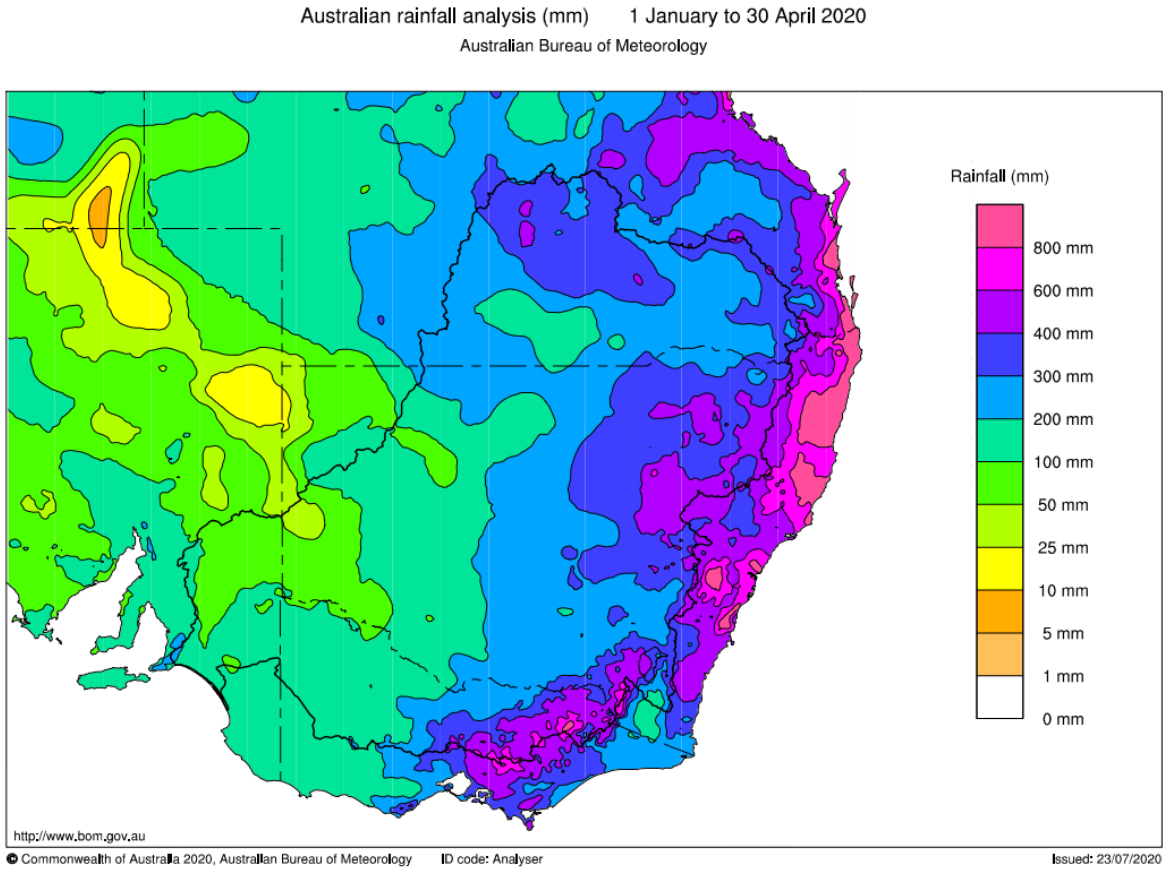
Overview

Background

From late January to the end of April 2020, widespread rain fell across various parts of north-west New South Wales (NSW) and southern Queensland, with some parts receiving more than 200 mm of rain in just a couple of days (see map below). This rainfall created significant inflows to the Northern Murray-Darling Basin Border Rivers, Peel, Namoi, Gwydir and Macquarie valleys and along the Barwon-Darling River, for the first time in several years following an extended record drought.



Map of rainfall across Murray-Darling Basin from 1 January 2020 to 30 April 2020.
Source: Bureau of Meteorology, July 2020.

A series of temporary restrictions on water extractions (including by floodplain harvesting) across the northern NSW rivers of the Murray-Darling Basin were introduced in January-March 2020 under the provisions of the NSW Water Management Act 2000 (WM Act), to responsively manage the first flows and prioritise water security for critical human and environmental needs which had been exacerbated by the extreme drought. This became known as the 2020 Northern Basin First Flush event. It was the first time that NSW managed a first flush event in this way.

In March 2020, the NSW Government commissioned an independent assessment into the management of the 2020 Northern Basin First Flush event following the 2018-2019 drought in the Northern Murray-Darling Basin.

The objectives of this assessment were to:

1. Provide transparency about the decision-making processes that were used to manage the event under the *Water Management Act 2000* (NSW).
2. Recommend strategies to improve the management of first flush events under the *Water Management Act 2000* (WM Act) in the future, including:
    a. system and process changes which would improve the management of a first flush event by the New South Wales (NSW) Department of Planning, Industry and Environment – Water (DPIE Water), the Natural Resources Access Regulator (NRAR) and WaterNSW, and
    b. regulatory, planning or policy changes (including to relevant Water Sharing Plans) which would improve the management of a first flush event.

An Independent Panel (the Panel), consisting of Dr Wendy Craik and Greg Claydon, was appointed to review the actions undertaken, consult with affected water users and communities, and report on how systems and processes, and transparency in water management, could be improved in relation to first flush events.

This report sets out the Panel's key findings and recommendations based on a review of documents, discussions with government agencies and key stakeholders, and public feedback provided through surveys, written submissions and a public webinar.

What the Panel heard

As part of its assessment, the Panel consulted with NSW, Commonwealth and agencies in other states, as well as local community, Traditional Owner and Indigenous community, water user and environmental representatives. It also carried out two rounds of public consultation, asking for feedback about the event generally as well as on a draft report. The approach to and extent of consultation, including the absence of face-to-face discussions and local site visits, were impacted by the restrictions imposed as a result of the COVID-19 pandemic.

The Panel interviewed NSW agency officials who were directly involved in managing the 2020 first flush event from DPIE Water, NRAR, WaterNSW and DPI Fisheries. The Panel also consulted with the Commonwealth Environmental Water Office, Murray-Darling Basin Authority, Bureau of Meteorology, the Energy, Environment and Science team of DPIE, Queensland Department of Natural Resources, Mines and Energy, Victorian Department of Environment, Land, Water and Planning, Commonwealth Department of Agriculture, Water and the Environment, the NSW State Emergency Services, the DPIE Deputy Secretary Water and staff of the Office of the Hon. Melinda Pavey, NSW Minister for Water.

A Water User Reference Group (WURG) was set up to provide the Panel with advice, particularly on the issues and impacts of decision-making approaches and communications. WURG members were nominated by peak bodies as follows:

- NSW Irrigators' Council nominated an irrigation representative for each of the Northern NSW tributaries, the Lower Darling and the Barwon-Darling areas,

- Local Government NSW nominated a local government representative for each of the Northern NSW tributaries, Lower Darling and Barwon-Darling areas,
- the Barkandji Traditional Owners, Northern Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations each nominated a representative,
- the Environmental Defender's Office nominated a representative for environmental interests; and
- the Australian Floodplain Association nominated a representative for its interests.

The group met seven times with the Panel prior to publication of the final report and a communique was published for each meeting on the DPIE website.

The Panel also spoke separately with native title applicant groups for the Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan People, and Gomeroi nations, and the Chair of the Southwest Water Users group.

The Panel invited initial public feedback on the first flush event and how it was managed from 11 May to 7 June 2020, and received 144 online survey responses and 29 written submissions which assisted the Panel to shape the draft report's findings and recommendations. The draft report was publicly exhibited from 13 July to 9 August 2020. On Monday 27 July 2020, 89 people participated in a public online webinar in which the Panel presented and answered questions regarding the draft report's findings and recommendations. The Panel received 29 written submissions on the draft report, which together with other feedback throughout the assessment process, shaped this report's final findings and recommendations.

Key Findings

Management of the 2020 Northern Basin First Flush Event was complex.

When the 2020 Northern Basin First Flush event began, environmental and river systems were under severe stress due to record drought conditions. Since mid-2017, there had been only one period when rainfall produced any significant inflow into the Barwon-Darling River, and in 2019, the only source of inflows into some sections of that river had come from releases of held environmental water. Individuals and communities from the north to the south were also under severe financial, emotional, cultural and physical distress.

When rain did finally fall in early 2020, it did not do so in a single event. The 2020 Northern Basin First Flush event was the product of a number of rainfall and flow events in many locations, some much larger than initially forecast, in a large and complex basin. Further, real-time management of uncontrolled flows (including floodplain flows) to provide for critical water needs throughout the Basin is a relatively new approach to managing water for the NSW Government, and this was the largest event to which real-time management has been applied. The event also took place at a time when a number of key water planning and management reforms essential to enabling effective real-time management are still being implemented, and while the information about, and understanding of, high and low flows and extractions and flow behaviour on floodplains, are limited.

Management of the 2020 Northern Basin First Flush event was also substantially complicated by floodplain harvesting issues. At the beginning of the event, a regulation was introduced

which, for the first time, exempted the need for certain floodplain harvesting to be licenced. On the same day, a temporary water restriction was made which, also for the first time, prohibited the take of water via floodplain harvesting.

The first flush event achieved some wonderful outcomes for an environment and communities in need.

Ultimately, the 2020 Northern Basin First Flush event led to some wonderful and much needed outcomes for communities in need. Water supplies were secured for Goondiwindi, Boggabilla, Mungindi, Collarenebri, Walgett, Brewarrina, Bourke, Wilcannia, Menindee, Sunset Strip and Pooncarie. Menindee Lakes received enough water to enable a pulse release which re-started the Lower Darling River without fish kills or blue-green algae outbreaks. Thousands of kilometres of rivers flowed for the first time in many months and the Barwon-Darling was reconnected with its tributaries and the Murray River. It enabled fish and other aquatic animals to move up and down significant lengths of the rivers, and catchments in the Northern Basin have shown improvements in water quality. The use of discretionary section 324 temporary water restrictions (also known as embargoes) under the provisions of the WM Act to protect these first critical inflows demonstrated the commitment of the NSW Government to provide water for critical human needs and to protect and restore water for the environment, and this has been recognised by the CEWO, the MDBA and some members of the Lower Darling communities.

These positive outcomes have been overshadowed by significant levels of frustration and stress across communities.

Despite the meeting of critical human and environmental water needs across the Northern Basin during the event, many water users, affected communities and others believed that the NSW agencies did not do a good job managing the event. The public provided feedback that they considered that communications were extremely poor, the objectives largely unknown, and that there were missed opportunities and substantial biases towards or away from certain water users and uses. The lack of engagement also prevented Traditional Owners and Indigenous communities from maximising the social and cultural benefits that the event aimed to achieve.

The Panel believes that there was insufficient resourcing in place to adequately plan and communicate for the first flush event.

As a result there was inadequate engagement, planning, incident management preparedness, transparency and communication for and of the event, which led to unpredictability for communities and water users, and did not help to rebuild the community's low levels of confidence and trust in NSW water management.

Insufficient planning and preparation was undertaken for the 2020 Northern Basin First Flush event - most significantly, in regard to not informing and engaging water users, Traditional Owners and communities when preparing the objectives, targets and principles, not preparing water users, Traditional Owners and communities for the first flush event, and not developing adequate incident management arrangements. Clear criteria, principles, and targets to manage the event were prepared, but these were completed only days before the event substantially unfolded, and these were not publicly communicated. Floodplain harvesting, and how this would be incorporated into the management framework, was not taken into account in any substantial way. Nor was any information provided to the public (in particular floodplain harvesters) about its treatment in a first flush event. While WaterNSW has some incident management capabilities associated with flood and water quality incidents, those systems were not applied to the 2020 Northern Basin First Flush event.

The decision-making framework and flow forecasting were reasonably robust, but there are some important improvements to be made.

As a whole, the Panel believes that water agency officers had reasonable decision-making processes in place to do a relatively good job of ensuring critical human and environmental water needs were met across the whole of the Northern Basin in NSW, based on the information and resources they had at the time. They demonstrated great focus, courage, tenacity and determination in their efforts to manage what was a very dynamic, stressful, complex and imperfect situation. However, some important improvements can be made to the decision-making framework.

In order to better manage the expectations of communities and water users, more work is needed to clearly articulate the critical human and environmental water needs that water managers will seek to protect in first flush management, and the connectivity objectives and how they will be achieved. Not all elements of targets were quantified (for example, native title, stock and domestic and harvestable rights requirements and town water supplies). Concerns have been raised about the absence of clear triggers that will determine the need to depart from, and the ability to return to, operation of normal Water Sharing Plan arrangements (given that temporary water restrictions effectively suspend rights to take water pursuant to Water Sharing Plan rules). Some groups in the community still have concerns on how upstream and downstream needs will be balanced, others are sceptical of the use of flow forecasting, and still others believe that there is no justification to adopt different rules during a first flush event unless there is evidence that operation of the Water Sharing Plan rules would not have led to the same outcome as the restrictions during the 2020 Northern Basin First Flush event.

NSW made substantial efforts to use the best available information to make decisions, but there were some significant data gaps relating to flows entering NSW from Queensland, floodplain harvesting extraction and flow data, unregulated extraction data, channel capacity and allowances for water to move to downstream locations. The dynamic nature of the event, coupled with inadequate incident management preparedness, meant that local scale insights, needs, demands and impacts did not factor into decision-making as they ideally would. Some stakeholders raised concerns that the conservative nature of WaterNSW's flow forecasting model unnecessarily compromised economic opportunities. However, the Panel is of the view that the approach taken by both WaterNSW in its flow forecasting and DPIE Water's decision-making was understandable having regard to the severity of drought conditions across the Northern Basin and the objectives of the First Flush. In addition, an independent review by Barma Water Resources of WaterNSW's flow forecasting model has found it to be sound and appropriate and has shown that it did not underestimate flows, as submitted by some stakeholders. Nevertheless, that review has also identified opportunities for improvement, generally in line with the Panel's assessment.

Transparency of decision-making and communications need to be improved for future events.

While the decision-making framework met statutory requirements for making temporary water restrictions under section 324 of the WM Act, the decision-making process was opaque. The community was not clear on who was doing what, why, or when, which led to communication and confidence issues, and frustrations. All of this contributed to a lack of trust and a strong view that the 'goal posts' were shifted during the event.

Community levels of trust in NSW water management have been low and in need of rebuilding since the July 2017 Four Corners program "Pumped". Not releasing information prior to the event was a significant shortfall in transparency. Inadequate systems to communicate information during the event made it very difficult for people to have confidence in the integrity of the Government's decisions, and even those with good knowledge of water issues and rules had difficulty following the decisions made during the event. While a great deal of information

was available, the manner of publication did not cater to enhancing the broader community's understanding of how water was being managed.

The lack of clarity denied water users the ability to plan their operations, compounding already high levels of stress and anxiety following the prolonged drought, and it denied Traditional Owners and Indigenous communities the opportunity to celebrate the positive cultural outcomes that were being generated by flows through the river system as the event unfolded.

There was a strong unmet demand for information about the event as it unfolded and after it was over. Adequate resources were not put aside to meet this demand. Delays in publishing information allowed speculation about extraction, impacts and outcomes of the event to become de facto truths, and promoted views of mistrust, secrecy and mismanagement. It inhibited a productive, fact-based discussion on the benefits and costs of first flush events and constrained the Panel's assessment, particularly for its draft report.

Use of temporary water restrictions demonstrated NSW Government's commitment to protecting environmental water and implementing some, but not all, of the recommendations arising from the Ken Matthews inquiry, Vertessy report and NRC review.

Management of the first flows under temporary water restrictions was both an explicit and courageous effort to achieve connectivity within and between otherwise ephemeral and intermittent water sources in the NSW Northern Basin and the NSW Government successfully took immediate steps to protect critical water needs for towns and the environment, consistent with the WM Act and the Government's response to the Vertessy report and the Natural Resources Commission (NRC) review. Water supply was secured and town weir pools filled for 11 communities across the Northern Basin. Menindee Lakes received 12-18 months of water supply. The Lower Darling was successfully restarted without significant fish deaths, blue green algae outbreaks or a salinity problem. River connectivity allowed fish and other aquatic animals to move up and downstream, significant areas of wetlands including Ramsar sites were inundated and refuge pools were replenished.

But regrettably, there was an overall failure to engage with Traditional Owners and Indigenous communities in managing this event to ascertain native title and cultural flow requirements (to the extent they fall within critical water needs), and to enable communities to enjoy the social and cultural benefits of protecting first flushes. For some, this exacerbated already elevated levels of frustration and disenchantment.

Separately, while there was some communication between NSW and Queensland in managing the first flows, there was no formal coordinated approach, including at an operational level.

Further, a key finding of the Matthews inquiry was a need for transparency in water regulation. The Panel is of the view that genuine transparency was not achieved before, during or immediately after the 2020 Northern Basin First Flush event. Information that was available was not necessarily accessible or timely, and there was a lack of communication to water users and the public about the objectives and rationale for water restrictions prior to the event. There was a lack of consultation and public communication regarding both the introduction of the floodplain harvesting regulation and the floodplain harvesting restriction, and there has not been accessible timely reporting during or after the event. There was also no clear framework to ensure equitable access to information for the full range of people impacted by water management, or a transparent set of engagement arrangements in place before or during the event.

However, management of the event did demonstrate consistency with other Ken Matthews inquiry recommendations in the sense that internally, there was clarity of roles and

responsibilities between agencies and collaborative relationships between the agencies lifted overall performance during the event. Agency officers showed great dedication and commitment, and mutual support of colleagues in their attempt to manage the event under sometimes very difficult conditions. However, this internal clarity did not translate to clarity for water users, Traditional Owners and communities who did not necessarily have a good understanding of who was doing what, why, or where a point of contact could be found.

The continued implementation of NSW reforms regarding metering, floodplain harvesting and connectivity is crucial to improving first flush management.

While NRAR compliance investigations related to the temporary water restrictions are ongoing, this event reinforced the need for the agreed NSW water management reforms to be fully implemented. Both management of the event, as well as compliance and enforcement activities, would have benefited from the pending reforms for non-urban water metering and telemetry, and floodplain harvesting licensing and measurement. The use of LiDAR and satellite remote sensing technology to measure on-farm water storages is an important development, but further progress is required. It is vital that reforms continue, not only for reasons of achieving better water management generally, but also because they will help improve management of future first flush events. Communicating progress of the reform agenda will also help to keep water users and the community informed, with a view to building understanding and trust.

While first flush events could be successfully managed under temporary water restrictions, embedding arrangements in the regulatory and policy framework would enhance transparency and certainty.

The dynamic use of temporary water restrictions as part of the 2020 Northern Basin First Flush event successfully supported a responsive decision-making process based on real-time information. However, given the level of mistrust and perceived absence of transparency in NSW water management, the continued use of these discretionary orders, especially outside of a clear, publicly consulted framework to manage first flushes, is likely to consistently lead to accusations of favouritism and incompetence.

Severe droughts are expected to increase in frequency and severity with a drying climate. Water users and the community have expressed strong support for including details about first flush management arrangements in the WM Act and Water Sharing Plans as an alternative to the use of temporary water restrictions under section 324 of the WM Act, to increase transparency and certainty, provide a forum to ensure proper consideration of the relevant issues, and ensure that the lessons learnt from the 2020 Northern Basin First Flush event are not lost with the passage of time and turnover of agency staff.

The Panel notes that there still remains a strong unmet demand for information about the event. Despite requests from the Panel and stakeholders, a comparison between the outcomes achieved under the restrictions, and those that would have been achieved under existing Water Sharing Plan rules without the restrictions over the course of the event, has still not been completed or published. It will be important for such comparison work to be completed as a matter of priority and before further first flush changes are embedded in the regulatory and policy framework.

Recommendations

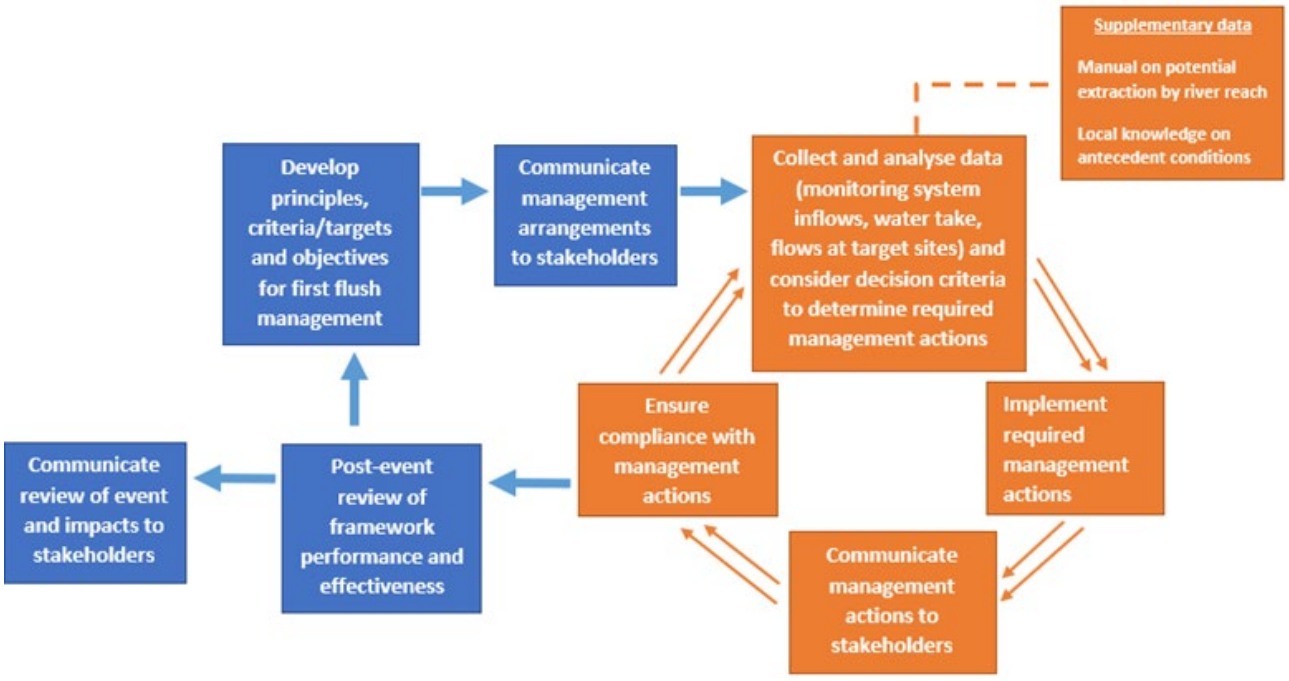
Following its assessment, the Panel recommends the NSW Government takes the following steps to improve first flush management in NSW:

1. Develop first flush arrangements, in consultation with water users, Traditional Owners and communities, that clearly articulate how connectivity within and between water

sources in the Northern Basin, and critical human and environmental water needs, will be provided for during first flush events.

Connectivity must be a primary objective of first flush management in the Northern Basin if insufficient water is available to meet tributary and downstream critical water needs. However, the arrangements to meet downstream critical water needs, of necessity, also have to be reflective of and responsive to the ephemeral and intermittent flow nature of the rivers in the Northern Basin.

2. Incorporate learnings from the 2020 Northern Basin First Flush event into systems that will be used to manage any future first flush event that arises in the short term, by:
    a. updating flow forecasting models,
    b. ensuring DPIE-EES is involved in future management,
    c. undertaking and publishing a comparison of what outcomes would have been achieved if temporary water restrictions were not put in place,
    d. updating models to reflect the capacity of water sources to contribute to meeting downstream targets,
    e. revising the objectives, principles and targets used to manage the event having regard to this information (and any further work completed pursuant to recommendation 3 below), and
    f. seeking feedback on the revised objectives, targets and principles.
3. Ensure the evidence base and methodology for first flush management is quantified, science-based and made publicly available, including estimated requirements to meet critical water needs (including basic landholder rights and cultural flow requirements that fall within critical water needs).
4. Review and update incident management systems for managing first flush events, including to develop a communications plan to support first flush management. The revised system should reflect the elements in the following diagram (blue boxes indicating the steps to be undertaken outside of the event, and the orange boxes indicating steps to be undertaken during an event. As far as practicable, management actions should be communicated prior to being undertaken, and the progress of flows and achievement of targets should be communicated as the event unfolds):



5. Until there are further provisions for first flush event management embedded in the regulatory and policy framework, publish guidance materials which outline how the NSW Government will use temporary water restrictions to manage first flush events.
6. Make any temporary water restrictions required to manage first flush events on a proactive basis (that is, before rain is forecast) to enhance the ability of water users and communities to plan their activities and minimise any potential adverse effects of restrictions.
7. Embed the management of first flush events in the regulatory and policy framework for managing drought. This is required to improve certainty that critical water needs will be protected in extreme events, improve predictability for Traditional Owners, communities and water users, and ensure that the lessons learnt from the 2020 Northern Basin First Flush event are not lost with the passage of time and/or changes of agency staff. An example of the types of matters that could be incorporated into the WM Act, Extreme Events Policy, Water Sharing Plans and Incident Response Guides is set out in the table below. Any framework adopted must be developed in discussion with communities, Traditional Owners and Indigenous communities (including the Barkandji Traditional Owners, Northern Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations) and water users.

What will be set out?	Rationale	Example
WM Act		
● Objectives for managing first flush events ● Requirement for Water Sharing Plans covering the Murray-Darling Basin to include rules for first flush management which must provide, to the extent practicable, for: ○ connectivity within and between water sources, and ○ the protection of critical water needs.	The objectives for first flushes should be consistent across all areas of the Basin and, given their broad nature, should not change over time. They should also be tied to the existing legal requirements under the WM Act and the Basin Plan 2012.	Objective of first flushes ● meet critical human water needs – provide flow locally and downstream, particularly to replenish town water supply weir pools and provide water supply for basic landholder rights (native title, stock and domestic and harvestable rights) and cultural water requirements that fall within critical water needs ● meet critical environmental water needs – provide flow along the length of the river systems to ensure re-connection of rivers and drought refuge pools.
Extreme Events Policy		
● Scope to be expanded to explain how water will be managed as intensity of drought reduces, as well as increases ● Principles for allowing access to flows in first flush events	The principles for allowing access to flows should be consistent across all areas of the Basin. However, given the level of detail and likely need to adjust these with time and experience, it is not appropriate to embed these in the WM Act.	**Principles** ● Consider providing access to upstream water users under normal rules if the nearest downstream targets are met or forecast to be met ***and*** there is an assessment that this event will not meaningfully contribute to meeting any other downstream targets.[1] ● Where an event is predicted to meaningfully contribute to meeting the next downstream target, the temporary water restriction should not be lifted ● When an event has met local targets and is no longer expected to contribute to meeting downstream targets or is in excess of that required to meet downstream targets, some local extraction relief could be allowed. ● Temporary water restrictions should apply to a consistent upstream network of both unregulated and regulated rivers systems in a valley, to provide sufficient volumes of water to meet critical water needs, avoid interceptions by extractors, and avoid inequitable sharing between users.

[1] Noting that the concept of 'meaningful' needs to be properly defined, as referred to in section 7.3 of this report.

		● Early relaxation of upstream access restrictions prior to downstream targets being met should only occur if there is very high confidence in downstream flow predictions meeting targets. ● When flow predictions are used for early relaxation of restrictions on upstream access, river system distribution efficiency assumptions must reflect the antecedent extended dry conditions
Water Sharing Plans		
● Describe and establish the point at which first flush rules kick in (triggers for first flush management) ● Describe the process to be followed to achieve the objective of first flush events in the relevant water source: ○ what critical water needs will be provided for ○ what local factors are to be considered (e.g. channel capacity) ○ how requirements for the critical water needs (targets) are to be quantified ○ how it will be known when take is restricted or permitted ● Require Incident Response Guides to set out critical water needs at each stage of drought	The procedure for managing first flush events should take into account unique local factors. Embedding this in Water Sharing Plans will provide transparency and certainty to community members that relevant matters will be taken into account, and how the water source will be managed. Embedding triggers for first flush management will ensure that Water Sharing Plans are better equipped to deal with drought scenarios and will avoid the need for section 324 orders to override Water Sharing Plan rules. Implementation will require quantifying native title rights and cultural water requirements and developing reasonable use guidelines where applicable.	**Trigger for first flush rules** ● Normal access rules cease to apply when the decision-maker determines that a water source is in stage 4 drought ● Instead, access is only allowed by Ministerial announcement ● Generally, the decision-maker must not allow access unless satisfied that the requirements for the following critical water needs have been, or are forecast to be, met: ○ stock and domestic watering (under basic landholder rights) ○ native title rights and cultural flow requirements that fall within critical water needs ○ town water supply for X years ○ the critical environmental needs in the specific water source ● However, access may be permitted where the decision-maker is satisfied that access will not compromise the ability to provide for critical in-stream or downstream needs ● The decision-maker is to determine the requirements to meet critical water needs having regard to: ○ Long term water plan ○ Antecedent conditions ○ Advice from a local committee Announcements are to be published on XX website at YY time
Incident Response Guides		
Updated based on the Water Sharing Plans process at each stage of drought to identify: ○ What are the specific needs for the Water Sharing Plan area? ○ What are the current antecedent conditions? ○ What are the targets (numbers) required to meet the specific needs, based on the antecedent conditions? ○ how first flush targets can be modified during an event if circumstances warrant.	Provides transparency to targets but enables best available evidence to be taken into account at the time it is required.	**Example targets to meet critical water needs** As at [insert date]: ● River Gauge A: XW ML ● River Gauge B: XY ML ● River Gauge C: XZ ML

8. Improve flow forecasting modelling and real-time monitoring capability, including measurement of extractions and the hydrometric system for inflows and monitoring end of system flows. This will require, among other things:
    a. timely implementation of the non-urban water metering reforms and floodplain harvesting licensing, measurement and reporting policy, and

b. putting in place more formal processes to obtain timely forecasts of flows expected across the Queensland/NSW border.

9. Current (and future) reform programs should be accompanied by clear implementation plans, and the Government should publish regular reports of progress against these implementation plans on a collective basis.
10. Improve and resource communication coordination and capability, including by establishing a water reform engagement group which includes the full spectrum of interests and impacted parties, including irrigator, Indigenous, environmental, local government, floodplain graziers and riparian water users from both the Northern and Southern basin.

In the face of climate change, the occurrence of cease to flow events is increasing. While the 2020 Northern Basin First Flush event ultimately led to some wonderful outcomes for the environment and communities in critical need, the NSW Government must take steps to avoid a repeat of some of the aspects of the 2020 Northern Basin First Flush event in the interests of agency staff, communities and water users.

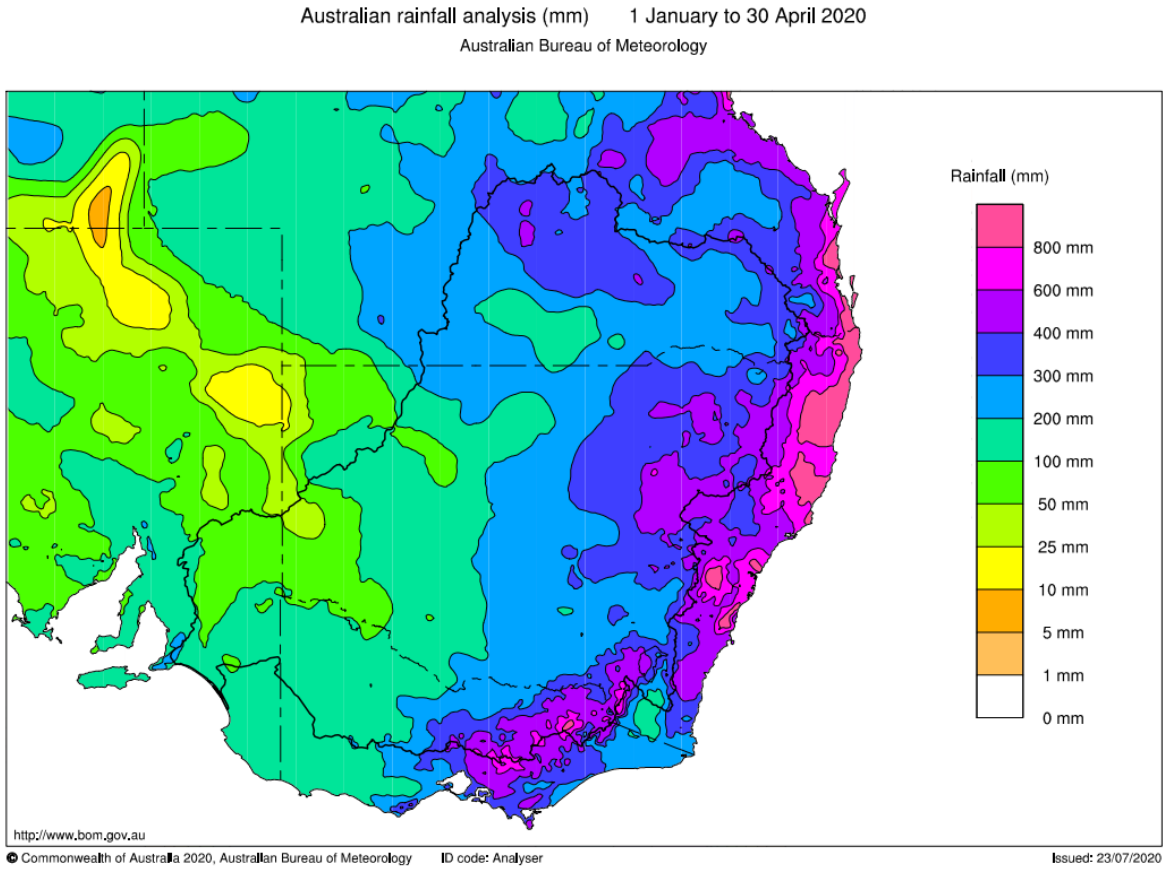
Generally, the recommendations recognise the need to focus the use of limited resources on those efforts that will provide the greatest value in that they will support both first flush and other areas of water reform. However, sufficient resourcing will still be required to implement these recommendations. A suggested timetable for actions to implement these recommendations is provided at Appendix L for consideration by the NSW Government.

Over the course of its assessment, the Panel observed a strong appetite for improving first flush management, across government agencies, water users and communities. It is hopeful that taking prompt action consistent with the recommendations of this report will achieve that objective.

1. Introduction

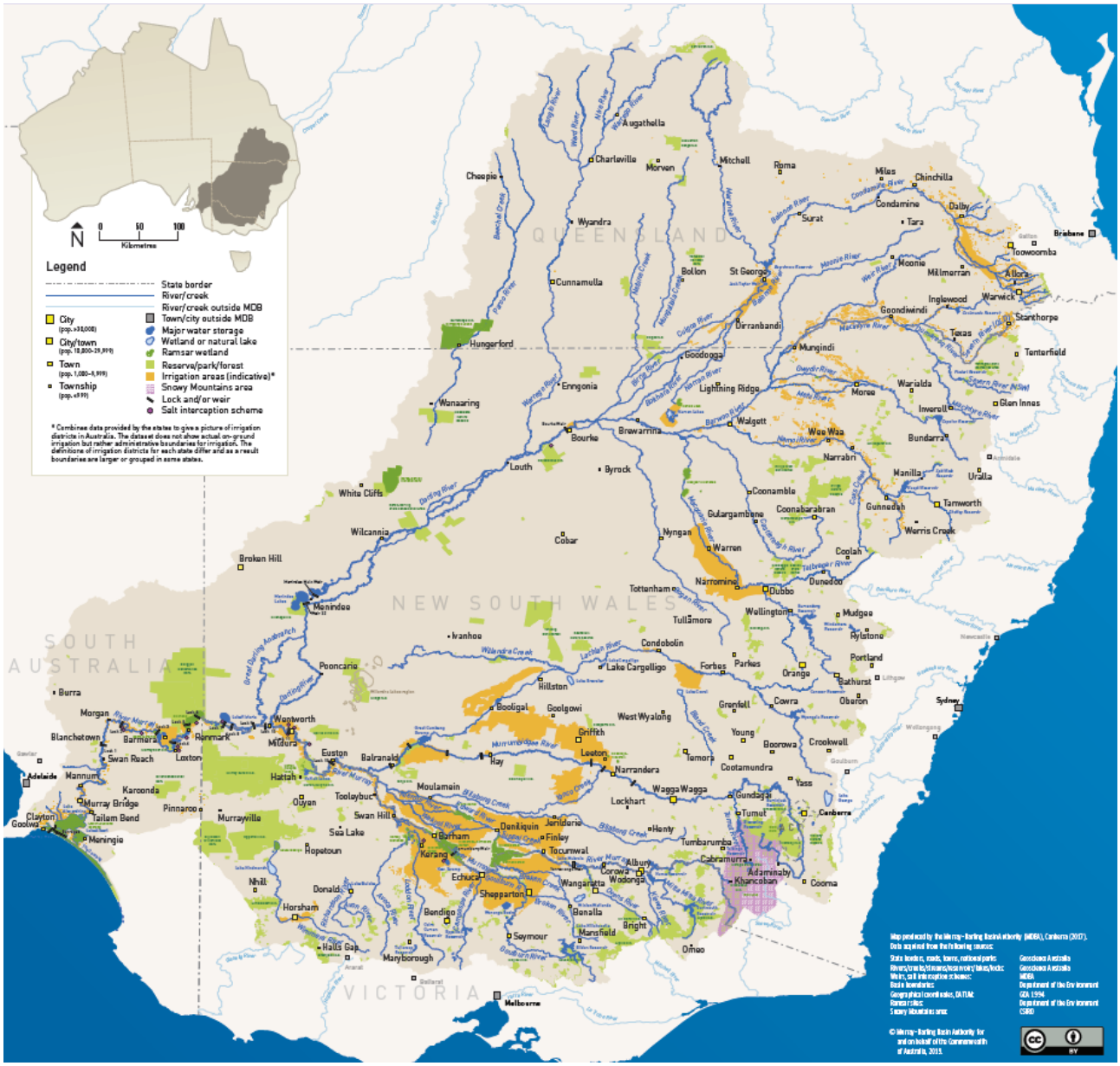
1.1 Preamble

From late January to the end of April 2020, widespread rain fell across various parts of north-west New South Wales (NSW) and southern Queensland (see rainfall map below), with some parts receiving more than 200 mm of rain in just a couple of days. This rainfall created significant inflows to the Border Rivers, Peel, Namoi, Gwydir and Macquarie valleys and along the Barwon-Darling River (see map below of the Murray-Darling Basin system for context), for the first time in several years following an extended drought period.



Map of rainfall across Murray-Darling Basin from 1 January 2020 to 30 April 2020.
Source: Bureau of Meteorology, July 2020.

In order to responsively manage the first flows and prioritise water security for critical human and environmental needs (which had been exacerbated by the foregoing record drought), a series of temporary restrictions on water extractions in the northern NSW rivers of the Murray-Darling Basin were introduced in January-March 2020 under the provisions of the NSW Water Management Act 2000 (WM Act). This became known as the 2020 Northern Basin First Flush event.



Map of the Murray-Darling Basin system.
Source: Murray-Darling Basin Authority, August 2020.

Management of the event was complicated by the commencement of the *Water Management (General) Amendment (Exemptions for Floodplain Harvesting) Regulation 2020* on 7 February 2020. This regulation formally permitted, for the first time under the WM Act, the take of water via certain floodplain harvesting works without a licence. On the same day, also for the first time, floodplain harvesting was prohibited by a temporary water restriction. The restriction was lifted in some areas two days later, when concerns were raised about infrastructure damage being caused by localised flooding events but was reinstated after a few days.

The rain created flows that recommenced and connected the Barwon-Darling River and the northern tributaries. By mid-April 2020 the Barwon-Darling was flowing along its full length from Mungindi, on the Queensland border, into the Menindee Lakes and downstream to Wentworth. Thousands of kilometres of rivers flowed for the first time in many months.

The first flows arrived at Menindee Lakes (Lake Wetherell) on 10 March 2020. On 26 March 2020, an initial high pulse flow was released from the Menindee system into the Lower Darling. This was followed by a lower base flow, managing water quality and impacts on remaining fish

populations. Flows along the Lower Darling reached the Murray River in mid-April 2020.[2] By the end of June 2020, Menindee Lakes had received more than 676 GL of total inflows (measured at Wilcannia), plus 10-20GL of inflows from local streams. Of this, the Menindee Lakes recorded a volume of over 601 GL, and 90-100 GL was used to wet up the soils of Lake Wetherell and Lake Pamamaroo.

Despite broad acceptance of the need to protect flows to meet critical needs, the restrictions and management of the event caused widespread angst across the community.

Leading up to the 2020 Northern Basin First Flush event, catchments had been extremely dry, and there had been an extended period of restricted access to surface water resources. The Northern Basin had experienced the lowest inflows over a prolonged period of time, and 2019 was the driest year on record across the Northern Basin, resulting in no connectivity throughout the river system.

Not only was the physical environment under severe stress due to drought, but individuals and communities from the north to the south were also under severe financial, cultural, emotional and physical distress. In their written submission, the Murray Lower Darling Rivers Indigenous Nations stated that "*First Nations along the Barka have experience[d] a prolonged period of distress and degradation of cultural values as a result of the increasing frequency and duration of cease-to-flow events on the river*."[3]

This placed great importance on the first major rainfall events of 2020. However, while the NSW Government had put significant resources into the planning and implementation of drought management measures within each river system as the drought intensified, it had not sufficiently planned the management arrangements for each system as flows returned.

Management of the event was also complicated by two physical rainfall factors:

- the event was not a singular event, but instead a series of multiple rainfall events, some much larger than forecast, occurring throughout February, March and April 2020 across the Northern Basin valleys (in NSW and Queensland), resulting in a number of increases in the forecast of inflows to the Menindee Lakes, and
- in early February 2020, much of the rain fell on unmonitored floodplains rather than in the monitored upper catchments. This rainfall was also unusual, in that the majority of the inflows to the northern tributaries occurred downstream of the major storages, with rain falling across the lower floodplains.

Communities and affected water users across the Northern Basin in NSW and along the Barwon-Darling expressed strong views that there was an absence of advance planning and preparation for the event by the NSW Government agencies. This left communities and affected water users disappointed and frustrated at the lack of engagement or ability to prepare for the event, the lack of transparency regarding the evidence base or framework for decisions being made by the agencies, and the poor quality of communications during and after the event. In a public feedback survey conducted for the purposes of this assessment, 70% of people did not think restrictions were communicated clearly, 77% of people did not think the reasons were communicated clearly, and 65% were concerned about the way restrictions were applied.

1.2 Background to this independent assessment

In March 2020, the NSW Government commissioned an independent assessment into the management of the 2020 Northern Basin First Flush event after questions were raised by

[2] DPIE Water Drought update - North-west flows in early 2020 - benefits from temporary water restrictions https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/north-west-flows-in-early-2020

[3] Written submission of the Murray Lower Darling Rivers Indigenous Nations dated 17 August 2020.

stakeholders about decisions and communications of the water restrictions. In particular, concerns were raised regarding:

- the evidence base for decisions,
- the consistency of decisions with legal requirements, and
- how the restrictions and their reasons were communicated.

1.3 Terms of reference

The Terms of Reference for this independent assessment are set out at Appendix A. In brief, the objectives of this assessment are to:

1. Provide transparency about the decision-making processes that were used to manage the event under the *Water Management Act 2000* (NSW).
2. Recommend strategies to improve the management of first flush events under the *Water Management Act 2000* in the future, including:
    a. system and process changes which would improve the management of a first flush event by Department of Planning, Industry and Environment – Water (DPIE Water), the Natural Resources Access Regulator (NRAR) and WaterNSW, and
    b. regulatory, planning or policy changes (including to relevant Water Sharing Plans) which would improve the management of a first flush event.

An Independent Panel, consisting of Dr Wendy Craik and Greg Claydon, was appointed to review the actions undertaken, consult with affected water users and communities, and report on how systems and processes, and transparency in water management, could be improved in relation to first flush events. Panel member profiles are provided at Appendix B.

In conducting the assessment, the Panel was required to:

- conduct interviews with relevant NSW and Commonwealth agencies,
- obtain the advice of key industry, environmental, Indigenous and local government stakeholders via a water user reference group, and
- undertake public consultation for and on the draft report.

2. Assessment approach

2.1 Process to prepare this report

Interviews

In the first instance, the Panel held a series of interviews with officials who were directly involved in managing the 2020 First Flush event from DPIE Water, NRAR and WaterNSW.

The Panel then consulted with other agencies including the Commonwealth Environmental Water Office (CEWO), the Murray–Darling Basin Authority (MDBA), the Bureau of Meteorology (BoM) and the Commonwealth Department of Agriculture, Water and the Environment. The Panel also spoke with officers from DPI Fisheries NSW, the Energy, Environment and Science team of the NSW Department of Planning, Industry and Environment (DPIE-EES), the Queensland Department of Natural Resources, Mines and Energy, the Victorian Department of Environment, Land, Water and Planning, and the NSW State Emergency Services (SES). The South Australian Department of Environment and Water and the Australian Capital Territory Office of the Deputy Director-General, Land Strategy and Environment were also invited to

provide feedback. Finally, the Panel spoke with the DPIE Deputy Secretary Water and staff within the Office of the Hon. Melinda Pavey, NSW Minister for Water.

The Panel also spoke separately with native title applicant groups for the Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan People, the Gomeroi nations and the Chair of the Southwest Water Users group.

Water User Reference Group

To establish the Water User Reference Group, the Panel sought nominations by peak bodies for representatives for the following interests:

- By NSW Irrigators Council, an irrigation representative for each of the following areas:
    - Northern NSW tributaries,
    - Lower Darling,
    - Barwon-Darling,
- By Local Government NSW, a local government representative for each of the following areas:
    - Northern NSW tributaries,
    - Lower Darling,
    - Barwon-Darling,
- A Traditional Owner and Indigenous community representative for each of the following:
    - the Barkandji Native Title Group,
    - the Northern Basin Aboriginal Nations,
    - the Murray Lower Darling Rivers Indigenous Nations,
- A representative of the Environmental Defender's Office, and
- A representative of the Australian Floodplain Association.

The Water User Reference Group met with the Panel seven times prior to publication of this report to provide the Panel with advice, particularly on implications and impacts of decision-making approaches and improvements to communications with water users and the public. Representatives of the Barkandji Traditional Owners withdrew from the process shortly before the final report was finalised. A communique for each meeting has been made publicly available.

Public consultation

The approach to and extent of consultation, including the absence of face to face discussions and local site visits, were impacted by the restrictions imposed as a result of the COVID-19 pandemic. From 11 May 2020 to 7 June 2020, the Panel invited public feedback on the first flush event and how it was managed, through an online survey and written submissions. This feedback (144 online survey responses and 29 written submissions) has assisted the Panel in shaping this report's findings and recommendations.[4]

The Panel sought the community's written feedback on the draft report from 13 July 2020 to 9 August 2020. The Panel also presented their draft findings and recommendations at an information webinar on Monday 27 July 2020. Eighty-nine individuals participated in the webinar (online or via telephone), which also included a question and answer session. The Panel's

[4] The written submissions and aggregate survey results are available online at https://www.industry.nsw.gov.au/water/allocations-availability/northern-basin-first-flush-assessment.

presentation and a summary of the questions and answers were published online. A summary of the feedback provided on the draft report's recommendations is set out at Appendix C.

2.2 Current situation

At the time of submitting this final report, river system improvements in recent months across the north-west secured critical water supplies for close to two years in most regulated river valleys. The Peel Valley is the only regulated system that continues into the 2020/21 water year with a reduced town water supply allocation of 70%.

High security allocations are reduced in the Peel Valley (once again to 50%) and the Upper and Lower Namoi have a 90% high security allocation. All other valleys in the north-west have full town, domestic and stock and high security allocations.

However, most of the major northern rural storages, with the exception of the Macquarie, are still at 25% or less capacity, with no general security allocations in the Peel, Upper and Lower Namoi and only small general security allocations in the Gwydir and Border Rivers. The Lower Darling received an opening general security allocation on 1 July 2020 of 30%.

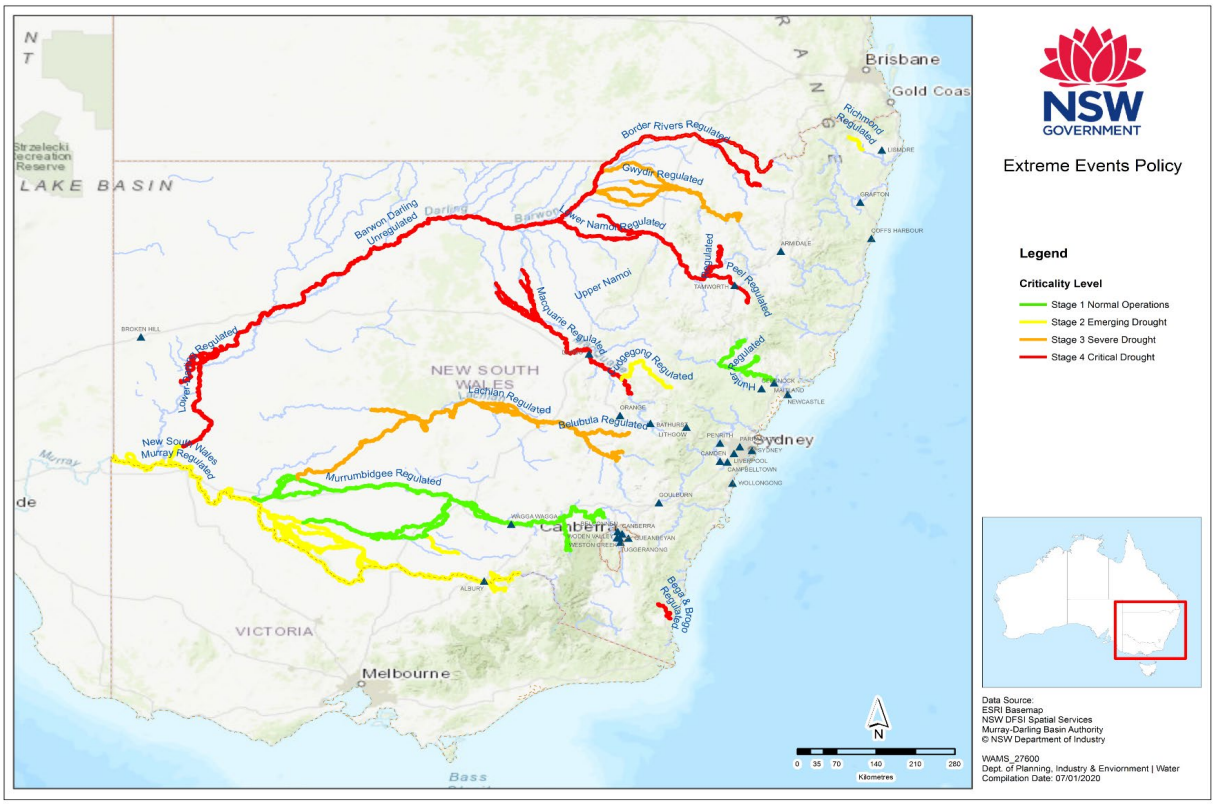
A summary of current water allocations for regulated river, unregulated river and groundwater water sources and links to comparisons of storage levels, allocations and carryover volumes for this new water year compared to 1 July 2019 is available on the DPIE Water website at https://www.industry.nsw.gov.au/water/allocations-availability/allocations/summary.

Chaffey Dam (holding around 25%) which supplies Tamworth remains the storage of most concern. The Peel Valley is still rated as in drought Stage 4 Critical under the Extreme Events Policy (as shown in the map below).

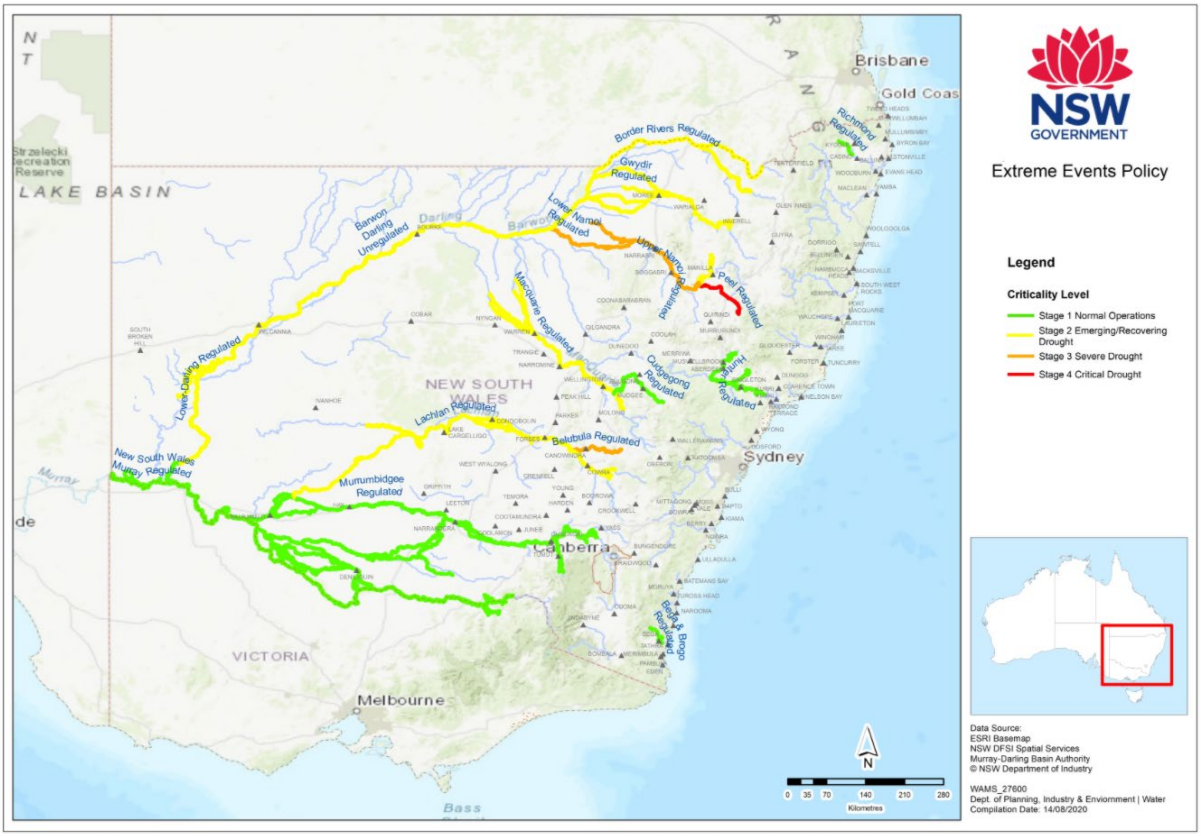
By the end of June, the Menindee Lakes had received more than 676 GL of total inflows (measured at Wilcannia), plus 10-20 GL of inflows from local streams. Of this, Menindee Lakes recorded a volume of over 601 GL and 90-100 GL of water was used to wet up the soils of Lake Wetherell and Lake Pamamaroo. Flows began arriving in the Lower Darling from 10 March 2020, reached the junction with the Murray River around 21 April 2020, and were completed by June.[5]

The following maps show the criticality of drought across regulated water sources in the Northern Basin and the Barwon-Darling, prior to the 2020 Northern Basin First Flush event (in January 2020), and shortly prior to completion of this report (as at 14 August 2020).

[5] Overview of drought situation in Lower Darling as at mid-August 2020 available at https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/critical-valleys-in-drought



Map showing drought criticality of NSW regulated river systems and the Barwon-Darling as at 7 January 2020.
Source: NSW Department of Planning, Industry and Environment, July 2020.



Map showing drought criticality of NSW regulated river systems and the Barwon-Darling as at 14 August 2020.
Source: NSW Department of Planning, Industry and Environment, August 2020.

3. Legislative and regulatory context

3.1 Overview of NSW regulatory framework for water management

In NSW, the take of water is regulated under the WM Act. Section 3 provides that the objects of the Act are *"to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations."*

The WM Act broadly provides that water may only be taken from a water source pursuant to:

- an access licence,
- a basic landholder right (being a stock and domestic, harvestable or native title right), or
- an exemption from the requirement to hold an access licence conferred by regulations.

A licence does not guarantee the amount of water the holder is entitled to in a given year. Instead, a licence holder must have an 'allocation' of water in their account before they can lawfully take water. Water may be allocated to an access licence by way of an available water determination made by the Minister (s 59), or through trade with another licence holder.

Section 5 of the WM Act sets out water management principles, which states in relation to water sharing (ss 3):

(a) sharing of water from a water source must protect the water source and its dependent ecosystems, and

(b) sharing of water from a water source must protect basic landholder rights, and

(c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

Section 9 imposes a duty on all persons exercising functions under the WM Act:

(a) to take all reasonable steps to promote the water management principles of the WM Act, and

(b) as between the principles for water sharing set out in section 5 (3), to give priority to those principles in the order in which they are set out in that subsection.

Section 57 establishes different categories for access licences, and section 58 establishes how those categories must be prioritised when making available water determinations under section 59 of the WM Act. The Act also establishes an approval framework for water management works, including floodplain harvesting works.

Water Sharing Plans made under the WM Act establish the rules for how water in a particular water source is allocated and managed for the duration of the Plan (typically 10 years). Most relevantly, a Water Sharing Plan:

(a) protects a proportion of all water available for fundamental ecosystem health and/or including specific environmental rules,

(b) protects the water required to meet basic landholder rights,

(c) sets annual limits on water extractions, to ensure that extractions do not increase and therefore erode the water for the environment or the security of supply to water users,

(d) may set different priorities of supply between access licences (distinct from the priorities established by the WM Act),

(e) may include rules that provide licence holders flexibility in the way they manage their water accounts (e.g. enabling unused water to carry-over between water years),

(f) may specify rules for water trading and dealings,

(g) sets out the mandatory conditions that apply to licence and approval holders (which may include conditions which restrict when water may be taken), and

(h) establishes monitoring and reporting requirements.

3.2 NSW regulatory framework for water management in circumstances of drought

The NSW Government Extreme Events Policy[6] (EEP) sets out broad principles for managing water in the Murray-Darling Basin during a water shortage, extreme drought or water quality event and applies a series of stages for applying increasing restrictions during water shortages. Incident Response Guides (IRGs) outline the framework for managing extreme events according to that policy for each major water source in the NSW Murray-Darling Basin.[7] Neither the EEP or the IRGs address principles to be applied when coming out of a drought to the same degree as they address the principles to be applied as a drought becomes more severe.

Among others, the EEP and IRGs identify the power for the Minister or delegate to make temporary water restriction orders under section 324 of the WM Act as a tool to manage water in an extreme event.

Section 324 (1) of the WM Act states:

> **324 Temporary water restrictions**
>
> (1) If satisfied that it is necessary to do so in the public interest (such as (but not limited to) to cope with a water shortage, threat to public health or safety or to manage water for environmental purposes), the Minister may, by order in writing, direct that, for a specified period, the taking of water from a specified water source is prohibited, or is subject to specified restrictions, as the case requires.

Section 324 (2) provides a separate power to make temporary water restrictions in regard to aquifers.

According to section 324(1) of the WM Act, the decision-maker must:

- be satisfied that it is necessary to make the restriction in the public interest. Examples of the public interest are given (to cope with a water shortage, threat to public health or safety or to manage water for environmental purposes), but these are not exhaustive,
- decide how long the restriction needs to have effect. It cannot be indefinite,
- decide the water sources to which the restriction needs to apply, and
- decide whether it is necessary to:
    - prohibit water to be taken, or
    - restrict water being taken, for example
        - by certain people
        - for certain purposes, or
        - by a certain amount.

An order only has effect upon publication in the NSW Government Gazette and in the authorised manner, or on the earlier date it is broadcast by a television or radio station

[6] Available online at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/187703/Extreme-Events-policy.pdf

[7] See example IRG for the Barwon-Darling at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/273753/schedule-g-barwon-darling-irg.pdf

transmitting to the part or parts of the State within which the water source is situated (s 324 (3) - (5)).

There is no express power to amend or repeal temporary water restrictions in the WM Act. However, under section 42 (2) of the *Interpretation Act 1989* (NSW), any power to make an order includes the power to amend or repeal the order. Therefore, temporary water restrictions can only be amended or repealed using the same process that applies to the making of the order (meaning the amendment or repeal can only take effect upon publication of the order in the NSW Government Gazette, or earlier broadcast on television or radio). However, orders can be drafted in a way that allows temporary water restrictions to be 'lifted' in an administratively simpler way. This approach is explained further in Section 5.1 of this report.

Other relevant provisions that continue to apply in drought circumstances include section 9 (1) (a) of the WM Act, which imposes a duty on the decision maker to give priority to the water sharing principles in section 5 (3) in the following order:

(a) sharing of water from a water source must protect the water source and its dependent ecosystems, and

(b) sharing of water from a water source must protect basic landholder rights, and

(c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

Section 58 of the WM Act establishes the following order or priority between access licences:

(a) local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences,

(b) regulated river (high security) access licences have priority over all other access licences (other than those referred to in paragraph (a)),

(c) access licences (other than those referred to in paragraphs (a), (b) and (d)) have priority between themselves as prescribed by the regulations,

(d) supplementary water access licences have priority below all other licences.

Those rules of priority also apply to making available water determinations, unless:

- they are otherwise amended by a Water Sharing Plan (s 58 (3) of the WM Act), and
- a Water Sharing Plan is suspended, in which case (pursuant to section 49A and 49B):
    - first priority is to be given to domestic and essential town services or critical human water needs, and
    - second priority is to be given to the needs of the environment.

Critical human water needs are defined as:

> "...the needs for a minimum amount of water, that can only reasonably be provided from the Basin water resources, required to meet—
>
> a. core human consumption requirements in urban and rural areas, and
>
> b. those non-human consumption requirements that a failure to meet would cause prohibitively high social, economic or national security costs." [8]

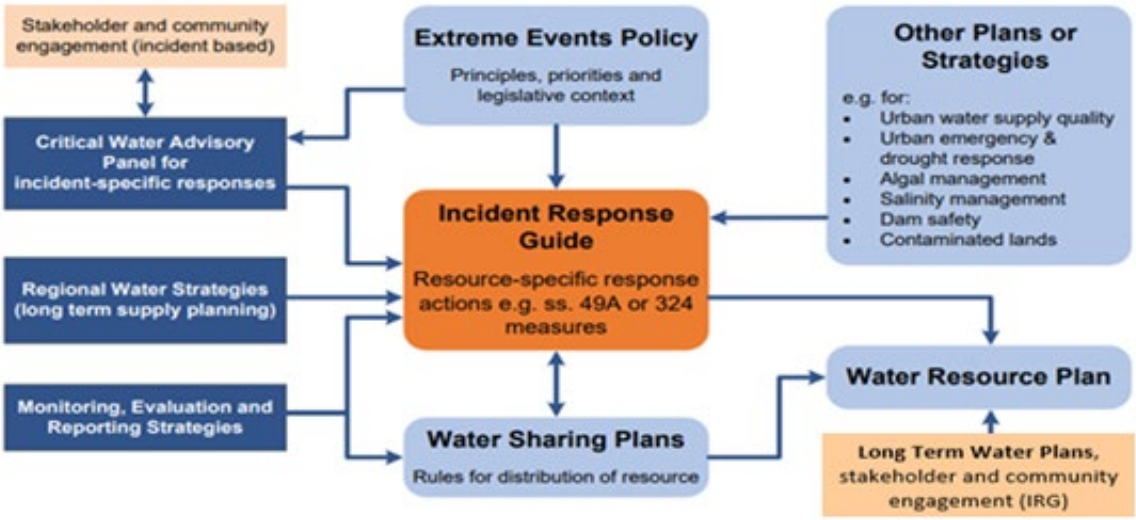
While those rules are relevant, because of section 324 (7), they do not have to apply strictly to making temporary water restrictions. That subsection states:

> "In the event of any inconsistency between an order under this section and any other provision of this Act relating to the distribution, sharing or taking of water (including any order made, or any

[8] Section 60 (3C) of the WM Act.

condition imposed on an access licence or approval, under this Act), the order under this section prevails to the extent of the inconsistency."

There is no other tool in the WM Act for managing first flush events. However, Water Sharing Plans could include rules to manage these matters. For example, the *Water Sharing Plan for the Barwon-Darling Unregulated River Water Sources 2012*, as amended on 1 July 2020, includes a resumption of flow rule.[9]



Interaction between the WM Act, EEP and IRGs.
Source: Incident response Guide for the Barwon-Darling Watercourse Water Resource Plan Area (SW12) July 2019, modified for the purposes of this report.

3.3 Agencies involved in the management of water in NSW

Water in NSW is managed by both State and Federal legislation.

At the state level, in simple terms, water is managed by three separate agencies:

- the Department of Planning, Industry and Environment (DPIE) makes the rules,
- WaterNSW implements the rules, and
- NRAR enforces the rules.

Further, there are two separate groups within DPIE with functions related to water management in NSW, being DPIE Water, and DPIE-EES.

1. Department of Planning, Industry and Environment - Water

DPIE Water supports the NSW Minister for Water in the administration of the WM Act. This means that DPIE Water:

- administers the WM Act, including to exercise Ministerial functions under that Act by delegation. This includes:
    - development of policy frameworks such as the Extreme Events Policy and the Floodplain Harvesting Policy,
    - development of Water Sharing Plans and regulations, and

[9] See https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/barwon-darling.

- the making of available water determinations and temporary water restrictions, and

- leads negotiations with the Commonwealth (including the MDBA) and other jurisdictions in relation to water management in NSW.

2. Department of Planning, Industry and Environment - Energy, Environment and Sciences

DPIE-EES has a specialised role in NSW water management. It:

- develops long term water plans that guide the management of water for the environment over the longer term, as required under the Commonwealth *Basin Plan 2012*,
- manages the state's environmental water holdings,
- provides advice to WaterNSW and DPIE Water on the management of planned environmental water, the planning and delivery of environmental watering events, and environmental watering requirements in water planning processes, and
- prepares the technical content of Floodplain Management Plans.

3. WaterNSW

WaterNSW is the NSW bulk water supplier and operational manager of surface water and groundwater resources. This means that WaterNSW:

- supplies water from the State's regulated surface water systems to water users,
- operates the State's river systems and bulk water supply systems,
- measures, monitors and records quality and quantity of water in NSW,
- manages customer relationships in NSW and the provision of information and communications,
- carries out forecasting and operational modelling associated with the management of surface water systems, working closely with the BoM as required, and
- conducts customer facing functions such as the delivery of water, billing, water allocation and licence trades and providing water resource and metering information.

4. Natural Resources Access Regulator

NRAR is an independent regulator established under the Natural Resources Access Regulator Act 2017 (NSW). NRAR:

- is responsible for enforcing NSW water laws, being the WM Act and the Water Act 1912,
- consistent with its regulatory priorities, undertakes compliance and enforcement activities to maintain public confidence in the water enforcement regime, through a combination of proactive, intelligence led monitoring and audit operations and reactive compliance responses to reports of suspicious water activity made by the public, and
- administers licensing requirements for a specific subset of water licences (including government entities such as water utilities and state-owned corporations, mining operations, state significant developments and infrastructure projects and irrigation corporations).

5. Other agencies

Other State and Commonwealth agencies also have a strong interest in NSW water management. The Commonwealth Department of Agriculture, Water and the Environment is responsible for administering the *Water Act 2007* (Commonwealth), which establishes the Basin Plan. The MDBA plays a key role in implementing the Basin Plan. In particular, the MDBA:

- operates the River Murray system, and directs the sharing of the River Murray's water on behalf of the Basin States in accordance with the Murray-Darling Basin Agreement,
- advises the Commonwealth Minister for Water Resources on the accreditation of NSW Water Resource Plans,
- measures, monitors and records the quality and quantity of the Basin's water resources,
- supports, encourages and conducts research and investigations about the Basin's water resources and dependent ecosystems,
- provides water rights information to facilitate water trading across the Basin, and
- engages and educates the Australian community about the Basin's water resources.

The Commonwealth Environmental Water Holder (CEWH) manages a large portfolio of licences for environmental water, having regard to annual priorities and longer-term targets set under the Basin Plan.

The Queensland Department of Natural Resources, Mines and Energy (DNRME) also works with DPIE Water to jointly manage the Border Rivers, in accordance with the NSW-Queensland Border Rivers Intergovernmental Agreement 2008.[10] The *New South Wales - Queensland Border Rivers Act 1947* (NSW) provides for the establishment of the Dumaresq-Barwon Border Rivers Commission. DNRME is solely responsible for managing other Northern Basin river systems in Queensland which flow into NSW.

4. Lead up to the 2020 Northern Basin First Flush Event

4.1 Climate conditions until December 2019

From 2017 until the rains in early 2020, northern inland NSW had been experiencing record drought conditions. Inflows to the Northern Basin over the previous two years (135 GL in 2018 and 94 GL in 2019) had been less than half of the previous lowest inflows (276 GL in 1994).[11]

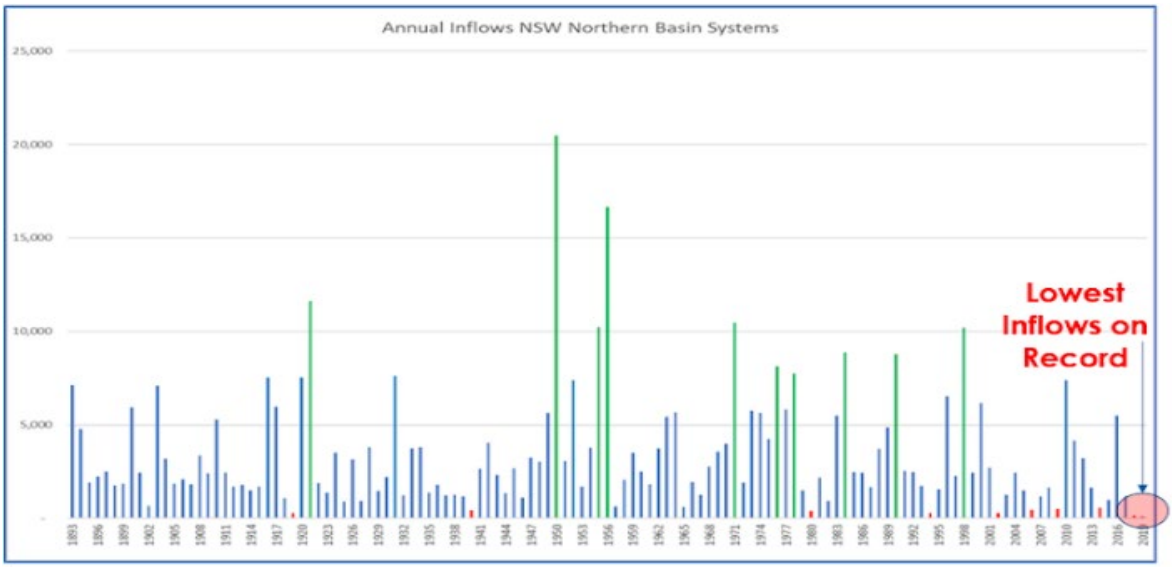
Many regional towns and villages relied on emergency groundwater bores or water carting to maintain basic domestic supply and irrigators had very limited or no access to water for extended periods (in some cases, for years). Water quality had deteriorated and large-scale fish deaths occurred in some areas. Some major river systems had ceased to flow for extended periods, including:

- the Namoi River below Keepit Dam,
- the Gwydir River below Tareelaroi Weir,
- the Lower Darling River below Menindee Lakes,
- the Macintyre River below Boggabilla,
- the Macquarie River below Warren,
- the Peel River below Dungowan, and
- the significant stretches of the Barwon-Darling system.[12]

[10] Available at https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0006/105963/intergovernment-agreement.pdf

[11] See written submission of WaterNSW dated 14 June 2020.

[12] See more at https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/north-west-flows-in-early-2020



Combined inflows to Northern NSW tributaries of the Murray-Darling Basin.
Source: WaterNSW, June 2020.

Since mid-2017, there had been only one period in early 2018 when rainfall produced any significant inflows in the Barwon-Darling, which were protected from irrigation extraction and followed up by releases of held environmental water to improve the health of parts of the river system. Between mid-2018 and early 2020, there was no significant natural inflow into the Barwon-Darling. Releases of held environmental water from storages in 2019 were the only source of inflows into some sections of the Barwon-Darling River during that time.

The regulatory framework for extracting water from rivers and streams reflected the dry conditions. Unregulated river system licence holders could not take water as their flow thresholds for take were not being met. Across the Northern Basin in early January 2020, given the lack of inflows, no new general security allocations had been made for some time, and temporary water restrictions were in place prohibiting or limiting the take of unused water remaining in accounts in most regulated river systems. Deliveries from regulated releases to the lower reaches of the Macquarie, NSW Border Rivers and Peel Rivers and along the entire Namoi were unavailable, and these water users were dependent on any tributary inflows downstream of the storages for access to water. The environmental water rules of Water Sharing Plans applying to the Macquarie and Peel systems were suspended to protect remaining water for town supplies.

The drought placed significant stress on the local environment, as well as extractive water users, dry land farmers and communities.

4.2 Independent assessments of NSW Water Management

Since 2017, several reports have assessed the management of water in NSW. Of particular relevance to the management of first flush events and this review:

- Ken Matthews' Independent investigation into NSW water management and compliance, in an interim report dated 8 September 2017 and a final report dated 24 November 2017 (commonly known as the Matthews inquiry).
- Independent assessment of the 2018-19 fish deaths in the Lower Darling dated 29 March 2019 (commonly known as the Vertessy report)

- Natural Resources Commission (NRC) review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012, Final report dated September 2019 (commonly known as the NRC review)
- The Australian Academy of Science Investigation of the causes of mass fish kills in the Menindee region NSW over the summer of 2018–2019 dated 18 February 2019,
- Independent review of NSW Floodplain Harvesting Policy implementation dated July 2019, and
- Interim Inspector-General of Murray-Darling Basin Resources report on the Impact of lower inflows on state shares under the Murray–Darling Basin Agreement dated March 2020 (commonly known as the Keelty report).

On 3 March 2020, the NSW Parliament also announced that an Upper House committee would conduct an inquiry into the impact and implementation of the Water Management (General) Amendment (Exemptions for Floodplain Harvesting) Regulation 2020. That inquiry is still underway at the date of submitting this report.[13]

The NSW Government issued responses to the recommendations by way of the NSW Water Reform Action Plan (in regards to the Matthews inquiry) and the NSW Government response to the Vertessy report and the NRC's review of the Barwon-Darling Water Sharing Plan dated September 2019.

Most relevantly, the NSW Government agreed to take steps to, among other things:

- clarify responsibilities in water management,
- implement a robust metering framework,
- increase transparency in water management,
- create and implement a stakeholder engagement framework,
- adopt innovative technologies to improve compliance effectiveness,
- protect water (and particularly the first flush) for towns and the environment,
- improve the representation of Aboriginal cultural interests and values in water management, and
- improve connectivity between Northern Basin river systems.

Chapter 8 of this report has a discussion of these matters and Appendix D includes a list of commitments made in the NSW Government responses to the Matthews inquiry, Vertessy report and NRC review.

The Panel has been informed that DPIE Water has commenced a number of work programs which implement the Water Reform Action Plan and the Government's response to the Matthews inquiry, Vertessy report and NRC review.

Under new non-urban water metering rules, licensed works for taking water will need an accurate, tamper-proof meter with a telemetry-capable data logger installed and checked by a qualified person. Surface water works greater than 200 mm will also need to remotely transmit data about water use via the NSW Government's telemetry system which became operational in April 2020. The telemetry system will be used by NRAR, DPIE Water and WaterNSW to support compliance and enforcement, policy and planning, river operations, billing functions and may be adopted voluntarily by other water users to reduce their ongoing compliance burden.

[13] See https://www.parliament.nsw.gov.au/committees/inquiries/Pages/inquiry-details.aspx?pk=2584 for further information.

The new rules, when fully rolled out, will capture more than 95 percent of licensed non-urban water take capacity in NSW. The new metering rules are taking effect in a staged roll-out between 2019 and 2023. The new requirements will apply from:

- 1 April 2019, to new and replacement meters installed after this date,
- 1 December 2020, to surface water pumps 500 mm and greater,
- 1 December 2021, to remaining works in the Northern Inland region,
- 1 December 2022, to remaining works in the Southern Inland region, and
- 1 December 2023, to remaining works in the Coastal region.

To improve connectivity between Northern Basin river systems:

- from 1 December 2020, the Water Sharing Plans applying to unregulated surface water river systems in the Barwon-Darling, Macquarie Bogan and Gwydir Water Sharing Plans include new rules which ensure water released for the environment remains in the river for its intended environmental purpose (by providing that licence holders must only take water in accordance with an announcement, known as 'active management'),
- from 1 July 2020, the *Water Sharing Plan for the Barwon-Darling Unregulated River Sources 2012* also includes new rules which:
    - consistent with recommendations of the NRC review, amended flow class thresholds applying to A class access licences based on enhanced flow targets that focus on protecting low flows to better deliver environmental and social outcomes,
    - place a limit on the amount of water that can be extracted per day under unregulated river class A, B and C class access licences (by introducing individual daily extraction components on relevant licences, also known as IDECs). This will help mitigate local environmental impacts of water extraction and promote access to flows being shared with both local and downstream users, and limit daily extractions to the levels permitted immediately before the 2012 Barwon-Darling Water Sharing Plan commenced,
    - restrict the ability to take water from the first flows after an extended low flow or dry period (known as a 'resumption of flow' rule). These rules require a no flow class to be announced if flows are below certain volume (ML/day) targets at Walgett, Brewarrina, Bourke and Wilcannia for a specific consecutive number of days at these locations in the four river sections, and
    - allow Aboriginal persons and Aboriginal communities to access up to 500 ML of water to enhance the Aboriginal cultural value of important lagoons and billabongs by restoring the natural filling sequence of that lagoon or billabong, via the issue of Aboriginal supplementary access licences.[14]

Active management rules are to be accompanied by monitoring and reporting requirements to provide transparency and ensure that management and operational practices continue to improve based on previous experiences. Some data will be recorded daily, and others monthly, annually or on an event-by-event basis. If successful, active management may then be implemented in other unregulated water sources.

Other work planned by DPIE Water includes:

- a review (by the end of June 2021) of the flow targets and approach in the Interim Unregulated Flow Management Plan for the North-West. That plan was developed in

[14] See DPIE written submission dated 18 August 2020.

1992 to protect riparian rights, suppress algae blooms and enable fish migration by recognising connectivity across the Northern Basin. However, the interim plan was rarely implemented, largely due to an inability to accurately forecast and predict flows, and its provisions have not been used since Water Sharing Plans commenced in NSW. In addition, significant work has been completed on flow requirements in the Barwon-Darling River since 1992 that better reflects contemporary available scientific information on environmental watering requirements, such as the long-term water plans developed by DPIE-EES,

- working with Queensland to improve flow forecasting arrangements and held environmental water protections for water coming across the border by the end of 2020. Queensland is due to complete work on identifying potential volumes of environmental water reaching the border by November 2020,
- developing regional water strategies, which set long term strategies for water management in NSW on a regional basis (including potential longer-term strategies to address connectivity),
- updating incident response guides to include the targets and principles for first flush management.[15]

Finally, DPIE Water has been working with water users and the public to put in place a licensing system and measurement and reporting regime for floodplain harvesting. Licensing floodplain harvesting will ensure that it is managed within the limits established by Water Sharing Plans and the Basin Plan. The licensing framework for floodplain harvesting is scheduled to be in place by June 2021, and requires all floodplain harvesting to be accurately measured. DPIE Water is also working to have a robust measurement, monitoring and evaluation program in place to help determine if the rules are effective and being followed, and whether they need to be modified over time. New metering and measurement requirements will need to be complied with by 1 July 2021 for existing meters and on-farm storages with a capacity of 1,000 ML or greater, and by 1 July 2022 for on-farm storages with a capacity of less than 1,000 ML.[16] Landholders will be required to install minimum standard telemetry-enabled metering devices fitted with tamper-evident seals. This requirement for automated metering for floodplain harvesting measurement will align with the new metering requirements for river pumpers.[17]

4.3 Floodplain Harvesting Policy

Historically, the take of water via floodplain harvesting has not been licenced under the WM Act, or its predecessor the *Water Act 1912* (NSW), which only enabled the licensing of water taken from watercourses, lakes and specified aquifers and approvals for works that affect the flow of water to or from a river or creek.

When the WM Act commenced, work began to licence and regulate floodplain harvesting, leading to the introduction of the NSW Government Floodplain Harvesting Policy in 2013 (the FPH Policy). The FPH Policy outlines a process to bring floodplain harvesting into the WM Act licensing framework, and stop unconstrained floodplain harvesting in NSW.

The FPH Policy (as amended in 2018) is currently being implemented in the designated floodplains of the five northern NSW Murray-Darling Basin valleys (the NSW Border Rivers, the Gwydir, the Namoi, the Macquarie and the Barwon-Darling), and will enable floodplain diversions to be subject to statutory limits both under NSW Water Sharing Plans and the

[15] See DPIE written submission dated 18 August 2020.

[16] For further information, see the Floodplain Harvesting Measurement Policy dated July 2020, available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/317093/floodplain-harvesting-measurement-policy.pdf

[17] DPIE written submission dated 18 August 2020.

sustainable diversion limits imposed under the Basin Plan. Floodplain harvesting licences and approvals for all five Northern Basin valleys are scheduled to be in place by July 2021. Landholders who receive a floodplain harvesting access licence will be required to contract duly qualified persons to install telemetry-enabled storage meter equipment to accurately measure floodplain harvesting to ensure that landholders remain within their licence limits.

In 2018, the MDBA and DPIE Water jointly commissioned an Independent review of the implementation of the Floodplain Harvesting Policy in Northern NSW. The key objective was to provide transparency around the technical information and improve confidence in the technical rigour and processes supporting implementation of the FPH Policy.

DPIE Water accepted the review recommendations in full and developed a Floodplain Harvesting Action Plan (the FPH Action Plan) in response. Key priorities in the FPH Action Plan are to:

- provide clarity about how floodplain harvesting will be managed,
- protect the environment and downstream water users,
- provide certainty for irrigators legally taking water from a floodplain,
- provide a licensing framework that supports compliance,
- ensure stakeholders and industry have a say in water sharing rules for floodplain harvesting, and
- rebuild trust in water management in NSW.

Most relevant to activities during the lead up to the 2020 First Flush event, the implementation process outlined in the FPH Policy includes providing a temporary exemption for floodplain harvesting from specified licensing and approvals requirements of the WM Act until the licensing process is completed.

4.4 Review of NSW Water Sharing Plans and preparation of water resource plans

Water Sharing Plans are a key component to implementing the Basin Plan in NSW. Relevant rules within NSW Water Sharing Plans will form part of NSW Water Resource Plans, when accredited. Throughout 2018 and 2019, DPIE Water prepared amendments to Water Sharing Plans, in consultation with communities, to make them consistent with Basin Plan requirements. This required changes to the following Water Sharing Plans which cover water sources directly relevant to the management of the 2020 first flush event (as they were known immediately prior to 1 July 2020):

- Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012,
- Water Sharing Plan for the Castlereagh River Unregulated and Alluvial Water Sources 2011,
- Water Sharing Plan for the Gwydir Regulated River Water Source 2016,
- Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources 2012,
- Water Sharing Plan for the Intersecting Streams Unregulated and Alluvial Water Sources 2011,
- Water Sharing Plan for the Lower Murray-Darling Unregulated and Alluvial Water Sources 2011,

- Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016,
- Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012,
- Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012,
- Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016,
- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016,
- Water Sharing Plan for the NSW Border Rivers Regulated River Water Source 2009, and
- Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012.

Amendments to Water Sharing Plan provisions applying to unregulated river water sources came into force on 1 July 2020.

These changes were developed by DPIE Water in targeted consultation with Stakeholder Advisory Panels, which include representatives from NSW Government agencies, water users, environmental interest groups, Traditional Owners and Indigenous communities and local councils, for each Water Resource Plan area.

Under section 43A of the WM Act, the NRC is required to independently review Water Sharing Plans approaching expiry and report its findings to the NSW Minister for Water. The NRC report must review:

(a) the extent to which the water sharing provisions have materially contributed to the achievement of, or the failure to achieve, environmental, social and economic outcomes, and

(b) whether changes to those provisions are warranted.

The NRC review of the Barwon-Darling Water Sharing Plan, mentioned in Section 4.2 of this report, was brought forward at the request of the former Minister for Regional Water (with the support of the Premier), having regard to the high public interest in the operation of the Water Sharing Plan and downstream fish deaths.

The NRC review led to proposed changes to the Barwon-Darling Water Sharing Plan which came into effect on 1 July 2020, including the revision of ‘commence to pump’ and ‘cease to pump’ rules (which determine when water extraction can commence and when it is prohibited, and together restrict extraction during low flows), the removal of ‘imminent flow’ provisions (which allowed water to be taken from low flows when a flow event was predicted with certainty), and contributed to the proposed introduction of a ‘resumption of flow’ rule (which protects the first flows after an extended low flow or dry period).

4.5 Development of Long Term Water Plans

Under the Basin Plan, NSW must prepare a long-term environmental watering plan for each Water Resource Plan area that includes surface water. Each plan must identify priority environmental assets and priority ecosystem functions in their relevant area, ecological objectives and ecological targets for those assets and functions, and the environmental watering requirements required to meet those targets.

In NSW, these plans (called 'Long Term Water Plans') were prepared by DPIE-EES and, following public exhibition throughout 2018 and 2019, were finalised in late December 2019.

4.6 Use of temporary water restrictions to manage "First Flushes" prior to the 2020 event

Northern Basin connectivity event (April 2018)

In January 2018, over 1,000 km of the Barwon-Darling River downstream of Brewarrina had ceased to flow. Extended dry conditions caused town water supplies to decline and there was concern about water security for landholders. Water quality in stagnant water holes deteriorated and blue-green algae alerts escalated to amber and red along the Barwon-Darling and there were concerns about the risk to survival of native fish under these conditions.

In February and March 2018, rainfall in Queensland resulted in first flush flows into and along the Barwon-Darling. Unlike the 2020 Northern Basin First Flush event, there was reasonable advance notice of the flows entering NSW water sources from across the Queensland border.

The NSW Minister for Water restricted the take of this water by A, B and C class water access licences in the Barwon-Darling Unregulated River by a temporary water restriction under section 324 of the WM Act.[18]

The restrictions were introduced having regard to targets and triggers identified in a draft Environmental Water Immediate Response Protocol and the 1992 Interim Unregulated Flow Management Plan for the North-West. Only the extraction of water for town water supply, stock and domestic use and irrigation of existing permanent plantings was permitted.

The restrictions protected flows to replenish town water supplies and provide stock and domestic water for riparian landholders (supporting basic landholder rights), achieved connectivity along the Barwon-Darling River starting from the Moonie, Condamine-Balonne/Culgoa and Warrego systems to the Darling at Wilcannia, and filled the Bourke and Brewarrina weir pools. In total, 670 ML of water flowed past Wilcannia and DPIE's analysis indicated that up to 16,000 ML of water was protected from extraction by the section 324 order. This water partly replenished drought refuge waterholes and provided some short-term connectivity between waterholes.

Although this event led to inevitable local increases in salinity as flows passed along the river system, these increases were temporary, decreasing as river levels reduced. Monitoring suggests that the flows broke down blue-green algae concentrations from Collarenebri and Walgett. The DPI Fisheries habitat mapping project also found that the event inundated the following proportions of mapped large woody habitat:

- upstream of Walgett-Brewarrina - approximately 48%
- Brewarrina-Bourke river section - 23%
- Bourke-Tilpa river section - 27%
- Tilpa-Wilcannia river section - 11%.

Following this rainfall event, in April 2018, the CEWO and DPIE-EES (known at the time as the Office of Environment and Heritage) used their licensed environmental water from the Gwydir and Border Rivers catchments to deliver a northern (rivers flow) connectivity event. The flows

[18] Government Gazette No 27 of 8 March 2018, p2 and No 37 of 29 March, p2-4.

from these water orders were protected from pumping for irrigation by another section 324 order.[19]

According to the CEWO Northern Connectivity Update No 8 dated 20 July 2018, building on the natural unregulated flows, the northern connectivity event sought to benefit native fish along rivers in the Northern Murray-Darling Basin by improving longitudinal connectivity, providing improved food sources and opportunities to move and disperse to better habitats. This created an innovative flow event in an unregulated river (the Barwon-Darling) using water from dams (regulated sources).

The event was supported by a range of face-to-face engagement activities and a series of written updates. In total, 7.5 GL of water passed Wilcannia.

In May 2020, DPIE Water published a fact sheet outlining observations from the March-April 2018 s. 324 event. In the lessons learnt, it identified that:

- the section 324 order effectively reduced pressure on Brewarrina and Bourke town water supplies as protected water re-filled weir pools for town water supply and supported basic landholder rights. Monitoring compliance with restrictions is also important to ensure their effectiveness,
- media coverage was patchy in the Barwon-Darling, and anecdotal evidence suggested a number of target audience members did not receive adequate notification. Media coverage must be accompanied by whatever complementary means can be generated to improve the likelihood of successful communication,
- there should be adequate monitoring and reporting protocols in place for such events to account for the outcomes achieved against the objectives of the event, and provide a sound foundation for transparency in reporting and interpreting where improvements have been made based on lessons learned from previous events, and
- a coordinated effort by both State governments to protect flows could have led to better outcomes for communities and the environment (as some flows were extracted in Queensland before being protected from the NSW boundary). However, where the release of regulated environmental water was a joint undertaking between State and Commonwealth governments, the interagency coordination contributed to the effective management of this event and provides an example for future flow events.

April 2019 event

On Saturday 30 March 2019, rainfall led to inflows to the Peel, Namoi and Macquarie River catchments. A section 324 temporary water restriction was imposed on Sunday 31 March 2019 to 6 May 2019 due to extended drought conditions, to protect inflows:

- in the Namoi, for essential needs (such as town water supplies, stock and domestic and basic landholder rights) and to enable delivery of high security water, and improve the possibility for various flows to connect the full length of the Namoi River from the junction of the Peel River to the Walgett Weir, and
- in the Macquarie, for essential needs (such as town water supplies, stock and domestic and basic landholder rights) and to maximise the potential for connection to the Barwon-Darling.

At the time, while the restrictions were largely supported by irrigators (with some voluntary embargoes already in place), concerns were raised about the inadequate notice given to water

[19] Government Gazette No 45 of 20 April 2018, p 750041

users of the formal restrictions being imposed.[20] The lack of notice also led to logistical challenges for NRAR, who had to deploy staff at short notice, and who were confronted with disgruntled water users.

Following this event, DPIE Water recognised a need to increase the planning, preparedness and coordination capabilities to manage rainfall events during the drought. Efforts were made to:

- document decision-making processes, workflow requirements and the roles and responsibilities of various stakeholders in the management of section 324 orders,
- establish a working group involving water planning, legal and NRAR staff, who met regularly to discuss the potential need and development of section 324 orders to manage the drought,
- develop a decision-making framework that could be used to manage a potential northern valley first flush event, and
- develop alternative, proactive and adaptive approaches to managing rainfall events, such as:
    - drafting section 324 orders to enable flow events to be managed responsively according to real-time information, by inserting the ability for restrictions to be lifted in a simple administrative manner, with the approval of certain Directors within DPIE Water, and
    - 'proactively' imposing section 324 orders, to ensure that water users understood well before any rain event, that take of the first flows would be restricted (see Chapter 5 of this report for more detail).

Northern Fish Flow (April - June 2019)

Between April and June 2019, the CEWO and DPIE-EES (known at the time as the Office of Environment and Heritage) arranged for the release of 27-36 GL of their licensed water held in Glenlyon and Copeton Dams for the environment for Northern NSW Basin rivers with DPIE Water and WaterNSW. The purpose of the flow was to top up waterholes along the Dumaresq, Macintyre, Gwydir, Mehi and Barwon rivers, enhancing fish habitats, river health, and supporting important Aboriginal environmental, cultural and spiritual values in the river systems.

DPIE Water imposed a section 324 temporary water restriction[21] to protect that water as it flowed through the Barwon-Darling Unregulated River Water Source.

The timing of the event had regard to the fact that:

- the absence of summer rains in the Northern Basin led to fish being confined to small, shallow, stagnant waterholes,
- recent rains would assist the flow, and
- cooler temperatures would improve water distribution efficiencies (including with less evaporation) and reduce the risk of spread of blue-green algae.

The Northern Fish Flow event followed the large fish death at Menindee Lakes over the summer of 2018 – 2019. It improved water quality, connected rivers, helped native fish survive along 1,500 km of the river system and provided relief to communities who had not seen parts of the rivers flow for nearly a year (such as Walgett). The flows travelled through the traditional lands of many Aboriginal nations, supporting important environmental, social and cultural values. Queensland also protected the flow from take for irrigation purposes.

[20] Moree Champion, "Watchdog investigating water embargo breaches in the Namoi catchment", 8 April 2019.

[21] NSW Government Gazette No 35 of 16 April 2019 at 1170-1173.

The Barwon River at Walgett would have ceased to flow for around 630 days between May 2018 and February 2020 had it not been for the Northern Connectivity Event and the Northern Fish Flow Event.[22]

4.7 Preparation of the Floodplain Harvesting Exemption

In October 2019, the NSW Minister for Water gave in-principle approval for the drafting of a regulation to make it clear that an access licence would not be required to take water via certain floodplain harvesting works:

- in areas where the FPH Policy has not yet been implemented, and
- in other areas not designated as floodplains.

This exemption was flagged in the FPH Policy in 2013 as a key step to transitioning floodplain harvesting activities into the WM Act framework but had not been codified.

The renewed focus on water compliance since the Matthews inquiry and the creation of NRAR increased the importance of codifying the exemption, but drought conditions meant there was no floodplain water harvesting.

Following Ministerial approval, drafting of the regulation was completed on 20 December 2019.

4.8 January 2020 rainfall, temporary water restrictions and preparation to commence the floodplain harvesting exemption

In mid-January 2020, the BoM advised of a forecast widespread rain event in the east of Australia from Thursday 16 January. The trough was forecast to be slow moving and the BoM predicted accumulated rainfall totals of 30-80 mm over a four-day period.

Due to the severe drought conditions, DPIE Water deemed it in the public interest to impose the section 324 Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020 to prevent regulated and unregulated access licence holders in the Northern NSW Murray-Darling Basin from taking water arising from this event from 17 to 31 January 2020. The restriction aimed to protect flows to meet critical needs (town water, domestic and stock, and basic landholder (including native title rights), the needs of critical drought refuge areas and filling of water holes along the river), and promote system wetting, replenish and maintain drought refuge pools and facilitate system connectivity to improve the likelihood of flows from this and subsequent events reaching the Lower Darling.

At the same time, DPIE Water took steps to commence the floodplain harvesting regulation on 24 January 2020. However, as the temporary water restriction in place at the time did not restrict floodplain harvesting, the regulation was put on hold to ensure that floodplain harvesting would be temporarily restricted under section 324 of the WM Act consistent with other forms of take when the regulation commenced.

Meanwhile, the January rain in the northern NSW Murray Darling Basin led to short, sharp inflows into some of the unregulated river systems, but no persistent flows except for in the unregulated Upper Namoi and Peel catchments on 26 January 2020. Approvals to take surface water in these catchments were granted as higher priority needs (such as requirements for the

[22] Commonwealth Environmental Water Office Northern Fish Flow 11 September 2019 wrap-up, available at https://www.environment.gov.au/system/files/resources/6e450083-697d-4da6-aceb-d2a878114373/files/northern-fish-flow-wrap.pdf

water source and its dependent ecosystems, basic landholder rights and town water supply) had been met.

In particular, high security access in the Peel Regulated River Source and unregulated access in the Mooki River and Quirindi Creek water sources was granted from 26 January 2020, after it was assessed that access would not impact the ability to achieve connectivity from Tamworth down to the Namoi River junction or the replenishment target at Carol gap, given:

- the flows were not forecast to extend downstream to meet other targets,
- the small volume of high security take, and
- the small pump sizes of unregulated users in the Mooki River and Quirindi Creek water sources relative to the flow rates.[23]

As detailed in Chapter 6 of this report, on 30 January 2020 the temporary water restriction was extended to 17 February 2020, having regard to follow up rainfall events forecast by the BoM to occur in February 2020, and for reasons similar to those applying to the initial making of the order. The approvals to take from the Peel, Mooki and Quirindi Creek water sources were extended to 7 February 2020.

5. Preparation for the first flush event

5.1 Steps taken to prepare for the first flush event

The proposal for a pre-emptive restriction

Since 2018, DPIE Water has documented processes and templates to support internal decision-making processes for making, amending and repealing temporary water restrictions. This included the routine online publication of the reasons for any decisions to make, amend or repeal standard temporary water restrictions (See Appendix E).

In Northern Community Drought meetings held in late May/early June 2019, water users sought clarity around when and how DPIE Water decides to apply water restrictions and asked that the government provide advance warning of the need for restrictions.

Information available to the Panel is that DPIE Water developed a proposal to proactively impose a temporary water restriction to protect the first inflows in the Northern Basin for critical water needs. Under the proposal:

- the initial aim was to ensure that local critical water needs were met with the first inflow volumes, and also to facilitate downstream system wetting, and maximise downstream system wetting and the prospects of flows reaching the Lower Darling,
- the objective was to address critical water needs (town water supply), critical in-stream needs and basic landholder rights (which included harvestable, domestic and stock and native title rights) and also high security licensed water entitlements in the northern catchments and the Barwon-Darling and Lower Darling systems, and maximise the prospects of early system recovery, and
- a restriction would be applied in advance (pre-emptively) and ahead of any forecasted uncontrolled flows, to give certainty and provide transparency for affected water users about when a restriction applied and when it might be lifted.

[23] See approval to take published on the DPIE Water website at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/288757/active-mgmt-peel-mooki-quirindi.pdf

While the exact flow triggers would not be specified, principles for lifting (such as sufficient supply for towns for the next few months) would be. Restrictions would directly apply to the unregulated river users, but also indirectly to access to general security (carryover) and supplementary access entitlement holders. Consideration would be given to allow access to overbank flows that would not return to the river (See Appendix F).

The 'proactive' or 'pre-emptive' restriction overcame challenges with the existing approach of applying restrictions on an event-by-event basis as uncontrolled flows occurred. These challenges included timely gazettal (and commencement) of restrictions, managing expectations of water users, and ensuring that water users were sufficiently aware of the restrictions to avoid compliance issues.

However, when the proposal was provided to irrigation representatives in July 2019, they raised concerns that restrictions would not be lifted in a timely manner and could lead to lost opportunities to consumptive water users.

Ultimately, this proactive approach was only implemented during the Christmas period of 2019/2020, in recognition of the additional challenges that would arise to make and notify water users of water restrictions if the need arose during the Christmas period.[24]

Adoption of responsive management provisions in section 324 orders

As flagged in 2019 to irrigator representatives, to improve the ability to responsively manage flows under a temporary water restriction (and avoid delays arising from administrative and gazettal processes), in October 2019, DPIE Water began incorporating a 'responsive management approach' to temporary water restrictions.

Orders included provisions to allow certain executives within DPIE Water to 'approve' a person to take water notwithstanding the temporary water restriction, upon certain requirements being met. These became known as approvals 'to take', or 'to lift' a restriction, and the provisions were:

- included in proactive temporary water restrictions imposed over the Christmas period of 2019/2020, and
- used to manage the first flows arising from rainfall in mid-January 2020 (described in Chapter 4).

Determining the Needs of the Environment During an Extreme Event (the NEDEE project)

In early July 2019, DPIE Water began working with DPIE-EES and DPI Fisheries to determine the critical environmental needs that should be targeted in the northern valleys under various first flush scenarios, particularly in circumstances where Water Sharing Plan rules were suspended. The 'Needs of the Environment During Extreme Events' (NEDEE) results would provide a basis for DPIE Water to demonstrate these environmental needs had been considered when allocating water and sharing uncontrolled tributary inflows. The work was intended to contribute to the implementation of a proactive restriction on irrigation take in the north-western valleys to protect critical needs (including critical instream needs) in anticipation of a first flush event, and the planned review of the Extreme Events Policy. The work continued despite the decision not to progress the proactive water restriction.

The NEDEE project established the following key objectives of temporary water restrictions, which were outlined in DPIE Water's Information Sheet titled *Northern Basin temporary water*

[24] See the Temporary Water Restriction (Northern Inland Tributaries) Order 2019 and the Temporary Water Restriction (Barwon-Darling Unregulated River and Intersecting Streams Unregulated Water Sources) Amendment Order 2019.

restrictions: targets and principles, published in May 2020 (the Targets and Principles Fact Sheet):

- meet critical human needs – provide flow locally and downstream, particularly to replenish town water supply weir pools and provide water supply for domestic and stock purposes, and
- meet critical environmental needs – provide flow along the length of the river systems to ensure re-connection of rivers and drought refuge pools.

Flow targets were developed to help meet these objectives, based on the minimum environmental water requirements stated in the draft Long Term Water Plan for each valley, and other literature (where available). The targets adopted to manage the event are set out at Appendix G.

The targets selected from the Long Term Water Plans (generally, base flow requirements) consisted of flows or volumes at key gauge locations relevant to important refuge areas, and some core wetland and lake habitats. They aimed to:

- maintain refugia pool water quality,
- provide some connectivity and fish passage between drying pools,
- provide low-level lake fill for fish and other aquatic biota supporting and maintaining lake processes, and
- inundate inner-core wetland areas for critical flow-dependent vegetation maintenance and wetland processes, where known thresholds were at risk.

Base flow targets in Long Term Water Plans are expressed as target flows for a minimum number of days per year, rather than being event-based targets. Targets can also differ between wet and dry years.

DPIE Water decided to adopt the number of flow days from the next biggest flow in Long Term Water Plans, the number of flow days for a small fresh. The flow duration for small freshes differed from plan to plan, given that the draft plans were all configured differently and based on different studies, and some state a number of days and others state how the number should be calculated. However, many plans targeted a flow duration of 10 days. This was considered achievable, but still difficult, in a drought situation.

During interagency consultation, WaterNSW also expressed concern about the ability for flow forecasting models to predict small flows and a duration of 10 days. To operationalise these targets in a dynamic and cumulative event, the relevant flow targets were converted to a volume at each site. For example, the initial baseflow requirement at Collarenebri gauge determined to meet critical environmental needs was 280 ML per day for 10 days. This was converted to a single volumetric target of 2,800 ML.

While it was recognised that one volumetric target may not provide as much ecological benefit as the flow occurring over a number of days, the adopted approach was more pragmatic, as it was easier to forecast and manage. The move to a single target volume, rather than a target flow rate and duration, was agreed by an interagency panel (including DPI-EES, DPI Fisheries, DPIE Water and WaterNSW) for its operational ease for this particular event.

DPIE Water formed the view that as the critical environmental need targets were (in theory) provided by a base flow, this would be enough to also supply critical human needs. The Panel was informed that, in practice, the volume required to re-start flows in a river is generally considered adequate to meet town, domestic and stock supplies and basic landholder rights, though no formal documentation of the volumes or numbers involved has yet been developed.

Other targets to meet water supply for critical needs

Further, although not expressly stated in the Targets and Principles Fact Sheet, additional targets were developed to ensure weir pool volumes were refilled to provide basic landholder rights and town water supply. Restrictions on access to water suspended in general security accounts would not be fully lifted until 12 months' worth of supply for critical needs was assured in major dams, and town weir pools had been filled (noting that the duration of supply of these weir pools in unregulated rivers is governed by the performance of the weir pool). This approach was consistent with the usual methods of determining water availability prior to making water allocations.

Prior to the event, no precise targets were formed in relation to Menindee Lakes, as BoM forecasts, and therefore DPIE Water, did not contemplate that rainfall events would be sufficient to achieve connectivity throughout the Basin.

Principles determining the lifting of restrictions

DPIE Water also developed principles to determine whether restrictions could be lifted if a local target was reached or forecast to be reached. As set out in the Targets and Principles Fact Sheet, these were as follows:

- Consider providing access to upstream water users under normal rules if the nearest downstream targets are met or forecast to be met ***and*** there is an assessment that this event will not meaningfully contribute to meeting any downstream targets.
- However, where an event is predicted to meaningfully contribute to meeting the next downstream target, the temporary water restriction should **not** be lifted (e.g. meet Menindee Lakes requirements).
- When an event has met local targets and is no longer expected to contribute to meeting downstream targets, or is in excess of that required to meet downstream targets, some local extraction relief could be allowed.
- Temporary water restrictions should apply to a consistent upstream network of both unregulated and regulated rivers systems in a valley, to provide sufficient volumes of water to meet critical needs, avoid interceptions by extractors, and avoid inequitable sharing between users.
- Early relaxation of upstream access restrictions prior to downstream targets being met should only occur if there is high confidence in downstream flow predictions meeting targets.
- When flow predictions are used for early relaxation of restrictions on upstream access, river system loss assumptions should reflect the antecedent extended dry conditions.

Putting the NEDEE work and responsive management provisions into practice

The mid-January 2020 rainfall event was the first occasion on which the draft frameworks outlined above were put into practice.

In order to responsively manage the mid-January 2020 rainfall event pursuant to the Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020 made under section 324 of the WM Act, DPIE Water prepared and relied on:

- the WaterNSW Early Warning Network to directly notify affected water users of the restrictions,

- a decision tree to assist operationally monitoring, assessing and managing potential and observed rainfall and tributary flow events (see Appendix H),
- interim triggers based on draft environmental criteria (developed as part of the NEDEE project, which had not yet been approved at an inter-agency level) to consider access to inflows while the temporary restriction is in place,
- an interagency protocol outlining roles and responsibilities for managing the event, particularly over a weekend, as follows:
    - WaterNSW to monitor rainfall, inflows and stream levels,
    - WaterNSW to contact DPIE Water Director, Water Planning Implementation to advise that triggers are predicted to be met,
    - DPIE Water Director, Water Planning Implementation to convene an inter-agency meeting to consider allowing access. Meeting to include DPIE Water, WaterNSW and DPI Fisheries,
    - If access is permitted, the Executive Director Water Policy Planning and Sciences of DPIE Water to issue advice to WaterNSW via email. Advice to include water sources where access is permitted, and
    - WaterNSW to advise customers of permission to access.

On 6 February 2020, the interim objectives, targets and principles for managing a first flush event were approved at an inter-agency meeting including officers of DPIE Water, WaterNSW, DPI Fisheries and DPIE-EES.

5.2 Communication and engagement in preparation for the first flush event

The need to protect any first flows to meet critical needs was generally discussed with communities, and accepted, in-principle, at drought road shows and WaterNSW River Operations Stakeholder Consultation Committees (ROSCCos) held around NSW in the second half of 2019.

As the proposal to proactively impose a temporary water restriction developed around July 2019, the concept was discussed with other agencies through the Critical Water Technical Advisory Group (including DPIE Water, WaterNSW, DPI Fisheries and DPIE-EES officers), representatives of peak northern irrigator bodies and Critical Water Advisory Panels (including officers of DPIE Water, DPIE-EES, DPI Fisheries, DPI Agriculture, NSW Environment Protection Authority, NSW Health and WaterNSW, and Local Government representatives).

Messaging was regarded as particularly important, given restrictions would apply to unregulated river users, who were not ordinarily restricted from taking water under section 324 orders.

While the proposal for a proactive restriction was not progressed in July 2019, the potential for temporary water restrictions in the north continued to be a key topic of discussion both in the northern and Lower Darling WaterNSW ROSCCos in late 2019, and with peak northern irrigator representative bodies in early 2020.

WaterNSW began consulting with northern valley stakeholders through its ROSCCos on criteria for determining when the restriction should be lifted (although the details of targets or principles, not yet finalised, were not shared with stakeholders).

The proactive restriction imposed over the Christmas 2019 period also demonstrated an indication of DPIE Water's intention to restrict access to first flows. The objectives for managing first flush events developed as part of the NEDEE project were outlined in the reasons for

decisions published in connection with that restriction on the DPIE Water website.[25] While a media release was issued in relation to the restriction, the issue was overshadowed by coverage of the 2019 bushfires. Anecdotal evidence suggests that water users were not directly or formally notified via customer networks, and peak bodies were not aware of this initial restriction until after it ended.

Prior to the making of the Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020 on 17 January 2020, WaterNSW sent a message to all affected water users advising them to register for notification of section 324 restrictions via the WaterNSW Early Warning Network (EWN). However, anecdotal evidence suggests that there was still a delay between the email and text notifications (for those subscribed to the EWN) and updating of the DPIE Water website to which those notifications directed people. There was also a 24-hour delay in SMS notifications after the restriction had been extended on 30 January 2020. In the written submission from Peel Valley Water Users, Joint President, Tom Woolaston, described the difficulty he had in obtaining information from water agencies regarding the extension to restrictions, stating *"I am not sure when the embargo was started (possibly 26th January 2020) but on 29th I started to try and find out if it was likely to be extended by NSW Water and was told that they did not know, ring back on 31st. I was expecting the embargo to be extended but on 31st I rang again to be told that no one knew*".[26]

The lack of communication and engagement with the community and water users about how the first flush event would be managed was a strong source of criticism, and public feedback reinforced that there was very little pre-event communication around expected targets and scenarios, even though the implementation of the restrictions was not unexpected.[27] In a letter to the Hon. Melinda Pavey MP, NSW Minister for Water, Property and Housing, the Menindee Lakes Sustainable Diversion Limit Stakeholder Group stated that "*of particular concern was the lack of communication from your office, DPIE and WaterNSW surrounding the reasons for exempting the embargo*." The level of communication in preparation for the event was perceived as unacceptable given the two years of drought conditions which preceded the event.

5.3 Preparation for the floodplain harvesting exemption and the floodplain harvesting restriction

As outlined in Chapter 4 of this report, the NSW Minister for Water gave in-principle approval for the drafting of the Floodplain Harvesting Exemption regulation in October 2019. The need for the regulation was identified in the 2013 Floodplain Harvesting Policy and, with particular regard to the renewed focus on water compliance, it was required to provide clarity on the legality of floodplain harvesting in NSW.

Drafting of the regulation was completed on 20 December 2019 and steps were taken to commence the regulation on 24 January 2020. A communications plan was prepared to accompany the making of the regulation, which noted that there were moderate and high risks associated with the making of the regulation.

However, the temporary water restrictions in place in January 2020 did not extend to floodplain harvesting. While some planning had been carried out as to how access to river flows would be managed to meet critical needs, very little consideration had been given to how restriction to floodplain waters would be managed. Therefore, commencement of the exemption regulation

[25] See https://www.industry.nsw.gov.au/water/allocations-availability/temporary-water-restrictions/expired/northern-inland-tributaries

[26] Written submission of the Peel Valley Water Users dated 7 August 2020.

[27] See written submissions of the Menindee Lakes Sustainable Diversion Limit Stakeholder Group dated 30 May 2020, Carrington Cotton Corporation dated 3 June 2020 and Cotton Australia dated 5 June 2020.

was put on hold to ensure that floodplain harvesting would be temporarily restricted under section 324 of the WM Act, consistent with other forms of take when the regulation commenced, and to attempt to improve the clarity of messaging around the new regulation.

In the interim, DPIE Water attempted to address practical issues around restricting floodplain harvesting, given that on-farm infrastructure was typically constructed to maximise the passive take of water flowing across floodplains.

Eventually, readiness to commence the regulation on 6 February 2020 with the corresponding temporary water restriction (commencing 7 February 2020) coincided with forecasts of possible localised and heavy storm activity in the Northern Basin.

5.4 Communication and engagement in preparing for the floodplain harvesting exemption and floodplain harvesting restrictions

DPIE Water officers met with northern irrigators to discuss implementation of the floodplain harvesting policy in September to November 2019 and to clarify DPIE Water's expectation that floodplain harvesting should not be taking place without either a regulatory exemption or a licence.

Over the course of consultation, DPIE Water has observed a disconnect between what peak bodies had been told with regards to the permissibility of floodplain harvesting, what was being advocated to DPIE Water, and what the floodplain harvesting community more broadly knew and accepted. DPIE Water has tried to address these issues through a variety of means including the independent peer review, consultation, the Floodplain Harvesting Action Plan and publications (such as fact sheets and videos) on the DPIE Water website.

DPIE Water has acknowledged that ideally it would have been preferable to consult and work with affected landholders after the regulation was drafted and before it commenced, but in the end it did not have the opportunity to do so, given the coincidence of the readiness of the regulation and rainfall events.

Regarding the temporary water restrictions, DPIE Water officers had advised some representatives of peak bodies that temporary water restrictions could be applied to prohibit floodplain harvesting. However, in addition to no advance notice being given to the broader community that certain floodplain harvesting would be exempted from licensing requirements via the regulation until the new Floodplain Harvesting Policy was fully implemented,[28] no advance notice was given to the broader community that floodplain harvesting would or could be restrained by a temporary water restriction under section 324 of the WM Act.

[28] See written submissions of the Nature Conservation Council dated 9 June 2020 and Healthy Rivers Dubbo dated 4 June 2020.

6. Management of the 2020 Northern Basin First Flush Event

6.1 What had to be managed?

The beginning of the event in February 2020

In late January 2020, the BoM forecast rainfall throughout February likely to be in the manner of localised storm events. Accordingly, on 30 January 2020 the temporary water restriction originally put in place on 17 January 2020 was extended to 17 February 2020.[29]

By 7 February 2020, the BoM predicted the possibility of heavy showers and storms across NSW for the coming days that had the potential to cause runoff and flash floods by the end of the weekend (8-9 February 2020). While most of the forecast rain was predicted to fall on the NSW North Coast, there was the possibility of localised and heavy storm activity in the Northern Basin. The predicted rain was not likely to produce significant floodplain events across any or all of the northern NSW floodplains, but could potentially produce localised overland flow or overbank flows that could be extracted for the purposes of floodplain harvesting. See Appendix I for maps of the BoM forecasts in late January and early February 2020.

This forecast coincided with DPIE Water's readiness to commence the regulation to exempt the requirement to hold a water access licence to take water via certain floodplain harvesting works, and the corresponding temporary water restriction. In accordance with normal government processes, the regulation was submitted to the Executive Council on Friday 31 January 2020, approved by the Governor on the following Wednesday 5 February 2020, for automatic commencement upon publication on the NSW legislation website on Friday 7 February 2020.

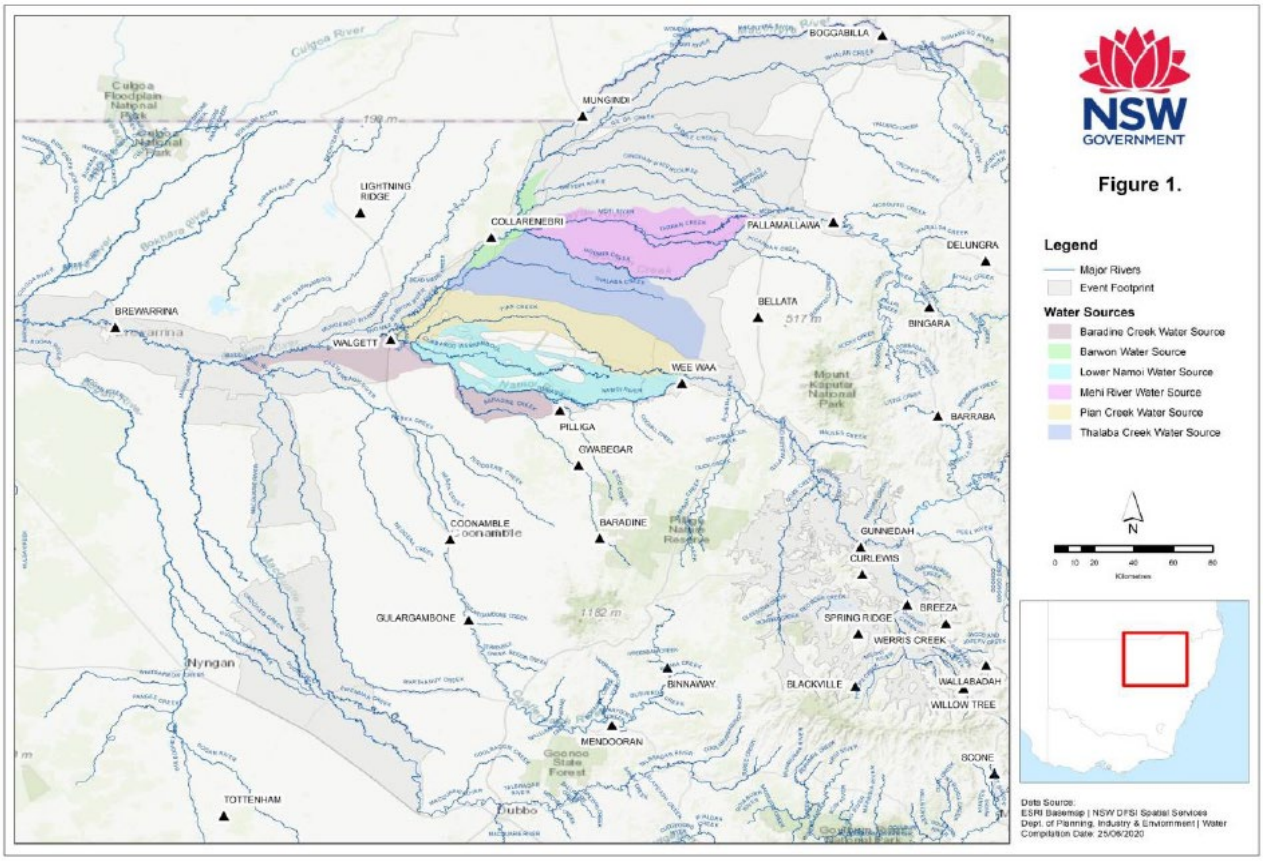
As a result, the Water Management (General) Amendment (Exemptions for Floodplain Harvesting) Regulation 2020 commenced on 7 February 2020. The regulation formally permitted under the WM Act, for the first time, the take of water via floodplain harvesting without a licence by those works while the Floodplain Harvesting Policy is being rolled out. On that same date of 7 February 2020, the Temporary Water Restriction (Northern Basin) (Floodplain Harvesting) Order 2020 was made to prohibit the take of water using those floodplain harvesting works, in order to protect water for higher priority critical needs, and consistent with the other restrictions in place across the NSW Northern Basin at that time. The order did not prohibit the 'passive take' of water – i.e. the take of water by a water management work that could not reasonably be prevented (e.g. the passive take of water by on-farm storages, dams, and open channels that do not have works to control or otherwise avoid the take of water via floodplain harvesting). The order applied to the following floodplains:

- Barwon-Darling Valley Floodplain,
- Gwydir Valley Floodplain,
- Lower Namoi Valley Floodplain,
- Narrabri – Wee Waa Floodplain,
- Narromine to Oxley Station Floodplain, and
- Upper Namoi Valley Floodplain.

The order was later amended on 12 February 2020 by the *Temporary Water Restriction (Northern Basin) (Floodplain Harvesting) Amendment Order 2020* to extend the restriction to

[29] See *Temporary Water Restriction (Northern NSW Murray Darling Basin) Amendment Order 2020* and the reasons for decision published on the DPIE Water website.

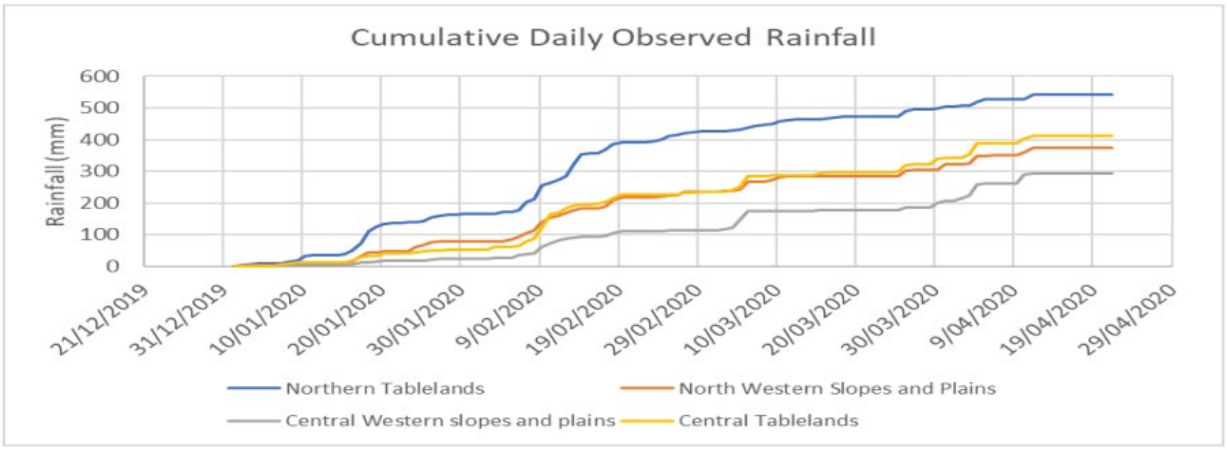
floodplains inadvertently omitted from the initial order, being the Lower Macintyre River, Whalan Creek, and Boomi River Floodplain (from Yelarbon Crossing to Barwon – Boomi Rivers confluence) and the Lower Macquarie Valley Floodplain.



Map showing floodplain locations where restrictions and temporary exemptions were applied.
Source: NSW Department of Planning, Industry and Environment, July 2020

Rainfall across the Northern Basin through to May 2020

Rainfall across the northern parts of the Basin began in late January 2020 in the upper Condamine-Balonne in Queensland and across the northern NSW tributaries. The rainfall, caused by storm cells with a large variation in rainfall intensity and location across the region, continued from January through to May 2020 (with data to late April graphed below).



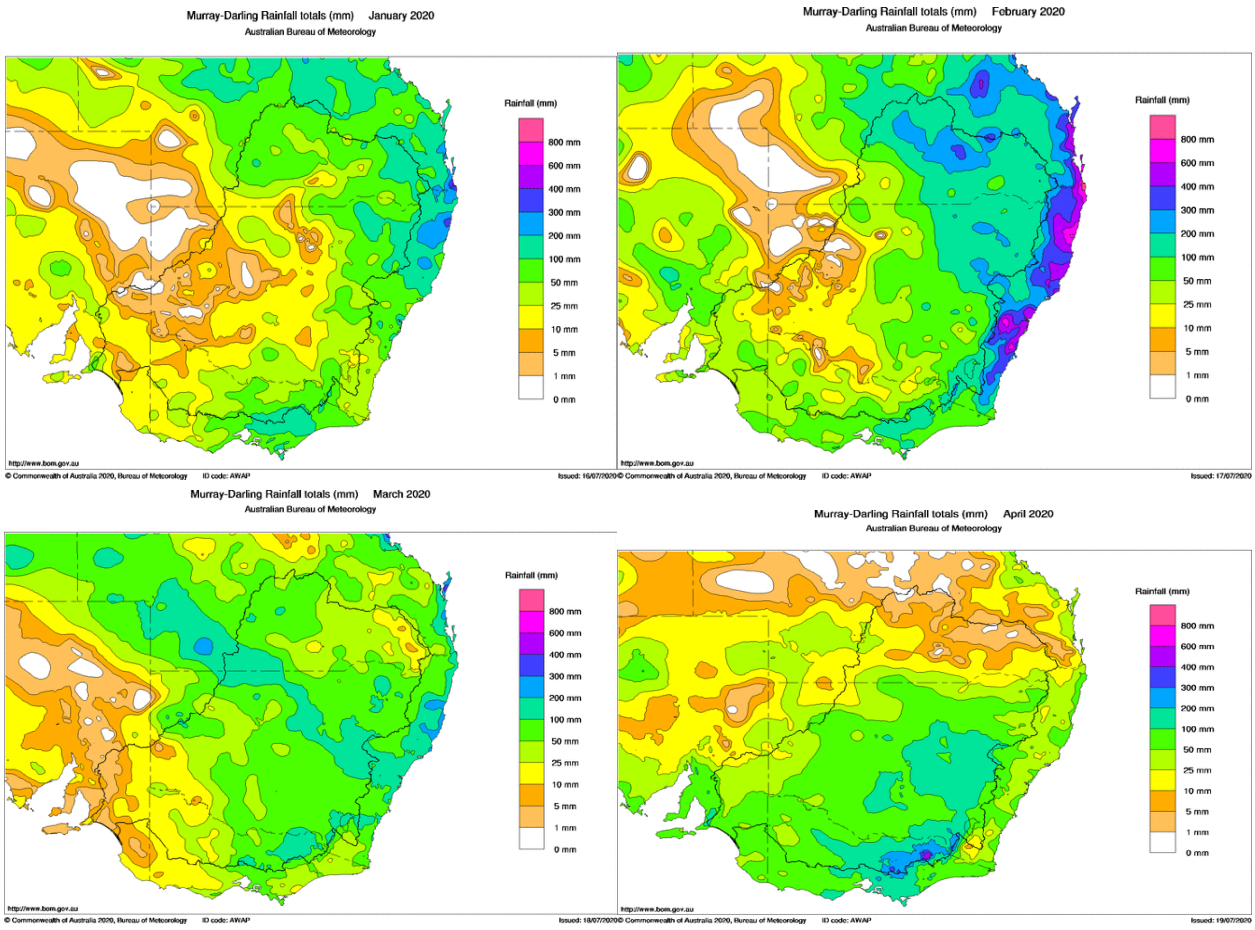
Cumulative daily observed rainfall, from January 2020 to the end of April 2020.
Source: WaterNSW, June 2020.

The cumulative rainfall events led to continuous updating of flow forecasts in the northern NSW tributaries and the Barwon-Darling. The summary below sets out the rainfall events, and the associated increase in forecast flows to Menindee Lakes, and has been prepared based on information provided to this review by WaterNSW and DPIE Water.

- From 6-10 February 2020, rain fell across the Lower Gwydir and Namoi systems. Flows were forecast to reach Wilcannia, but not Menindee Lakes.
- Over the weekend of 8-9 February 2020 in particular, localised storm events caused unexpected localised flooding across the Namoi and the Lower Gwydir valley. No BoM or SES warnings had been issued in relation to flood risks in those locations prior to that weekend. Rainfall was highly variable, for example, BoM recorded 6 mm at Pillaga and 90 mm at Narrabri. Peak bodies reported that intense rain of up to 260 mm had fallen in some locations. After that weekend, flows were forecast to only just connect with the Menindee Lakes, with an inflow of 0-8 GL.
- From 12 to 14 February 2020, rainfall continued across the northern region with a further 30-60 mm recorded at the Northern Western Slopes and Plains. By 16 February 2020, there had been increased rainfall around the Border Rivers catchment. These events increased the forecast flows to Menindee Lakes to 15-35 GL.
- Over 18-19 February 2020, rainfall in the range of 25-70 mm was recorded across the northern NSW tributaries and Queensland. On 19 February 2020, the forecasted flows to Lake Wetherell increased to 36-60 GL, and by 21 February 2020 this had increased to 60-80 GL, meeting the volume of 60-70 GL determined by DPIE Water (with the advice of WaterNSW) on 11 February 2020 as being required to:
    - provide connectivity in the Barwon-Darling from Mungindi to Wentworth,
    - provide a single flush along the Lower Darling with a rate of release high enough to minimise fish deaths (60 GL being the amount required in the Menindee storages to provide sufficient head to allow for a release in the order of 1,500 - 2,000 ML per day),[30] and
    - provide a reserve in Lake Wetherell as a refuge pool.
- Over the weekend of 22-23 February 2020, the Maranoa River catchment area in the south western region of Queensland (in the western part of the Balonne River catchment) received significant rainfall in the range of 200 mm, leading to significant river flows in the Balonne at St George. The forecasted inflows to Menindee Lakes increased to 170-200 GL on 27 February 2020. The target for Menindee Lakes subsequently increased to 200 GL on 4 March 2020 as a result of significant additional inflows forecast from Queensland (200 GL being the amount estimated as being required to meet 12-18 months' supply for critical needs in the Lower Darling, consistent with the reliability of targets for dams in upstream water sources). On 5 March 2020, the forecasted inflows to Menindee Lakes increased again to 270-295 GL following an increased flow forecast at St George, and having regard to flows from the Bokhara, Culgoa and Warrego.
- On 6 March 2020, additional rain was recorded on the North Western slopes, the Central Western Slopes and Plains and the Central tablelands of NSW. As a result, forecasted flows to Menindee Lakes increased to 260-315 GL on 16 March 2020.
- On 20 and 31 March 2020, further rainfall events in the Northern Western and Central regions and further flows at St George increased forecasted inflows to Menindee Lakes to 365-405 GL.

[30] See Appendix B to WaterNSW submission dated 27 August 2020.

- On 4 and 11 April 2020, rainfall events saw an additional 40-55 mm of rainfall in the north and Western Slopes, and over 100 mm on the Central Western Slopes of NSW. By 30 April 2020, the Menindee Lakes forecast increased to 485-535 GL.
- At the start of May 2020, another 40-50 mm of rain was recorded across the Central West. By 1 June 2020, forecasted flows to Menindee Lakes reached 578-590 GL.



Map of rainfall across Murray-Darling Basin in: **Top left inset:** January 2020; **Top right inset:** February 2020; **Bottom left inset:** March 2020; **Bottom right inset:** April 2020.
Source: Bureau of Meteorology, July 2020.

As the sequence of events above demonstrates, the 2020 Northern Basin First Flush event was very dynamic in nature, having regard to both the various temporal and spatial rainfall patterns as well as the stress that had been placed on the physical and social environment by the extended drought throughout the system. A chronology of the decisions made to manage the event is set out at Appendix J.

6.2 Who was involved?

Although section 324 of the WM Act gives the NSW Minister for Water the power to make temporary water restrictions, that function is also delegated to DPIE Water officers.

Depending on the context in which the need for a section 324 order arises, other government agencies may also provide advice to DPIE Water in relation to the making of a temporary water restriction. For example:

- WaterNSW may provide advice to DPIE Water on resource availability, water demands and flow forecasts,

- the CEWH and/or DPIE-EES may give advice in cases if a section 324 order is being made for environmental purposes, or especially if held environmental water entitlements are involved, and
- DPI Fisheries may give advice on the potential impacts on fish populations.

NRAR are responsible for monitoring and compliance activities, and WaterNSW are generally responsible for notifying water users of water restrictions once they have been made.

When forecasts indicated the possibility of rainfall, DPIE Water informed the NSW Minister for Water of the general intention to protect the first flows before imposing the first temporary water restriction and then DPIE Water officers exercised all decision-making responsibilities to manage the event. The NSW Minister for Water was notified of decisions after they were made. Some stakeholders felt that the NSW Minister for Water should play a larger role in the decision-making process for first flush events, recommending a similar communications process to that undertaken for the NSW 2019/20 bushfires.[31]

Management of the 2020 Northern Basin First Flush event was as follows:

- **DPIE Water** delegated officers made all decisions in relation to managing the Northern Basin First Flush event, having regard to the advice of other officers when required (e.g. regarding floodplain harvesting),
- the NSW **Minister** for Water was notified of decisions after they were made but was not involved in the decision-making process. Any correspondence from stakeholders during the event was passed onto the decision-makers for their consideration,
- **WaterNSW** routinely provided forecasting advice (including BoM forecasts and flow forecasts) to the DPIE Water decision makers,
- **DPI Fisheries** routinely provided advice to the DPIE Water decision makers regarding the watering needs of fish habitat along the river,
- **NRAR** was routinely notified of decisions after they were made to enable them to undertake monitoring and compliance activities as required, and
- Both **DPIE Water** and **WaterNSW** routinely took a variety of steps to notify water users of decisions after they were made.

Notably, DPIE-EES were not included in the decision-making process because of a concern that DPIE-EES could have a perceived conflict of interest, given they participate in the water market as the NSW Environmental Water Holder and temporary water restrictions have the potential to be market-sensitive, and have a material effect on the price or value of water access rights. For example, a restriction that prohibits water from being taken until the end of a water year would devalue the price of a water right that had to be exercised within that year. Therefore DPIE-EES' involvement was limited to development of the triggers for managing the event (as outlined in Section 5.1 of this report). DPIE-EES also provided advice to DPIE Water about the critical needs of the Macquarie Marshes following recent bushfires, after they raised concerns about access to supplementary flows.

6.3 How did they manage the event?

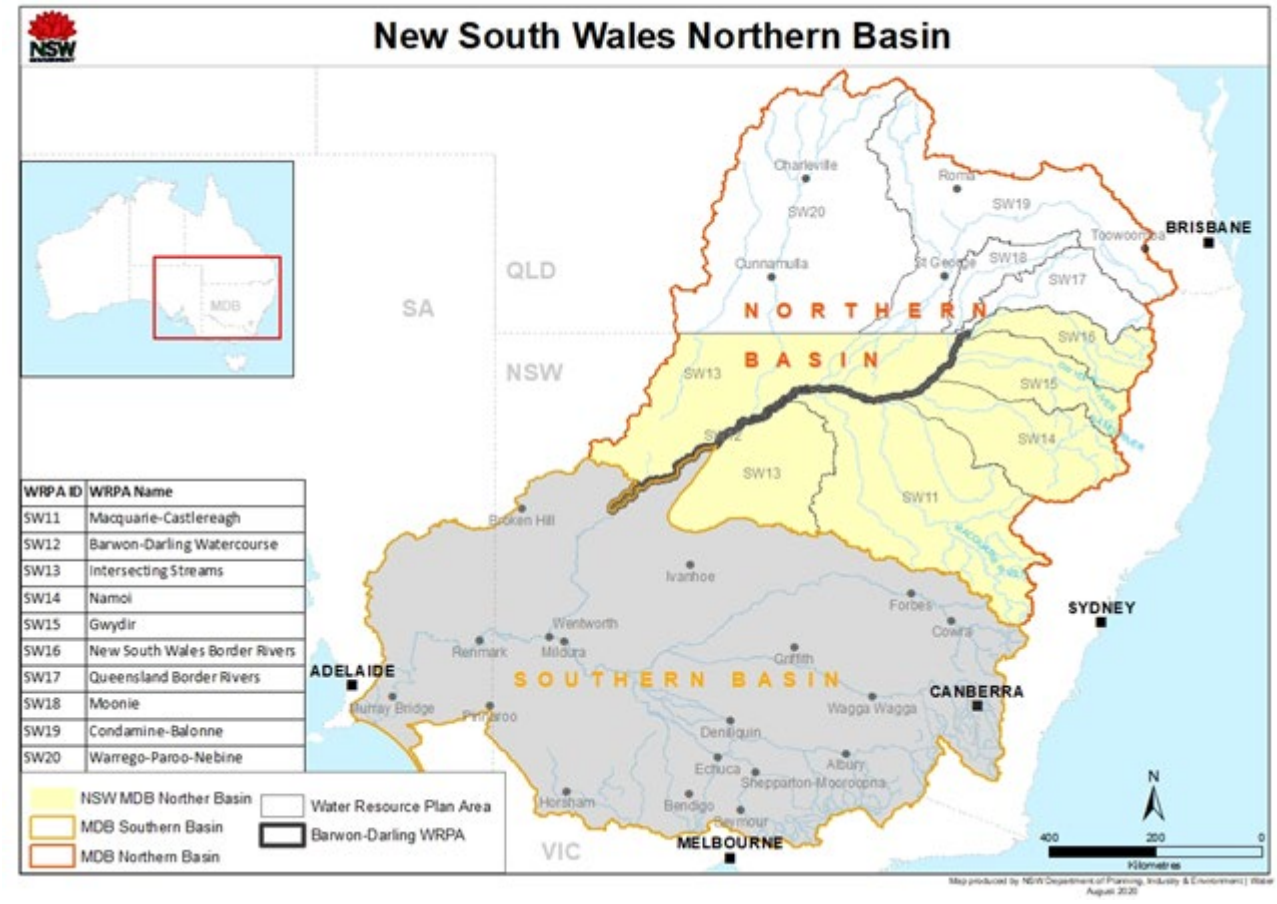
The temporary water restrictions and responsive management provisions

The 2020 Northern Basin First Flush event was essentially managed under three temporary water restrictions made under section 324 of the WM Act (and amended under the same section throughout the course of the event):

[31] See written submission from Dr John Cooke, Howard Jones and Barrie MacMillan dated 5 August 2020.

- The *Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020* which prohibited the take of water in northern NSW water sources by certain regulated and unregulated licence holders (the **pumping restriction**). This was initially in place from 17 to 31 January 2020, extended to 17 February 2020 and then again to 28 February 2020 (on which date the order lapsed). However, northern valley restrictions were permanently lifted between 21 and 25 February 2020, and the restriction on take from the Barwon-Darling upstream of Culgoa was permanently lifted on 27 February 2020.
- The *Temporary Water Restriction (Northern Basin) (Floodplain Harvesting) Order 2020* which prohibited certain takes of water using floodplain harvesting works in certain northern NSW floodplain areas (the **floodplain harvesting restriction**). This commenced on 7 February 2020, was amended to include the Macintyre and Lower Macquarie Valleys on 12 February 2020 and expired on 28 February 2020. However, restrictions for most northern valley floodplains were permanently lifted between 21 and 25 February 2020.
- The *Temporary Water Restriction (Barwon-Darling) Order 2020* which prohibited take from the Barwon-Darling below Culgoa and the Barwon-Darling floodplain from 29 February to 17 April 2020. Restrictions along the Barwon-Darling, below Culgoa, and the Barwon-Darling floodplain were permanently lifted on 6 and 31 March 2020, respectively.

The restrictions covered the entirety of the NSW Northern Basin valleys, encompassing the NSW Border Rivers, NSW Intersecting Streams, Namoi, Gwydir, Macquarie and Barwon-Darling River upstream of Menindee Lakes (shaded yellow in the map below).



Map of the Murray-Darling Basin. Yellow shaded indicates the valley which constitutes the NSW northern Basin.
Source: NSW Department of Planning, Industry and Environment, August 2020.

Each restriction included provisions to enable extractions to be responsively managed based on real-time flow information during the period of the restrictions. In all cases, take was prohibited unless otherwise approved by the Director, Water Planning Implementation or Executive Director, Policy, Planning and Sciences within DPIE Water, effectively allowing restrictions to be temporarily or progressively lifted when sufficient flow had passed from upstream areas, and downstream targets were forecast to be met.

Under the pumping approval, the Director was *required* to approve the take of water for the period during which the Director was satisfied that there was, or was forecasted to be, sufficient water available for higher priority needs (Schedule 1, clause 1, 2 of the Order).

Clause 5 (1) of the Order stated *"**higher priority needs** includes the requirements for the water source and its dependent ecosystems, basic landholder rights and higher priority access licences (including town water supply)."*

The floodplain harvesting restriction provides that the Director *may* approve the take of water if in his or her opinion there was, or was forecasted to be, sufficient water available for higher priority needs (Schedule 1, clause 1, 2 of the Order).

Clause 5 (1) of that Order stated *"**higher priority needs** includes the requirements for the relevant water source, or part of the relevant water source, and its dependent ecosystems, basic landholder rights and access licences (including town water supply) of a higher priority to floodplain harvesting (regulated) access licences and floodplain harvesting (unregulated) access licences."*

Access to supplementary flows was not specifically restricted by the temporary water restrictions, as that take is only permitted when announcements are made. However, the decisions on whether or not to announce access to supplementary flows also considered the likely impacts on downstream flows and targets.

On 5 February 2020, a workflow process similar to that used to manage the January restriction was established to manage the forecasted rain event over the weekend of 8-9 February 2020. The same process was subsequently used throughout the event.

1. WaterNSW to monitor rainfall, inflows and stream levels.
2. WaterNSW to contact DPIE Water Director Water Planning Implementation to advise that triggers/targets are predicted to be met.
3. DPIE Water Director, Water Planning Implementation to convene an inter-agency meeting (DPIE Water and WaterNSW) to consider allowing access to specific surface water flows. This meeting was to include DPIE Water, WaterNSW and DPI Fisheries.
4. If access was permitted, the Executive Director Water Policy Planning and Sciences DPIE Water issues advice to WaterNSW via email. Advice to include water sources where access was permitted.
5. WaterNSW to advise customers of permission to access.

In implementing this process, from the period of 8 February 2020 until 17 April 2020, key personnel from DPIE Water, WaterNSW and DPI Fisheries staff met to discuss management of the restrictions whenever forecasting indicated that targets would be met, or as required to discuss representations from water users or communication issues. This occurred at least every day throughout February, and sometimes multiple times each day.

On each occasion, a routine process was adopted whereby the interagency group:

- reviewed the operating principles (as outlined in Section 5.1 above and set out in the Targets and Principles Fact Sheet),

- applied the operating principles to the forecast and other information before them in relation to the triggers and targets, and
- jointly recommended a management action(s) to the delegate making the decision.

Despite the differences in the lifting provisions between the pumping restriction and the floodplain harvesting restriction, the same objectives, principles and flow targets arising from the NEDEE project and finalised on 6 February 2020 were used to decide whether or not a restriction should be lifted.

Overview of the WaterNSW modelling and forecasting

As outlined above, one of WaterNSW's roles throughout the event was to manage and undertake river modelling and to forecast flows during the advice period. This advice would confirm or otherwise whether the targets designed to ensure that critical human and environmental water needs would be met. Where WaterNSW forecasts were expressed as a range (e.g. 30-60 GL), restrictions were not lifted by DPIE Water until the minimum volume in that range (e.g. 30 GL) met the target.

WaterNSW relied on its Computer Aided River Management (CARM) operational model throughout the event. The model has been developed across NSW in the rural space over the past 3 years and Barwon-Darling since 2018. The CARM models have updated older Computer Aided Improvement in River Operation (CAIRO) models that have been used since the early 1990's, while still incorporating the data of the CAIRO models. Prior to use of this model, a range of similar approaches were used on an ad hoc basis to forecast Menindee Lakes inflows, with inconsistent results.

The main source of data for this flow forecasting model is NSW river flow data from gauging stations in 14 river zones across NSW. The model calculates travel times and estimates increases and decreases of flows between gauges (based on key events in the past 10 to 20 years).

Other data which was input to the model, when available and sufficiently accurate, includes:

- weather and rainfall forecasts from the BoM,
- Queensland river flow data from the Queensland Government's Water Monitoring Information Portal,
- extraction data based on pump capacity and flow class,
- locational flood height forecasting from the BoM,
- field observations through a range of channels including field staff, customers and communities, and
- floodplain data from the DPIE and satellite imagery from Sentinel.[32]

Throughout the 2020 Northern Basin First Flush event, WaterNSW generally re-ran and updated its model on a daily basis as flows and forecasts changed.

Although WaterNSW considers that its data sources and models performed reasonably well through a difficult and dynamic event, the event did expose some important gaps relating to data regarding:

- Queensland flows,
- floodplain harvesting flows, extraction and in-river flows,
- extraction from unregulated systems,

[32] See written submission from WaterNSW dated 14 June 2020.

- flow behaviour during extreme events, including with regard to channel capacity and distribution efficiency, and
- the contribution of flows in certain river reaches or floodplains to instream or downstream targets.

However difficult to model, one submission stated, *"In our view, WaterNSW modelled the event appropriately, taking into consideration the data, knowledge and tools available to them".*[33]

In some cases, landholders and other stakeholders reported (and provided photographic evidence of) observed conditions in these unmonitored areas, which was used to assess information being recorded in the WaterNSW monitoring network.

Following the event, WaterNSW engaged an independent and experienced hydrologist to review WaterNSW's models and how they were used during the event. While the review found that WaterNSW's application of its forecasting model for the event was sound and appropriate, it identified that:

- the single biggest opportunity to improve NSW forecasting in the future would be to capture additional real-time rainfall information for large local ungauged contributory sub-catchments (particularly those in the Namoi and Gwydir catchments, such as Thalaba Creek or the Pilliga Region in the Lower Namoi),
- linking information on real-time extractions, future orders, and installed or authorised pump capacities to the forecast model would enable a better assessment of the impact of pumping on the forecast estimate,
- the forecast was subject to considerable uncertainty with respect to end-of-system flows,
- at the beginning of the forecast, a lack of information on cross border flows hampered the forecast estimate. A more formal collaboration process between WaterNSW and the Queensland Department of Environment and Science in forecasting cross border flows would enable future forecasts to be improved,
- similar past historic events can assist in predicting current event behaviour. Development and categorisation of a suite of past Menindee inflow events would contribute to better forecasts, and
- the need for improved forecasting is becoming more apparent with recent initiatives such as active management of NSW unregulated flows. There is a significant opportunity for WaterNSW to develop a more sophisticated forecasting model for use in the NSW North Western Rivers. The spine of such a model already exists in the form of the WaterNSW river system valley Source models, which could be joined together to form the basis of an improved forecasting model. A suitable user interface using the existing Computer Aided River Management (CARM) system could also be developed.[34]

The review also found that WaterNSW's forecasts tended to overestimate flows to Menindee Lakes.

Difficulties in forecasting Queensland flows into NSW

Some northern Basin members of the NSW Irrigators' Council reportedly believe that *"water accounting for the first flush event did not account for the inflows from Queensland, which were significant and overshot the original flow targets".*[35]

[33] Written submission of eWater dated 6 August 2020.

[34] See Appendix A of the written submission of WaterNSW dated 27 August 2020.

[35] Written submission of NSW Irrigators' Council dated 7 June 2020.

The Condamine Balonne system can provide significant inflows to the Barwon-Darling. However, WaterNSW had difficulty forecasting how much Queensland flows would reach NSW.

The nature of the Queensland system can make it difficult to determine what NSW was likely to receive by way of inflow, because the percentage of the water that flows past St George into the NSW system has been shown to vary significantly for the same water volume at St George. For example, since the 1950's, the percentage of water recorded at the bottom of the Culgoa has ranged from 8% (1993) to 48% (2009). WaterNSW advised that a flow of 380 GL at St George in both 1973 and 2016 resulted in flows at Collerina of 298 GL (78%) and 84 GL (22%) respectively.[36] This variation in NSW inflows in previous events in addition to the complex river network, long travel time, and expansive floodplain, made forecasting during the 2020 First Flush event particularly challenging. Further, while WaterNSW was aware of rainfall occurring in the system, and that Queensland irrigators were permitted to extract water in accordance with Queensland's accredited water resource plans, it did not have information as to the likely volume of the extractions.

In light of these difficulties, from 26 February 2020, in its forecasting, WaterNSW conservatively estimated that only 10% of flows past St George in Queensland would flow into the NSW Barwon-Darling from the Culgoa River, and only after flows had reached the border. This was increased to 12% in late March 2020. This was the subject of criticism throughout and following the event from some water users.

A number of written submissions questioned the flow forecasting of volumes by WaterNSW.[37] For example, in its written submission, Namoi Water referred to information which it contends was readily available on 19 February but was not considered. Namoi Water stated that *"during the 2020 Northern Valley First Flush there was data available and provided directly to the Department that quantified flows from Queensland, the Castlereagh River and Marthaguy Creek far earlier than were included in the Departments modelling. The Department disregarded data provided from outside sources, which would have informed the modelling earlier and created a better outcome for all."* [38] Namoi Water was of the view that proper consideration of this information would have allowed the lifting of some restrictions on 19 February, rather than 21 February, and that those two days of access opportunity may have enabled 30 GL of irrigation water to be taken in the Namoi, representing $20 million in production at the farm gate. On the other hand, WaterNSW advised that between 15-21 February 2020, while Queensland flows had significantly increased, Queensland water authorities were allowing access to flows in the Lower Balonne and *"were providing advice that the flows were not likely to provide significant flows over the Border."* [39]

The independent hydrologist's review of WaterNSW's models noted that *"At the beginning of the forecast a lack of information on cross border flows hampered the forecast estimate. The delay in receiving information on cross border flows in Queensland led to underestimation of the flushing event forecast volume in tributaries and at Menindee early in the event. This was rectified to some extent by the end of February."* [40]

Ultimately, the Lower Balonne Water Management Area February to March 2020 flow event report published by the Queensland Department of Natural Resources, Mines and Energy revealed that 1,442 GL of flow passed the gauging station at St George, and 139 GL was

[36] See written submission of WaterNSW dated 14 June 2020.

[37] See written submission of Cotton Australia dated 5 June 2020, NSW Farmers Association dated 26 June 2020, Carrington Corporation dated 3 June 2020, Border Rivers Food & Fibre dated 7 June 2020 and written submissions from Josh & Mel Hatton, Nicole McGinnity, Josh Schwager, Andrew Watson, Susan Wright and Andrew Carberry dated 15-22 May 2020.

[38] Written submission of Namoi Water dated 9 August 2020.

[39] Written submission from WaterNSW dated 14 June 2020.

[40] See Appendix A of the written submission of WaterNSW dated 27 August 2020.

recorded at the Culgoa gauging station at Collerina (being the last gauging station before the Culgoa meets the Barwon-Darling). The volume recorded past Collerina was 9.6% of the flow recorded at St George, being slightly below the original 10% forecast used by WNSW. The Queensland report noted that 32 GL was recorded at the most downstream gauging station on the Bokhara (which also flows into the Barwon-Darling). This meant that 11.9% of flows at St George reached the Barwon-Darling, which was also marginally lower than the later (Culgoa only) forecast used by WaterNSW. The independent hydrologist's review also identified that the WaterNSW forecasts overestimated the total event volume (being the amount that arrived at Menindee Lakes) arising from the Queensland Tributary Event. These relative percentages can be expected to vary with the size and nature of each event, including the antecedent conditions and extractions undertaken.

The Panel endorses WaterNSW's view that in order to improve the forecasting of flows coming across the border during these events, it needs to build greater formal cooperation with Queensland river operators and consider developing protocols to assist in the timely exchange of relevant information during first flush events.[41] This view was also expressed in the independent desktop review of the WaterNSW models and modelling. In addition, the Panel is of the view that lessons in flow forecasting need to be taken from the 2020 First Flush event and the data and information from the event used to improve future models and forecasts, reducing uncertainties and improving timeliness.

NSW water extraction data

During the 2020 Northern Basin First Flush event, the potential for extractions in unregulated rivers was assessed based on pump capacity and flow size, given that real-time metering was not available.

As was identified in Ken Matthews' interim report, arrangements for metering, monitoring and measurement of water extractions, especially in the Barwon-Darling river system, have not historically been at the standard required for sound water management and expected by the community.

New metering arrangements (including telemetry for surface water take) are currently being rolled out across NSW. Metering in the Northern Basin is anticipated to be completed by 1 December 2020 for surface water meters with a pump capacity above 500 mm, and 1 December 2021 for the remainder of eligible meters in the northern inland region.

Floodplain harvesting data

During the event, significant volumes of water flowed off the floodplains surrounding the tributaries of the Barwon-Darling. However, floodplain flow and extraction data is scarce. Due to the lack of gauging stations on the floodplain, DPIE Water and WaterNSW have a limited real-time understanding of the floodplain resource from what falls on the floodplain to what makes it into the rivers. As a result, the risk that some properties could incur damage when floodplain harvesting activities were restrained, without actually contributing to the objective of the restriction, was poorly understood.[42]

This type of data has been described by floodplain harvesting experts of DPIE Water as the 'holy grail' of information, given the dynamics of flood waters, the limited technology currently available, and the costs and resources that would be required to obtain this data.

[41] See written submission from WaterNSW dated 14 June 2020.

[42] See written submission of WaterNSW dated 14 June 2020, Doug and Megan Marshall dated 5 June 2020 and NSW Irrigators Council dated 7 June 2020.

WaterNSW also has few gauging stations on some unregulated tributaries feeding into the Barwon-Darling system, which made it difficult to forecast water flowing to those unregulated tributaries and off their catchments. Without a good understanding of the flows across the unregulated catchments and the floodplains, WaterNSW could not include such flows in the forecast model until it was identified at streamflow gauges.

WaterNSW has advised that it is currently pursuing development of hydrodynamic models of the Barwon-Darling river system, using detailed topographic data to improve understanding of channel dynamics/storage and floodplain flow, and that this model will improve the understanding of flow from the floodplain.

Flow behaviour, including during extreme events

There was also a limited understanding of the extent to which the flows in some unregulated systems would contribute to meeting downstream targets, particularly during extreme events. This meant that the general 'blanket' approach to applying water restrictions which had to be adopted had a high cost to some water users. Further, once a natural flow has passed an unregulated licence holder's extraction point, there is no longer a physical opportunity to extract water. As described by some written submissions, in some areas, these users *"receive limited opportunity, they have small storages and the flows usually last less than 12 hours."* [43] This means that decisions about making or lifting restrictions in such catchments needed to be especially timely.

Prior to the event, DPIE Water designed a decision tree to assist monitoring, assessing and managing potential and observed rainfall and tributary flow events, including consideration of physical constraints (see Appendix H). However, the actual forecasting and decision-making reflected a limited understanding of how some rivers operate at higher flows, having regard to weir pool and channel capacity. During the event, in some parts of the river system, water left and re-entered the main channel at different parts, affecting flow forecasting.[44] Border Rivers Food & Fibre reported that *"as the flow exceeded channel capacity downstream of Goondiwindi leading to over-bank flows occurring, it naturally directed the bulk of the flow into QLD effluent streams allowing it to be legally extracted in QLD."* [45] Another submission reported that *"in the Gwydir, overbank flows are caused as active management isn't practiced. If excess water that cannot pass through the narrow sections of the Carole Creek and Mehi River can be operated under normal water sharing rules then more than half of that water can be diverted to the wetland and the remainder to the community via supplementary flows and the Barwon still receives the same amount as under present activity"*.[46]

WaterNSW proposes to carry out a more detailed analysis of historic events to enhance its understanding of regulated river and unregulated tributary behaviour during extreme events and operational data inputs and to improve its ability to accurately model and manage future events, including weir pool capacity and initial recharge, channel breakouts and identified backwater locations.

However, the Panel recognises that these are natural systems that change over time and in response to different types of flow events, and that there will be costs involved in making these improvements. There will always be uncertainties and inaccuracies in quantifying this water flow. The water management approach taken needs to recognise and have regard to these uncertainties and inaccuracies in a transparent way.

[43] Written submissions from Josh & Mel Hatton, Nicole McGinnity, Josh Schwager, Andrew Watson, Susan Wright and Andrew Carberry dated 15-22 May 2020.

[44] See written submission of WaterNSW dated 14 June 2020.

[45] Written submission of Border Rivers Food & Fibre dated 7 June 2020.

[46] Written submission of Mark A Winter dated 7 June 2020.

6.4 Unexpected developments during the event

The temporary lifts of restrictions on Floodplain Harvesting

One matter which raised considerable concern in relation to the event by environmental and floodplain grazing stakeholders and members of Lower Darling communities in particular, was the temporary lift of the floodplain harvesting restriction:

- in relation to the Gwydir Valley Floodplain within the Mehi and Thalaba unregulated water source, from 9 to 12 February 2020, and
- in relation to the Lower Namoi Valley, Gwydir Valley Floodplain and the Mehi, Thalaba and Barwon water sources of the Barwon-Darling Floodplain, from 10 to 13 February 2020.

Both the floodplain harvesting regulation and the floodplain harvesting restriction commenced on Friday 7 February 2020. As outlined above, although weather forecasts had identified the possibility of localised and heavy storm activity in the Northern Basin that could lead to overland flow and localised flooding, the predicted rain was not considered likely to produce significant floodplain events across any or all of the northern NSW floodplains.

From the evening of Saturday 8 February 2020, stakeholders began contacting WaterNSW with requests that restrictions be lifted, on the basis that localised flooding had led to road closures and was threatening infrastructure damage. From Sunday morning, WaterNSW and DPIE Water began receiving photographs taken by landholders, alleging flood damage to their properties and risks of significant infrastructure damage arising from the prohibition on floodplain harvesting. The photos showed flooding of properties and waters breaking over roads/storage walls.[47]

For DPIE Water and WaterNSW, the situation was complex for a number of reasons:

- as it was the first time that floodplain harvesting was also restricted, there was no understanding of likely flow patterns in circumstances where floodplain harvesting was prohibited,
- the localised storms meant that rainfall was extremely heavy in some areas, and non-existent in others. No sources of measurement were installed. DPIE Water and WaterNSW did not have many local staff available to provide on-the-ground information, and therefore had to rely on representations from water users, and
- there was a highly unusual pattern of rainfall and runoff. In most circumstances, water reaches the floodplains following the spilling from flowing rivers where the rain has occurred higher in the catchment. In this case, water was falling on the floodplains and dispersing.

DPIE Water experts in floodplain harvesting provided information regarding the magnitude of extraction that could be expected if restrictions were lifted, and how it might affect downstream flows. But given that floodplain water extraction management is still in the process of being implemented by the NSW Government, despite having data relating to the potential rate of floodplain harvesting take, and when and how properties may take water, DPIE Water and WaterNSW lacked the tools to properly understand the impact of floodplain harvesting and the return of water from floodplains back to rivers. Neither WaterNSW nor DPIE Water had access to any independent, on-ground information.

[47] See written submission of WaterNSW dated 14 June 2020 and NSW Irrigators' Council dated 7 June 2020.

In response to the claims of infrastructure damage[48], DPIE Water weighed up the following factors:

- local targets were being met,
- given the unexpected and localised nature of heavy rainfall, there was no clear evidence that rainfall would meaningfully contribute to meeting downstream targets,
- there was insufficient time to properly investigate claims of risks to life or property,
- the amount of water that could be potentially taken during the time required to investigate the claims,
- the time required to clearly signal and communicate permissions or restrictions to affected landholders, and
- the potential consequences if the alleged risks to life or property were correct, keeping in mind infrastructure had been set up to optimise the take of water, so it was unclear what risks and damage would arise by preventing them from taking water.

On the afternoon of Sunday 9 February 2020, in consideration of these factors, on the advice of the interagency group, the DPIE Water decision-maker decided to temporarily lift the floodplain harvesting restriction from 9-12 February in some areas, and on Monday 10 February 2020 from 10-13 February in others, in order to mitigate threats to life or property while it investigated those claims. DPIE Water then wrote to affected landholders seeking to obtain further evidence of infrastructure damage, in order to determine whether the alleged flood damage provided a basis for the temporary lift to be extended. This was reported in the media,[49] but as stated above, some photographic evidence had already been provided prior to the decision to temporarily lift floodplain harvesting restrictions.

On 11 February, an NRAR chartered plane surveyed the affected areas to validate the hydrology models being used in relation to the event, given the event was novel and the models rely on assumed circumstances. NRAR officers sought to physically observe how the water was moving through the watersheds, make observations of properties that might be in breach of the restrictions, and at the same time, take note of any observable infrastructure damage.

NRAR's assessment (see Appendix K) indicated that minimal evidence of infrastructure damage was observed.[50] On that basis, DPIE Water allowed the temporary lifts on restrictions to lapse after three days.

Having regard to the considerations outlined above and the limited information available to the decision makers at the relevant time, the Panel can understand why the decision to temporarily lift embargoes was made, having regard to the complexity and unanticipated nature of the situation.
But during and immediately following the event, there was strong concern about the lack of transparency and process which allowed the restrictions to be lifted, and the volume of floodplain harvesting extractions during that temporary period.[51] The Inland Rivers Network stated *"the temporary lifting of restrictions on the 10 February for various forms of water take, resulted in the loss of extremely important flows to downstream environmental assets, communities, basic rights and [n]ative [t]itle holders. There was no strong justification for this decision."* [52]

[48] See written submission of NSW Irrigators' Council dated 7 June 2020.

[49] For example, Barrier Daily Truth dated 19 February 2020, "*NSW Govt scrambles for embargo excuses*"

[50] The Panel notes that survey comments indicated that flooding caused significant fencing, infrastructure, soil, and mechanical damage in some cases.

[51] See written submissions from the Menindee Lakes Sustainable Diversion Limit Stakeholder Group dated 31 May 2020, the Lower Darling Horticulture Group dated 5 June 2020 and Sarah Moles dated 8 June 2020.

[52] Written submission of the Inland Rivers Network dated 7 June 2020.

The temporary lifts have been viewed by some community members with suspicion, as *"a blatant politically motivated decision to favour a few large scale irrigators"*, one for which *"huge outcries prompted the Minister to recant and reimpose the embargo."* [53]

However, while the Minister's office received photographs claiming flood damage, the Panel has been informed that these were simply forwarded to the decision-makers for consideration and the Panel did not find any evidence of political intervention in these decisions. As exemptions were designed to automatically lapse if evidence didn't show that the lifts were necessary, there is also no evidence that the embargoes were only reimposed after outcries of the community.

Information published on DPIE Water's website since the event has revealed that an estimated 30 GL of water was taken by on-farm storages during the three to four day period of the temporary lifts, noting that these increases could have arisen through direct rainfall, on-farm runoff/tailwater capture or pumping from rivers and aquifers, as well as floodplain harvesting.[54] As licensing and measurement frameworks for floodplain harvesting were not implemented at the time of the 2020 Northern Basin First Flush event, we will never be able to ascertain how much of that 30 GL is actually attributable to floodplain harvesting.

Adoption of Menindee Lakes Targets

As indicated in Chapter 5 of this report, when the rainfall event began in early February 2020 (and in planning for the event throughout 2019) there was no expectation by the NSW water agencies that flows would reach Wilcannia, let alone the Menindee Lakes.

When that possibility became apparent, DPIE Water undertook work to determine the minimum volume that would be required for a first flush event down the Barwon-Darling. It determined that 60-70 GL would enable a release of water along the full length of the Lower Darling River to Wentworth. Approximately 20-30 GL was required to replenish the dry riverbed, flush out pools with poor water quality and top up within-channel storages behind temporary weirs. 40 GL was needed within Lake Wetherell to provide a water supply reserve for the township of Menindee and a drought refuge if dry conditions returned. That target was made publicly available on 24 February 2020, via the release of a fact sheet on the DPIE Water website, after restrictions had been lifted in all northern unregulated rivers except for the Barwon-Darling and Intersecting Streams.[55]

However, as the rainfall continued, and larger flows to Menindee became achievable, that target was revised to 200 GL, being the amount estimated as being required to meet 12-18 months' supply for critical needs in the Lower Darling, and generally consistent with the reliability of targets for dams in upstream water sources. This was made public via another DPIE Water fact sheet published online on 5 March 2020.[56] A full two years' supply was not targeted due to operational complexities (such as spill risks and evaporation rates) associated with the Menindee Lakes.

DPIE Water have clarified to the Panel that having set a target for a volume in Menindee Lakes to provide for critical human and environmental needs in the regulated Lower Darling system and establish connectivity with the Murray at Wentworth, it did not set a target to provide for

[53] Written submission of Keith E Richards OAM dated 29 July 2020.

[54] This volume estimation method is set out on page 8 to 13 of the DPIE Assessment of take and protection during first flush flows in the Northern Basin dated July 2020.

[55] Available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/290731/River-and-overland-flows-in-the-northern-Basin-fact-sheet.pdf

[56] Available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/291652/river-and-overland-flows-fact-sheet-5-march-2020.pdf.

critical needs in the NSW Murray, as that system was not in the critical condition of stage 4 drought, and had sufficient water in storage to meet its critical needs.

Therefore, *"[o]nce the flows were captured in Menindee Lakes, NSW agencies managed the releases along the Lower Darling to ensure a flush along the length of the river in a manner that protected fish and water quality and supplied water users, and ensured that reserves were available for ongoing flows to the Lower Darling."* [57]

Supplementary Water Announcements

The Macquarie Marshes is a wetland system of around 200,000 hectares, of which 19,850 hectares is Ramsar listed across four private and public portions. It lies 100 kilometres north of Warren in central west NSW. The Macquarie Marshes are one of the most important nesting sites for waterbirds in Australia and the largest reedbed in the Murray-Darling Basin.

According to the DPIE Water Factsheet,[58] wildfires caused by a lightning strike in October 2019 burnt around 3,000 hectares of the reedbed and some adjacent river red gum woodland. While the reedbed had re-sprouted from subsequent rainfall, it still needed inundation to replenish the root zones and ensure continued growth of the reeds.

In February 2020, flows entered the Macquarie in several events through the Bell, Little and Talbragar Rivers downstream of Burrendong Dam. This created a combined total of 84 GL flow at the Baroona gauge near Narromine. By 5 March 2020, 22.3 GL of this first flow had been recorded at Marebone Weir, with only 7 GL reaching the northern Macquarie Marshes (measured at Pillicawarrina Gauge 421147). This inundated a small part of the critical northern reedbed area. Some of the flow was diverted by WaterNSW to other streams to meet stock and domestic replenishment flows, and some was extracted under a supplementary announcement. Much of the flow also performed a valuable role of soaking into alluvial aquifers and soils, filling pools in the river and meeting riparian needs for stock and domestic supply under basic landholder rights.

However, the increased watering requirements for the Macquarie Marshes arising from the recent bushfires were not reflected in the Long Term Water Plans used to form the interim targets used to manage the First Flush event which, in relation to the Macquarie Marshes, required a volume of 60 GL. According to the interim principles used to manage the event, the target was not going to be met. Accordingly, some supplementary access was allowed from 20 February 2020 consistent with ordinary operational processes. Some 12 GL was subsequently extracted from the peak of the flow, reducing the extent of inundation of the reedbeds. Healthy Rivers Dubbo believe that because *"the peak flow was taken, that meant the area of wetland that potentially could have been inundated by the first flow was greatly reduced...The same volume of water flowing down the river over a longer period of time wouldn't have had the same potential to inundate as many hectares as the water arriving in one peak flow. The value of the peak flow to the environment in this circumstance was exponentially higher than the same volume of subsequent inflows at lower daily flow rates."* [59] In their written submission to the draft report, Macquarie Food & Fibre stated that *"Whilst some 12 GL of water was extracted during the peak of the flow in February, this extraction did not reduce the extent of inundation of the reedbeds, nor is the value of a peak flow 'exponentially higher' than subsequent flows. This is because the peak flows that trigger Supplementary Access create breakouts along the river and run effluent creeks that drain away from the river upstream of Marebone. This water*

[57] Written submission of DPIE Water dated 18 August 2020.

[58] Available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/296465/macquarie-marshes-drought-recovery-fact-sheet.pdf

[59] Written submission of Healthy Rivers Dubbo dated 4 June 2020.

subsequently does NOT reach the reedbeds. The flow rate to target the northern reedbed is far less than that creating over bank flows between Warren and Marebone."[60]

Following supplementary access, staff from DPIE-EES and local landholders within the Ramsar wetland contacted DPIE Water advising that flows were critically required, given the fires and extended dry conditions.[61] DPIE-EES advised that a minimum volume of 30 GL over 3-5 months was required to meet a critical water demand (including for an area that would be inundated to a different extent, compared to the case where the target was 60 GL).

Having regard to this advice, when further flows were forecast to reach the wetlands in March 2020, supplementary access was not allowed. With the benefit of the February 2020 flows which had helped 'prime' the streams and wetlands of the Southern Marshes (allowing more efficient transmission of follow-up flows through to the Northern Marshes) the March flows increased the total flow into the Marshes in three months to around 18 GL.

When further flows occurred during the first week of April 2020, it was forecast that 32 GL would arrive at Pillicawarrina by 23 April 2020 and that allowing some supplementary access would reduce the total by only 0.4 GL. Accordingly, supplementary access was permitted from 5 April 2020 to ensure the 30 GL target would not be compromised. With the further rainfall over Easter, by 15 April 2020 the cumulative flow at Pillicawarrina was 30.7 GL and it reached 37.7 GL by 20 April 2020.[62]

6.5 Communications throughout and following the event

Communicating notice of the making and lifting of restrictions

Prior to the event, DPIE Water and WaterNSW considered their communication systems were adequate to convey information on restrictions and any lifts to affected water users (although they did not anticipate that the 2020 First Flush event would be as dynamic, complex or significant as it turned out to be).

A communications plan was developed at the same time temporary water restrictions were prepared (in relation to the temporary water restrictions made on both 17 January 2020 and 7 February 2020). This plan adopted the usual methods of communicating all temporary water restrictions and focussed on meeting the legislative requirements for making and commencing temporary water restrictions under section 324 of the WM Act. Notably, the plan did not include any procedures for communicating when restrictions were lifted via approvals to take, nor communications to other government agencies. Additionally, WaterNSW's Early Warning Network did not include floodplain harvesters unless they had signed up because they owned other irrigation licences.

[60] Written submission of Macquarie Food & Fibre dated 11 August 2020.

[61] See written submission of Garry Hall dated 7 June 2020.

[62] More information is available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0005/296465/macquarie-marshes-drought-recovery-fact-sheet.pdf.

The plan identified the following channels to be used in managing the event:

When restrictions were imposed	When restrictions were amended or revoked
Media release	Media release
DPIE Water website update	WaterNSW customer service notice to affected licenced water users (not community at large)
WaterNSW customer service notice to affected licenced water users (not community at large)	Newspaper advertisement
Newspaper advertisement	DPIE Water website update
DPIE Water Twitter	

While the communications plan included clear questions and answers regarding the restrictions, the actual communication products did not necessarily reflect this.

WaterNSW led communications to water users throughout the event, using a mix of electronic and traditional media channels. However, both WaterNSW and DPIE Water have reflected that the event confirmed not all of its communication channels are suited to incident management and the incident management communication capability can be improved. Further, some channels (e.g. newspaper advertisements) are becoming rapidly obsolete, in particular for regional NSW.

There is generally limited daily media coverage in regional areas. Regional radio (ABC) is the only real-time media option in rural areas to notify local areas of rule changes taking immediate effect. However, the deadline for weekend media coverage is lunchtime on Fridays, meaning there is virtually zero locally generated media coverage available until Mondays.63 This imposes significant limitations in relying on traditional print, television or radio to communicate urgent information to communities. To illustrate, BoM forecasts become more accurate approximately four days before an event, which leaves limited time to prepare to both make temporary water restrictions and arrange publication via local media outlets.

Use of the Early Warning Network

The primary channel to communicate the making and lifting of restrictions throughout the event to water users was the WaterNSW Early Warning Network, or EWN. This is an automated notification system initially set up to notify the public of dam and supply activities, and also used to alert customers of potential supplementary access events. Members of the public must register for the service and nominate the type of notifications they would like to receive. Registered users are sent notifications by SMS, email or telephone according to their selection.

However, many water users (especially unregulated system licence holders and currently unlicensed floodplain water harvesters) were unaware of the EWN and its role in keeping people up to date prior to the event. And while there was a significant increase in registrations across the Northern Basin during the event, the initial EWN notifications only reached a relatively small percentage of water users, who were left relying on traditional media channels or peak body membership for information. In the public (self-selected) feedback survey conducted for the purposes of this assessment, 30% of participants found out about water restrictions through peak membership groups, while only 15% found out via the EWN.

As noted above, of particular relevance to the event, floodplain harvesters and unregulated river users were far less likely to be aware of the EWN service or be a member of a peak body, but

[63] See written submission of WaterNSW dated 14 June 2020.

also the most likely to be directly affected by water restrictions associated with the event, leaving them reliant on traditional media channels.

By way of example, farmers Alan and Kym Redfern explained *"On Saturday morning, 8 February 2020 we received significant rainfall which generated considerable runoff. We subsequently found out via ABC media on Wednesday 12 February that a 3 day temporary suspension of s324 order had been in place for February 10 – 13. We had not received any communication from the NSW Government concerning this."* [64]

Information available on the DPIE Water and WaterNSW websites

A range of information was available on the DPIE Water and WaterNSW websites. DPIE Water's website was updated with copies of the temporary water restrictions, the approvals to take (lifting orders), and reasons for decisions. Often, EWN notifications directed members of the public to these documents. However, the decisions were not drafted in a way that enabled the public and many water users to easily understand what they could or couldn't do. For example, designated floodplain maps issued to clarify where floodplain harvesting restrictions applied did not contain sufficient detail for landholders to identify where their property was located.

Fact sheets were published on the DPIE Water website at various dates during the event, which summarised details of rainfall and flows to date, and outlined the rationale for imposing, maintaining and lifting temporary restrictions at various points. While they are useful documents, their timing was unpredictable, and they are not easily found on the DPIE Water website.

Throughout the event, water operation updates were regularly published (up to every two days) on the WaterNSW website, as well as weekly water availability reports. Supplementary announcements were made and published on the WaterNSW website and notified to relevant water users via the usual means. Members of the public could subscribe to automatic email notifications of the same updates and water reports via the WaterNSW website, but only if they knew about this service in advance. However, as acknowledged by DPIE Water, *"This information is, by nature, targeted at licence holders and therefore other stakeholders are not specifically notified unless they register."* [65]

The WaterNSW website also includes an interactive real-time data map, which includes real-time data on the height and flow of rivers, storage capacity of dams and reservoirs, meteorology and rainfall. WaterNSW's mobile phone application "WaterLive" is linked to this real-time data. However, during the event, traffic to the real-time data website increased from an average of 1,000 hits per day to 10,000 hits per day, as stakeholders sought to understand what flows were coming into the system. This caused the database to exceed its maximum capacity, crashing the website and WaterLive application.

Point of contact for enquiries during the event

There was no clear single point of contact for questions about the restrictions or lifts in relation to the event, or a person or agency who had been assigned with this responsibility before the event. As a result, stakeholders commented to the Panel that enquiries were shuffled back and forth between WaterNSW, DPIE Water, the MDBA, the CEWO and DPIE-EES. Water users and landholders heavily relied on peak bodies to get information.

Peak body representatives relied on contact details of agency staff (obtained prior to the event in relation to unrelated water matters) to speak directly to, and email, decision-makers who were

[64] Written submission of Alan and Kym Redfern dated 7 June 2020.

[65] Written submission of DPIE Water dated 14 August 2020.

simultaneously trying to manage the event. This meant that both agency staff and staff of peak bodies had to be available and working at all hours of the day, night and weekends for briefings to give and receive advice. This caused all parties significant stress, not least because some callers were particularly agitated about the unfolding events.

The absence of a central point of contact for media enquiries added another level of confusion, misinformation and stress.[66]

Communication with other government agencies throughout the event

Officers in agencies directly involved in managing the event (DPIE Water, WaterNSW and DPI Fisheries) generally described the communication between those agencies as one of the best experiences of cross-agency collaboration in water regulation of their careers. The Queensland Government, the MDBA and CEWO were notified of the general approach that would be taken to first flush management and were kept abreast of significant developments through the recently established Northern Basin Environmental Working Group (NBEWG). Other Basin State agencies were not directly notified or updated about events.

There was no structured communication between the NSW and Queensland Governments in regard to flows coming across the border, except in relation to the Border Rivers via the Border Rivers agreement and Commission. However, Queensland did provide a range of information, including daily flow event announcements and advice on the progression of flow events and their management, to the NSW Government via the NBEWG.[67] While DPIE-EES provided advice at certain points during the event, it was not always clear to them how or whether this advice was taken into account.

Government agencies interviewed by the Panel generally agreed that a more structured approach to communications would be beneficial.

Development of communications throughout the event

A more comprehensive communication plan was put into place in managing the re-commencement flows from the Menindee Lakes into the Lower Darling. In March 2020, communication procedures were prepared in advance of releases, outlining the type of information that would be made available, how that information would be made available, and when it would be made available. These were sent to members of the Lower Darling Critical Water Advisory Panel and DPIE Water stakeholders on email lists for the Menindee Lakes and Lower Darling in late March 2020. This resulted in more timely information being provided to interested parties in the south of the Northern Basin.

Public feedback on communications

Public feedback received in the course of this assessment overwhelmingly indicated that the community did not believe communication of the restrictions, and their lifts, was accessible, timely or clear. Further, because detail about the targets and principles for managing the event had not been made publicly available until May 2020, there was strong community view that decisions were inconsistent (particularly given the only target disclosed was later adjusted upwards), based on nil or flawed logic or evidence, and / or the subject of undue influence or political intervention. The lack of communication also limited the ability for other Government agencies to respond to requests for advice. The Murray-Darling Basin Authority stated that *"the decision to allow mid-event floodplain harvesting access (i.e. the three-day suspension of the*

[66] See written submission of Healthy Rivers Dubbo dated 4 June 2020.

[67] See example in the written submission of the Queensland Department of Natural Resources, Mines and Energy dated 10 August 2020.

temporary access restriction) generated numerous requests for information and considerable angst within different sectors of the community from many different parts of the Basin (including beyond NSW). The lack of publicly available information, particularly regarding the basis of some of the earlier NSW decisions to relax embargoes, made it difficult for the MDBA to be well informed and respond adequately".[68]

Both public feedback surveys and written submissions expressed frustration at the unreliability of EWN alerts, and the sign up for the EWN not being simple.[69] Communications throughout the event were also targeted to extractive water users. Very little resources were applied to communicating to Traditional Owners and Indigenous communities, and the broader community, who were also directly affected by the event. This not only limited the opportunity for Indigenous communities to make the most of the cultural uses and values the event was trying to promote, but also meant the opportunity to celebrate the outcomes of the event was lost.[70]

Communications regarding floodplain harvesting when the regulation and restriction commenced

When the floodplain harvesting regulation was made and commenced on Friday 7 February 2020, there was no direct notification to landholders or communities who were directly or indirectly affected by the regulation. Although a media release was prepared, it was not issued by the NSW Government.

On the same day, the floodplain harvesting restriction commenced by publication in the NSW Government Gazette and a media release was issued by WaterNSW and published on their website, and sent to the media at around 4pm. Notifications were sent to subscribers of the Early Warning Network between 4pm and 5.30pm. This was the first time landholders had directly received a notice concerning the implementation of temporary water restrictions on floodplain harvesting.

Imposing the floodplain harvesting restriction only hours before intense rainfall commenced in some parts of the Northern Basin led to confusion and stress for landholders, whose farm infrastructure was present for normal water harvesting conditions and who had not been given adequate notice to consider and implement measures to minimise the impacts of complying with the floodplain harvesting restriction. Northern Basin irrigators expressed that *"a blanket policy with no plans in place and no individual communication, despite us repeatedly calling various departments and requesting clarification, created major issues and concerns for us mentally, financially and structurally on our farm."* [71]

Following complaints, meetings were organised by peak irrigator groups for the morning of Saturday 8 February 2020. The groups required an explanation of the floodplain harvesting restriction and demanded communication channels be set up for stakeholders, including DPIE Water staff mobile contact details. A fact sheet was quickly prepared to clarify the effect of the restrictions and this was emailed to peak bodies and distributed via the Early Warning Network on the same day at around 1pm. A dedicated email address was set up by DPIE Water on Tuesday 11 February 2020 to answer queries relating to the restrictions.

[68] Written submission of the Murray Darling Basin Authority dated 8 June 2020.

[69] See written submission of Alan & Kym Redfern dated 7 June 2020 and comments in survey responses here.

[70] Feedback received during interviews with the Gomeroi Native Title Applicant Group and the Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan People Native Title Applicant Group.

[71] Written submission of Doug and Megan Marshall dated 5 June 2020.

Communication of the objectives, targets and principles of managing the first flush event

The objectives for first flush management were outlined in the reasons for decisions published in connection with each of the temporary water restrictions on the DPIE Water website. They were later made explicit in the Targets and Principles Fact Sheet published in May 2020.

However, neither the principles nor the flow targets were made publicly available throughout the event, despite requests from stakeholders. At the time, DPIE Water chose not to publicly release the principles or targets:

- because this was the first time such targets had been developed, and
- so that the targets could be adjusted if found to be inappropriate (for instance, as DPIE Water decided was necessary in relation to the Macquarie Marshes).

DPIE Water was also concerned that if the targets were released, they would not have sufficient resources to both discuss the targets and their development with stakeholders, and effectively manage the event.

Only one target was disclosed during the event, that being the target for Menindee Lakes. This target was subsequently adjusted upwards, as outlined in section 6.4 of this report.

On 24 February 2020, DPIE Water released a fact sheet stating that flows were forecast to enable a target of 60-70 GL in Lake Wetherell to be met. On this basis, all restrictions in the northern unregulated rivers had been lifted (except in the Barwon-Darling and Intersecting Streams, to allow flows protected through the northern tributaries and expected to arrive from Queensland to pass through the system).[72] On the same day, the WaterNSW Operations Update stated that 85-105 GL was expected to reach Lake Wetherell by 15-27 March 2020.

On 5 March 2020, DPIE Water released another fact sheet updating the target to 200 GL, having regard to further flows from Queensland. Adoption of the new target was not contrary to any expectation previously given about when and how much water would be made accessible, but neither had the possibility of increasing the target on the forecast of higher flows been made public.

Accordingly, this was overwhelmingly seen by stakeholders as a 'changing of the goal posts.' The NSW Irrigators' Council stated that *"the rapidly changing flow targets did not provide confidence that there was proper process in place regarding end-of-system flows, nor did it provide confidence that they were scientifically determined"*.[73]

Not releasing detailed information about the objectives, principles and targets caused a lot of confusion and anger within the community, with significant resources diverted to managing stakeholder concerns. This burden fell on individual officers and decision-makers who were already under significant pressure trying to manage the dynamic event. DPIE Water has acknowledged that, in hindsight, it may have been better to release the targets and principles, rather than appear to be working without any framework for decision-making.

Communications following the event

Public feedback received in the course of this assessment demonstrates a strong demand for information about the event after its conclusion. Members of the public routinely expressed frustration at the lack of information about the benefits and impacts of how the event was

[72] Although the fact sheet indicated that restrictions remained in place upstream of Bathurst, these were lifted on 21 February 2020 by the approval available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/290640/Approval-to-take-Northern-20200221.pdf

[73] Written submission of NSW Irrigators' Council dated 7 June 2020.

managed, including how much water was taken during the event.[74] The Commonwealth Environmental Water Holder's Office suggested that following a first flush event, the responsible agency *"publishes a report on the events for the whole of the northern Basin"* and that *"a hydrological analysis using data from flow gauges and management arrangements across the whole northern Bain would be useful."*[75]

The Targets and Principles Fact Sheet was published in May 2020. On 14 May 2020, a DPIE Water webpage was also created outlining preliminary information about the benefits from temporary water restrictions, and includes an outline of rainfall and flows, the replenishment of town water supplies and groundwater resources, and impacts on water quality, fish and wetlands and riparian habitats arising from the event. Information regarding the distribution of flows (water balance) information was first published in early July 2020,[76] and an assessment of take and protection during first flush flows in the Northern Basin (using a methodology reviewed and endorsed by the MDBA) was published on 23 July 2020.[77]

It includes the water balance for the 2020 Northern Basin First Flush event, replicated on the following page.

[74] This frustration was particularly apparent in survey responses. See also written submissions from Menindee Lakes Stakeholder Group dated 30 May 2020 and Howard Jones, Barrie MacMillan and Dr John Cooke dated 4 June 2020. The need for follow up information and reporting was also acknowledged in the written submission of the Murray Darling Basin Authority and the Commonwealth Environmental Holder's Office dated 8 and 5 June 2020, respectively.

[75] Written submission of the Murray Darling Basin Authority and the Commonwealth Environmental Holder's Office dated 8 and 5 June 2020 respectively.

[76] https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/north-west-flows-in-early-2020

[77] https://www.industry.nsw.gov.au/__data/assets/pdf_file/0014/316310/assessment-of-take-and-protection-during-first-flush-flows-in-the-northern-basin.pdf

Water Source	Inflows (ML)[78]	Licensed take (ML)[79]	System replenishment (ML)	Outflows (ML)
Border Rivers February	164,000	8,800 (5%) QLD 27,200 (17%)[80]	77,600 (47%)	50,100 (31%)
Border Rivers Total February-April	**200,800**	**9,900 (5%) QLD 27,200 (14%)**	**71,100 (35%)**	**92,500 (46%)**
Gwydir February	60,000	5,200 (9%)	16,700 (28%)	38,000 (63%)
Gwydir Total February-April	**100,800**	**17,900 (18%)**	**30,700 (30%)**	**52,200 (52%)**
Namoi February	122,000	3,700 (3%)	42,300 (35%)	76,100 (62%)
Namoi Total February-April	**132,800**	**10,900 (8%)**	**26,000 (19%)**	**96,100 (72%)**
Macquarie February	76,000	13,100 (17%)	62,300 (82%)	600 (1%)
Macquarie[81] Total February-April	**235,100**	**30,800 (13%)**	**187,800 (80%)**	**16,500 (7%) (Bogan[82] 41,000) (Marthaguy[83] 90,000)**
Barwon-Darling Total	**876,900**[84] inflow from regulated outflows 257,300 inflow from other unregulated water sources 619,600	**Not available**[85]	**Not available**	**496,400 (57%)**[86]

[78] Estimated total inflow to the regulated river systems downstream of major storages, 1 to 29 February and 1 February to 28 April for total.

[79] Provides take volumes from the rivers including supplementary water take. Held environmental water usage was 3,700 ML in Gwydir and 4,600 ML in the Macquarie and is included in the system replenishments. The water balance excludes floodplain harvesting activities. That is, any water that was captured on-farm or on the floodplain and did not flow into a river.

[80] Provisional estimate of QLD take for the period 14 to 24 February 2020 supplied by QLD government. No further QLD take volumes are provided.

[81] Inflows and direct outflows to the Barwon Darling are for the regulated river downstream of Burrendong Dam. The system replenishments presented for the regulated balance are inclusive of flows in Gunningbar Creek (8,000 ML) and Duck Creek (6,000 ML) which connect to the unregulated Bogan River system.

[82] Bogan River cumulative flows recorded at Gongolgon 421023.

[83] Marthaguy Creek cumulative flows recorded at Carinda 421011.

[84] Barwon-Darling River inflow estimate includes the outflows from the regulated Border Rivers, Gwydir, Namoi, and Macquarie Rivers together with an estimate of the contribution from all other unregulated inflow sources such as the Culgoa, Moonie, Castlereagh and Bogan Rivers. An estimate for loss processes and extraction was included which will be refined when further information on extraction volumes is available. The minimum volume inflow volume determined allowing for no loss or extraction was 671,000 ML.

[85] The final extraction volumes for the Barwon-Darling were not available at time of publication, due to A class extractions continuing, and the timing of meter reads being scheduled for the end of the water year. The preliminary extraction volume is 230,000 ML. This table will be updated and republished when the final information is available.

[86] Barwon Darling River water balance outflows at Wilcannia Main Channel 425008.

The final extraction volumes for the Barwon-Darling were not available when the water balance was first published in July 2020, but it included a preliminary extraction volume of 230,000 ML. The Panel heard, through members of the Water User Reference Group, that stakeholders felt the delay in obtaining and releasing this information was unreasonable.

WaterNSW has advised that the current manual and labour-intensive process to obtain extraction data for the Barwon-Darling inhibited the timely publication of that information. Currently, meter reads along the Barwon-Darling must be done manually - a labour (and resource) intensive process that requires WaterNSW officers to visit sites along the length of the Barwon-Darling. Ordinarily, this process is carried out once per year, after 30 June to line up with the end of the water year. Given the event concluded in late May, it wasn't considered an appropriate use of resources to do an extra meter reading for the event (rather than waiting until the end of the water year. An event-based meter run would probably have been appropriate if the event concluded in December, for example). COVID restrictions caused additional difficulties. This emphasises the importance of continuing and completing metering and telemetry reforms in a timely manner.

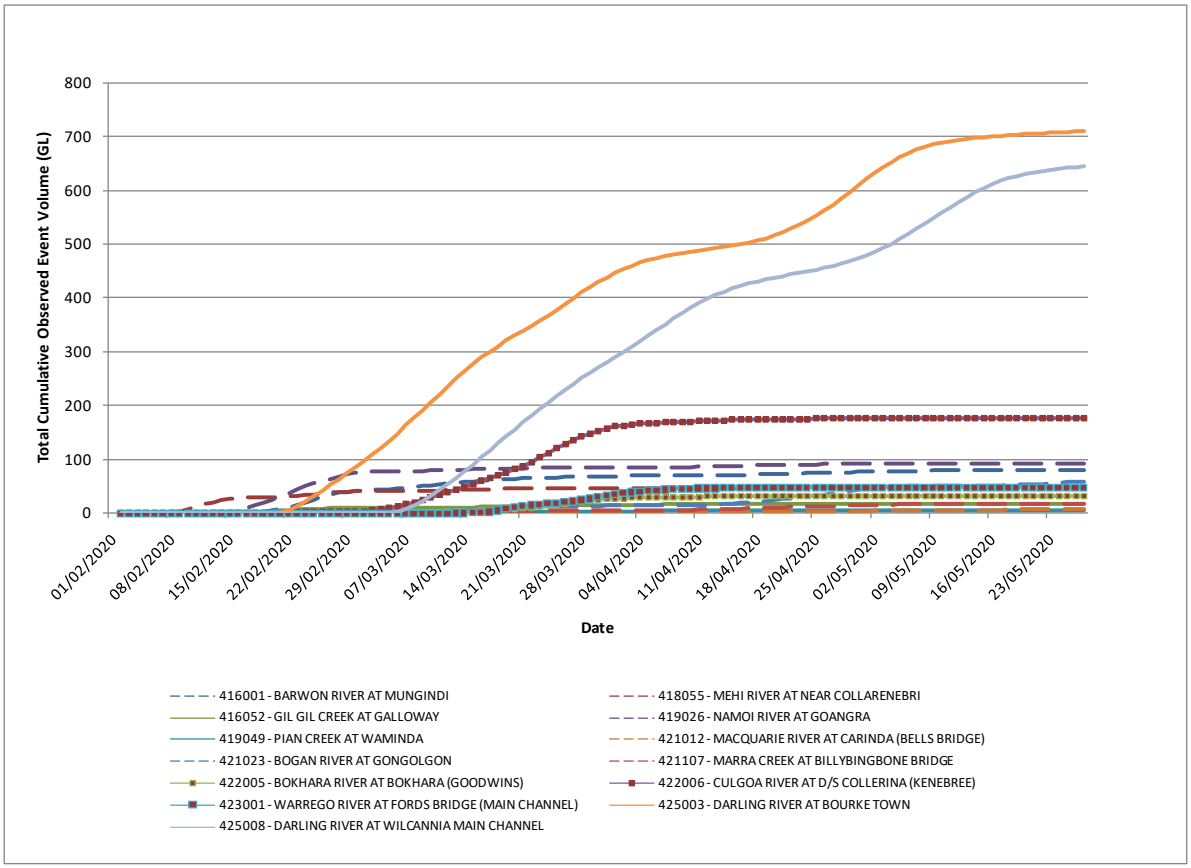
The Panel also notes that:

- approximately 69.5 GL of water was extracted pursuant to access licences in the northern NSW tributaries between February and April 2020,
- there is no clear data about the volume of water that was taken via floodplain harvesting over the course of the 2020 Northern Basin First Flush event, and due to limitations in technology, that data will never be available for this event. Instead, the only data available is in relation to estimated increases of on-farm storages, which may include volumes arising from direct rainfall, on-farm runoff/tailwater capture, harvesting from floodplains or pumping from rivers and aquifers. On-farm storage increases were estimated to be approximately 30 GL over the period when floodplain harvesting restrictions were temporarily lifted, and approximately 270 GL between February and April 2020 (in both cases, from a combination of sources and not only floodplain harvesting), and
- Replenishment of the Border Rivers, Namoi, Gwydir and Macquarie combined took approximately 316 GL, almost half the inflow, illustrating the dryness of the system.

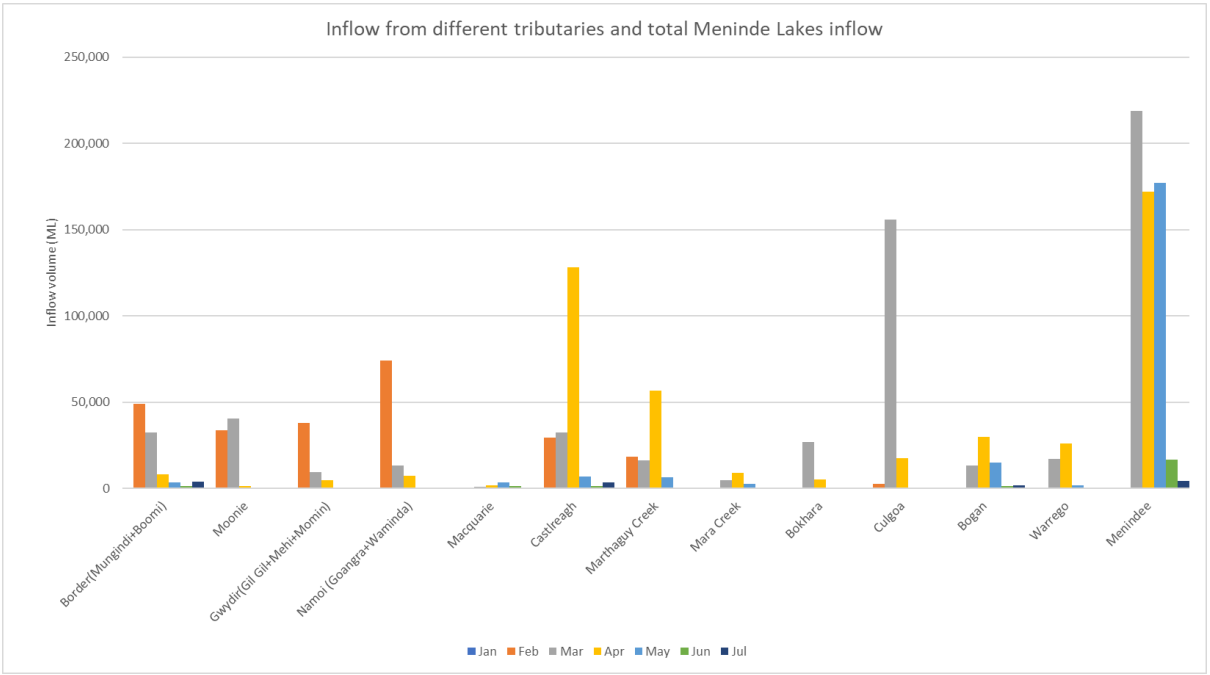
Separately, the independent review by Barma Water Resources of WaterNSW's flow forecasting model also included information on the progression of the 2020 Northern Basin First Flush event in terms of cumulative volume through the tributaries of the Barwon Darling and then along its length. It stated:

> "...the runoff response and contribution to Barwon Darling inflows from NSW tributaries occurred more rapidly than for Qld tributaries. NSW tributaries primarily produced the first Menindee inflow event (with the Namoi being the biggest contributor), whilst Qld tributaries produced the second. Peaks of the two events were separated by approximately one month with NSW tributary contribution to Barwon Darling inflows being slightly greater than that of the Qld tributaries. The event was also characterised by substantial local inflows between stream gauging stations."

The diagrams below show the volume and timing of flows in and from various water sources throughout the event.



Cumulative Event Volume (GL).
Source: Data sourced from WaterNSW.[87]



Timing of inflows from different northern tributaries, including the total inflow to Menindee Lakes.
Source: Data source from WaterNSW.[88]

[87] See Appendix A of the written submission of WaterNSW dated 27 August 2020.

[88] See Appendix B of the written submission of WaterNSW dated 27 August 2020.

DPIE's written submission also noted that:

- Initial estimated extractions from the Barwon-Darling River for the entire 2019/20 water year are around 230 GL. Prior to the 2020 Northern Basin First Flush event there would have been no or very limited opportunity for A, B and C class access (because of the low river flows) and extractions would have been limited to town water and stock and domestic supply. Therefore, most of the 230 GL of extraction occurred upstream of Culgoa from 27 February 2020, and downstream of Culgoa after 6 March 2020, after temporary water restrictions were lifted on A, B and C class licences.
- While a total of around 570 GL[89] eventually entered Menindee Lakes by June, the Barwon-Darling River upstream has again returned to low flows with no pumping permitted by A, B and C class pumpers along most of the river from 12 June to early August 2020.
- A substantial portion of the inflows were protected from extraction and either replenished the northern valley systems or passed through to the Barwon-Darling River. During February, 422 GL flowed into the northern regulated river tributaries, of which only 31 GL (7%) was taken by licensed NSW water users (mostly when supplementary access was permitted) and 164 GL (39%) flowed to the Barwon-Darling River.
- An additional 100 GL of water could have been made available to supplementary access if standard Water Sharing Plan arrangements were followed. Instead, throughout the event some 27 GL of supplementary water was taken from the northern NSW tributaries for consumptive purposes and 4 GL of supplementary water was left in the river for environmental purposes.[90]

7. Findings in relation to management of the event

7.1 Preliminary

First and foremost, the Panel's task in undertaking this assessment was not to scrutinise each decision (and there were many), or the accuracy of each target used in managing the event. The task of this assessment was to review the systems and processes underpinning the management of the event to identify where improvements can be made. The Panel also recognises that it is easy to judge the actions of another with the benefit of perfect information that was not available at the time. However, the actions and decisions of the officers involved in managing the 2020 Northern Basin First Flush event have to be judged by reference to the information to which they had access at the time decisions were being made.

A complex event to manage

Management of the 2020 Northern Basin First Flush event was complex for a number of reasons. At the time the event began, not only were environmental systems under stress due to the drought, but individuals and communities from the north to the south were also under severe financial, emotional, cultural and physical distress.[91] Staff working in agencies faced information, decision-making and communications pressures, and the extremely challenging task of balancing competing, truly critical needs and wants. The drought leading into the first flush event was extreme and unprecedented, and arguably the precise type of extreme event

[89] Since the date of DPIE Water's submission (14 August 2020), this figure has been updated as over 676 GL of total inflow, measured at Wilcannia.

[90] Written submission of DPIE written dated 18 August 2020.

[91] See written submission of Dugald Bucknell, and that of Robert and Katharine McBride, and Garry Hall all dated 7 June 2020.

that temporary water restrictions made under section 324 of the WM Act were designed to manage.

Then, when rain finally fell, it did not do so as a single event. The 2020 Northern Basin First Flush event was the product of several rainfall and flow events in many locations, some much larger than initially forecast, across a large and complex basin. Further, real-time management of uncontrolled flows, including floodplain flows, across the whole of the Northern Basin is a relatively new approach in NSW and this was the largest first flush event to which it has been applied. A number of key water planning and management reforms, such as the implementation of the NSW floodplain harvesting policy and the non-urban water metering framework, essential to enabling effective real-time management, are still being implemented. The current level of information about and understanding of high and low flows, and extractions and flow behaviour on floodplains, is limited. This further complicated management of the first flush event, because even though the flows themselves were not necessarily extreme and unprecedented in all areas, and over time, there was a heightened need for timely updated information and management responses as the flows unfolded.

Finally, management of the event was substantially complicated by the simultaneous introduction of the floodplain harvesting exemption regulation. The unfortunate timing was compounded by the long gestation period for implementing the floodplain harvesting policy, and insufficient communications around the regulation substantially inflamed the issue. Even if introduction of this exemption won't be an issue in future first flush events, floodplain harvesting remains a complex and controversial matter.[92]

All findings and recommendations of this report firmly acknowledge this difficult situation.

Some wonderful outcomes for communities and an environment in need

The flows arising from the 2020 Northern Basin First Flush event produced some wonderful and much needed outcomes for communities and an environment in need. According to DPIE Water's website,[93] water supplies were secured for Goondiwindi, Boggabilla, Mungindi, Collarenebri, Walgett, Brewarrina, Bourke, Wilcannia, Menindee, Sunset Strip and Pooncarie. Menindee Lakes received enough water to enable a pulse release which re-started the river without fish kills or blue-green algae outbreaks, a strategy welcomed by the Lower Darling community and acknowledged by the MDBA.[94]

Thousands of kilometres of rivers flowed for the first time in many months and catchments in the Northern Basin have shown improvements in water quality. Salinity levels along the Barwon-Darling improved. The flows disrupted stratification and dispersed a number of algal blooms that were present in the system. During the drought, water mixers were placed in ten large weir and refuge pools in the river at Menindee Lakes and in the Lower Darling River. These mixers protected some fish so that populations could recover when the river began to flow again. The mixers are no longer required as the water quality has improved because of these flows.

The Barwon-Darling River again connected with its tributaries, meaning fish and other aquatic animals could move up and down significant lengths of the rivers. Within the Central Gingham Water Management Area, more than 1700 hectares of semi-permanent wetlands (Common Reed, Cumbungi, Water Couch) were inundated. In the Lower Gwydir, more than 1800 hectares

[92] See written submission of Justin Field MLC dated 31 July 2020.

[93] https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/north-west-flows-in-early-2020.

[94] See written submission of the Lower Darling Horticulture Group dated 5 June 2020, the Murray Darling Basin Authority dated 7 June 2020 and the Commonwealth Environmental Water Office submission dated 5 June 2020.

of semi-permanent wetland were inundated as a result. Communities and Traditional Owners were generally delighted to see water return to their rivers.

The use of discretionary section 324 temporary water restrictions demonstrated commitment by the NSW Government to protect and restore water for the environment in critical need, and those efforts have been recognised and praised by the Commonwealth Department of Agriculture, Water and the Environment, the CEWO, the MDBA and some members of the Lower Darling communities. Some said they "*strongly support the introduction of embargoes in numerous valleys for the protection of the flow event*". [95] One submission said "*the government department did the right thing*" regarding the water restrictions that were put in place, but thought more water should have been allocated to agriculture for the economic benefit of Basin communities.[96]

Frustration, stress and scepticism remains

Unfortunately, these positive outcomes have been overshadowed by significant levels of frustration and stress across communities, and the Panel heard that there was an overriding view that the event was very poorly managed, leading to lost opportunities that cannot be regained, from both economic and environmental perspectives alike.[97] In a survey conducted at the beginning of this assessment, a significant majority of public feedback survey responses and written submissions to the Panel indicated that many water users, affected communities and others believe the NSW agencies did a very bad job in managing the event, with extremely poor communications, largely unknown objectives, missed opportunities and substantial biases towards or away from certain water users and uses, including the environment[98]. Levels of anxiety and mistrust expressed were palpable as a result. One submission described the management of the first flush event as a "*lost opportunity, may be the last, to save the ecosystem*" when referring to Ramsar listed site, the Macquarie Marshes.[99] The lack of engagement also prevented Traditional Owner groups and Indigenous communities to maximise the social and cultural benefits that the event aimed to achieve, and while "*[t]he rainfall that occurred in and around February 2020 was a critical opportunity to restore connectivity and replenish degraded landscapes and First Nations' water-dependent assets, values and uses*", the Murray Lower Darling Rivers Indigenous Nations felt that *"[t]his opportunity was undermined through the management of the first flush event, in particular the lifting of 324 orders to allow significant extraction before key connectivity and flow objectives had been achieved*."[100]

The transparency of decision-making provided through information released over the course of this assessment by DPIE Water, and the publication of the Panel's draft report, has shifted the focus in several submissions to improving the frameworks used to manage the 2020 Northern Basin First Flush event for future first flush events. However, there remains some scepticism that the outcomes achieved by the 2020 Northern Basin First Flush event were not a product of the restrictions which were put in place, but rather, just the rain fall events that occurred.[101]

[95] See written submission of Robert and Katharine McBride dated 7 June 2020, the Murray Darling Basin Authority dated 8 June 2020 and Commonwealth Environmental Water Office dated 5 June 2020, and survey responses here.

[96] Written submission of Clem Wheatley dated 13 July 2020.

[97] See written submissions from Mike Carberry, Josh & Mel Hatton, Nicole McGinnity, Josh Schwager, Andrew Watson, Susan Wright and Andrew Carberry, Alan & Kym Redfern, Healthy Rivers Dubbo, Dugald Bucknell, Garry Hall, Sarah Moles and the Nature Conservation Council dated between 15 May and 8 June 2020, and also see comments in survey responses here.

[98] See written submission of Will Marsh dated 13 July 2020.

[99] Written submission of Dugald Bucknell dated 7June 2020.

[100] Written submission of the Murray Lower Darling Indigenous Nations dated 14 August 2020.

[101] See written submission of Barwon-Darling Water dated 9 August 2020.

7.2 Adequacy of planning for the event

The Panel's assessment concludes that some, but ultimately insufficient planning and preparation was undertaken for the 2020 Northern Basin First Flush event by the NSW Government. Most significantly, in regard to not informing water users and the community of the evidence being used to develop targets and principles, giving them an opportunity to provide feedback on that approach, and failing to develop adequate incident management arrangements.

Clear criteria, principles, and targets to manage the event were prepared internally, and this was well understood by agency staff who were directly involved in managing the event. However, this work was finalised relatively late (only days before the event unfolded) and arguably, it would have been known for some time throughout 2019 that at some point, a first flush event would occur.

Floodplain harvesting, and how this would be incorporated into the management framework, was not substantially taken into account. The severe weather warnings, including warnings of heavy rainfall that may lead to local flash flooding in the Northern Basin catchments, were issued by the BoM and SES *after* the floodplain harvesting exemption regulation and the floodplain harvesting restriction were gazetted. Such severe weather warnings were issued for various locations on the evening of Friday 7 February 2020, the afternoon and evening of Saturday 8 February 2020, the late afternoon and evening of Sunday 9 February 2020 and the evening of Monday 10 February 2020. While there were no relevant severe weather warnings anticipating flash flooding in the week or so leading up to the gazettals, it would still have been prudent to undertake some preparatory scenario/risk management planning for a situation where overland flow or overbank flooding occurred during or immediately after the first flush. This would have also enhanced the capacity for NRAR to deploy staff to monitor compliance in relation to the event.

There was a lack of general information in the public domain about who, when and how it is decided that a section 324 temporary water restriction should be imposed, including understanding of the associated public interest test. In January 2019, DPIE Water committed to develop guidance materials on temporary water restrictions, the factors the Minister could consider and how to inform the public - all of which would have supported greater transparency around the rationale, benefits and impacts of temporary water restrictions in advance of an event. The Panel understands that northern valley irrigators had written to DPIE Water on several occasions regarding the process and improvement they perceive is needed in quantifying the public interest test as recently as January 2020, evidencing the need for a more engaged and transparent process.[102] Unfortunately, such materials were not and have not yet been prepared.

In their written submission, Border Rivers Food & Fibre said that "*The communications between the department and stakeholders reflected a lack of prior planning and preparation*"[103] and the Nature Conservation Council stated "*far more care and planning must be done to ensure equitable sharing of water is upheld*"[104]. The Murray Darling Association, in their written submission, have stated that they continue to call on Basin Governments, including NSW, to work with them in developing an agreed community consultation standard and framework, and

[102] See written submissions from Josh & Mel Hatton, Nicole McGinnity, Josh Schwager, Andrew Watson, Susan Wright and Andrew Carberry dated between 15-22 May 2020.

[103] Written submission of Border Rivers Food & Fibre dated 5 June 2020.

[104] Written submission of the Nature Conservation Council dated 12 June 2020.

have reinstated this offer to the NSW Government in light of insufficient resourcing revealed by this event.[105]

To be clear, the Panel does not consider it appropriate to 'negotiate' science based, peer reviewed targets. However, the prior disclosure and discussion of work being carried out to develop a framework for managing the first flush would have helped water users, Traditional Owners and the community better prepare for the first flush event.

Further, while internal cross-agency technical and decision-making advisory groups and processes were established, there was no real incident management preparedness. Interviews revealed that DPIE Water had not appreciated the extent to which this would be required, and that is partially understandable given this was the first time the NSW Government had attempted to responsively manage a natural event of this magnitude. Nevertheless, cumulative rainfall events are not unprecedented following record droughts.

Proper incident management requires the functions of planning, intelligence, public information, operations, investigation, logistics and finance to be put in place. Under the Australasian Inter-Service Incident Management System, the function of public information requires the same priority and level of focus as any incident that may impact on community safety.[106] In this case, not all incident management functions were clearly or adequately put in place. While WaterNSW has some incident management capabilities associated with flood and water quality incidents, those systems were not explicitly applied to the 2020 Northern Basin First Flush event.

2019 was a particularly difficult year given the need to manage the extreme drought, bushfires, and preparation of Water Resource Plans across the State. In addition to this, DPIE Water was subject to a Ministerial and Departmental leadership change which commenced on 1 July 2019, which was the second government restructure post the 2017 Matthews report. The NSW Government also had to respond to a number of independent assessments such as the Vertessy report and the NRC review while still in the process of implementing reforms arising from the Matthews inquiry.

However, in connection with drought management, more prior planning was required to consider a range of incident scenarios, corresponding management responses and to prepare water users and the community for how water would be managed when rainfalls finally returned. The 2020 Northern Basin First Flush event grew over time, and the NSW Government needed to adequately plan and communicate for this possibility. However, it is apparent that it did not have sufficient resourcing in place to do so.

Ultimately, this lack of planning, communication and incident management preparedness led to major challenges and shortfalls which impacted the staff involved, as well as the water users and communities they were using their best efforts to serve.

7.3 The objectives, targets and principles

A reasonable first attempt

As a whole, the Panel is of a view that agency officers had reasonable internal decision-making processes in place to do a relatively good job to meet the objectives of satisfying critical human and environmental water needs across the whole of the NSW Northern Basin, based on the information and resources they had at the time. They also demonstrated great focus, courage,

[105] See written submission from the Murray Darling Association dated 8 August 2020.

[106] *The Australasian Inter-Service Incident Management System*, Australian Fire and Emergency Service Authorities Council 2017. AFAC Ltd

tenacity and determination in their efforts to manage what was a very dynamic, stressful, complex and imperfect situation.

Internally, the interim targets and principles used to manage the event provided the decision-makers and their advisors a clear, consistent and structured approach to decision-making. While the principles were sometimes expressed slightly differently in various documents throughout the event, the general approach was consistent, and targets were generally consistently applied. The workflow was also reasonably robust and well documented, despite being done in a short amount of time. This was the product of a significant effort by the staff involved and despite the lack of systems to support documentation in incident management scenarios.

In the Panel's view, the interim targets and principles themselves formed a reasonably sound basis for first flush event management. While the concept of using section 324 temporary water restrictions to protect flows for the purpose of meeting downstream needs and targets was not new, the approach to managing the 2020 Northern Basin First Flush event was novel in various ways:

- the restrictions applied to a broader range of water take than has occurred previously - being regulated, unregulated and floodplain harvesting take,
- given the preceding record drought conditions across the Northern Basin, the restrictions applied to a much larger area than had previously occurred and both local and downstream targets (extending to the Menindee Lakes and the Lower Darling) were incorporated into the decision-making framework to determine when access could be allowed,
- the orders introduced a new concept of responsive management, where restrictions could be lifted in a faster, more responsive manner than previous temporary water restrictions. Decisions were made based on daily assessments about whether access should be permitted. This approach had only been used on a handful of occasions in NSW, and not on such a broad scale,
- the broad application of restrictions combined with the regulatory flexibility to apply responsive management meant that decisions were made using both actual and forecasted flows, and
- the management framework had to be applied having regard to multiple rainfall events occurring at different times and in different locations throughout NSW and Queensland, over the four-month period of January to April 2020.[107]

Being the first time that this type of decision-making framework was applied to this extent, the event demonstrated the need for improvement in a number of areas.

Further, as stated by DPIE Water, "*A key aspect of the Northern Basin restrictions was to ensure connectivity along local river systems and to floodplains, plus downstream as far as possible into the Barwon-Darling River and the Menindee Lakes*."[108] This demonstrated a commitment to improving connectivity, consistent with the recommendations of the NRC review and Vertessy report which encourage taking a whole of system view in water management. As stated by the Victorian Department of Environment, Land, Water and Planning, "*There are growing concerns across the southern Basin regarding the impact northern Basin water resource management changes have on the overall health of our waterways*." [109]

[107] See written submission of DPIE Water dated 18 August 2020.

[108] Written submission of DPIE Water dated 18 August 2020.

[109] Written submission of the Victorian Department of Environment, Land, Water and Planning dated 14 August 2020.

This renewed focus on connectivity also presented some specific policy challenges that are yet to be fully explored and addressed.

The objectives of first flush event management and connectivity implications

Further clarity on critical needs

Building on section 5.1 above, the objectives of the restrictions should be to protect first flows in order to, for example:

- meet critical human water needs – provide flow locally and downstream, particularly to replenish town water supply weir pools and provide water supply for basic landholder rights, including native title, harvestable and domestic and stock rights and cultural water requirements that fall within critical water needs (noting that this is arguably broader than the definition of 'critical human water needs' in the WM Act, but is consistent with the water sharing principles of that Act), and
- meet critical environmental water needs – provide flow along the length of the river systems to ensure re-connection of rivers and drought refuge pools.

However, even if targets were established to meet these critical water needs, the critical water needs themselves have not been fully articulated. After an extended dry period (like the record drought affecting the Northern Basin since 2017), communities and the environment are in such extreme states of stress that every additional day of water supply, and every enhancement of water quality for fish populations, could arguably be considered critical. So there needs to be clarity about when the line crosses from a 'critical' need to a 'desirable' one, and what makes a human or environmental water need 'critical' versus 'desirable'. Further, critical needs could also differ as a drought changes in severity. What is 'critical' in one stage of drought may be different to what is 'critical' in a more severe, or less severe stage of drought - so this also needs to be considered.

The Gwydir Valley Irrigators Association has suggested there is a need for consultation on these issues, such as "*What are critical needs versus desirable? How are they measured? Can a range of critical needs be achieved with a range of management approaches?*" They also suggest that "*There is no reason why a range of targets cannot be consulted and considered. There is also no reason why a range of responses to achieve these targets can also be adjusted against the degree of criticality of these targets, aligning risk and consequence more appropriately rather than the blanket approach applied more recently*."[110]

Clearer guidance on the definitional question of what needs are 'critical' will provide a stronger basis for developing targets. For example, a number of submissions suggested that end-of-system targets should be increased. The Lower Darling Horticulture Group "*believes it important that flow triggers in the Barwon-Darling and Lower Darling, and storage volumes in the Menindee Lakes be determined that will ensure that the protection of the health of the river is made a priority before access to water for irrigation is allowed*."[111]

The Panel also notes that only instream environmental needs were considered in managing the 2020 Northern Basin First Flush event. At some point in the future, as the understanding of floodplain management matures, it would be appropriate to consider the critical environmental needs of floodplains.

[110] Written submission of Gwydir Valley Irrigators Association written dated 13 August 2020.

[111] See written submissions of the Lower Darling Horticulture Group dated 5 June 2020, Healthy Rivers Dubbo dated 4 June 2020, Sarah Moles dated 8 June 2020, Rob and Katharine McBride dated 7 June 2020 and the survey comments here.

Clarity on what the connectivity objectives are in first flush events, and how they will apply

The renewed focus on an objective of connectivity requires the development of a clear statement of what that means in practice, particularly in the Northern Basin.

Connectivity is a broad term, and in the context of surface water, connectivity can refer to the connection of flows along the length of a river, between hydrologically connected rivers (both forms of longitudinal connectivity), between a river and its anabranches, riparian zones, wetlands and floodplains (lateral connectivity) or connection between surface water and groundwater sources.[112]

But the Northern Basin is not a system where natural inflows would ever provide for permanent flows and connectivity - even without extraction or infrastructure. These systems naturally run dry for some periods. Further, *"[t]he northern part of the Murray–Darling Basin region consists mostly of unregulated systems although there are major storages in the rivers including Border, Gwydir, Namoi and Macquarie. Many of the rivers and streams in the northern Murray–Darling Basin region are ephemeral and flow for a short period following precipitation. Generally, water users in much of the northern Murray–Darling Basin region rely on collecting water during floods and storing it on-farm for later use."*[113] Carrington Cotton Corporation also pointed out that *"the Darling and its tributaries are not historically always connected and can remain healthy when not permanently connected."*[114]

As stated by WaterNSW, *"Over the period from late 2016 to early 2020 the northern New South Wales (NSW) tributaries natural inflows would not have provided connectivity to Menindee Lakes."* The main rivers only continued to flow for an extended period with the benefit of regulated releases of water captured during inflows in the second half of 2016, and connectivity only otherwise occurred in some sections of the Barwon-Darling during 2018 and 2019 because environmental water holders used licensed water held in the northern storages.[115]

The NSW Irrigators' Council contend that:

> "*Measures that strive to provide for connectivity must recognise:*
>
> - *The ephemeral and event-based nature of some systems;*
> - *Channel capacity constraints to deliver water between systems, including choke points;*
> - *Hydrology to understand the movement of water across and between valleys, including into/out of river systems and across floodplains;*
> - *Rainfall patterns, particularly in areas with highly variable rainfall, and the dependency of inflows on rainfall;*
> - *Changing climatic patterns with more extreme and prolonged dry periods*."[116]

The Extreme Events policy refers to connectivity in connection with water shortages as follows:

> "Connectivity between water sources will be considered to ensure water is available to meet critical human water needs in connected systems during an extreme event. This includes interconnections between surface water and groundwater sources as well as longitudinal connections between surface water sources.
>
> When considering restricting access to a lower-priority use to provide water to a higher priority use in separately managed but hydrologically connected systems, the other principles identified in

[112] See written submission of DPIE dated 18 August 2020.

[113] Bureau of Meteorology National Water Account 2017 - Murray-Darling Basin: Geographic Information

[114] Written submission of Carrington Cotton Corporation dated 9 August 2020.

[115] See written submission of WaterNSW dated 27 August 2020.

[116] Written submission of NSW Irrigators' Council dated 7 August 2020.

this policy should also be considered. A number of additional factors must also be carefully weighed:

- the relative priority between the access restriction (lower) and the access provision (higher)
- the severity of the extreme event
- the alternative options available to meet the higher-priority needs
- the physical constraints to delivery
- any unintended impacts."

While this provides some guidance, to manage the expectations of communities and water users, there needs to be a clear articulation of what connectivity objectives for first flush events should strive to achieve, as well as how the objectives will apply.

In terms of the 'what', connectivity for the Northern Basin could mean seeking to reach the next target within a single river system, the Barwon-Darling, the Murray River, or the Murray mouth and/or it could include reaching the floodplain(s).

The Murray Lower Darling Rivers Indigenous Nations feel that *"longitudinal connectivity along the length of the waterway should be the primary objective for management of first flush events on the Barka and other rivers."* [117] Others have also suggested that *"access should not be allowed until critical needs (as detailed) have been or are forecast to be met in all downstream WSP areas, not just for that specific WSP"*[118] and that the Panel should reinforce that ensuring *"connectivity means all the way to the Lower Darling's connectivity with the Murray at Wentworth"*.[119] It was submitted that *"The river does not simply stop above Menindee Lakes, and the ecology of the system cannot function under such arbitrary borders", and that the Darling River "plays a critical role for the lakes, the Lower Darling, and the Murray from its confluence to the mouth. It is therefore critical that the whole river be considered in flow targets."*[120]

In terms of 'how' connectivity objectives for first flushes will apply, there needs to be clarity on just how far downstream should be considered in relation to each decision, and overall.

For the 2020 Northern Basin First Flush event, the extent of downstream targets changed according to forecasting. When the rain first fell, the most distant downstream target was to achieve connectivity between the tributaries and the Barwon-Darling. When rain continued, the most downstream target was then to achieve connectivity along the Barwon-Darling to Menindee Lakes, and with further rain, the target became a volume of 60-70 GL in the Menindee Lakes (which includes providing for a controlled release into the Lower Darling to meet the Murray at Wentworth). As outlined in section 6.4 above, this volumetric target provided for connectivity between the Lower Darling and Murray river systems. When the Queensland contributions became apparent, the final downstream target of 200 GL in Menindee Lakes was set, to provide 12-18 months' supply, consistent with the aim for stored town supplies in the northern regulated tributaries.

Targets and objectives need to be proportionate to the issues and challenges existing at the time that a first flush event occurs. Therefore, setting just one fixed target or objective may not lead to an efficient sharing of water across a system in social, emotional, cultural, environmental and/or economic need. Given the current limitations of forecasting (which simply cannot predict rainfall amounts, locations and dates months or even weeks in advance with sufficient accuracy), the Panel considers that it is appropriate for first flush arrangements to include

[117] Written submission of the Murray Lower Darling Rivers Indigenous Nations dated 17 August 2020.

[118] Written submission of Lower Darling Pastoralist Group dated 9 August 2020.

[119] Written submission of Keith E Richards OAM dated 29 July 2020.

[120] Written submission of Robert and Katherine McBride dated 9 August 2020.

provisions for objectives and targets to change if more water becomes available, to take advantage of additional flows to meet critical water needs down the system, as far downstream as possible.

For example, by including "if…, then…" type provisions in the decision-making framework, this would enable different targets to be progressively met according to flow conditions and circumstances. For example (and as required), the progression of the objectives and targets could be:

- to meet critical human and environmental water needs within a water source,
- to achieve connectivity with the next water source,
- to meet critical human and environmental water needs in the connected water source,
- to achieve connectivity between tributaries and the Barwon-Darling,
- to meet critical human and environmental water needs in the Barwon-Darling,
- to achieve connectivity between the Barwon-Darling and the Lower Darling,
- to meet critical human and environmental water needs in the Lower Darling,
- to achieve connectivity between the Lower Darling and the Murray, and
- to meet critical human and environmental water needs in the Murray.

This approach does not have to come at the cost of uncertainty for communities and water users. These arrangements can and should be decided as part of the planning and preparation for various scenarios prior to an event, and effectively communicated.

In the case of the 2020 Northern Basin First Flow event, the flows that eventuated were beyond initial expectations. While the change to the target for Menindee Lakes was communicated in fact sheets, the initial target, nor the possibility of the target changing, was not communicated prior to the event. The Panel considers that, ideally, the process for management should be communicated in advance, so that any feedback can be provided about the process before an event occurs. These matters need to be considered carefully by the Government in consultation with Traditional Owners, communities and water users, so that everyone is clear about what water management is trying to achieve.

Triggers for starting and finishing first flush rules

Given the record dry conditions since 2017, and in light of recent independent reports such as the Vertessy review, it was well understood by water users and communities that, when the first flows finally arrived, access would be restricted in order to provide for critical human and environmental water needs. Therefore, there was no requirement leading up to the 2020 Northern Basin First Flush event to establish a clear 'trigger' for when 'first flush' arrangements had to be put in place - because whatever the threshold was, it had obviously been met by the prior unprecedented drought conditions. However, there was no clear trigger for when 'normal' water sharing arrangements could resume, and even now, it is not clear when the 2020 Northern Basin First Flush event 'ended'. For some, the event ended on 23 February 2020, when flows in the Border Rivers had passed and no further rain fell. For others, the event is much more recent, with flows into the Lower Darling being completed by the end of June. If a first flush framework is going to provide enough certainty to allow water users to plan their activities, and enough transparency to give confidence in water management and regulation, then these triggers for the commencement and end of alternate first flush arrangements need to be clearly articulated.

Border Rivers Food & Fibre also submit:

> "*If there are to be new First Flush rules then they must compliment [sic] WSP's and cannot overlap, they must only apply below an agreed point of exceptional circumstances and must have a clear point at which WSP's are reinstated. These triggers must be applied on a 'area by area' basis and not a blanket basis. They can only be targeted to address the unique needs of system*

management that occur only when emerging from the depths of Extreme Drought. The specific set of circumstances that constitute a "First Flush event" must be clearly defined and thoroughly communicated locally to all stakeholders to avoid any misunderstandings and unrealistic expectations. It cannot be used as a proxy to reduce legal long-term access to water-users licensed to access those shares of the resource detailed in their local Water Sharing Plans."[121]

In the Panel's view, a 'first flush' could be a particular type of 'resumption of flow' that is required when extended dry conditions lead to there being insufficient water being available to meet critical human and environmental water needs. Triggers for first flush requirements could be the types of circumstances described as Stage 4 drought in the Extreme Events Policy. But ultimately the triggers for beginning and ending of first flush arrangements should be developed with proper policy analysis and informed by feedback from water users, Traditional Owners and communities.

The targets used to manage the event and connectivity implications

Quantification of the basis for targets

While some elements that formed the basis for the targets were quantified, not all of them were. Volumes for basic landholder rights were not clearly documented. Instead, these were subject to a broad assumption that basic landholder rights (including native title rights) would be met if critical environmental water needs were met. Evidence for this may exist, but it is not obvious or well known. Further, in times of critical drought, every drop of water holds value, and there is a heightened demand for knowing who (or what) has access to how much water, and on what basis, as the community demands a higher degree of accountability and transparency. Inadequate consideration was given to native title rights and cultural flow requirements (to the extent they fall within critical water needs) generally, as evidenced by their exclusion from the objectives in managing the event.

Neither the volumes nor a description of the target in relation to refilling storage dams and weir pools were clearly expressed in the targets or principles, and the appropriateness of using ten days duration of base flows (freshes) to develop volumetric targets requires further analysis and support.

DPIE Water has informed the Panel that the targets will be reviewed prior to being used again in the future, and the extent to which the targets were met, the appropriateness of the targets, and the outcomes of the restrictions, are being further evaluated.

The principles used to manage the event, and connectivity implications

Balancing upstream and downstream needs

Even once the objectives and targets have been established, clear principles will need to be developed to establish when and whether some extraction can be allowed upstream, for example, because flows will not 'meaningfully contribute' to meeting downstream targets. The decision-making framework should clarify what the threshold is for a 'meaningful' contribution - whether it be a 1%, 10%, 1 GL or 10 GL difference. And what and when should any value be attributed to the potential of flows to prime riverbeds to maximise the efficiency of future flows and how will this vary with the antecedent conditions? These are not simple matters to resolve, but they will need to be considered. DPIE Water has advised that this principle does need to be revised.

The principles used for the 2020 Northern Basin First Flush event also did not clearly deal with how high priority use downstream was balanced against lower priority uses upstream, even

[121] Written submission of Border Rivers Food & Fibre dated 9 August 2020.

though this was a matter stated in the Extreme Events Policy as being a relevant consideration when considering connectivity during water shortages. Particular concerns were raised in one written submission regarding the decision to lift restrictions on C Class Licences in the Barwon-Darling prior to an allocation being made to high or general security licences in Menindee or Lower Darling, claiming *"there was a lack of transparency"* around how this decision took into consideration certain provisions of the Water Management Act 2000.[122]

The use of forecasted, as well as actual flows, and maximising economic opportunities while still providing for downstream needs

Concerns have been raised that *"reliance on forecasted rainfall is fraught with danger"*[123] and therefore the approach of allowing upstream access when targets are forecast to be met, rather than simply being met, is not appropriate.[124]

However, as stated by DPIE Water:

> "*Flows generated in the headwaters of the northern valleys can take weeks to reach the Barwon-Darling and months to reach Menindee Lakes. Not allowing any access until the last downstream target was physically met (i.e. Menindee Lakes) would have meant no one could access water for almost three months in the upstream valleys. In practice, this would have meant that upstream users would not have had access to any of the flows even though the flows required for downstream needs would have already passed*."[125]

Therefore, reliance on forecasted rather than actual flows is a more nuanced approach that seeks to ensure realistic downstream targets are met without unnecessarily compromising upstream economic opportunities. As also stated by DPIE Water:

> "*Just as Councils along the Barwon Darling River were rightly concerned that sufficient flows should be protected to replenish their town water supplies, once that point had been reached, there was also concern raised by those same Councils that commercial users should be given access to provide important economic stimulus for their communities*."

However, the Inland Rivers Network contends "*This notion is reliant on improved and reliable forecast modelling of both climate and whole of system flows*."[126]

Not all river valleys contribute to Barwon-Darling flows in the same way. The Border Rivers, Namoi and Macquarie–Castlereagh–Bogan catchments together contribute on average to nearly 80% of the Barwon Darling River's flow.

	Average Inflow to Barwon–Darling (GL/yr)	**Average Inflows as a % of total Average inflows from Barwon–Darling Tributaries**
Border Rivers	535.8	25%
Moonie	70.6	3%
Gwydir	151.8	7%
Namoi	588.8	28%

[122] See written submission of Howard Jones, Barrie MacMillan and Dr John Cooke dated 4 June 2020.

[123] Written submission of Howard Jones, Barrie MacMillan and Dr John Cooke dated 4 June 202

[124] See written submission of the Inland Rivers Network dated 9 August 2020 and Murray Lower Darling River Indigenous Nations dated 14 August 2020.

[125] Written submission of DPIE Water dated 18 August 2020.

[126] See written submission of the Inland Rivers Network dated 9 August 2020 and that of the Murray Lower Darling Rivers Indigenous Nations dated 17 August 2020.

Macquarie-Bogan	497.1	24%
Condamine/Balonne	202.2	10%
Warrego	58.0	3%
Total Flow (GL/yr)	2104.3	100%

Long-term modelled inflows to the Barwon-Darling (1900 to 2013).
Source: DPIE Water submission dated 14 August 2020.

Contributions can be affected by physical issues, such as channel constraints and flows onto floodplains, which may or may not make their way back into river systems.[127] This is material because as stated by DPIE Water, *"There would be little value in denying access to upstream users to flows that would not be able to reach downstream even if all access upstream was restricted."*[128]

DPIE Water offered the following reflection on management of the 2020 Northern Basin First Flush event:

> Most droughts typically end with significant flooding flows that flush through the system, filling major dams and on-farm storages. The high flows that occurred in the Northern Basin in 2016 resulted in Menindee Lakes increasing from almost empty to 1,528 GL by December 2016 - close to full capacity. However, the flows that occurred in the north-west in early 2020 were reasonable, but they were not drought breaking.
>
> Menindee Lakes is now only around 27% of its full capacity. The major northern rural storages received some improvement from the 2020 rainfall, but most of the flows in this period occurred downstream of the major dams. Therefore there needed to be a balance in ensuring that critical needs were met, that some reserves in storages were achieved, that drought refuges were filled, but in also allowing some opportunity for commercial users – many of whom had not had access and therefore any economic opportunities for some time. It required a careful balancing act of ensuring that flows could pass through the system, while allowing commercial users long awaited access.[129]

The Northern Basin is a very large area and blanket restrictions similar to those applied in the 2020 Northern Basin First Flush event have the potential to exclude irrigators from legitimate extraction after critical needs targets have been met. For example, in areas where flows will never contribute to meeting downstream targets.

Some have claimed that pump capacity and pumping behaviour differs between different systems, and if properly taken into account, these matters could have more effectively maximised upstream economic opportunities without compromising the achievement of downstream targets.[130]

Developing measures that provide for equitable contributions to connectivity in future first flush events will not be an easy task. Least of all, because rain never falls equitably. Ultimately, the ability to maximise upstream economic opportunity without unnecessarily compromising the ability to meet critical human and environmental water needs downstream depends on the quality of forecasts, availability of information and the practical and physical considerations of the large Northern Basin.

[127] See written submission of Macquarie Food & Fibre dated 8 August 2020.

[128] Written submission of DPIE Water dated 18 August 2020.

[129] DPIE written submission dated 14 August 2020.

[130] See written submission of Peel Valley Water Users Association Inc dated 7 August 2020.

A more complicated localised approach than that taken for the 2020 Northern Basin First Flush event would have higher data and information requirements not available at the time of the event. These may be available in the future as more real-time (or near to real-time) metering and monitoring systems are established, e.g. when implementation of the metering and telemetry reforms is complete, and improvements in flow forecasting would also assist. The more information available regarding system water requirements based on antecedent conditions, and better precision of forecasts, the greater the ability to make decisions based on forecast, rather than point-in-time conditions. Nevertheless, sufficient information must be available to make those decisions with reasonable certainty, and recognising the risks, and who bears them.

How does first flush water get 'accounted' for?

Some stakeholders queried how flows in a first flush event get 'accounted' for within the water management framework. [131] DPIE Water have advised that as flows during the 2020 First Flush event came from unregulated tributary inflows (and were not released from storage), the water is part of the system flows and is a State resource, required to restart the river systems benefiting all water users. It is not environmental water in the accounting of water.

However, under the Basin Plan and Water Sharing Plans, any extractions during the flow events will be included in the assessment of compliance against the long-term average annual extraction limits and sustainable diversion limits. Therefore, as extractions were constrained by the temporary water restrictions, this will assist in ensuring that extractions remain within the annual compliance limits benefitting water users. If extractions exceed compliance limits, then future water allocations for commercial users can be reduced.

Clarity on why changes to normal operating rules are required to meet connectivity objectives of first flush events

Some stakeholders contend that, currently, all Water Sharing Plans have rules that ensure first flushes and connectivity downstream.[132] There are rules in Water Sharing Plans that contribute to connectivity. According to the DPIE Brochure *Northern connectivity: Better management of environmental water in NSW (June 2020):*

> *"...there are 25 rules in place that may contribute to northern connectivity. These rules can be grouped into four rule types:*
>
> - *flow targets – includes unregulated river flow classes, cease and commence-to-pump requirements, end-of-system flow and downstream flow targets*
> - *flow access conditions – protect portions of flows (such as supplementary access conditions) to provide water for the environment*
> - *long-term average annual extraction limits – set aside flows above the extraction limit derived from a long-term average model for the environment*
> - *environmental water allowances – set aside a proportion of water in storages to be managed for environmental purposes (for example the Gwydir environmental contingency allowance)."*

However, as stated by DPIE Water, *"These rules are designed to provide for connectivity under normal conditions. It should be stressed that the Northern Basin restrictions were imposed during extreme and unprecedented drought conditions and were specifically designed to protect*

[131] See written submission of Carrington Cotton Corporation dated 9 August 2020.

[132] See written submission of Cotton Australia dated 7 August 2020.

the first flush down the northern tributaries and into the Barwon Darling to meet critical needs."[133]

Some Water Sharing Plans also include rules that strive to promote connectivity based on targets set out in the *Interim Unregulated Flow Management Plan for the North West* released in 1992 (which is currently being reviewed, as referred to in section 4.2 above). However, "*there have been challenges to implementing WSP rules that contribute to connectivity, such as a lack of accurate metering and a lack of flow forecasting capacity in the Barwon-Darling River*." [134] Further a draft critical water situation strategy in 2004 prepared by the NSW Department of Land & Water Conservation, and provided to the Panel, stated "*The North-West Plan is designed to achieve its low flow targets when "normal" low flows exist in the Barwon-Darling prior to the flow event occurring. In the current extraordinary situation significant volumes are required to fill river pools and the riparian sand beds before the flow will pass to the next section of river. The standard North-West Plan flow targets will not satisfy this requirement*."

Other rules which commenced in Water Sharing Plans on 1 July 2020 that will also contribute to improving connectivity include:

- individual daily extraction components, to limit the total volume of water that can be extracted in the Barwon-Darling River on a daily basis,
- a resumption of flow rule to protect the first flow of water through the Barwon-Darling system after an extended dry or low flow period from extraction,
- the creation of Aboriginal supplementary access licences in the Barwon-Darling water source, to enable Aboriginal persons and Aboriginal communities to access up to 500 ML of water to enhance the Aboriginal cultural value of important lagoons and billabongs, by restoring the natural filling sequence of that lagoon or billabong.

The key aim of the resumption of flow rule in the Barwon-Darling Water Sharing Plan is to protect the critical first flows after an extended low flow or dry period. The rule is triggered when a flow event occurs after a continuous period of dry or low flow conditions, and prevents water users from accessing the first flow for a period of time. Normal access conditions then apply after the flow has reached the required target flows. The option to use a section 324 temporary water restriction order under the WM Act to prevent access to flows will continue into the future, when it is in the public interest to do so. However, the new resumption of flow rule will offer water users greater certainty about which flows will be protected. It will also reduce the frequency of use of section 324 orders.

The new resumption of flow rule in the Barwon-Darling Water Sharing Plan has been designed such that standard access conditions resume when a flow event is forecast to be received in that section, and all downstream sections of the Barwon-Darling River of at least the flow equivalent of 400 ML/day at Wilcannia for a minimum of 10 days, or if a total flow of 30 GL is forecast to pass Bourke since the commencement of the suspension. However, the CEWO has advised that "*If the Menindee Lakes are dry and there are acute social and environmental needs in the lower Darling, then we believe that 30 GL is inadequate*."[135]

DPIE Water has also stated that "*if these rules were in place and implemented as part of the first flush event, rather than the section 324 restrictions, the same outcome would not have been achieved, as they were designed for a less extreme dry period than had occurred up until 2020. This demonstrates the difficulty in "hard wiring" rules to deal with extreme events*."[136] It is important to remember that drought conditions across the Northern Basin and Lower Darling at

[133] Written submission of DPIE dated 18 August 2020.

[134] See DPIE Brochure *Northern connectivity: Better management of environmental water in NSW (June 2020)*

[135] Written submission of the Commonwealth Environmental Water Office dated 5 June 2020.

[136] Written submission of DPIE dated 14 August 2020.

the start of January 2020 were extreme. Towns risked running out of river supplies, many landholders had no access to river water, and there had been water quality issues and recent mass fish deaths. In that context, DPIE Water reiterated that protecting the first flows was essential to enable the wetting up of the riverbeds and assist with system recovery.

The Panel also believes that it is very unlikely that 30 GL past Bourke would have been adequate to meet the critical needs of the Lower Darling given the unprecedented drought and consequent antecedent dry conditions, and it would have been extraordinarily difficult to justify a decision not to impose temporary water restrictions. Despite the anticipated limitations of these rules and the antecedent conditions, a number of stakeholders have expressed frustration and concern that there is not yet any documented evidence that the current Water Sharing Plan rules outlined above, which have "*come as a result of long and tedious efforts by stakeholders and government agencies,*"[137] would have achieved lesser outcomes than those achieved under the restrictions, or are otherwise insufficient to meet connectivity objectives. Various claims have been made about the economic costs to industry because "*legitimate access was denied*."[138] A participant of the public feedback survey stated "*This caused hundreds of thousands of dollars' worth of infrastructure, soil, fence & mechanical damage to our property. It is an enormous burden on us financially, mentally & physically as now we face the repair costs. If we were permitted to pump this floodwater i[n] a regulated fashion we would not be experiencing these damaging conditions now. It will be in the 100s & 1000's of dollars to repair the damage as well as now facing Winter crop productivity severely reduced due to the lack of knowledge, foresight & understanding from the inept NSW Water Resources whom were oblivious to our received damage.*"

DPIE Water contend that "*The restrictions were effective in meeting the objectives to protect flows across the Northern NSW Basin to replenish town water, domestic and stock supplies and refuge pools.*"[139] While the Panel agrees that the restrictions did protect flows across the Northern NSW Basin, and that the town water, domestic and stock supplies and refuge pools were replenished, it also agrees that, until the outcomes achieved under the restrictions are compared to the outcomes that would have occurred if the restrictions were not in place (and only standard water sharing rules in Water Sharing Plans applied), there is insufficient transparent evidence to convince all the interested parties that the restrictions were responsible for the outcomes.

The Panel would have liked to consider this comparison as part of its assessment, but the modelling required to make these comparisons has not yet been completed. The Panel recognises it is important for these comparisons to be done, not only to respond to such stakeholder requests and provide transparency around these matters, but also because they are instructive to improve the management of future first flush events. Consequently, the Panel has strongly recommended that the NSW water agencies do the necessary work to enable the comparisons to be made and to report on that work. Even if this work shows that the final outcomes were not the result of decisions made early on in the event, ultimately, what is important is whether the decisions made based on the information available at the time would have achieved what they set out to do, had the additional rainfall events not occurred. The Panel understands that NSW water agencies intend to undertake this comparison modelling with the results to be available in November this year.

[137] Written submission of Barwon-Darling Water Inc dated 8 August 2020.

[138] Written submission of Cotton Australia dated 7 August 2020. They estimate that at least 100,000 ML of access was restricted, equating to loss of at least $50 million (Farmgate) economic activity across the northern tributary valleys of NSW. See also written submission from the Gwydir Valley Irrigators Association dated 13 August 2020 who estimated a $174 million of lost economic potential resulting from the management of the event.

[139] Written submission of DPIE dated 18 August 2020.

Some have also suggested a cost-benefit analysis of the event be completed.[140] While a matter for the NSW Government to consider, the Panel notes that quantifying the social and environmental costs and benefits, which are central to critical water needs, would be challenging.

7.4 Roles and responsibilities in decision making

Internally, there was a strong clarity of roles and responsibilities in managing this event that should be commended. When asked what worked well, every agency directly involved in managing the event commented on how well and collaboratively agency staff worked with each other. The event was managed by a cohesive and resilient working group who had clarity of roles and responsibilities and showed great dedication and commitment, and mutual support in their attempt to manage the event under sometimes very stressful conditions. Over time, officers developed rosters to help cope with the near 24/7 demands of managing the event. But unfortunately, this hard work and dedication was overshadowed by the lack of a clear point of contact for external communication with stakeholders.

As described by DPIE Water:

> "*The department had a core group of staff from DPIE-Water, WaterNSW, and Fisheries constantly on call to assess flows and determine if triggers had been met. This group met multiple times a day during the height of some of the rainfall events. Within the agencies the process worked well to ensure that decisions were made as quickly as possible, including over weekends and public holidays. The key issue remained how to communicate these decisions just as quickly to water users and the community*."[141]

The community was not clear on who was doing what, which led to communication and confidence issues and frustrations which generated a lack of trust. Some decisions lacked access to local knowledge, and this was of strong concern to water users and communities. Carrington Cotton Corporation believes that "*trigger points and thresholds must be set with significant input from the locally based, NSW Government employees, stakeholders and local community members with significant historical knowledge of the river and be adequately substantiated, transparent and unambiguous.*"[142]

Information gaps were compounded by the exclusion of DPIE-EES from routine decision-making processes. DPIE-EES were involved in the decision-making process that developed the targets and the NEDEE project, and the targets were derived from Long-Term Water Plans prepared by DPIE-EES. However, during the event, operational decisions were made with the objective of meeting critical environmental water needs, but advice from environmental experts was not being routinely sought or provided, except by DPI Fisheries to the extent that the critical environmental needs related to fish impacts.

Advice was provided by DPIE-EES in relation to supplementary announcements that affected specific environment sites, such as the Macquarie Marshes and the Gwydir Wetlands. But there was no other involvement in decision-making during the event, apparently due to perceived conflict of interest issues. This was a concern raised in public submissions, "*remembering that EES are tasked with the management of environmental water and have many years of experience in managing environmental flows as well as an accurate understanding of the*

[140] See written submission of NSW Irrigators' Council dated 7 August 2020 and Barwon-Darling Water Incorporated dated 9 August 2020.
[141] Written submission of DPIE Water dated 14 August 2020.
[142] Written submission of Carrington Cotton Corporation dated 3 June 2020.

environmental water needs of the Macquarie Marshes after the exceptionally long period of no flows."[143]

DPIE-EES has advised the Panel that it is aware of its obligations and has in place the necessary governance, confidentiality and approval processes to ensure DPIE-EES cannot commercially benefit from information not available to the public consistent with clause 12.51 and 12.52 of *the Basin Plan 2012*.[144] In particular, industry best practice arrangements have been implemented to ensure the separation of operational and trade units of DPIE-EES. In the case of the NSW Northern Basin First Flush event, DPIE-EES advised the Panel that they had no potential to trade with market sensitive information as they do not trade unregulated or floodplain harvesting licences or allocation, and that the separation of roles within DPIE-EES meant that their Environmental Water Governance unit was not aware of any information or advice that was shared in closed forums as standard practice.

The Panel is of the view that any further outstanding issues or concerns should be dealt with in advance. DPIE Water has recognised that in hindsight, it would have been preferable to routinely include advice from DPIE-EES as part of the decision-making process, in relation to their policy/operational functions (and not their role as a licence holder).

7.5 Evidence relied upon in decision-making

In the Panel's view, the overall flow forecasting approach used to manage the event was generally robust, generally enabling decisions to be made on the best available evidence at the relevant time. The Panel agrees with the MDBA's view that NSW made substantial efforts to use the best available information to make decisions,[145] and with the findings of the independent review by Barma Water Resources of WaterNSW's forecasting model that *"[t]he application of the spreadsheet models in forecasting the first flush event is sound and appropriate*."[146]

Nature of WaterNSW forecasting and DPIE Water decision-making

There have been strong criticisms that WaterNSW's flow forecasting tools need review on the basis that they were too conservative,[147] and other criticisms that DPIE Water waited too long to lift restrictions in some cases.[148]

In respect of some of these criticisms, WaterNSW have stated:

> "*Generally, it is a well-recognised principle that water managers must tend to a conservative rather than speculative approach in making resources assessments in recognition of the consequences of over allocation compared to under allocation. While it is accepted that an element of conservativism may result in foregone opportunity to some, it mitigates the risk to many that water that should be available, is not. Decisions made by the water system managers reflect the information available at any point in time. So, while after an event it may be viewed by some that operations were very conservative, the information at the time of making decisions was not sufficient to take a different approach*."[149]

[143] Written submission of Garry Hall dated 7 June 2020.

[144] Clause 12.51 of the Basin Plan prevents a person trading if they are aware of a water announcement before it has been made publicly available, and clause 12.52 allows for Chinese wall arrangements to be put in place so that trading can continue.

[145] See written submission of the Murray Darling Basin Authority dated 8 June 2020.

[146] Appendix A of the written submission of WaterNSW dated 27 August 2020.

[147] See written submission of Gwydir Valley Irrigators' Association Inc dated 13 August 2020, Namoi Water dated 9 August 2020, Cotton Australia dated 5 June 2020 and Bourke Shire Council dated 15 June 2020.

[148] See written submission form Namoi Water dated 9 August 2020, Cotton Australia dated 7 August 2020, Cotton Australia dated 3 June 2020 and Gwydir Valley Irrigators Association dated 13 August 2020.

[149] Written submission of WaterNSW dated 27 August 2020.

Given the criticality of human and environmental water needs that had to be met in the 2020 Northern Basin First Flush event, the Panel endorses the 'conservative approach' WaterNSW adopted to forecast flows in first flush events, and the prudent approach adopted by DPIE Water when relying on forecasted flows to determine whether restrictions should be lifted. But the Panel also suggests that important lessons can be learnt from the 2020 Northern Basin First Flush event and useful improvements can be made for future first flush events.

Example of the approach to decision-making based on flow forecasts.

After further rains and gauged streamflows in mid-February indicated that inflows to Menindee Lakes were subsequently likely, DPIE Water set a target of ensuring that flows would achieve 60-70 GL inflow to the Menindee Lakes. On 19 February 2020, WaterNSW forecasted flows of 30-60 GL at Lake Wetherell. Given that an inflow of 30 GL (the bottom of the range) would not achieve the established target, DPIE Water did not consider this forecast flow to be a sufficient basis for lifting restrictions. On 21 February 2020, this forecast was increased to 60-80 GL at Lake Wetherell. On that basis and on the same day, DPIE Water lifted all pumping and floodplain harvesting restrictions in areas where flows were no longer required to meet that target.

Significantly, an independent comparison of WaterNSW's forecasted flows to the actual observed flows demonstrates that in fact, contrary to being conservative, "*in both the NSW and Queensland flow forecasting cases, final event volume was overestimated by the forecast*."[150]

However, there remain some major data gaps to be resolved, including flows out of Queensland, floodplain harvesting and flow data (particularly overbank flows), and allowances for amounts of water to move to downstream locations. Consistent with criticism from some stakeholders,[151] the independent review by Barma Water Resources also identified that "*the delay in receiving information on cross border flows in Queensland led to underestimation of the flushing event forecast volume in tributaries and at Menindee early in the event.*"[152]

There are lessons to be learned from each event and better and more predictable coordination with Queensland will be essential. While some submit that the availability of Queensland accredited Water Resource Plans alone should have been sufficient to enable flows across the border to be estimated in a timely and accurate manner,[153] rules alone cannot accurately indicate likely flow and extraction volumes. While there were communications regarding the event at a senior executive level, optimal event management requires more formal and structured communication at an operational level.

The Queensland Department of Natural Resources, Mines and Energy has stated "*It should be noted that the restructure of water agencies in New South Wales has disrupted effective cross-border networks that previously existed. Queensland would welcome the reestablishment of these networks for operational staff. This would also be the appropriate forum to develop a protocol to assist in the timely exchange of relevant information during future flow events.*"[154]

The Panel also considers that WaterNSW should work with stakeholders to ensure there is a clear understanding of the assumptions incorporated into its models, to build trust and transparency in water management and regulation.

[150] See Appendix A of the written submission of WaterNSW dated 27 August 2020.

[151] See written submission from Namoi Water dated 9 August 2020, Carrington Cotton Corporation dated 3 June 2020, Gwydir Valley Irrigators' Association dated 13 August 2020 and written submissions from Josh & Mel Hatton, Nicole McGinnity, Josh Schwager, Andrew Watson, Susan Wright and Andrew Carberry dated 15-22 May 2020.

[152] See Appendix A of the written submission of WaterNSW dated 27 August 2020.

[153] See written submission of Cotton Australia dated 7 August 2020.

[154] Written submission of Queensland Department of Natural Resources, Mines and Energy dated 10 August 2020.

Floodplain Harvesting Data

There remains wide speculation about the extent to which water on floodplains contribute to downstream flows, as well as the impact of interception works such as embankments and roads,[155] and the significance of 'passive take' by floodplain harvesting storages, which was not prohibited under the temporary water restrictions.[156] The Panel notes the NSW Parliamentary inquiry into the introduction of the Floodplain Harvesting Exemption Regulation has not reported its findings, and the Panel will not comment on matters within that inquiry's terms of reference.

However, better data and information on matters like floodplain flows and extractions would not only enable more precise management of floodplain harvesting take, including in first flush events, but also reduce the level of angst amongst water users and in the community associated with these activities. Therefore, it is imperative that implementation of the floodplain harvesting licensing framework and associated metering, monitoring and reporting continues and is completed. Until this occurs, there will be no reliable, verifiable data to inform the debate about the significance of this highly controversial activity. Concern over matters like passive take can be resolved as it is brought within the regulatory framework. Matters like interception activities may not be so easily resolved, although some aspects may be addressed by the Commonwealth *Water Act 2007* and Basin Plan. However, delays to implementation will further exacerbate the lack of trust and unsatisfactory outcomes of first flush and other water management.

Incorporation of other data and local knowledge to improve decision-making

As outlined in section 7.3 above, better data and information about channel capacity, pumping extractions and allowances for water to move downstream will allow more precise management of take to occur. Information on how antecedent conditions are taken into account is another area requiring consideration. The dynamic nature of the 2020 event, coupled with inadequate incident management preparedness, meant that local-scale insights, needs, demands and impacts did not factor into decision-making as clearly as they ideally would. In the future, first flush management should include clear processes to ensure local information can be taken into account not only to maximise the outcomes of first flush management, but also to improve water users and the community's confidence in the robustness of decision-making.

7.6 Transparency and communication

While internally, the decision-making framework met statutory requirements, this was not helpful to water users, and less helpful to the general public in understanding how the event was being managed. As commented by one submission, *"the process was opaque"*.[157] Another submission stated that "*decisions were made on the run*".[158]

The Panel acknowledges the impossible task of developing water management frameworks in a way that will satisfy all parties impacted by water management. As stated by one submission, "*Our rivers are our livelihood. They are critical to us, but we value them for diverse, and sometimes competing purposes.*"[159] No framework or set of rules will ever make everyone

[155] See written submission of Justin Filed MLC dated 31 July 2020.

[156] For example, Clem Wheatley believes that as much as 60% of floodplain flows does not make it back to the river (see written submission dated 13 July 2020) but the Victorian Government remains concerned that floodplain harvesting may have a direct impact on inflows to the Menindee Lakes and the Southern Basin, and leads to an increased risk of water users taking more water than is permitted under their Sustainable Diversion Limit (see written submission dated 15 August 2020).

[157] Written submission of Sarah Moles dated 8 June 2020

[158] Written submission from Speak Up Campaign Inc. dated 5 August 2020.

[159] Written submission of Jonathon Howard dated 9 August 2020.

happy. Further, the resources and capacity to engage in water management is not equal across the range of impacted parties, even if the interests are equally valid. In this context, even though the hesitation in publicly releasing the principles and flow targets is somewhat understandable (particularly given they were finalised only days before the event unfolded), the effect was that water users, Traditional Owners and communities were not adequately prepared for the event.

Community levels of trust in NSW water management have been low and in need of rebuilding since the July 2017 Four Corners program "Pumped", which raised significant public concern about the effectiveness of current NSW compliance and enforcement arrangements for water. In this climate, and with the additional stress caused by severe drought, initiating stakeholder consultation on yet another water management issue can be a particularly resource intensive exercise.

However, not releasing this information was a significant shortfall in transparency which does not assist in rebuilding that trust. It does not live up to the Government's commitments in response to the Matthews inquiry in relation to making information available. In his Interim report, Ken Matthews noted the importance of clearly communicating the methodology for adjustments to stream gauging data as soon as possible for the sake of public confidence and sound legal process. In the Panel's view, the same principle applied to the proposed framework for first flush management.

Although the objectives of restrictions were published on the DPIE Water website, they were only published in the individual reasons for decisions for each restriction and in some of the more general fact sheets put out by DPIE Water, and were not readily accessible to a member of the community who might have been looking for that information. While the published reasons for decision do provide insight into the matters that decision-makers took into account for a particular circumstance, they did not cater to enhancing the broader community's understanding of how water was being managed.

It's been noted that "*the Southern Connected System is dependent on the volumes of water held in Menindee Lakes... The management of the first flush directly impacts food producers and their communities in the Southern Connected System, particularly the NSW Murray Valley.*"[160] During the 2020 Northern Basin First Flush event, the focus of communication efforts was directed at water users immediately impacted by the restrictions and their lifting. DPIE Water have since recognised that, given the broad impacts of water restrictions, in the future, communications have to cater to all stakeholders both directly and indirectly impacted by water restrictions.

The dissemination of information through a scattered variety of gazettals, fact sheets, operational updates, notifications and media articles reflects the unexpected complexity of the first flush event. But it also made it very difficult for the public to have confidence in the integrity of the decisions being made. Bourke Shire Council, in their written submission, believed that "*Even those water users with a good understanding of water issues and rules, at times had difficulty following all the decisions made during this event*".[161] Another written submission stated that *"the event caused considerable confusion and concern amongst the public - which in turn led to frustration about the lack of consultation".*[162]

Frustration at the lack of transparency was compounded by the fact that the only target which was publicly released during the event (the target volume for the Menindee Lakes), was also one of the two targets that changed throughout the event (the other target relating to the

[160] Written submission of Speak Up Campaign Inc. dated 5 August 2020.

[161] Written submission of the Nature Conservation Council dated 9 June 2020 and Bourke Shire Council dated 15 June 2020.

[162] Written submission from Jonathon Howard dated 7 August 2020.

Macquarie Marshes). While the adjustment of the targets may have reflected a logical commitment to adaptive and responsive management practices and reliance on best available information, it is understandable that, publicly, this was treated with confusion, suspicion and regarded as a changing of the goal posts.

Externally, the lack of clarity also led to an inability for water users to plan their operations, compounding already high levels of stress and anxiety following the prolonged drought. Cotton Australia stated that "*It was extremely frustrating that flow targets changed on a regular basis, often without any logic.*"[163] It also denied Traditional Owners and Indigenous communities the opportunity to celebrate the positive cultural outcomes that were being generated by flows through the river system as the event and its management unfolded.

Further, the lack of communication and access to information made it seem to water users that, overall, the decision makers did not put themselves in water users' shoes to understand how they would be impacted. This was noticeably the case for restrictions around floodplain harvesting. The Panel does not believe this to be necessarily true, but instead that the sentiment reflects the polarised views and competing demands for a limited resource, and insufficient resources being dedicated to facilitating better communication and engagement before, during and after the first flush event. While floodplain harvesters may well have been unhappy about the harvesting restriction even if they had known about it in advance, not knowing about it in advance compounded their disgruntlement.

One submission stated:

> "*We are not comfortable that it was just the lack of transparency that led to the adverse response of the community towards the process and its outcome. The whole of the area west of the Great Divide in NSW was in drought and had been so for a number of years. The community was suffering as a consequence of drought, as were most water users in western NSW. Financial assistance was available. Our experience is that pressure builds within communities in cases where some farmers receive rain and others don't. This was the case in 2020. The 2020 Event did not occur evenly across all of the area affected by drought. Some individuals were allowed access to water for irrigation by nature of their location and the variable rainfall. Others who were not in an area where it rained were not able to take water. Their drought impacts continued. The existence of Section 324 Temporary Water Restrictions may have given false hopes to irrigators*."[164]

While this may be true, unfortunately, NSW is likely to be in this same situation at some point in the future. The Panel considers it essential that lessons are taken from the 2020 Northern Basin First Flush event to reduce the risk that shortfalls in transparency of this nature add to already heightened levels of stress and anxiety again in future first flush events.

7.7 Communications after the event

For stakeholders in the northern tributaries, rainfall events, and the 2020 Northern Basin First Flush event, effectively finished before the end of February 2020. But as outlined in section 6.5 above, an explanation of the objectives, targets and principles used to manage the event was only made available in May 2020.

The first water balance information about any aspect of the event, which included more detail on the methodologies used to develop the estimated volumes of take by floodplain harvesting works, was not made available until early July 2020.

[163] Written submission of Cotton Australia dated 7 August 2020.

[164] Written submission of Cooke, Jones and MacMillan dated 7 August 2020.

A water balance report was published on 23 July 2020, with limited information about the volume of extractions in the Barwon-Darling. Some stakeholders have claimed this report still lacks the requisite level of detail.[165]

Delays in publishing information about the 2020 Northern Basin First Flush event have allowed speculation about extraction, impacts and outcomes of the event to become de facto truths, and promote views of mistrust, secrecy and mismanagement.

In particular, the controversy around the temporary lift of floodplain harvesting led to wide speculation about the quantity of water taken during this period. On 7 May 2020, a newspaper article quoted the NSW Minister for Water stating that the volume of water taken by floodplain harvesting during the period of the temporary lifts was around 20 GL.[166] On 29 May 2020, a Twitter post claimed the real figure being "*north of 400 GL*." On 2 June 2020, DPIE Water sent a Water News update to stakeholders stating an estimated volume of 32 GL of water was harvested during the same period.167 But it was not until early July 2020 that DPIE Water made information available to the general public, by publishing the estimated volume of take by on-farm storages over the period of temporary lifts as 30 GL on its website (along with information on the limitations of the measurement methodology). In late August 2020, appearing on the ABC program 'The Drum', Maryanne Slattery from Slattery & Johnson claimed to have information suggesting that 90 GL had been taken from the Macquarie valley alone. The Panel requested evidence to support that claim but it was not available by the time of the completion of this report. This again shows the importance of having the necessary measurements and monitoring undertaken and the information made available in a transparent and timely way.

In their written submission, the NSW Irrigators' Council stated "*Water users had to call on DPIE-Water to communicate key figures, such as the volumes of water which were actually taken during access opportunities, in order to counter incorrect claims. There were claims circulating at the time of volumes of up to 5000 GL being 'unlawfully' taken through Floodplain Harvesting (FPH), when in fact, there was just 32 GL taken in what was a legal access opportunity. The NSW Department clarified this figure in their May 2020 'Water News' which was positive, however, this should have occurred sooner as reputational damage had already occurred*."[168]

There still remains a strong unmet demand for information about the event from water users and the community, and community expectations about the nature and timing of information that would be published about the event have not been managed well. Despite requests from the Panel and stakeholders, a comparison between the outcomes achieved under the restrictions, and those that would have been achieved under existing Water Sharing Plan rules without the restrictions over the course of the event, has still not been completed or published. Adequate resources have not been put aside to meet the demand for information following the 2020 Northern Basin First Flush event. This has been a significant source of frustration across the community, from extractive users to environmental groups alike.[169] It has inhibited a productive fact-based discussion on the benefits and costs of first flush events, including by this Panel in this report.

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[165] See written submission of Namoi Water dated 11 August 2020 and Gwydir Valley Irrigators Association dated 13 August 2020.

[166] The Land, *"Sensory technology measures water in floodplain harvesting"*, 7 May 2020.

[167] DPIE newsletter, Water News, Issue #16 May 2020 'Sensor technology measuring floodplain harvesting, apply for water carting rebate, drought update, and more'

[168] Written submission of the NSW Irrigators' Council dated 7 June 2020.

[169] See written submissions of Healthy Rivers Dubbo and Dr John Cooke, Howard Jones and Barrie MacMillan, both dated 4 June 2020 and also see comments in survey responses here. This has also been strongly expressed by members of the Water User Reference Group.

8. How management of the event satisfied NSW Government responses to prior independent investigations into NSW water management

8.1 The Matthews inquiry

Ken Matthews AO was commissioned to conduct an Independent Investigation into NSW Water Management and Compliance following the broadcast of a Four Corners program *"Pumped: who is benefiting from the billions spent on the Murray-Darling?"* on 24 July 2017. The program presented allegations of widespread non-compliance with NSW water law, particularly in the Barwon-Darling River system in Northern NSW and prompted significant public concern about the effectiveness of current NSW compliance and enforcement arrangements for water.

In his interim and final reports, Matthews found that water-related compliance and enforcement arrangements required significant and urgent improvement.

In his interim report, he found that:

1. The overall standard of NSW compliance and enforcement work had been poor.
2. Arrangements for metering, monitoring and measurement of water extractions, especially in the Barwon–Darling River system, were not at the standard required for sound water management and expected by the community.
3. Certain individual cases of alleged non-compliance had remained unresolved for far too long.
4. There was little transparency to members of the public of water regulation arrangements in NSW, including the compliance and enforcement arrangements which should underpin public confidence.

The interim report recommended a far-reaching reform package which included creation of the new and independent NSW Natural Resources Access Regulator to assume responsibility for compliance and enforcement responsibilities, and complementary administrative and operational reforms to support a more transparent, independent and effective enforcement system.

The NSW Government adopted the recommendations from the interim report, and the final report assessed the Department's implementation progress to date and offered advice on how to tackle the work involved in the months ahead. The key risks identified to continued momentum included:

- risks associated with planning the implementation of the reforms,
- risks in not allocating the necessary financial and staff resources to the tasks,
- the challenges in translating the government's desired high-level reform outcomes into specific and practical measures on the ground,
- increasing pressure from certain stakeholders to 'water down' key reforms, including reforms to water metering and improving transparency of information about water usage, and
- the risk of uncooperative relationships between government agencies and the risks associated with a new round of restructuring of staff involved in compliance and enforcement.

In December 2017, the NSW Water Reform Action Plan was released outlining the following NSW water goals, with key initiatives to be achieved by specific dates.

- **Introduce best practice for water management**

  Most relevant to this assessment, key initiatives included defining and explaining the specific roles of government bodies that have accountability for water management.

- **Build a compliance and enforcement regime that ensures strong and certain regulation**

  Most relevant to this assessment, key initiatives involved strengthening compliance and enforcement capacity, implementing a robust metering framework and adopting innovative technologies to improve compliance effectiveness.

- **Ensure transparency in how we share, allocate and manage water**

  Key initiatives included increasing transparency in water management, creating a stakeholder engagement framework, and improving the management of environmental water.

- **Build capability to support implementation of water reforms**

  Key initiatives aimed at building capability, improving standards and embedding an ethical culture.

8.2 Extent to which management of the event was consistent with the Government's response to the Matthews inquiry

Introduce best practice management for water

The final Matthews report highlighted the critical importance of clarity between the respective roles of NRAR, WaterNSW and the now DPIE Water, and the need to delineate roles to avoid any overlap in responsibilities, causing unnecessary costs as well as confusion in the minds of clients and staff. It also emphasised the need for constructive and collaborative relationships between the agencies to lift overall performance.

Internally, for the management of the 2020 Northern Basin First Flush event, there was strong clarity about the differences between the roles of each agency. Further, there was a commendable effort of staff to work cooperatively and collaboratively which was needed to manage this event. The only blurring of boundaries between the agencies occurred regarding communications, but this was due to a collective effort to address the systemic gaps, rather than any ambiguity in roles and responsibilities. The Panel hopes the positive tone of the relationships modelled by senior officers in managing the event continues to lift ongoing performance.

However, this internal clarity did not translate to clarity for water users, Traditional Owners and communities. While peak industry groups making direct representations to DPIE Water and WaterNSW officers during the event understood the delineation of roles, other stakeholders and community members, particularly Traditional Owners and Indigenous communities, did not have a good understanding of who was doing what or where a point of contact could be found.

Build a compliance and enforcement regime that ensures strong and certain regulation

NRAR compliance investigations related to the temporary water restrictions are ongoing. Earlier advice to NRAR would have enabled them to consider more in-field compliance activity. This event also reinforced the need for reforms which are not yet fully implemented. This applies

particularly to implementation of the Floodplain Harvesting Policy as is evidenced by the speculation about the initial regulation, the lifting of restrictions on take and how much water was taken. Both management of the event, as well as compliance and enforcement activities, would have benefited from the pending non-urban water metering and telemetry reforms (being implemented in stages from 1 December 2020), and implementation of the floodplain harvesting licensing, measurement and reporting frameworks. The use of LiDAR remote sensing technology to measure on-farm water storages is an important development, but further progress is required.

Ensure transparency in how we share, allocate and manage water

The Matthews inquiry identified that water is a community-owned resource and members of the public have the right to satisfy themselves that it is being used in compliance with the law. While a great deal of information was published throughout the event (as outlined in the table at Appendix J), genuine transparency was not achieved before, during or after the 2020 Northern Basin First Flush event due to:

- the sporadic and varied nature of the information (published on different platforms, catered to different audiences, seemingly for different purposes, according to no clear timetable and not always easy to find even if the finder knows what they are seeking),
- the lack of public communication for water users or the public about objectives, rationale, and how the first flush would be managed prior to the event,
- the lack of transparency of the targets, principles and processes for managing the event,
- the lack of any public communication regarding the proposed introduction of the floodplain harvesting regulation and the floodplain harvesting restriction,
- the feedback that communications were not accessible, timely or clear, and
- the absence of a contact point for enquiries.

The final Matthews report commented on the need for consultation regarding reforms to be broad-based, with no single group having a monopoly on access. In preparing for this event, and in particular the proposal to proactively impose a temporary water restriction, there was not broad-based consultation, even if there was relatively comprehensive consultation with relevant government agencies. During the event, there was no clear framework to ensure equitable access for the full range of stakeholders and impacted parties or a transparent set of engagement arrangements in place. This will be essential to improving first flush management in the future.

The Panel considers that ultimately these shortfalls were not due to a lack of will on the part of staff within agencies, but rather a broader lack of resources to adequately, strategically and operationally plan and prepare for the return of flows in rivers following sufficient rainfall. Ultimately, first flush management in this event was about the one-off application of temporary water restrictions under section 324 of the WM Act. It was a part of the regulatory framework which needs further development. And if this was not apparent prior to the 2020 Northern Basin First Flush event, it is now.

However, the final Matthews report also highlighted the need for greater protection of environmental water. The Panel considers that management of the 2020 Northern Basin First Flush event demonstrated a very strong commitment to ensuring that protection.

Finally, the Matthews inquiry highlighted the need for reforms to be adequately resourced and noted the damaging effect of government restructures, and the Panel's assessment is consistent with those findings and concerns. Changes which have reduced the regional

presence of agency staff has led to a loss of trust in water management. Border Rivers Food & Fibre commented:

> "*The withdrawal of senior staff from the regional centres over many years and by both sides of politics when in government, has left a vacuum of knowledge within the department and has left the small, centralised bureaucracy dependent on second and third hand information with little context of the overall event. There is a strong case for the rebuilding of capacity of the department in regional centres, as used to be the case before they were stripped out. This move can only improve the overall management of natural resources and especially the dynamic subject of water in the northern basin, not just some decision-making in emergency events. It would rebuild the knowledge base within the department and restore some confidence in the government's ability to manage water responsibly*."[170]

DPIE Water have advised that close to 40% of DPIE Water's staff are regionally based (that is outside of Sydney, Wollongong and Newcastle areas). However, the department's role has changed over time with the removal of licensing and compliance functions, which would have had large regional presence, to WaterNSW and NRAR. As a result, it is not clear whether locally based DPIE Water staff would be in a position to provide the kind of real-time water management information required under first flush (or similar) circumstances. Further, restructures affect individuals, and even if functions are transferred to another agency, the personnel will not necessarily follow.

Restructures also lead to lack of clarity of who does what - among both government, impacted parties and the public. For example, DPIE-EES commented that, in the past, interaction between floods and floodplain works has relied upon real-time, on-ground inspection and management by NSW agencies. The responsibility for this type of on-ground presence and management is no longer clear (due to restructures within the water portfolio), even though it remains a necessary element of managing flood passage, floodplain development and floodplain harvesting.

Restructures have come at a cost of the loss of corporate knowledge, relationships with water users and communities, relationships with other government agencies and the ability for real progress to be made in a timely manner. The Panel considers that the complexities of water management and balancing competing demands on a diminishing resource make progress in water management difficult enough. The restructure and reorganization of water agencies has exacerbated these delays and left communities frustrated and disenfranchised by the reform process.

8.3 The Vertessy assessment and report

The *Independent Assessment of the 2018-19 Fish Deaths in the Lower Darling,* was undertaken by an Independent Panel appointed by the Hon. David Littleproud MP, Commonwealth Minister for Agriculture and Water Resources, following three significant fish death events in the Darling River near Menindee between December 2018 and January 2019. Among other matters, the assessment found that:

- the fish death events in the Lower Darling were preceded and affected by exceptional climatic conditions, unparalleled in the observed climate record, and
- water extractions from the tributaries of the Barwon–Darling have a much greater impact on Menindee inflows than extractions directly from the Barwon–Darling River, but when flows are low, the capacity for A class extractions from the Barwon-Darling is a serious threat to the connectivity of the river between Bourke and Menindee.

[170] Written submission of Border Rivers Food & Fibre dated 9 August 2020.

The Independent Panel recommendations included that:

- water access arrangements under the Barwon–Darling Water Sharing Plan should be modified to protect low flows,
- Queensland and NSW should ensure that they give greater attention to the need to maintain hydrologic connectivity in the Barwon–Darling River,
- NSW and Queensland should adopt an active event-based management approach to providing flows through the Barwon–Darling system. Flow management strategies should be implemented as soon as possible to protect first flushes, protect low flows, shepherd environmental releases, enhance system connectivity, and improve water quality,
- NSW should review and refine the flow requirements to control stratification in weir pools deemed to be at high risk of fish deaths,
- within one year, NSW and Queensland should establish an agreed protocol to protect first flushes,
- within two years, NSW and Queensland should introduce more accurate continuous and real-time monitoring of diversions in the Barwon–Darling, to ensure protection of managed connectivity events. Compliance around all metering requirements and overland flow extractions should be strengthened expeditiously,
- within two years, NSW and Queensland should improve the reliability and transparency of the assessment of the hydrologic impacts of floodplain harvesting, and
- within three years, NSW and Queensland should improve monitoring of end-of-system tributary flows that contribute to hydrologic connectivity in the Darling system, and make that data readily available.

As set out in section 4.2 of this report, these recommendations largely have been, or are in the process of being, implemented by DPIE Water. The fact that implementation of some of these recommendations has not yet been completed certainly impacted on management of the event and emphasises the need for implementation effort to continue.

8.4 The NRC review

As outlined in section 4.6 of this report, the Natural Resources Commission's (NRC) statutory review of the Barwon-Darling Water Sharing Plan (published September 2019) was brought forward at the request of the former Minister for Regional Water (with the support of the Premier), having regard to the high public interest in the operation of the plan and downstream fish deaths.

The NRC reviewed the extent to which the water sharing provisions materially contributed to the achievement of, or the failure to achieve, environmental, social and economic outcomes, and found that the current plan did not effectively prioritise protection of the water source and dependent ecosystems, followed by basic landholder rights (including native title rights), and then other extractive uses.

The NRC review recognised the reforms undertaken since 2017 regarding improved metering, transparency, compliance and enforcement, and management of environmental water (including the use of section 324 orders to ensure that water held and released for the environment was not available for extraction, and the creation of NRAR).

However, it identified the need for further action to address the extraction of water during critical low flow periods (by raising the cease to pump level) and the removal of the 'imminent flow' allowance. The NRC also recommended:

- protection of flows under new provisions to enable implementation of an updated Interim Unregulated Flow Management Plan for the North-West (the Interim Flow Plan). It also recommended the acknowledgement of native title rights to water in the Water Sharing Plan, and
- provision of interim allocations for Aboriginal nations and organisations and taking steps to improve management of connectivity across the Northern Basin, including review of upstream Water Sharing Plans for their connectivity to the Barwon-Darling and contribution to improved outcomes.

8.5 The Government's response to the Vertessy report and NRC review

In response to the Vertessy report and the NRC review, the NSW Government announced it would adopt a staged approach to address those recommendations, and continue to use the best available information and work with stakeholders to make positive changes to water management rules that ensure the best outcomes for regional communities, the environment and industries.

The first stage was to implement actions to better manage environmental water and the health of fish populations, including to implement rule changes in response to the NRC's recommendations to protect low flows, immediately protect water for towns and the environment and implement commitments to better manage environmental water. This included introducing new rules to the Barwon-Darling Water Sharing Plan (which came into effect on 1 July 2020) which manage the resumption of flows in the river following extended dry or low flow periods, implementing Individual Daily Extraction Components (IDECs) for licence holders, and preventing the extraction of environmental water so it can remain in the river and achieve the desired environmental and social outcomes.

The second stage includes exploring options for an Aboriginal water policy with the aim of improving the representation of Aboriginal cultural interests and values in water management.

The third stage involves implementing an effective monitoring, evaluation and reporting framework to understand how far changes in Stage 1 and 2 go towards improving environmental, social and cultural outcomes in the Barwon–Darling. Stage 3 work was contemplated as providing a better understanding of connectivity between the rivers and valleys in the northern NSW Basin, acknowledging that many of the Vertessy and NRC recommendations go towards looking at water as a whole system, rather than as individual valleys. It identified working with Queensland as a key focus, given the significant impact that water management in Queensland has on water flowing into NSW.

8.6 Extent to which management of the event was consistent with the Government's response to the Vertessy report and NRC review

Management of the 2020 Northern Basin First Flush event was successful in taking immediate action to protect water for towns and the environment. Water supply was secured and town weir pools filled for 11 communities across the Northern Basin, including Menindee Lakes which received 12-18 months' water supply, and sufficient water was available and managed to restart the Lower Darling River without fish kills, a salinity problem or blue-green algae outbreaks.

By the end of April 2020, more than 2600 hectares (ha) of the critical Northern Reedbed of the Macquarie Marshes was inundated. In relation to the Gwydir Wetlands, in the Central Gingham

Water Management Area, more than 1700 hectares of semi-permanent wetlands (Common Reed, Cumbungi, Water Couch) were inundated. In the Lower Gwydir, more than 1800 hectares of semi-permanent wetland was inundated.

The flows reconnected the Barwon-Darling River with its tributaries and enabled fish and other aquatic animals to move up and down significant lengths of the rivers. Preliminary results indicate that Golden Perch had numerous breeding events because of these flows.[171]

The improved environmental outcomes and return of flows to the river brought hope to communities. However, the capacity to maximise these social outcomes was compromised by the lack of communications about the event. For example, with more notice, Indigenous communities in the Gomeroi, Ngemba, Ngemba, Ngiyampaa, Wangaaypuwan, Wayilwan and Barkandji regions could have organised celebrations of the return of flows in the river and optimised the exercise of traditional cultural practices.

There was an overall failure to engage with Traditional Owners and Indigenous communities in managing this event which represented a lost opportunity to remind communities of the social and cultural benefits of protecting first flushes. Not considering Traditional Owners' and Indigenous communities' water values, uses and objectives, and native title and cultural water requirements that fall within critical water needs when developing the first flush management framework, or consulting with Traditional Owners and Indigenous communities, has exacerbated already elevated levels of frustration and disenchantment. The failure to implement the recommendations of previous independent reports to reflect Aboriginal cultural interests and values in water management left the Barkandji Traditional Owners with a sentiment that this Panel's efforts to seek feedback from Indigenous people as part of this assessment was merely a box ticking exercise, and that engagement would not actually produce any outcomes for cultural or native title people of any significance. While being extremely disappointing for the Panel and this assessment, that position is understandable, given that Indigenous participation in water management to date has not yet produced substantial real outcomes for Traditional Owners and Indigenous communities.

Separately, while the Northern Basin Environmental Working Group enabled some communication between NSW and Queensland in managing the first flows, there was no coordinated approach or structured communications at the operational level. This has led to feelings of frustration and inequity for Northern Basin communities, as northern NSW irrigators felt that they missed their opportunity to take water as a result.

Ultimately, the implementation of commitments and programs regarding metering, rule changes and increased monitoring, evaluation and reporting to better understand connectivity and improvements to environmental, social, cultural and economic outcomes are essential to improve the future management of first flush events.

9. Appropriateness of the use of section 324 orders to manage first flush events

While the 'public interest' threshold for imposing a temporary water restriction is broad enough to enable temporary water restrictions to be used to limit access to flows which will protect water sources, in the vast majority of cases, temporary water restrictions made under section 324 of the WM Act are used to cope with the decreasing availability of water, not the increasing availability of water. In the Extreme Events Policy and Incident Response Guides, section 324

[171] DPIE Water Drought update "North-west flows in early 2020 - benefits from temporary water restrictions" information at https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/north-west-flows-in-early-2020

orders are referred to as a tool to manage water sources as they go into drought, rather than as they come out of drought. The WM Act in and of itself does not provide the complete framework for section 324 orders to be applied and lifted dynamically, as is required to manage first flush events.

Given the way the event unfolded, and how first flush events often evolve (being in the form of cumulative rainfall events that cannot be predicted very far in advance), the use of more flexible provisions which incorporated the ability to grant 'approvals to take' was a wise decision. It would have been very difficult to manage the event as adaptively and responsively as was done, if broadcast and individual gazettals were required to enable water users to take water (see boxed example below). Delays would have been particularly prejudicial to unregulated water users in systems which rise and fall quickly and whose opportunity to take only lasts as long as the river remains at a certain level.

Example of the impacts on the timeliness of decisions provided by including 'approval to take' provisions in temporary water restrictions orders

On Friday 21 February 2020, WaterNSW forecast flows sufficient to meet the established target of 60 GL at Lake Wetherell. On that basis and on the same day, DPIE Water lifted all unregulated river pumping and floodplain harvesting restrictions in areas where flows were no longer required to meet that target.

While the forecasted flows presented conditions that would have also enabled restrictions in the Border Rivers and Upper and Lower Namoi regulated river sources to be lifted on the same day, these water sources were subject to a temporary water restriction made before the approach to include 'approval to take' provisions was adopted.

Therefore, restrictions in these river sources were not lifted until Tuesday 25 February 2020, because of the time required to prepare and publish the order to repeal the relevant restriction in the NSW Government Gazette.

However, not having the ability to effectively and responsively manage flows embedded in the legislative framework or any government policy means it is difficult to ensure a consistent application of decision-making frameworks, and the process is not transparent or necessarily subjected to a rigorous public process before being relied upon.

In 2017, the Australian state and territory governments developed a module to the National Water Initiative (NWI) Policy Guidelines for Water Planning and Management entitled '`[172] to provide guidance to jurisdictions on how to consider and incorporate possible impacts from climate change and extreme events in water planning and management (the NWI Module). That states:

> Climate change projections indicate that drought frequency and severity is likely to increase in southern Australia (CSIRO and BoM, 2014; CSIRO and BoM, 2015b). It is important for water planning and management frameworks to consider the potential for the frequency and/or intensity of droughts to change in the future. For example, events that were once considered extreme may occur more regularly. Suspending water plans may be appropriate in the most extreme circumstances, yet this approach should not be relied upon for frequent events due to the large disruptions and uncertainties for water users.[173]

Temporary water restrictions made under section 324 orders effectively 'suspend' the normal operating rules of Water Sharing Plans. Therefore, in light of the likely increase in drought

[172] Available at https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/water/climate-change.pdf

[173] National Water Initiative (NWI) Policy Guidelines for Water Planning and Management, *'Considering Climate Change and Extreme Events in Water Planning and Management Module 2017* at section 3.2, page 35

frequency and severity, the Panel considers that it would be appropriate to start to incorporate more specific first flush rules into the water management framework. As stated in the NWI Module:

> It is important for water plans to describe how water resources will be managed during extreme events to allow water users and managers to respond should these events occur. Improving the transparency of the decision-making process will assist in a timely and efficient response during extreme events, and help avoid delays caused by the need to amend or suspend water plans.[174]

The reliance on section 324 orders relies on the courage of the decision-makers of the day to make conscious decisions to protect the first flows after extended dry periods, and the burden of making the 'right' decisions falls solely on their shoulders. This is not an ideal situation for the community, water users or agencies.

As of 1 July 2020, clause 50 of the *Water Sharing Plan for the Barwon-Darling Unregulated River Water Sources 2012* sets out a 'resumption of flow rule'. This rule prevents the take of water after an extended dry period. The incorporation of this rule will obviate the need for a section 324 order to be used to manage some first flows, but, without further evidence and a comparison of scenarios, the Panel is of the view that this rule alone will not be sufficient to manage all first flush events.

All sectors of the community who undertook the public feedback survey, made written submissions and were represented on the Water Users Reference group for this assessment have supported the inclusion of rules to manage first flush events in Water Sharing Plans. A written submission from AGB Farming, located in the northern Basin, stated that "*NSW Water Sharing Plans have been developed over years of consultation with stakeholders, communities and agencies and are the best effort to serve the wider community's best interests*".[175] Another submission said they "*believe that the Water Sharing Plans are the best regulatory instruments for managing first flush events – as is evident with the new provisions in our Barwon-Darling Water Sharing Plan.*"[176]

The Panel agrees with this proposal, in principle. But in practice, full incorporation of first flush management (including detailed rules and specific targets) into all required Water Sharing Plans will take years. In addition, the evidence base and experience is currently insufficient to provide confidence that all targets which would need to be set in Water Sharing Plans will achieve the outcomes required to most effectively meet the competing needs across the Basin in times of drought.

For example, a key element to determine the requirements to meet critical water needs after an extended dry period is understanding the amount of water required to refill pools and wet up sections of river channels. However, this varies greatly based on antecedent conditions. Three times as much water was required to refill pools and wet up sections of river channel between Collarenebri and Brewarrina during the Northern Fish Flow as compared to the Northern Connectivity Event, simply because conditions prior to the Northern Fish Flow were much drier than for the Northern Connectivity Event. The current understanding of these matters is limited.

On this basis, the Panel considers that, in the first instance, a similar decision-making approach taken to managing the 2020 Northern Basin First Flush event (with greater rigour, and informed through consultation with water users, Traditional Owners and communities) should be embedded in the WM Act, Extreme Events Policy, Water Sharing Plans and Incident Response

[174] National Water Initiative (NWI) Policy Guidelines for Water Planning and Management, *'Considering Climate Change and Extreme Events in Water Planning and Management Module 2017* at section 3.2, page 34-35

[175] Written submission from AGB Farming dated 8 August 2020.

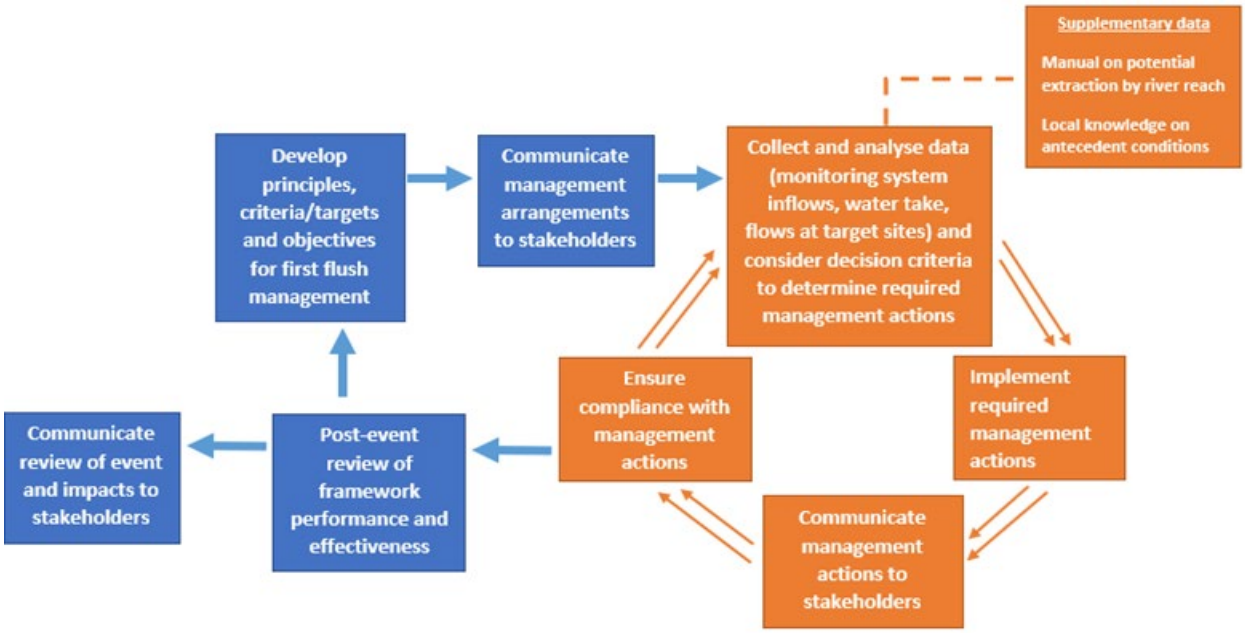
[176] Written submission from Barwon-Darling Water dated 9 August 2020.

Guides, to reduce the current reliance on event based section 324 orders, and improve transparency and predictability for Traditional Owners, communities and water users. Over time and with experience, more rules can be incorporated into Water Sharing Plans.

This process of embedding first flush arrangements in the regulatory and policy framework will provide an opportunity to improve current levels of understanding of connectivity, and its implications, across water users and the community, and the necessary resolution of the issue of 'who bears the risk' when all water users, communities and the environment across the state are in need. As stated by the NWI Module:

> Abrupt changes in water availability due to extreme events may impact how objectives in water plans are realised. Water plans contain economic, social and environmental objectives, and reductions in water availability may result in a trade-off between consumptive, social and environmental uses. In developing water plans it is important that the basis of any potential trade-off as a result of extreme events within a water planning period is clearly articulated.[177]

Separately, irrespective of the regulatory and policy framework adopted to manage first flush events, the Panel considers that the 2020 Northern Basin First Flush event provided enough experience to indicate a system that would lead to improved first flush management. That system relies on thorough planning and preparation before a first flush event, clear communication of management arrangements to water users, Traditional Owners and communities, and putting processes in place to ensure that the best available evidence is available to decision-makers when an event is unfolding. A diagram of the suggested system is set out below. Blue boxes indicate steps undertaken outside of the event. Orange boxes indicate steps undertaken during an event. As far as practicable, management actions should be communicated prior to being undertaken, and progress of flows and the achievement of targets should be communicated as the event unfolds.



[177] National Water Initiative (NWI) Policy Guidelines for Water Planning and Management, *'Considering Climate Change and Extreme Events in Water Planning and Management Module 2017* at section 3.1, page 33

The suggested changes to first flush management are reflected in the recommendations set out in Chapter 10 of this report, including an example of the types of matters that could be incorporated into the WM Act, Extreme Events Policy, Water Sharing Plans and Incident Response Guides. Any framework adopted must be developed in consultation with water users, regional communities, Traditional Owners and Indigenous communities.

The Panel understands that the benefits that would arise from embedding first flush management more thoroughly into the legal and policy framework (such as improving the ability for water users and managers to respond to extreme events, improving the transparency of decision-making processes and avoiding delays) could be achieved through other means. The same work can be done to consult with water users, Traditional owners and communities, understand, decide and articulate the trade-offs, and set out the actions that will be taken in a clear policy framework that supports use of temporary water restrictions made under section 324 of the WM Act.

However, the value of going the further step of embedding rules into the legal and policy framework (as the Panel suggests) is that it provides the extra element of certainty, requires the conversation to be had and the matters to be resolved, and reduces the risk of politicisation of the decisions during an event.

10. Recommendations

The Panel makes the following ten recommendations to improve the management of first flush events in the future.

1. **Develop first flush arrangements, in consultation with water users, Traditional Owners and communities, that clearly articulate how connectivity within and between water sources in the Northern Basin, and critical human and environmental water needs, will be provided for during first flush events.**

The WM Act provides that, in relation to water sharing, first priority should be given to protecting the water source and its dependent ecosystems, followed by protection of basic landholder rights (including native title rights), and extraction under other rights must not prejudice those principles (section 5 (3) and 9 (1) of the WM Act). Critical human water needs are identified as a priority during times of severe water shortages and extreme events (section 60 of the WM Act). The Basin Plan also identifies the protection and restoration of connectivity within and between water-dependent ecosystems as an objective relating to the protection and restoration of the ecosystem functions of water-dependent ecosystems (at section 8.06 (1)).

Enabling connectivity within and between water sources is key if these provisions are to be adhered to, and connectivity must be a primary objective of first flush management in the Northern Basin if insufficient water is available to meet tributary and downstream critical water needs. However, the arrangements to meet downstream critical water needs, of necessity, also have to be reflective of and responsive to the ephemeral and intermittent flow nature of the rivers in the Northern Basin.

As recently noted by the NSW Supreme Court of appeal:

> The section 9 duty is one of imperfect obligation, to be exercised in the public interest, for purposes of serving a wide range of broadly expressed policy objectives of a character that overlap, conflict and are incommensurable with each other… in most decisions that apply to a large area, there are apt to be winners and losers... An element of compromise is necessarily

involved, e.g. between environmental flows and agricultural users, and this can occur in accordance with and promoting the water management principles.[178]

Accordingly, work must be carried out to determine and articulate the compromise that will inevitably need to be struck to create a clear framework for managing first flush events that provides both predictability and sufficient flexibility to respond to dynamic events. This includes:

- developing a clear definition of and quantifying 'critical water needs',
- developing clear triggers that will determine when first flush management arrangements commence, and when they cease to apply (reverting back to other water sharing rules)
- identifying the various valley, end of system flow and storage targets of a first flush event, and the principles to determine which of these targets will apply in a particular circumstance, and
- developing clear principles that will be used to determine when access to flows is permitted during a first flush event (including to clearly articulate how 'meaningful contributions' to downstream targets will be determined).

This further policy work is required to determine how competing needs across the system will be balanced, and what measures need to be in place in order to share risks transparently and equitably between water users and between communities along the length of the system, especially in times of drought.

2. **Incorporate learnings from the 2020 Northern Basin First Flush event into systems that will be used to manage any future first flush event that arises in the short term.**

Steps should be taken to immediately incorporate learnings from the 2020 Northern Basin First Flush event into systems that will be relied upon to manage future events.

Flow forecasting models should be updated with the latest information, including lessons on distribution efficiencies, travel times and the like for all Northern Basin rivers (including those in Queensland) from this and other events as identified in this independent assessment. Better models will improve flow forecasting capacity, which will in turn improve the ability to ensure that targets and objectives of first flush management are met as efficiently as possible and in a timely way.

DPIE-EES should also be involved in any future management of first flushes. Measures should be taken in these planning stages to resolve any potential or perceived conflict of interest.

As a priority, the Panel recommends that DPIE Water and WaterNSW undertake and publish a comparison of what outcomes would have been achieved if temporary water restrictions were not put in place in early 2020, to demonstrate what could and could not have been achieved by managing flows under existing Water Sharing Plan rules during the course of the 2020 Northern Basin First Flush event. The Panel understands that there are some Water Sharing Plan rules (based on the 1992 Interim North West Flow Plan) that have not been implemented due to flow forecasting and other difficulties and are to be reviewed. The Panel believes the comparison should reflect the actions that would have been reasonably taken by water managers progressively in February to April, if the restrictions were not in place. This comparison analysis will provide a better understanding of the extent to which current arrangements provide for connectivity and meet critical water needs in extreme circumstances, and may lead to refinements to the objectives, principles and targets used to manage a future first flush event.

[178] *Randren House Pty Ltd v Water Administration Ministerial Corporation* [2020] NSWCA 14, Leeming JA at [135]-[136], [124] and [139].

More generally, those objectives, principles and targets should also be re-assessed based on the outcomes they achieved, and expanded to cater for different scenarios, such as cumulative events. The framework should be improved to reflect the most up-to-date understanding of what capacity each valley has to meaningfully contribute to downstream targets, including by having regard to channel constraints. Consultation with water users and communities will, in some cases, be the most efficient means of starting to obtain this information.

The revised objectives, principles and targets should be further refined with feedback from water users and communities, Traditional Owners and Indigenous communities, so that constructive feedback can be considered and incorporated into the framework to be adopted for managing any first flush events in the near future.

Seeking feedback on methodologies and targets is not an opportunity for outcomes to be 'negotiated'. Ultimately, the Panel recognises it will be extremely difficult to achieve full consensus between all water users and communities. However, as reinforced by Ken Matthews in his final report, it is critical for concerns to be considered carefully and respectfully, and there must be equitable access to information and the views of different stakeholders and interested and affected parties. The consultation approach should enable and encourage access to the full range of those parties, and clearly address questions and answers about why certain targets, or approaches are or are not considered appropriate, to enable an informed discussion of these matters.

3. **Ensure the evidence base and methodology for first flush management is quantified, science-based and made publicly available.**

As has been largely done to date, the basis for first flush management must be undertaken with a clear methodology and based on the best-available scientific data. Clear hydrological triggers for initiating first flush events (as referred to in Recommendation 1) should be science-based, consistent with the relevant legal framework and linked to community and environmental objectives.

Quantifying the requirements to meet critical water needs will be essential in providing this transparency. DPIE Water should develop a transparent methodology to assign a volume to town weir pool requirements, other town water requirements relevant to critical human water needs and basic landholder rights (including native title rights), and cultural flows to the extent that they fall within critical water needs for the purpose of first flush events. Reasonable use guidelines may assist in quantifying domestic and stock rights, and harvestable rights also need to be accounted for.

Further, DPIE Water should actively work with Traditional Owners and Indigenous communities to better understand and address barriers to effectively practicing cultural activities during these types of flow events, particularly in relation to statutory and other barriers to accessing water. This will require a commitment from the Government to implement actions that will make a real difference to access to water for Traditional Owners and Indigenous communities. DPIE Water should build on its relationships with Traditional Owners and Indigenous communities across the Basin that have been established through engagement programs such as the First Nations Water Resource planning program (including with the Northern Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations) and continue engagement through the development of Regional Water Strategies, Water Sharing Plans, as well as projects and negotiations relating to native title.

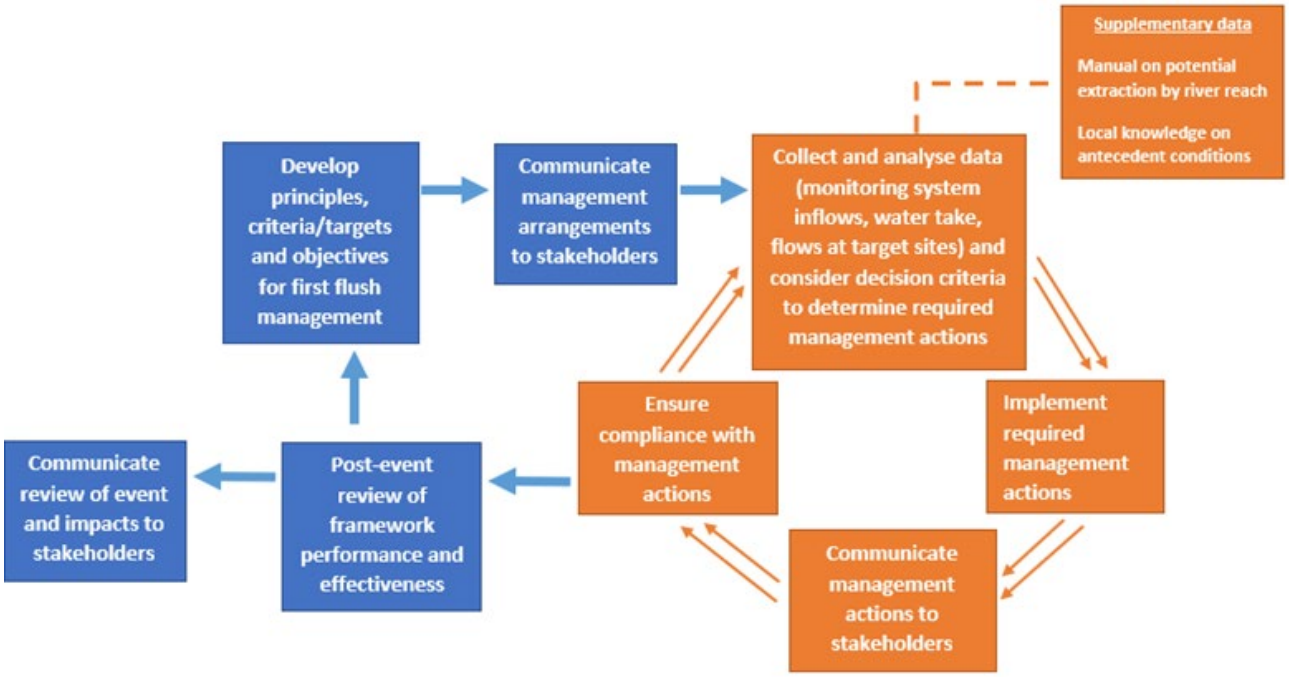
An outline of this evidence base should be published to develop confidence that decisions will be made based on the best available information. Advance publication will enable the information to be constructively criticised and properly understood, before it needs to be relied upon. It should explain and document, in simple terms, for example:

- how forecasting is carried out,
- those aspects of forecasting and modelling that rely on imperfect information, and what steps (if any) can be taken to address those imperfections,
- approximate contribution of upstream valley flows to flows in the Barwon-Darling, and
- potential volumes of extraction for each river reach and floodplain.

This information should be updated as legal or environmental factors, best available data or preparedness to manage a first flush change.

4. **Review and update incident management systems for managing first flush events.**

Incident management systems should be reviewed and updated to address deficiencies highlighted by the 2020 Northern Basin First Flush event, to better deal with any first flush events that arise in the short term. The system should reflect the elements in the following diagram.



Note: The blue boxes indicate steps to be undertaken outside of the event, and the orange boxes indicate steps to be undertaken during an event. As far as practicable, management actions should be communicated prior to being undertaken, and progress of flows and the achievement of targets should be communicated as the event unfolds.

Each boxed element should be accompanied by procedures that articulate how that step will be carried out, and the procedures should be available to water users and the community to provide transparency and predictability about how first flush events will be managed.

WaterNSW has incident management capabilities including communication arrangements, event escalation/de-escalation frameworks, operational procedures and roles and responsibilities protocols with other key agencies including the BoM, the SES, Sydney Water and NSW Health (arising from its need to manage risk across its assets for flood and water quality). This capability should be expanded, in collaboration with DPIE Water, to provide an incident management framework that can be used to manage first flush events.

Most importantly, an improved communications plan should be developed which, in addition to the information set out in guidance materials:

- identifies measures to ensure that all key stakeholders are notified of or know how to access relevant information at the relevant times (for example, in a manner similar to the way that supplementary access announcements are made),
- sets out methods to more clearly communicate restrictions and subsequent lifts to water users and communities, so they are understood in practical terms. For example, by maps with sufficient detail for individual landholders to determine their rights and obligations. This is essential to enable both compliance by water users and compliance action by NRAR, if required,
- identifies measures to manage the flow of information between decision-makers, water users and communities during an event. It may be appropriate to identify local staff, or in the absence of local employees, contracted government officers from other agencies, who can be on stand-by for these purposes,
- recognises the role that peak bodies can play in assisting with communication flows during first flush events. In the 2020 Northern Basin First Flush event, industry peak bodies played a key role in communications. The incident management process should recognise this, and optimise relationships with all peak bodies, and with Traditional Owners and Indigenous communities. No one group should have a monopoly on access,
- provides for regular public updates about a first flush event to be published. Maps could be used to show the actual and forecasted progress of flows throughout the system, and indicate the objectives and targets achieved along the way. Updates published by the CEWO in respect of the Northern Fish Flow and Northern Connectivity events are a good model for such updates. While it is not reasonable to expect the same quality of updates to be prepared for uncontrolled events as those prepared for controlled and planned regulated release events, accessible, predictable and regular updates drafted in plain English will enable water users and the community to understand the reasons for decisions in the context they are being made, rather than decision-makers being forced to justify their actions after the event. Information on progress as water travels the length of the system will assist in appreciating the rationale behind the exercise,
- identifies a contact for media and stakeholder inquiries, and
- provides for the timely publication of water balance information and information outlining the outcomes of an event, after it has finished. This is key to building community trust in NSW water management and demonstrating commitment to continuous improvement.

These updates to the incident management framework should aim to enhance community understanding of water management and provide information in a way that is accessible and meaningful to communities.

5. **Until there are further provisions for first flush event management embedded in the regulatory and policy framework, publish guidance materials which outline how the NSW Government will use temporary water restrictions to manage first flush events.**

The current drought is not over. Therefore, it remains very likely that some future inflows will still need to be protected to meet critical water needs before any steps can be taken to incorporate rules into the regulatory and policy framework.

The NSW Government should take immediate steps, including to begin consultation with water users, Traditional Owners and communities, to develop guidance materials which provide increased transparency and confidence around how temporary water restrictions may be used to manage first flush events, including how floodplain harvesting will be managed in first flush events.

Water users, Traditional Owners and communities should know in advance who will be doing what, what will be expected of them, how they can find out information, and who they should

contact with questions. This will give water users, Traditional Owners and communities time to prepare for first flush management and to sign up to relevant platforms to be up-to-date with necessary, accessible and understandable information. Enhanced use of digital platforms and social media should be considered, noting their effectiveness based on the public feedback survey results.

The guidelines should outline:

- general information about the use of section 324 orders to manage a first flush event, including:
    - what temporary water restrictions are and what they do,
    - how they may be used to manage first flows,
    - factors a decision-maker could consider in deciding whether to impose or lift a restriction,
- information about how restrictions will be communicated to the public during an event, including:
    - how the public and/or water users will be informed if and when a water restriction needs to be imposed or lifted,
    - where water users and the public can go to find out information during a first flush event,
    - the person/entity water users and the public can contact if they have questions during an event,
    - the media spokesperson(s),
- how a first flush event will likely be managed, including:
    - who will be responsible for what,
    - the general objectives, principles and targets that will be used to manage the event, and how these were developed (or are still being refined),
    - an outline of the evidence base that will be used to manage the event (and how this is being refined), and
    - what and when monitoring, evaluation and reporting will be carried out, and when and how this information will be made publicly available.

Guidelines should be kept up to date, to ensure they reflect any changes in responsibilities and improvements in incident management systems.

6. **Make any temporary water restrictions required to manage first flush events on a proactive basis (that is, before rain is forecast).**

If conditions require first flows to be protected to meet critical water needs (or high priority water needs), then temporary water restrictions, adopting responsive management provisions, should be published proactively, rather than waiting for rainfall to be forecast. This, coupled with the guidance materials set out in recommendation 5, will provide water users, Traditional Owners and communities the ability to plan their activities and minimise any potential adverse effects of restrictions. It will also minimise potential work health and safety risks for NRAR officers carrying out compliance activities, in circumstances where there could otherwise be high levels of angst amongst water users and in the community. This approach should be taken in combination with the use of real-time management of flows and ensuring effective and timely communications during an event.

7. **Embed the management of first flush events in the regulatory and policy framework for managing drought.**

The Panel is of the view that the approach used to manage the 2020 Northern Basin First Flush event had a number of elements that would be appropriate to incorporate into longer term regulatory and policy instruments. Key issues were the lack of engagement, inadequate communication and a lack of transparency which ultimately led to unpredictability for communities and water users. That is not an ideal outcome. From a water management point of view, sole reliance on event-based temporary water restrictions to manage first flush events does not provide the requisite certainty that, after extended dry periods, first flows will be protected to meet critical water needs. From a resourcing and effectiveness point of view, it increases the risk that valuable lessons from previous first flush management will be lost due to the passage of time between first flush events (particularly in light of the increased occurrence of government restructures and staff turnover). And from a staff welfare point of view, relying solely on temporary water restrictions places a great burden and responsibility on agency staff of the day to make very difficult, discretionary decisions in a highly charged environment.

Therefore, the Panel recommends that elements of the approach similar to some of those used to manage the 2020 Northern Basin First Flush event, but with greater rigour and informed by consultation, be embedded in the WM Act, the Extreme Events Policy, Water Sharing Plans and Incident Response Guides, to reduce the reliance on temporary water restrictions and improve transparency and predictability. This is not to suggest a rewrite of current Water Sharing Plan rules, but instead, extension of the current plans to deal with the increasing occurrence of extended dry periods and, as a consequence, first flush events.

The Panel recommends that in the first instance, first flush management is incorporated using a combination of ‘hard’ (imposed by law) and ‘soft’ (imposed by policy) requirements. Experience in first flush management across the whole of the Northern Basin is currently limited, and the current understanding of connectivity in the Northern Basin is limited. Therefore, hard wiring targets (numbers) into legal instruments, at present, would risk compromising environmental, social, cultural and economic outcomes. In the first instance, the process for managing first flush events could be better embedded into the legislative and policy framework, to reduce reliance on temporary water restrictions made under section 324 of the WM Act.

As outlined in the table below, the objectives for first flush management could be incorporated into the WM Act, given their Basin-wide application and that they derive from existing statutory obligations. The principles for allowing access could be included in the Extreme Events Policy, given their general application, level of detail and the likely need for the principles to be adjusted with time and experience.

Water Sharing Plan rules could establish the circumstances in which ordinary access rules are varied having regard to an extended dry period, and a process for how first flows are managed in those circumstances. This process could include the matters that need to be considered when setting targets, and how water users and the community will know when take is restricted or permitted.

Finally, Incident Response Guides could be used to provide clarity on the targets required to meet critical water needs as communities move in and out of stages of drought. Regular situation reports and updates will be required throughout the drought, both going into and coming out of the drought, with contingency actions, if those values are insufficient. An example of how the first flush management could be embedded into the regulatory and policy framework is set out below. Any framework adopted must be developed in discussion with communities, Traditional Owners and Indigenous communities and water users, and after the work outlined in recommendation 2, comparing the outcomes of the 2020 Northern Basin First Flush event with what would have happened without the restrictions, has been completed and published.

What will be set out?	Rationale	Example
WM Act		
● Objectives for managing first flush events ● Requirement for Water Sharing Plans covering the Murray Darling Basin to include rules for first flush management which must provide, to the extent practicable, for: ○ connectivity within and between water sources, and ○ the protection of critical water needs.	The objectives for first flushes should be consistent across all areas of the Basin and given their broad nature, should not change over time. They should also be tied to the existing legal requirements under the WM Act and the Basin Plan 2012.	Objective of first flushes ● meet critical human water needs – provide flow locally and downstream, particularly to replenish town water supply weir pools and provide water supply for basic landholder rights (native title, stock and domestic and harvestable rights) and cultural flow requirements that fall within critical water needs ● meet critical environmental water needs – provide flow along the length of the river systems to ensure re-connection of rivers and drought refuge pools.
Extreme Events Policy		
● Scope to be expanded to explain how water will be managed as intensity of drought reduces, as well as increases ● Principles for allowing access to flows in first flush events	The principles for allowing access to flows should be consistent across all areas of the Basin. However, given the level of detail and likely need to adjust these with time and experience, it is not appropriate to embed these in the WM Act.	**Principles** ● Consider providing access to upstream water users under normal rules if the nearest downstream targets are met or forecast to be met ***and*** there is an assessment that this event will not meaningfully contribute to meeting any other downstream targets.[179] ● Where an event is predicted to meaningfully contribute to meeting the next downstream target, the temporary water restriction should not be lifted ● When an event has met local targets and is no longer expected to contribute to meeting downstream targets or is in excess of that required to meet downstream targets, some local extraction relief could be allowed. ● Temporary water restrictions should apply to a consistent upstream network of both unregulated and regulated rivers systems in a valley, to provide sufficient volumes of water to meet critical water needs, avoid interceptions by extractors, and avoid inequitable sharing between users. ● Early relaxation of upstream access restrictions prior to downstream targets being met should only occur if there is very high confidence in downstream flow predictions meeting targets. ● When flow predictions are used for early relaxation of restrictions on upstream access, river system distribution efficiency assumptions must reflect the antecedent extended dry conditions
Water Sharing Plans		
● Describe and establish the point at which first flush rules kick in (triggers for first flush management) ● Describe the process to be followed to achieve the objective of first flush events in the relevant water source: ○ what critical water needs will be provided for	The procedure for managing first flush events should take into account unique local factors. Embedding this in Water Sharing Plans will provide transparency and certainty to water users and community members that relevant matters will be taken into account, and how the water source will	**Trigger for first flush rules** ● Normal access rules cease to apply when the decision-maker determines that a water source is in stage 4 drought ● Instead, access is only allowed by Ministerial announcement ● Generally, the decision-maker must not allow access unless satisfied that the requirements for the following critical water needs have been, or are forecast to be met: ○ stock and domestic watering (under basic landholder rights)

[179] Noting that the concept of 'meaningful' needs to be properly defined, as referred to in section 7.3 of this report.

What will be set out?	Rationale	Example
○ what local factors are to be considered (e.g. channel capacity) ○ how requirements for the critical needs (targets) are to be quantified ○ how it will be known when take is restricted or permitted ● Require Incident Response Guides to set out critical water needs at each stage of drought	be managed. Embedding triggers for first flush management will ensure that Water Sharing Plans are better equipped to deal with drought scenarios and will avoid the need for section 324 orders to override Water Sharing Plan rules. Implementation will require quantifying native title rights and cultural water requirements and developing reasonable use guidelines where applicable	○ native title rights and cultural flow requirements that fall within critical water needs ○ town water supply for X years ○ the critical environmental needs in the specific water source ● However, access may be permitted where the decision-maker is satisfied that access will not compromise the ability to provide for critical in-stream or downstream needs ● The decision-maker is to determine the requirements to meet critical water needs having regard to: ○ Long term water plan ○ Antecedent conditions ○ Advice from a local committee Announcements are to be published on XX website at YY time.
Incident Response Guides		
Updated based on the Water Sharing Plan process at each stage of drought to identify ● What are the specific needs for the Water Sharing Plan area? ● What are the current antecedent conditions? ● What are the targets (numbers) required to meet the specific needs, based on the antecedent conditions? ● how first flush targets can be modified during an event if circumstances warrant	Provides transparency to targets but enables best available evidence to be taken into account at the time it is required.	**Example targets to meet critical water needs** As at [insert date]: ● River Gauge A: XW ML ● River Gauge B: XY ML ● River Gauge C: XZ ML

As experience and evidence grows over time, more details can be moved from policies into Water Sharing Plans, enhancing certainty for water users, Traditional Owners and communities, and decision-makers.

Embedding first flush rules in Water Sharing Plans may lead to questions of compensation that will need to be addressed. In these circumstances, it would be appropriate to review the risk sharing provisions of the National Water Initiative.

8. Improve flow forecasting modelling and real-time monitoring capability, including measurement of extractions and the hydrometric system for inflows and monitoring end of system flows

In a world first, the NSW Government used LiDAR sensor technology to estimate the volume of floodplain harvesting captured in private water storages in the Northern Basin valleys during the 2020 Northern Basin First Flush event. New requirements for non-urban water metering (including telemetry) and floodplain harvesting measurement are in the process of being rolled out.

Further, WaterNSW is currently:

- completing and integrating its eWater Source model for the Barwon-Darling to support and integrate with the CARM (Computer Aided River Management) operational model,

- using a hydrodynamic model incorporating LiDAR and recent bathymetric surveys to improve forecasting of distribution efficiencies in the future and assist in forecasting flows along the river, especially during low flow periods, and
- developing hydrodynamic models of the Barwon-Darling river system, using detailed topographic data to improve understanding of channel dynamics/storage and floodplain flow.[180]

Increasing the capability for real-time monitoring of flows and extractions and improving the general understanding of flow behaviour at both low flow and high flow scenarios is essential to improving management of first flushes. This will require:

- a better understanding of the extent to which various tributaries and floodplains contribute to downstream systems, both generally and also if existing Water Sharing Plan rules that contribute to connectivity are applied,
- a better understanding of the location and nature of physical constraints that may provide opportunities for access during first flush events, and
- timely implementation of the non-urban water metering reforms.

As identified in the independent review by Barma Water Resources of WaterNSW's flow forecasting model used for the 2020 Northern Basin First Flush event, the forecast model could be improved by installing gauges on currently ungauged large local contributory sub-catchments (in particular those in the Namoi and Gwydir catchments), and linking information on real-time extractions, future orders, and installed or authorised pump capacities to the forecast model.

NSW must also work closely with Queensland to improve the monitoring and forecasting of flows entering NSW from Queensland, by putting in place more formal procedures to enable NSW to obtain timely forecasts of flows expected across the Queensland/NSW border, based on flows and extractions in Queensland water sources.

Improving the quality of information built into forecasting models such as regarding extractive capacity in different management zones, contributions of valleys to downstream flows and clarity about the targets that have to be met at each point down the river system will improve the likelihood of being able to confidently protect flows for critical water needs and permit flows to be extracted in the north of the system.

Timely implementation of floodplain licencing, measurement and reporting is essential to improve current floodplain harvesting data gaps.

9. Current (and future) reform programs should be accompanied by clear implementation plans, and the Government should publish regular reports of progress against all those implementation plans, on a collective basis.

A number of programs already in place will, when implemented, lead to strong benefits to improved first flush management. This includes the efficient roll out of metering and telemetry requirements and work to improve the understanding of connectivity across the Northern Basin. Bringing floodplain harvesting into the full regulatory, monitoring and compliance framework is also an essential element of the way forward. On the other hand, delays will exacerbate the community's lack of trust in the management of water in NSW and will result in unsatisfactory first flush outcomes.

However, the 2020 Northern Basin First Flush event demonstrates that it is not enough to just state the intent to improve management and protection of water resources, and in some cases,

[180] See written submission of WaterNSW dated 14 June 2020.

it is not even enough to just take action to improve management and protect water sources. Effective communication of those actions is also an absolute necessity.

Levels of both water literacy and confidence in NSW water management are low. There is a lack of faith that any real changes are being, or will be made, and thus a lack of trust in what is done. Traditional Owners and Indigenous communities are particularly frustrated that engagement efforts have not translated to real outcomes.

These sentiments are reinforced by the lengthy implementation processes currently in place, or needed to deliver reforms in the complex area of water management. In some cases, the reforms simply take time. Therefore, progress should be regularly updated and communicated to the public, so it is not confused for inaction. Communities need to be confident that the Government is going to do what it says it will do, when it said it would do it. And if circumstances change and timeframes can't be met, this information also needs to be communicated in acknowledgement of the Government's accountability to the public.

This kind of reporting needs to be truly accessible, not just available. There should be collective, regular reporting on the progress of water reform implementation programs (e.g. every six months) to demonstrate accountability, the positive progress being made to improve water management, and enhance water literacy in the community. The Government could also consider having these progress reports independently reviewed, if it would assist to promote transparency and rebuild trust in water management.

10. Improve and resource communication coordination and capability.

Water regulation is a complex science. The current labyrinth of information is an additional and significant barrier to improving water literacy within communities. Trust in water management needs to be rebuilt, and this can be facilitated by making information more accessible, authoritative and understandable, not simply available.

Getting the balance right requires the engagement of all interested and impacted parties across the community. Communities cannot engage in an informed discussion without information. The issues are complex enough, without the added burden of misinformation and a lack of transparency.

For this purpose, the Panel recommends that the Department establish a water reform engagement group which includes the full spectrum of interested and impacted parties, including irrigator, Indigenous, environmental, community, local government, floodplain graziers and riparian water users from both the Northern and Southern basin. The group should provide advice to the Minister and Department on the development and implementation of water reform. A group of this nature may provide the opportunity to reduce the 'consultation fatigue' experienced by many parties, improve the coordination of reform projects by centralising consultation activities, and enhance the development of a shared understanding of the difficult and complex aspects of water management.

Engagement and communication programs, including those that encompass the water reform engagement group, also need to respond to and respect the information needs and engagement protocols of Traditional Owners and Indigenous communities, recognising that they, and native title holders in particular, "*are rights-holders, with cultural rights and responsibilities for management of water on their Country, not 'stakeholders' or people with a 'general interest in water'*".[181]

There needs to be one point of truth for information. The Panel is aware that some work is already underway at the Commonwealth level to develop a 'one-stop shop' for water

[181] See written submission of Murray Lower Darling Rivers Indigenous Nations dated 14 August 2020.

information. Nevertheless, useful and helpful work can still be progressed now to improve the quality and accessibility of communications. The WaterInsights portal maintained by WaterNSW already contains substantial information, and this platform may be further developed to meet this need.

There is a particular gap in the availability of:

- introductory information about water management. There would be significant value in developing a range of induction manuals targeted at different groups, accessible to the community and new participants in the water sector,
- information outlining how various water reform projects interact with each other (collective reform reporting outlined in recommendation 9 may assist in communicating these interactions), and
- overview information about how floodplain harvesting is regulated.

Importantly, information must be tailored to suit different audiences - Traditional Owners and Indigenous communities, those with a general interest in water, and those who require more detail to properly plan commercial activities. And it needs to be accessible, not just available - easy to find, and easy to understand - particularly for contentious issues such as floodplain harvesting, northern basin flows, and work being completed to improve the understanding of these issues.

Improving the quality of communication will require additional resources, but it is an investment that can lead to returns across the board for water management.

Finally, regulatory changes must be communicated to the public before they commence. Floodplain harvesting remains a very contentious issue,[182] but in the context of the 2020 Northern Basin First Flush event, it has been compounded by insufficient communication (in particular, that the floodplain harvesting exemption regulation was being made and that floodplain harvesting would be prohibited by temporary water restrictions). The current level of mistrust in NSW water management, and the importance of water management to the community, means that regulatory changes cannot go unannounced.

[182] See written submissions of the Inland Rivers Network dated 7 June 2020, the Nature Conservation Council dated 9 June 2020 and Justin Field dated 31 July 2020.

11. Closing

Prior to the 2020 Northern Basin First Flush event, real-time management of uncontrolled flows (including restrictions on floodplain harvesting) to provide for critical water needs throughout the Basin was a new approach to managing water for the NSW Government, particularly at the scale of the Northern Basin. Further, the event took place at a time when a number of key reforms, essential to enabling effective real-time management, are still being implemented.

Some areas identified for improvement throughout this assessment are a result of limitations in current datasets, tools and systems for such real-time management. These are known deficiencies in current water management capabilities and a number of them are the subject of programs already in development, or in the process of being implemented. Some of these will not yield the benefits they seek to achieve for some time. Other areas for improvement are the result of inexperience in managing events of this nature, and the finite nature of resources to deal with what can often feel like an infinite number of unresolved issues.

The Panel has not prioritised its recommendations based on importance or estimated the costs of the measures set out in its recommendations. This will inevitably have to be considered by the NSW Government. There are benefits and costs in the pursuit of perfect data, perfect information, perfect communication and perfect regulatory frameworks. The question of who pays the costs, and for whose benefit, must also be considered.

The Panel is mindful that resources are limited, and therefore it would not be practical, realistic or sensible to expect prioritisation of a significant reform program to achieve a gold standard of first flush management in the immediate future. These are circumstances that, by definition, are not the norm.

However, in the face of climate change, the occurrence of cease to flow events is increasing. While the 2020 Northern Basin First Flush event ultimately led to some wonderful outcomes for the environment and Basin communities in critical need, the NSW Government must take steps to avoid a repeat of some of the aspects of the 2020 Northern Basin First Flush event in the interests of agency staff, Basin communities (including Traditional Owners and Indigenous communities) and water users. Sufficient resourcing will be required to make these changes.

The Panel recognises the need to focus the use of limited resources on those efforts that will provide the greatest value in that they will support both first flush management and other areas of water reform. Therefore, the recommendations of this report seek to optimise and reinforce the importance of work already planned and/or already in the process of being implemented. With this in mind, a suggested timetable for actions to implement these recommendations, is provided for consideration by the NSW Government. This timetable is set out at Appendix L.

Over the course of this assessment, the Panel observed a strong appetite for improving first flush management, across government agencies, water users and communities. It is hopeful that taking prompt action consistent with the recommendations of this report will achieve that objective.

Appendix A – Terms of Reference

INDEPENDENT ASSESSMENT OF THE MANAGEMENT OF THE NORTHERN BASIN FIRST FLUSH EVENT

The NSW Government has requested an independent assessment of the management of the first flush event following the 2018/2019 drought in the Northern Basin.

The review will be conducted by an independent panel including Wendy Craik and Greg Claydon, and informed by public consultation with industry, environmental, Aboriginal and town water supply representatives, and experts in incident management.

Objectives of the Assessment

The objectives of the assessment are as follows:

1. Provide transparency about the decision-making processes that were used to manage the event under the *Water Management Act 2000*.
2. Recommend strategies to improve the management of first flush events under the *Water Management Act 2000* in the future, including:
   (a) system and process changes which would improve the management of a first flush event by Department of Planning, Industry & Environment – Water (DPIE Water), the Natural Resources Access Regulator (NRAR) and WaterNSW, and
   (b) regulatory, planning or policy changes (including to relevant Water Sharing Plans) which would improve the management of a first flush event.

How the Assessment is to be carried out

In undertaking the assessment, the independent panel should review and consider:

- the DPIE Water, NRAR and WaterNSW planning, systems and processes that were used to manage the event, with particular regard to:
  - decision making processes, including the availability of information and evidence to support decision-making pursuant to the public interest test (including, but not limited to, information to assist in forecasting inflows from Queensland tributaries)
  - communication with water users, the general public and between agencies
  - the resourcing and incident management capability of DPIE Water, NRAR and WaterNSW (including risk management and WHS implications)
- the extent to which management of the event satisfied relevant aspects of the NSW Government's response to the Independent investigation into NSW water management and compliance by Ken Matthews (being the NSW Government water reform action plan[183]) and the Vertessy report and the Natural Resources Commission's review of the Barwon-Darling Water Sharing Plan[184]
- the effectiveness of the current and proposed regulatory and policy tools for managing a first flush event
- any other matters the Panel considers relevant to achieving the objectives of the assessment.

[183] Available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0016/136204/nsw-government-water-reform-action-plan.pdf

[184] Available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/279080/NSW-Government-response-to-NRC-report.pdf

The independent panel should also:

- conduct interviews with relevant NSW and Commonwealth agencies
- obtain the advice of key industry, environmental, Indigenous and local government stakeholders via a water user reference group
- engage and seek advice from relevant experts (as required)
- provide a draft report to the Secretary of the Department of Planning, Industry & Environment by 30 June 2020
- undertake public consultation for and on the draft report[185]
- provide a final report to the Secretary of the Department of Planning, Industry & Environment no later than 31 August 2020.

The draft and final report of the independent panel will be released publicly.

Background

In mid-January and early February 2020, northern NSW experienced the first rainfall events following record drought conditions. A series of temporary water restrictions were introduced, including to restrict the take of water by floodplain harvesting works, to responsively manage the first flows and prioritise water security for critical human needs.

[185] Consultation will be carried out in accordance with relevant public health advice.

Appendix B – Panel Member Biographies

Dr Wendy Craik

Wendy has over 25 years' experience in senior roles in public policy, including as Commissioner of the Productivity Commission, Chief Executive of the Murray-Darling Basin Commission, President of the National Competition Council, Chair of the Australian Fisheries Management Authority and Australian Rural Leadership Foundation, Executive Director of the National Farmers' Federation and Executive Officer of the Great Barrier Marine Park Authority. She has been a director on a number of boards. Wendy is currently the Chair of the Climate Change Authority and a board member of the Reserve Bank of Australia and Australian Farm Institute. Wendy was invested as a Member of the Order of Australia in 2007 for service to the natural resource sector of the economy, particularly in the areas of fisheries, marine ecology and management of water reform, and for contributions to policies affecting rural and regional Australia.

Greg Claydon

Greg Claydon has extensive water industry and natural resources management knowledge, experience and achievements, built on his roles as a senior executive with Queensland and Western Australia state government water, environment and natural resources agencies. He is recognised at state, national and international levels for his work in water and natural resources reforms. Greg has been actively involved in several interjurisdictional water and natural resources initiatives, including those covering the Council of Australian Governments (CoAG), the Murray-Darling Basin, the Queensland/New South Wales Border Rivers, the Lake Eyre Basin, the Great Artesian Basin and the Ord River Basin. He also has specific professional experience in the design, construction, and management of irrigation, water supply and drainage schemes in tropical, sub-tropical and semi-arid environments. Greg has been a director on a number of boards and co-led an independent review of the NSW floodplain harvesting policy implementation in 2019. Greg was awarded a Public Service Medal (PSM) in 2009 by the Governor-General of Australia for outstanding public service in natural resources management and water reform.

Appendix C – Feedback from public submissions on the Panel's draft recommendations

Draft Recommendation	Feedback

1. Ensure that water management provides for and promotes connectivity within and between water sources.	• Supported in principle by:
	  ○ Jonathan Howard (7 August 2020)
	  ○ Murray Darling Association (7 August 2020)
	  ○ Victorian Department of Environment, Land, Water and Planning (DELWP) (15 August 2020)
	  ○ NSW Department of Planning, Industry and Environment - Water (DPIE Water) (14 August 2020)
	  ○ WaterNSW (27 August 2020)
	• Supported by the NSW Irrigators Council (7 August 2020) on the condition that further work is undertaken to better understand connectivity.
	• Supported by the Inland Rivers Network (9 August 2020) on the condition that further work on better understanding connectivity and the end-of-the-system is undertaken.
	• Supported by Robert and Katherine McBride (9 August 2020) on the condition that there is clarity on what this recommendation means and what it is trying to achieve.
	• Supported by the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) (17 August 2020) on the condition that the recommendation is strengthened to incorporate how it will address Water Management Act provisions.
	• Not supported by AGB Farming (8 August 2020) because connectivity has not been defined.

2. Make any temporary water restrictions required to manage first flush events on a proactive basis (that is, prior to specific forecasts of rain).
(Note: this is now Recommendation 6 of the final recommendations)
	• Supported in principle by:
	  ○ Jonathan Howard (7 August 2020)
	  ○ Inland Rivers Network (9 August 2020)
	  ○ Border Rivers Food & Fibre (9 August 2020)
	  ○ Lower Darling Pastoralist Group (9 August 2020)
	  ○ Robert and Katherine McBride (9 August 2020)
	  ○ DELWP (15 August 2020)
	  ○ DPIE Water (14 August 2020)
	• Supported by the Murray Darling Association (7 August 2020) on the condition that provisions to make temporary water restrictions are outlined in Water Resource Plans and align with Water Sharing Plans and Floodplain Harvesting Policy.
	• Not supported by AGB Farming (8 August 2020) because s324 orders are ad hoc, cause confusion and angst among communities and undermine trust in water management.

3. Until there are further statutory provisions for first flush event management, publish guidance materials which outline how the NSW Government will use	• Supported in principle by:
	  ○ Murray Darling Association (7 August 2020)
	  ○ Inland Rivers Network (9 August 2020) Namoi Water (13 August 2020)
	  ○ Lower Darling Pastoralist Group (9 August 2020)

Draft Recommendation	Feedback
temporary water restrictions to manage first flush events. (Note: this is now Recommendation 5 of the final recommendations)	○ Robert and Katherine McBride (9 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020)
4. Incorporate learnings from the 2020 Northern Basin First Flush event into systems that will be used to manage any future first flush events that arise in the short term, including by undertaking consultation with communities, Aboriginal people (in particular the Northern Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations) and water users on the objectives, principles and targets. (Note: this is now Recommendation 2 of the final recommendations)	● Supported in principle by: ○ Murray Darling Association (7 August 2020) ○ Lower Darling Pastoralist Group (9 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Robert and Katherine McBride (9 August 2020 ○ Namoi Water (13 August 2020) ○ MLDRIN (17 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ○ WaterNSW (27 August 2020)
5. Take steps to ensure the evidence base and methodology for first flush management is quantified, science-based and made publicly available. (Note: this is now Recommendation 3 of the final recommendations)	● Supported in principle by: ○ Jonathan Howard (7 August 2020) ○ Murray Darling Association (7 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Barwon Darling Water (9 August 2020) ○ Namoi Water (13 August 2020) ○ Lower Darling Pastoralist Group (9 August 2020) ○ Robert and Katherine McBride (9 August 2020) ○ Macquarie Food & Fibre (11 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ● Supported by Border Rivers Food & Fibre (9 August 2020) on the condition that a thorough analysis of existing Water Sharing Plan rules is undertaken.
6. Review and update incident management systems for managing first flush events. (Note: this is now Recommendation 4 of the final recommendations)	● Supported in principle by: ○ Cooke, Jones & MacMillan (5 August 2020) ○ Jonathan Howard (7 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Namoi Water (13 August 2020) ○ Murray Darling Association (7 August 2020) ○ WaterNSW (27 August 2020) ● Supported by Border Rivers Food & Fibre (9 August 2020) on the condition that Water Sharing Plans are not re-written.

Draft Recommendation	Feedback
7. Embed the management of first flush events in the regulatory and policy framework for managing drought. An example of the types of matters that could be incorporated into the WM Act, Extreme Events Policy, Water Sharing Plans and Incident Response Guides is set out in the table below. However, any framework adopted should be developed in discussion with communities, Aboriginal peoples (including the Northern Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations) and water users.	● Supported in principle by: ○ Jonathan Howard (7 August 2020) ○ Murray Darling Association (7 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Barwon Darling Water (9 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ● Supported by Cooke, Jones & MacMillan (5 August 2020) on the condition that Water Sharing Plans do not become a replacement or alternative for s324 orders ● Supported by the NSW Irrigators Council (7 August 2020) on the main condition that rules are positioned in Water Sharing Plans. ● Supported by AGB Farming (8 August 2020) on the condition that further investigation in undertaken on the potential impacts to water users ● Supported by the Lower Darling Pastoralist Group (9 August 2020) on the condition that connectivity is further considered, and the example Extreme Events Policy principles of the report are reviewed. ● Supported by Robert and Katherine McBride (9 August 2020) on the condition that connectivity is further considered, and the example Extreme Events Policy principles of the report are reviewed.
8. Improve flow forecasting modelling and real-time monitoring capability, including measurement of extractions and the hydrometric system for inflows and monitoring end of system flows.	● Supported in principle by: ○ eWater (6 August 2020) ○ Jonathan Howard (7 August 2020) ○ Murray Darling Association (7 August 2020) ○ AGB Farming (8 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Border Rivers Food & Fibre (9 August 2020) ○ Namoi Water (13 August 2020) ○ Lower Darling Pastoralist Group (9 August 2020) ○ Robert and Katherine McBride (9 August 2020) ○ Macquarie Food & Fibre (11 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ○ WaterNSW (27 August 2020)
9. Ensure that current (and future) reform programs are accompanied by clear implementation plans and regular communication of progress to the public.	● Supported in principle by: ○ Murray Darling Association (7 August 2020) ○ Border Rivers Food & Fibre (9 August 2020) ○ Namoi Water (13 August 2020) ○ Lower Darling Pastoralist Group (9 August 2020) ○ Robert and Katherine McBride (9 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ● Supported by the NSW Irrigators Council (7 August 2020) on

Draft Recommendation	Feedback
	the condition that the final report includes detail on the ongoing reforms currently being implemented by the NSW Government. ● Supported by the Inland Rivers Network (9 August 2020) on the condition that the recommendation be stronger regarding floodplain licencing framework timeframes.
10. Improve and resource communication coordination and capability.	● Supported in principle by: ○ Jonathan Howard (7 August 2020) ○ Murray Darling Association (7 August 2020) ○ Inland Rivers Network (9 August 2020) ○ Border Rivers Food & Fibre (9 August 2020) ○ Namoi Water (13 August 2020) ○ Lower Darling Pastoralist Group (9 August 2020) ○ Robert and Katherine McBride (9 August 2020) ○ DELWP (15 August 2020) ○ DPIE Water (14 August 2020) ○ WaterNSW (27 August 2020) ● Supported by MLDRIN (17 August 2020) on the condition that further detail on the information needs and engagement protocols of First Nations and native title holders are included in the final recommendation.

Appendix D – Government responses to Matthews inquiry, Vertessy report and NRC review

NSW Government Water Reform Action Plan (Response to Matthews reports)

What we are doing	How we will do it
Introduce best practice for water management	
Established a new Lands and Water division	Create a division solely focused on the management of land and water resources
Establishing a new regulatory framework for water management	Legislate to establish an independent regulator—Natural Resources Access Regulator (NRAR)
	Appoint an interim chief regulatory officer
	Appoint an independent board to oversee the NRAR
	Appoint a chief regulatory officer
	Develop and publish the Natural Resources Access Regulator Establishment Plan
Define and explain the specific roles of government bodies that have accountability for water management	Clarify the accountabilities of departments and agencies with water management responsibilities in NSW
	Create clear functional separation between those who provide and sell water to customers and those who oversee and regulate water as a public resource
	Make information on accountability and roles publicly available
Build a compliance and enforcement regime that ensures strong and certain regulation	
Strengthening compliance and enforcement capacity	Increase compliance and enforcement resourcing by $9.5 million per year
	Recruit additional compliance and enforcement officers
	Conduct additional training for all compliance and enforcement staff including in investigation techniques
	Invest in case management technology, databases and analytics to more effectively target compliance activity
	Report annually on compliance and enforcement activities and publish on the Department of Industry website
Establish a new independent regulator with strong regulatory powers	Natural Resources Access Regulator (NRAR) to lead on compliance matters
	NRAR to take appropriate enforcement action, including penalty infringement notices and prosecutions
	WaterNSW to implement mandatory immediate reporting to the NRAR of suspected breaches

	NRAR to produce and publish clear and effective policies and processes for compliance that also address the recommendations of the Matthews and NSW ombudsman reports and the MDBA's water compliance review
	NRAR to undertake proactive targeted compliance operations
Implement a robust metering framework	Consult on a metering and water discussion paper for public consultation incorporating: ● an approach to implementing 'no meter, no pump' objectives ● identification of any necessary legislative reforms to support these changes ● how we monitor metering of water consumption ● policy on self-reporting and random checks
	Finalise a timetable for implementing new metering requirements following consultation
Adopt innovative technologies to improve compliance effectiveness	Seek proposals to pilot the use of technology for water monitoring and compliance activities, which could include remote sensing of on-farm water storages and indicators such as crop growth and telemetry
	Develop a water monitoring technology plan
Ensure transparency in how we share, allocate and manage water	
Increase transparency in water management	Release a discussion paper on creating a public register of water information that could cover water entitlements, water licences and water work approvals
	Publish compliance and enforcement activities
	Publish information on the Department of Industry's website about activities in protecting environmental water
	Regularly report on progress implementing water inquiry reforms
	Have NRAR establish mechanisms for the public to report alleged breaches, including a statewide hotline and email channel
	Commission an annual, independent review of progress on this plan and publish the results
	Redesign the Department of Industry website to provide updated and more accessible information on water management
Create a stakeholder engagement framework	Implement a new stakeholder engagement framework
	Develop and publish a schedule of stakeholder engagement activities
Better manage environmental water	Establish an interagency working group to develop solutions to improve the management of environmental water

	Have the working group present interim solutions within 90 days of commencement
	Publish explanatory materials to inform the public on how environmental water is managed
	Have all NSW water resource plans accredited by the MDBA
Build capability to support implementation of water reforms	
Build capability, improve standards and embed an ethical culture	Update staff induction processes to emphasise ethical and conduct obligations of staff
	Roll out department-wide ethics and professional standards training
	Commence a 'speak-up' service to enable anonymous reporting of suspected unsatisfactory conduct
	Develop the Department of Industry ethical framework to connect all training, systems and activities to embed ethical behaviour into departmental culture

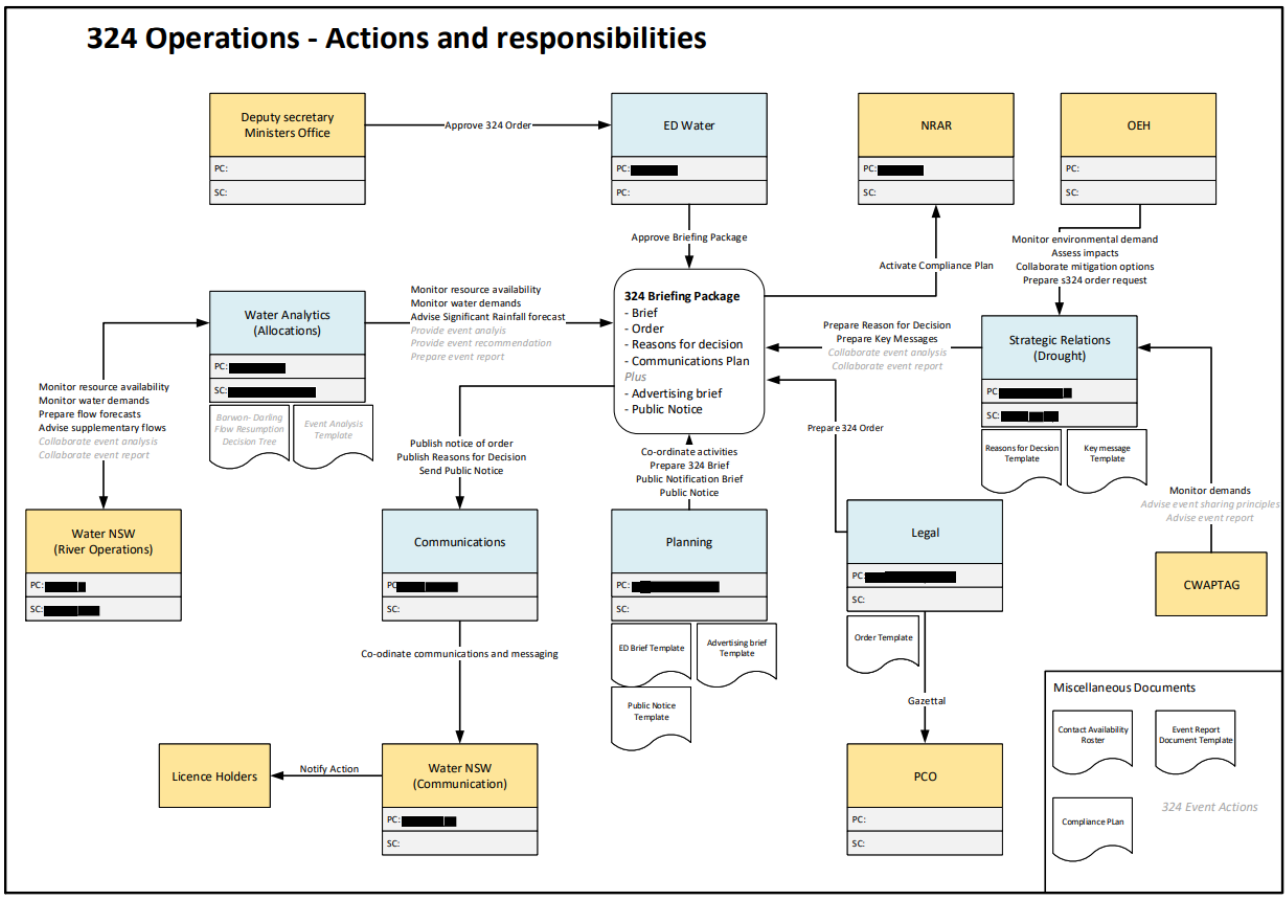
NSW Government response to Vertessy report and the Natural Resources Commission's review of the Barwon-Darling Water Sharing Plan

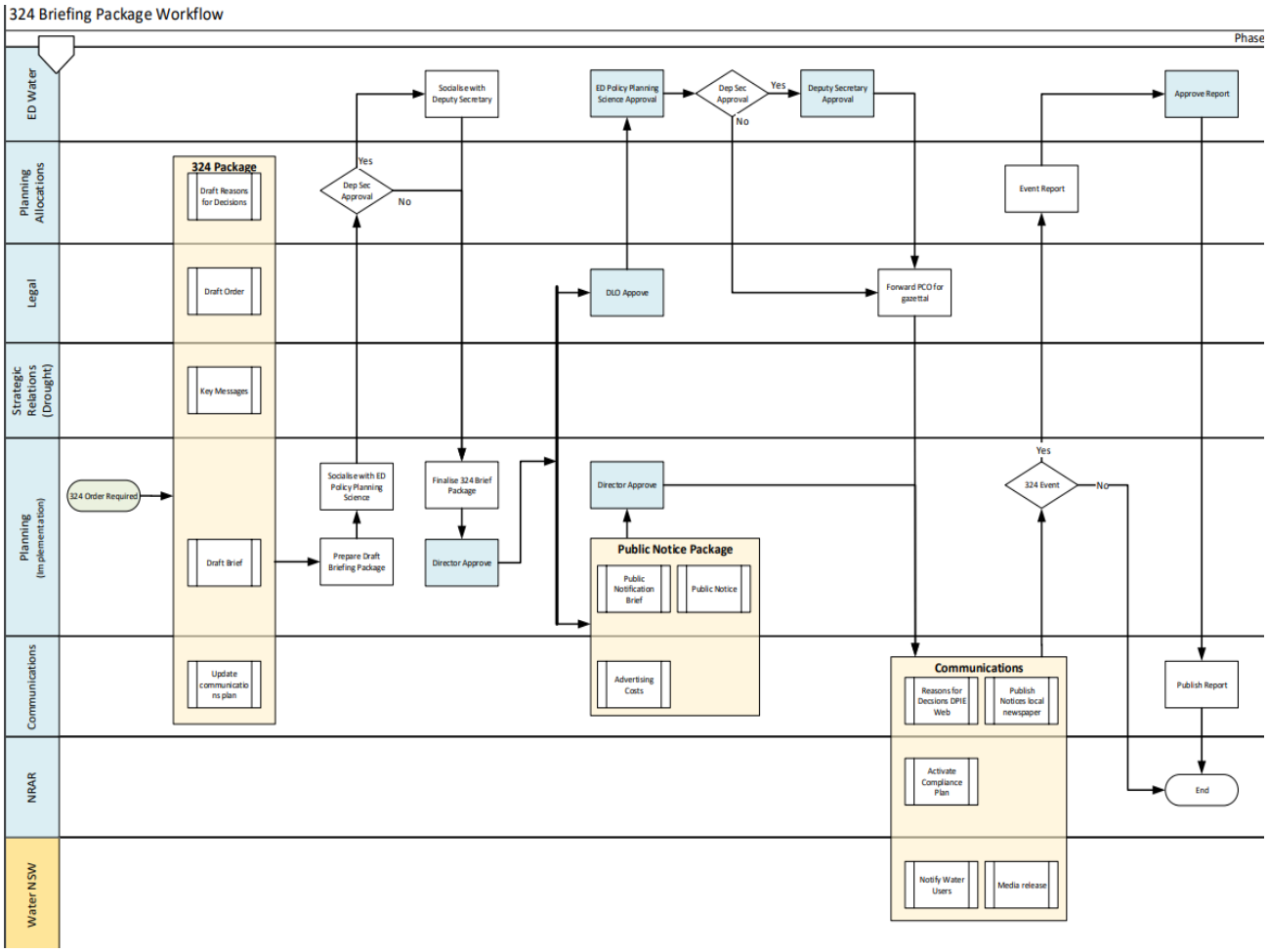
What we are doing	How we will do it
Stage 1: Implement actions to better manage environmental water and the health of fish populations	
Action 1.1: Manage risks to fish health and contribute to native fish recovery	Short term emergency response measures in response to fish deaths
	Monitor fish populations to better understand the impacts of recent fish deaths on the remaining fish populations
	● Continue to identify sites across the entire NSW Murray–Darling Basin that are key to the long-term maintenance of fish populations, and assess the risk factors that could result in fish deaths at each site ● Identify the range of technological interventions available, such as de-stratification and oxygenation, to reduce the potential for fish deaths at key sites ● Prioritise intervention actions for the key sites ● Continue monitoring activities at key sites to assess the impact of any deployed intervention Develop and adopt a communication strategy that informs and involves communities and agencies across the Basin.
	Continue to contribute to and implement measures that will help recovery of native fish populations and river health across the Basin, including through the Northern Basin Toolkit and the Native Fish Management and Recovery Strategy.
	Work with the Australian Government to remove barriers to fish movement and enhance river connectivity at existing weirs and regulators in the Lower Darling and Menindee areas.

Action 1.2: Implement rule changes in response to the NRC's recommendations to protect low flows	Listen to the community's views on proposed changes to A Class licence pumping thresholds
	Seek the views of communities on the NRC's proposed removal of clauses in the Barwon-Darling Water Sharing Plan that can provide irrigators with access to low and no-flows before an anticipated flow event reaches normal pumping levels (the 'imminent flow' rule)
	Not permit the taking of water under imminent flow rule until a decision on that rule is finalised
Action 1.2 Immediately protect water for towns and the environment	Use mechanisms such as temporary water restriction orders to manage specific issues while consulting with the community on proposed rule changes
Action 1.3: Implement our commitments to better manage environmental water	Making changes to introduce rules to manage the resumption of flows in the river following extended dry periods
	Implementing individual daily extraction limits (IDELs) for licence holders
	Preventing the extraction of environmental water so it can remain in the river and achieve the desired environmental and social outcomes
	Listen to community views on proposed changes to A Class licence threshold that the NRC has recommended. Reforms will be developed with input from the community and stakeholders.
	Improve the way we track our progress against Water Sharing Plan objectives—we are developing SMART (specific, measurable, achievable, relevant and time-based) objectives and robust monitoring, evaluation and reporting (MER) plans for all systems across the state, including the Barwon–Darling
	Develop environmental watering requirements as part of the long-term water plans (LTWPs) to support the protection of ecological assets
	Look closely at how we can improve connectivity between northern Basin river systems by undertaking a review of Water Sharing Plan rules that could contribute to this.
Support the Commonwealth buyback of A Class licences	Ask the Commonwealth to transfer some of the bought-back A class licences to Aboriginal ownership for cultural use. Feedback is that this will lead to better environmental, socio-economic and cultural outcomes in the Barwon–Darling.
Stage 2: Explore options for amending the Menindee Lakes Water Saving Project and improving Aboriginal outcomes	
Action 2.1: Explore options for an Aboriginal water policy	Work with key agencies involved in NSW water management and Aboriginal groups to explore options for an Aboriginal water policy with the aim of improving the representation of Aboriginal cultural interests and values in water management.
Action 2.2: Amend objectives for the Menindee Water Saving Project	Work with the local community to design the project in a way that meets their needs. Changes to the project will involve the Commonwealth and other Basin jurisdictions.

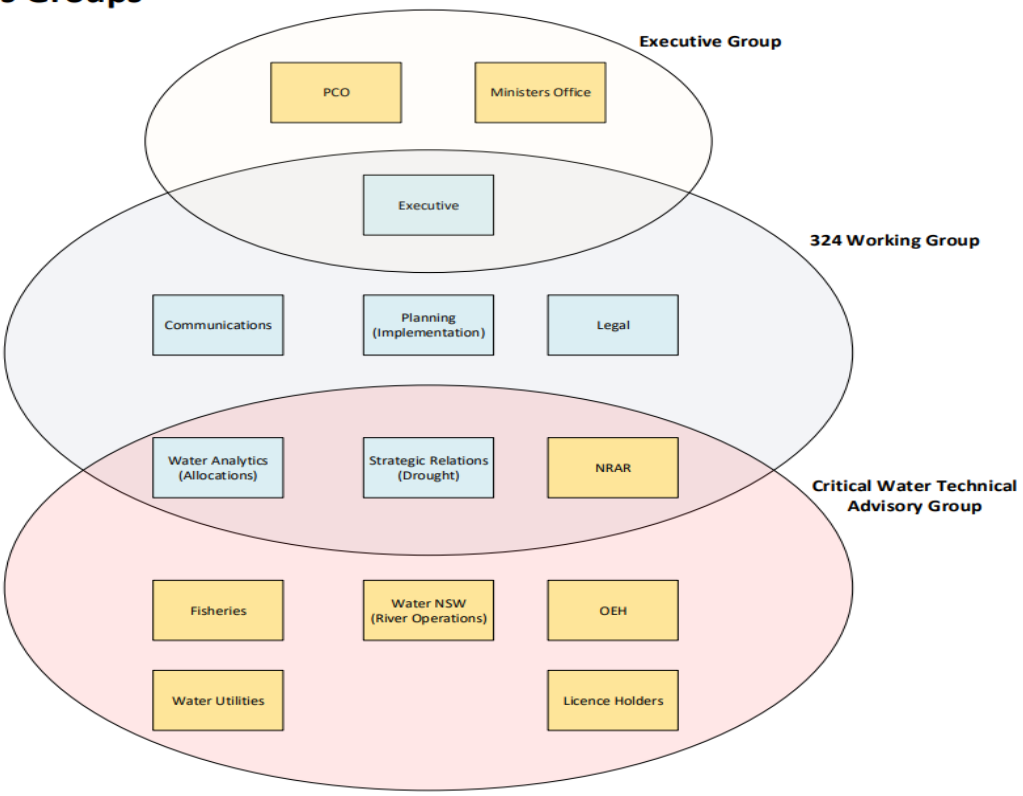
Stage 3: Make further improvements based on evidence	
Action 3.1: Remake of the Water Sharing Plan in 2023 informed by evidence gathered over time	We will put in place an effective monitoring, evaluation and reporting framework to understand how far the changes in Stage 1 and 2 of our response outlined in this document go towards improving environmental, social and cultural outcomes in the Barwon–Darling.
	Work closely with stakeholders to gather evidence through this process and to decide whether further changes are needed when the Barwon–Darling Water Sharing Plan is remade in 2023.
	Working with Queensland will also be a key focus, as water management in Queensland has a significant impact on water flowing into NSW.

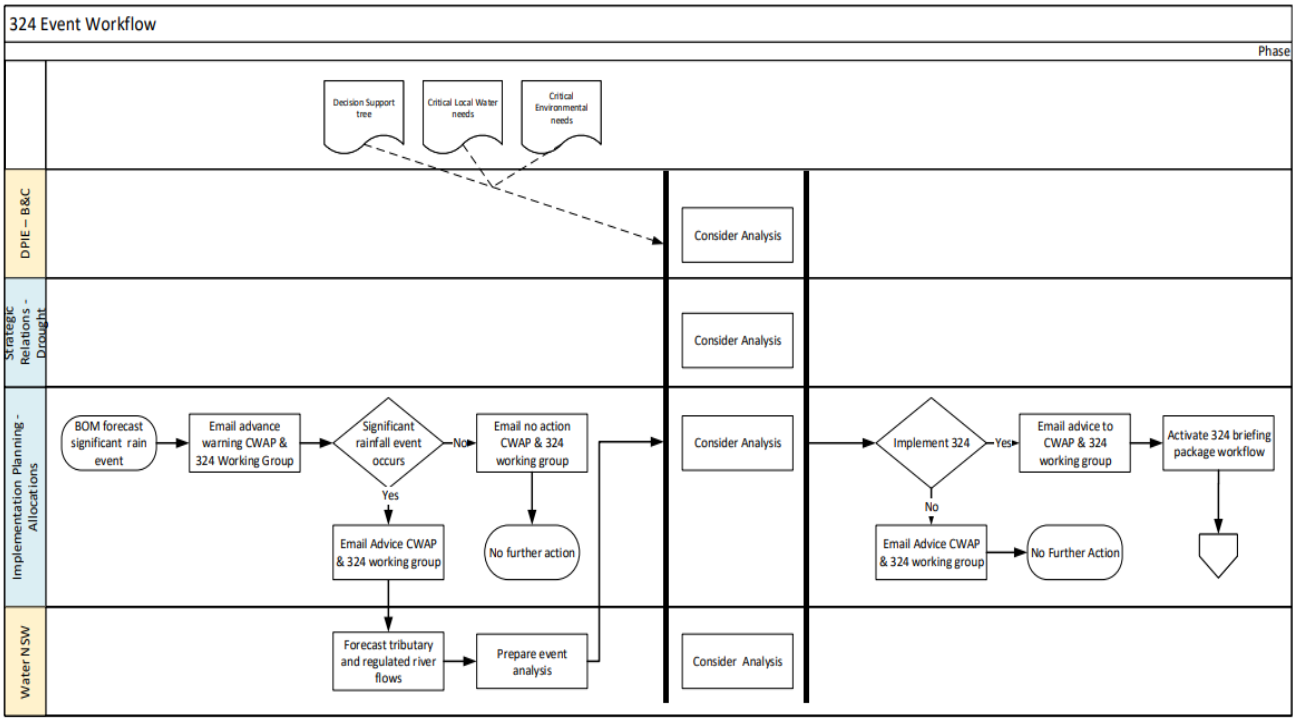
Appendix E – Flowcharts of temporary water restriction processes




324 Briefing Package Workflow
Phase
ED Water
Planning Allocations
Legal
Strategic Relations (Drought)
Planning (Implementation)
Communications
NRAR
Water NSW
324 Package
Draft Reasons for Decisions
Draft Order
Key Messages
Draft Brief
Update communicatio ns plan
324 Order Required
Dep Sec Approval
Yes
No
Socialise with Deputy Secretary
Socialise with ED Policy Planning Science
Prepare Draft Briefing Package
Finalise 324 Brief Package
Director Approve
ED Policy Planning Science Approval
Dep Sec Approval
Yes
No
Deputy Secretary Approval
DLO Appove
Forward PCO for gazettal
Director Approve
Public Notice Package
Public Notification Brief
Public Notice
Advertising Costs
Communications
Reasons for Decsions DPIE Web
Publish Notices local newspaper
Activate Compliance Plan
Notify Water Users
Media release
Event Report
324 Event
Yes
No
Approve Report
Publish Report
End

324 Operations Groups





Appendix F – Proposal for the proactive temporary water restriction

Concept: pre-emptive 324 temporary water restriction on northern uncontrolled flows Discussion points

WHAT:

- A proposal for a temporary water restriction to proactively manage and protect future inflows upstream and downstream of storages and bring forward system recovery.
- The initial aim would be to ensure that the local critical needs are met with the first inflow volumes and also to facilitate downstream system wetting, ultimately to meet Lower Darling.
- Objective: to address critical water needs (town water supply, basic landholder rights, high security and critical in-stream needs) in the northern catchments and the Barwon-Darling/Lower Darling systems, and maximise the prospects of early system recovery.

WHY:

- All northern regulated valleys and Barwon-Darling Lower Darling are in Stage 3 severe or Stage 4 critical drought.
- Many town weir supplies are vulnerable, domestic and stock replenishments have been scant, connectivity along the Barwon-Darling has been sporadic and brief, and non-existent into the Lower Darling, drought refuge pools are limited and could again present an unacceptably high risk of a recurrence of fish deaths.
- With the recent wetting of parts of the Barwon-Darling River by environmental water releases in the upper reaches, flows from the Culgoa to Bourke and from the Warrego to Menindee, the system is well primed to respond to winter inflows, meaning protecting upstream flows will maximise the prospects of water reaching Menindee and ultimately connecting to the refuge pools in the Lower Darling.

<u>Current approach:</u>

- Restrictions are applied on an event-by-event basis as uncontrolled inflows occur.
- We have challenges assessing early an emerging event and gazetting restrictions as required.
- We have challenges managing expectations of water users and ensuring they are aware that the order is in place to avoid compliance issues.

<u>Proposal:</u>

- Applying the restriction in advance (pre-emptively), ahead of any uncontrolled flows, to give certainty and ensure immediate protection.
- Provide transparency for affected water users about when a restriction applies and when it might be lifted.
- Provide transparency for regulated river water users about when supplementary access might be announced.

WHO:

- Restrictions would apply to **unregulated river access licence holders** (excluding those associated with town water supply or other higher priority purposes) – in the Barwon-

Darling, and northern tributaries upstream and downstream of the storages, including the Border Rivers, Gwydir, Namoi, Castlereagh, Macquarie and Bogan unregulated river catchments.
- Restrictions would not explicitly apply to **regulated river general security licence holders**. Details below.
- Restrictions would not explicitly apply to **regulated river supplementary access licence holders**. Details below.

HOW:

River pumping would not be permitted by unregulated river licence holders below "bank full" flow conditions unless the following conditions have been met:

- Town water weirs replenished within last 120 days
- Basic landholder right access, domestic and stock access, local in-stream connectivity and pool replenishment, within the last 90 days
- High security access within the last 90 days
- Connectivity of flow along the main stem Barwon-Darling River within last 120 days
- Flow between 40-60 GL into Menindee Lakes for Lower Darling pools.

The pumping restriction could be considered as augmenting the existing cease to pump / take rules of the Water Sharing Plan for the respective unregulated river water sources.

Although restrictions would not explicitly apply to regulated river general security access licence holders, WaterNSW may decline water orders that are inconsistent with, or that adversely impact upon, primary flow objectives. It should be noted that very small volumes of general security carryover water is currently in accounts.

Supplementary access by regulated river users would not be made available until the above criteria had been met. However, consideration would be given to announcing a volume of supplementary access commensurate with the overbank flow volume that is estimated will not return to the river. This could occur at localised choke or effluent points.

Flows and conditions will be monitored against these criteria. Water users can be kept up to date with the prospects of water access through water user forums, drought engagement meetings and water allocation statements. Restrictions will be promptly lifted and water users advised once some sustained system recovery is achieved.

Some sustained system recovery might include three of the following five targets being met simultaneously:

- 50 GL or more received at Menindee Lakes in the past 6 months
- over 50 ML/d flow at Wilcannia
- over 200 ML/d flow at Bourke
- over 500 ML/d flow at Walgett
- over 500 ML/d flow at Boggabilla.

Appendix G – Flow Targets for the 2020 Northern Basin First Flush Event

Target location	Original criteria for environmental needs	Adopted volumetric targets for considering lifting restrictions – where the event is predicted to provide the following total flow volume
Barwon-Darling		
Barwon River at Collarenebri 422003	>280 ML/d (10 days)	2,800 ML
Barwon River at Dangar Bridge 422001	>320 ML/d (10 days)	3,200 ML
Barwon River at Brewarrina 422002	>500 ML/d (10 days)	5,000 ML
Darling River at Bourke 425003	>500 ML/d (10 days)	5,000 ML
Darling River at Wilcannia 425008	>350 ML/d (10 days)	3,500 ML
Border Rivers		
Severn River at Ashford 416006	>40 ML/d (10 days)	400 ML
Macintyre River at Ridgelands 416031	>210 ML/d (10 days)	2,100 ML
Macintyre at Boggabilla 416002	>230 ML/d (10 days)	2,300 ML
Macintyre at Goondiwindi 416201A	>120 ML/d (10 days)	1,200 ML
Macintyre u/s Boomi 416043	>60 ML/d (10 days)	600 ML
Boomi River at Boomi Weir Offtake 416037	>5 ML/d (10 days)	50 ML
Barwon River at Mungindi 416001	>300 ML/d (10 days)	3,000 ML
Gwydir		
Gwydir River including Gwydir Wetlands		
Gwydir @ Gravesend 418013	>440 ML/d (10 days)	4,400 ML
Gwydir @ Yarraman 418004	>240 ML/d (10 days)	2,400 ML
Lower Gwydir Gwydir DS Tyreel 418063	>100 ML/d (10 days)	1,000 ML

Target location	Original criteria for environmental needs	Adopted volumetric targets for considering lifting restrictions – where the event is predicted to provide the following total flow volume
Central Lower Gwydir	>6,000 ML event with a ***maximum period between flows*** (i.e. maximum interflow) of 1 yr (418066 Millewa) >36GL maximum interflow 2 yr (418078 Allambie)	>6,000 ML event maximum interflow 1 yr >36GL maximum interflow 2 yr (418078 Allambie)
Gingham watercourse		
Gingham @ Teralba 418074	>100 ML/d (10 days)	1,000 ML
Central Gingham Gingham @ Tillaloo 418076	>15 GL event maximum interflow 1 yr >30 GL event maximum interflow 2 yr	>15 GL event maximum interflow 1 yr >30 GL event maximum interflow 2 yr
Lower Gingham Gingham @ Gingham Brd 418079	>3GL event maximum interflow 1 yr >15GL event maximum interflow 2 yr	>3GL event maximum interflow 1 yr >15GL event maximum interflow 2 yr
Mehi River inc. Mallowa and Moomin		
Mehi @ Moree 418002	>130 ML/d (10 days)	1,300 ML
Mehi near Collarenebri 418055	>40 ML/d (10 days)	400 ML
Moomin Creek at Combadello 418048	>30 ML/d (10 days)	300 ML
Mehi and Mallowa wetlands	>3GL event maximum interflow 18 mth >8GL event maximum interflow 2 yr	>3GL event maximum interflow 18 mth >8GL event maximum interflow 2 yr
Mallowa creek at regulator 418049	>10 ML/d (10 days)	100 ML
Carole/Gil		
Carole near Garah 418052	>70 ML/d (10 days)	700 ML
Namoi		
Namoi River at Manilla 419022	>70 ML/d (10 days)	700 ML
Namoi River at Gunnedah 419001	>200 ML/d (10 days)	2,000 ML

Target location	Original criteria for environmental needs	Adopted volumetric targets for considering lifting restrictions – where the event is predicted to provide the following total flow volume
Namoi River at Mollee 419039	>200 ML/d (10 days)	2,000 ML
Namoi River upstream of Walgett 419091	>30 ML/d (10 days)	300 ML
Pian Creek at Waminda 419049	>50 ML/d (10 days)	500 ML
Peel River at Piallamore 419015	> 100 ML/d (10 days)	1,000 ML
Peel River at Carroll 419006	>100 ML/d (10 days)	1,000 ML
Macquarie		
Macquarie at Baroona 421001	>200ML (10 days)	2,000 ML
Macquarie at Warren (@ Warren Weir) 421004	>200ML (10 days)	2,000 ML
Macquarie River Marebone Weir inflows (@combined Marebone Break & Macquarie River below Marebone gauges) 421088 + 421090	>100 ML/d (10 days)	1,000 ML
Streams between Marebone Weir and the Macquarie Marshes (@combined Macquarie River & Marebone Break below Marebone gauges) 421088 + 421090 * excluding take	>65 ML/d (10 days)	650 ML
Inner core of Macquarie Marshes wetland system Northern, Southern & Eastern Marshes (@combined Macquarie River & Marebone Break below Marebone gauges) 421088 + 421090	For core wetlands: 60,000 ML event maximum interflow period 18 months - 2 years over 3-4 months	# For core wetlands: 60,000 ML total volume over 3 to 4 months

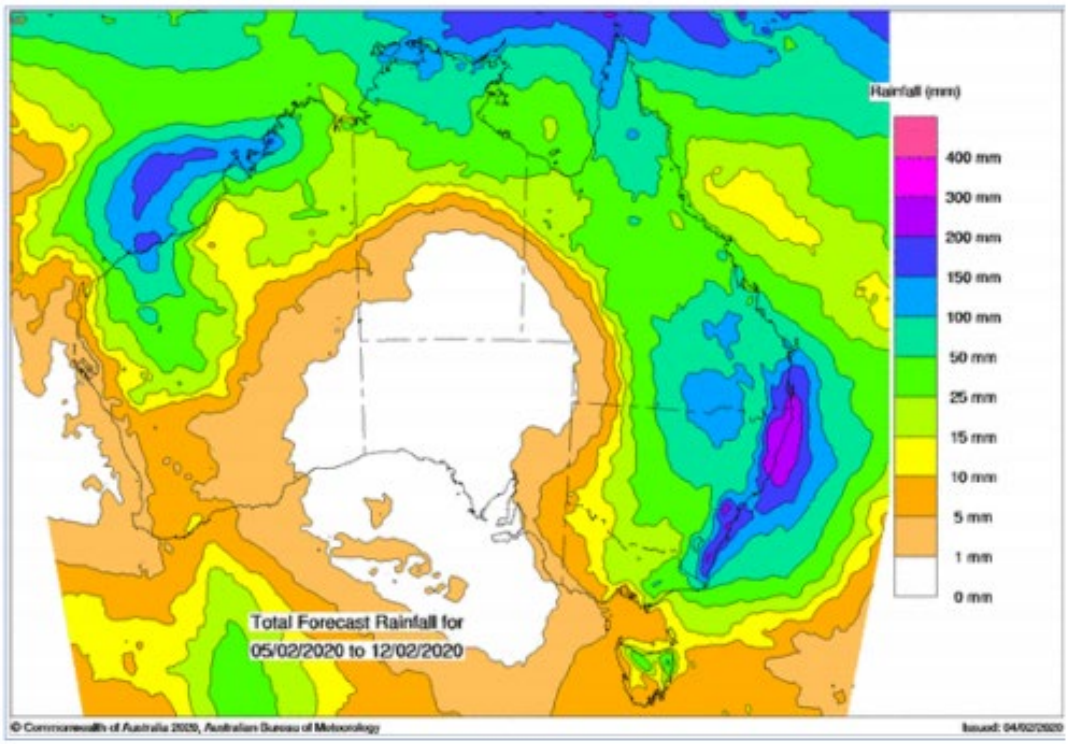
Source: *Information Sheet: Northern Basin temporary water restrictions: targets and principles*, published by DPIE Water, May 2020 available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0015/301416/northern-basin-restriction-triggers-and-principles-fact-sheet.pdf.

Appendix H – Decision Tree for Northern Valleys Flow Event

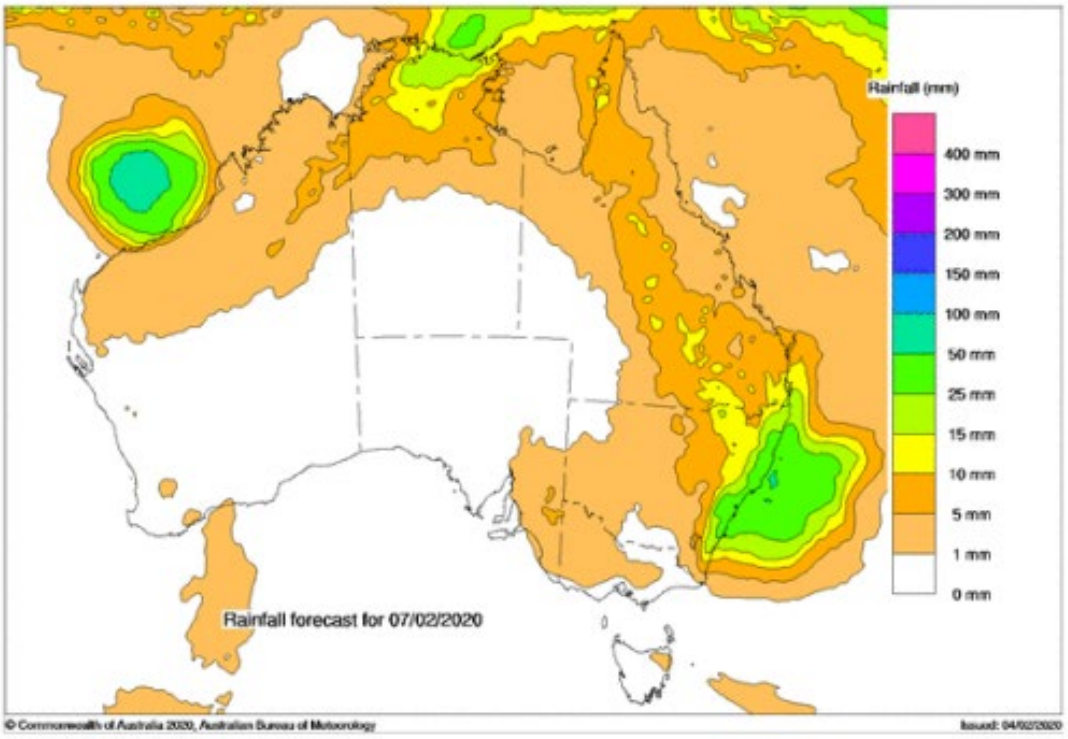
Appendix I – Bureau of Meteorology Forecasts

Bureau of Meteorology Rainfall Forecasts

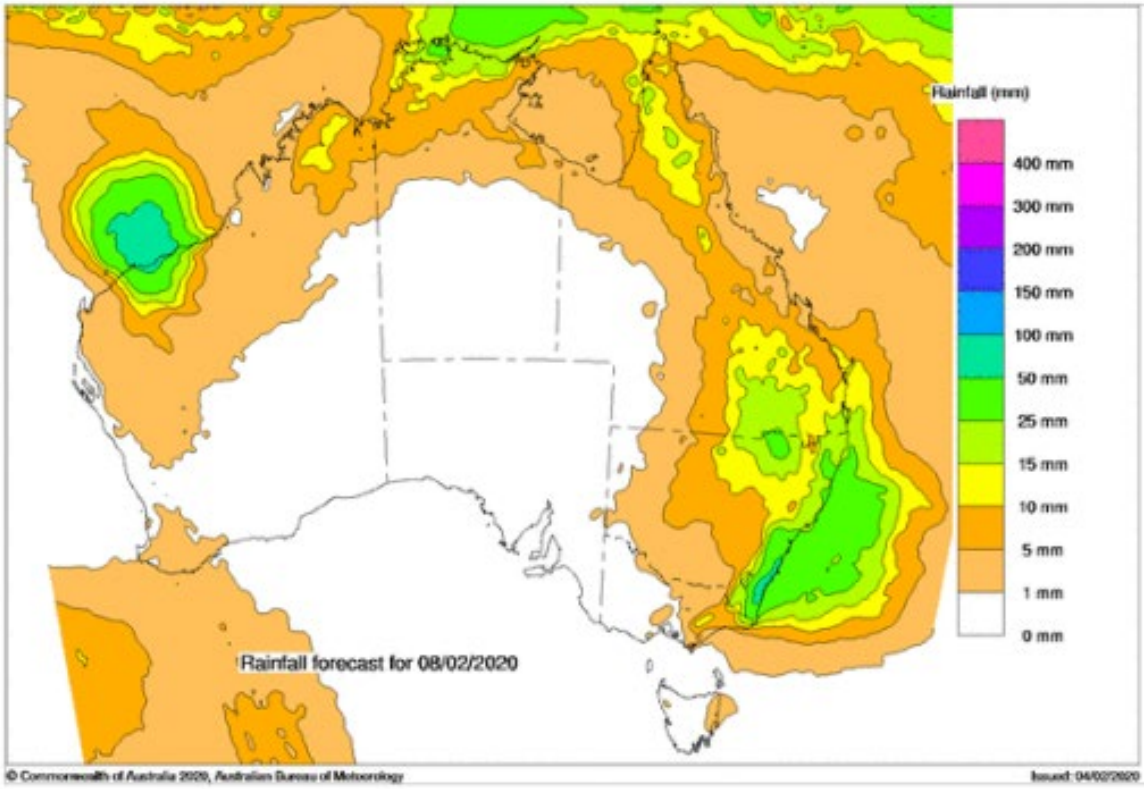
Wednesday 29 January



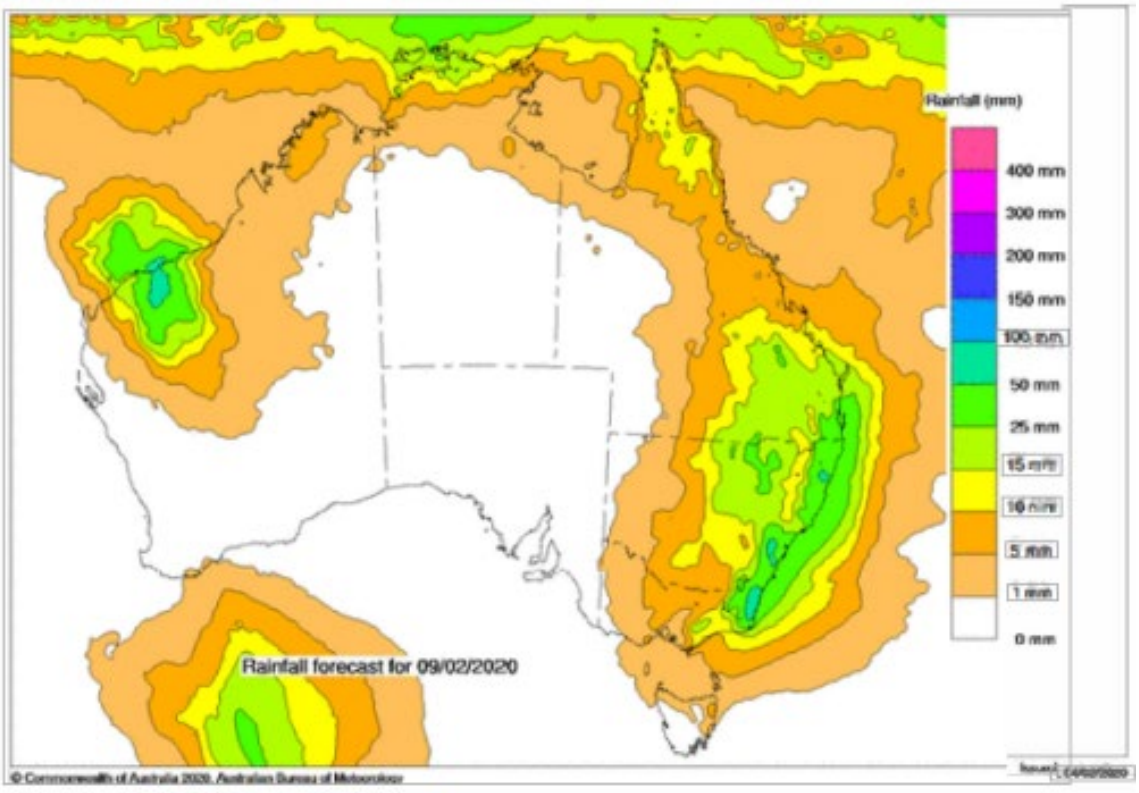
Friday 7 February



Saturday 8 February



Sunday 9 February



Appendix J – Chronology of decisions and communications

TIMELINE OF NORTHERN BASIN FIRST FLUSH MANAGEMENT DECISIONS					
LEGEND	Context only	Restriction	Temporary lift	Permanent lift	Communications

Note, this table does not include supplementary access announcements made throughout the course of the 2020 Northern Basin First Flush event (of which there were over 40).

	Date	Decision	Public Supporting information
1.	Mon 1 Jul 2019	*Temporary Water Restriction (NSW Border Rivers) Order 2019* (pg 48-50) restricts the take of 50% of water in accounts as at 30 June 2019 from the Border Rivers Regulated River for holders of regulated river (general security) licences (A and B class). Expires 30 June 2020, but repealed on 25 February 2020 (see item 58 in table below).	Reasons for decision published on DPIE website.
2.	Wed 30 Oct 2019	*Temporary Water Restrictions (Lower Darling Regulated River Water Source) Amendment Order No. 2 2019* (pg 30-34) amends current restrictions in place (since 4 December 2018) to restrict the take of water from the Lower Darling Regulated River Water Source except for: ● town water supply, domestic use, stock watering ● irrigation of existing permanent plantings (e.g. vineyards, orchards) ● the purpose of testing metering equipment in accordance with licence conditions Expires 30 June 2020, but repealed on 30 March 2020 (see item 96 in table below).	Reasons for decision published on DPIE website.
3.	Fri 1 Nov 2019	*Temporary Water Restriction (Macquarie Bogan Unregulated Water Sources) Order 2019* limits permissible take to 20% of water credited on 1 July 2019 within the Macquarie Bogan Unregulated water sources from the following: ● Campbells River Water Source in the Campbells River Downstream Management Zone, ● Macquarie River above Burrendong Water Source in the Macquarie River above Bathurst Management Zone, ● Fish River Water Source from downstream of Lake Oberon to the confluence with Macquarie River. Water can still be taken for the purpose of testing metering equipment in accordance with licence conditions. Expires 30 June 2020.	Reasons for decision published on DPIE website.
4.	Wed 4 Dec 2019	*Temporary Water Restriction (Upper and Lower Namoi Regulated River Water Sources) Amendment Order No. 2 2019* (pg 49-55) amends current restrictions to restrict general security licence holders taking water from the Upper and Lower Namoi Regulated River Water Sources. Water can still be taken for the purpose of testing metering equipment in accordance with licence conditions. Expires 30 June 2020.	Reasons for decision published on DPIE website.

	Date	Decision	Public Supporting information
5.	Wed 8 Jan 2020	*Temporary Water Restriction (Bega and Brogo Regulated Rivers Water Source) Order 2020* restricts the take of water from the Bega and Brogo Regulated Rivers Water Source by: ● regulated river (general security) access licence holders, and ● any other licence holders in relation to water purchased from those holders while the order was in force. Water can still be taken for the purpose of testing metering equipment in accordance with licence conditions. Expires 30 June 2020.	Reasons for decision published on DPIE website.
6.	Fri 17 Jan 2020	*Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020* prevents the take of water: ● from the Barwon-Darling Unregulated River Water Source, by unregulated river (A-C class) licences ● by unregulated river and unregulated river (special additional high flow) licence holders (where relevant) from: o Castlereagh River Unregulated River Water Sources o Macquarie Bogan Unregulated Water Sources o NSW Border Rivers Unregulated Water Sources o Gwydir Unregulated River Water Sources o Intersecting Streams Unregulated Water Sources o Namoi Unregulated Rivers Water Sources o Peel Unregulated River Water Sources ● by regulated river high security, general security (inc A and B class) from: o Border Rivers Regulated River Water Source o Gwydir Regulated River Water Source o Lower Namoi Regulated River Water Source o Upper Namoi Regulated River Water Source o Peel Regulated River Water Source Expires 31 January 2020. **Note:** this restriction was subsequently extended to 17 February 2020 (item 14), and then again to 28 February 2020 (item 41).	Reasons for decision published on DPIE website. See also WNSW media release and link on Twitter.
7.	Fri 17 Jan 2020	WNSW provided an operations update regarding significant rainfall in the Bell and Little river catchments which will result in high flows downstream of Burrendong Dam.	
8.	Mon 20 Jan 2020	Lift of restrictions for unregulated river licence holders to take from the following water sources within the Macquarie Bogan Unregulated Water Source area (20-31 January 2020): ● Campbells River Water Source in the Campbells River Downstream Management Zone ● Macquarie River above Burrendong Water Source in the Macquarie River above Bathurst Management Zone	'Reasons for Approval' section of the approval document, published on DPIE website.

	Date	Decision	Public Supporting information
		• Fish River Water Source from downstream of Lake Oberon to the confluence with Macquarie River Relates to the restriction in item 3 which already restricted extractions in these rivers and was due to expire 30 June 2020.	
9.	Mon 20 Jan 2020	WNSW provided an operations update regarding the management of flows in the Burrendong catchment under the tributary flow management plan.	
10.	Wed 22 Jan 2020	Nil – WNSW media release re 324 restriction lifted for users upstream of Bathurst.	WNSW media release.
11.	Fri 24 Jan 2020	Temporary lift of restrictions for unregulated licence holders to take from the Macquarie River between Bathurst and Evans Plains Creek (23-31 January). Relates to restriction in item 6 due to expire 31 January (but subsequently extended to 17 February (item 14) and again to 28 February 2020 (item 41).	'Reasons for Approval' section of the approval document, published on DPIE website. WNSW publishes Operations update .

12.	Sun 26 Jan 2020	Temporary lift of restrictions to allow take (from 26 – 31 January 2020):
		• by unregulated licence holders from the Namoi Unregulated Water Source in relation to the:
		  ○ Mooki River
		  ○ Quirindi Creek
		• by regulated river (high security) licence holders from the Peel Regulated River Water Source.
		
		Relates to restriction in item 6 due to expire 31 January (but subsequently extended to 17 February (item 14) and again to 28 February 2020 (item 41).
			'Reasons for Approval' section of the approval document, published on DPIE website.
			
			WNSW media release.

13.	Tue 28 Jan 2020	WNSW provided an operations update confirming that only one more block release of water to the Beribula River system is scheduled for summer 2020.	
14.	Thu 30 Jan 2020	*Temporary Water Restriction (Northern NSW Murray Darling Basin) Amendment Order 2020* ends some restrictions (see next item) and extends duration of *Temporary Water Restriction (Northern NSW Murray Darling Basin) Order 2020* (see item 6) to 17 February 2020.	Reasons for decision published on DPIE website. Link on Twitter.
15.	Thu 30 Jan 2020	*Temporary Water Restriction (Northern NSW Murray Darling Basin) Amendment Order 2020* **ends** the restriction on: • unregulated river licence holders taking water from the Macquarie River above Burrendong Water Source between Bathurst and Evans Plains Creek Management Zone • unregulated river licence holders subject to the *Temporary Water Restriction (Macquarie Bogan Unregulated Water Sources) Order 2019* (see item 3). **Note:** this means that restriction operates to its full extent.	Reasons for decision published on DPIE website.

	Date	Decision	Public Supporting information
16.	Fri 31 Jan 2020	WNSW provided an operations update on significant rainfall in the Namoi river catchment area.	
17.	Fri 31 Jan 2020	Temporary lift of restrictions to allow take of water: ● by unregulated licence holders from the Namoi Unregulated Water Source (from 26 January - 7 February) in relation to: ○ Mooki River ○ Quirindi Creek ● by regulated (high security) licence holders from the Peel Regulated River Water Source (from 31 January – 7 February 2020) Substantially extends the lift in item 12 following extension of the restriction in item 6 from 31 January to 17 February 2020 (see item 14). The restriction was later extended again to 28 February 2020 (item 41).	Reasons for approval section of the approval document, published on DPIE website. WNSW issues media release.
18.	Tue 4 Feb 2020	WNSW provided an operations update confirming that NSW DPIE had not approved access to uncontrolled flows in the Beribula River but had approved access to Supplementary Flows in the Belubula from 4 February to 7 February 2020.	
19.	Fri 7 Feb 2020	*Temporary Water Restriction (Northern Basin) (Floodplain Harvesting) Order 2020* restricts floodplain harvesting (except for basic landholder rights and passive take) from the: ● Barwon-Darling Valley Floodplain ● Gwydir Valley Floodplain ● Lower Namoi Valley Floodplain ● Narrabri – Wee Waa Floodplain ● Narromine to Oxley Station Floodplain ● Upper Namoi Valley Floodplain Expires 28 February 2020.	Reasons for decision published on DPIE website. See also WNSW media release . Link on Twitter.
20.	Fri 7 Feb 2020	WNSW provided an operations update reminding high security licence holders accessing water from the Peel River of the current temporary water restrictions.	
21.	Sat 8 Feb 2020	Lift of restrictions on unregulated licence holders taking water from the Namoi Unregulated Water Source (8 February until 17 February 2020) in relation to: ● Upper Macdonald River Water Source ● Mid Macdonald River Water Source ● Upper Namoi Water Source ● Werris Creek Water Source ● Rangira Creek Water Source ● Bluevale Water Source ● Coxs Creek Water Source ● Maules Creek Water Source ● Eulah Creek Water Source ● Bohena Creek ● Spring and Bobbiwaa Creeks Water Source ● Mooki River Water Source ● Quirindi Creek Water Source ● Warrah Creek Water Source Relates to restriction in item 6 as extended by item 15 to 17 February 2020 (and subsequently extended again to 28 February 2020 by item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.

	Date	Decision	Public Supporting information
22.	Sat 8 Feb 2020	Lift of restrictions on unregulated licence holders taking water from the Gwydir Unregulated Water Source (8 February until 17 February 2020) in relation to: ● Thalaba Creek ● Millie Creek Relates to restriction in item 6 as extended by item 15 to 17 February 2020 (and subsequently extended again to 28 February 2020 by item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.
23.	Sun 9 Feb 2020	Lift of restrictions on unregulated licence holders taking water from the Gwydir Unregulated Water Source (9 February until 12 February 2020) in relation to the Mehi Unregulated River Water Source. Relates to restriction in item 6 as extended by item 15 to 17 February 2020 (and subsequently extended again to 28 February 2020 by item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.
24.	Sun 9 Feb 2020	Lift of restrictions to permit take by regulated river (high security) licence holders from: ● Namoi Water Source ● Upper Namoi Water Source ● Peel Water Source Relates to restriction in item 6 as extended by item 15 to 17 February 2020. When the restriction was extended again to 28 February by item 38, it excluded these licences from the continued restrictions.	'Reasons for Approval' section of the approval document, published on DPIE website.
25.	Sun 9 Feb 2020	Lift of restrictions on unregulated licence holders taking water from the Namoi Unregulated Water Source (from 9 to 17 February 2020) in relation to the following: ● Brigalow Water Source ● Bundock Water Source ● Coghill Water Source ● Etoo and Talluba Water Source ● Lower Namoi Water Source ● Baradine Water Source. Relates to restriction in item 6 as extended by item 15 to 17 February 2020 (and subsequently extended again to 28 February 2020 by item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.
26.	Sun 9 Feb 2020	Lift of restrictions to take water pursuant to floodplain harvesting (9 – 12 February 2020) from the Gwydir Valley Floodplain within the Mehi River and Thalaba Creek Water Sources. Relates to restriction in item 21 expiring on 28 February 2020.	'Reasons for Approval' section of the approval document, published on DPIE website.
27.	Mon 10 Feb 2020	Nil - WNSW provided an operations update regarding rainfall and forecasted flows in the Barwon-Darling system.	
28.	Mon 10 Feb 2020	Lift of restrictions to take water pursuant to floodplain harvesting (10 – 13 February 2020) from the: ● Barwon- Darling Floodplain within the Mehi River, Barwon, and Thalaba Creek Water Sources (as specified in the Gwydir Unregulated Water Sharing Plan) and Pian Creek and Barandine Creek Water Sources (as specified in the Namoi Unregulated Water Sharing Plan)	'Reasons for Approval' section of the approval document, published on DPIE website . See also WNSW media release. See also WNSW operations update.

	Date	Decision	Public Supporting information
		• Lower Namoi Valley Floodplain within the Pian Creek and Barandine Creek Water Sources specified in the Namoi Unregulated Water Sharing Plan • Gwydir Valley Floodplain within the Mehi River, Barwon, and Thalaba Creek Water Sources specified in the Gwydir Unregulated Water Sharing Plan Relates to restriction in item 21 expiring on 28 February 2020.	
29.	Tue 11 Feb 2020	Nil – but WNSW media release re 324 Orders on floodplain harvesting in the Northern Basin.	WNSW media release.
30.	Wed 12 Feb 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	
	Wed 12 Feb 2020	Nil - WNSW provided an operations update on recent rainfall affecting the Macquarie - Tributary Flow Management Plan.	
32.	Wed 12 Feb 2020	Lift of restrictions for unregulated licence holders to take water from the Namoi Unregulated Water Source (from 12– 17 February 2020) in relation to the Yarraman Creek with the Lake Goran Water Source. Relates to restriction in item 6 as extended by item 15 to 17 February 2020 (and subsequently extended again to 28 February 2020 by item 38).	'Reasons for Approval' section of the approval document, published on DPIE website . See also WNSW media release. WNSW Early warning network 10.45AM.
33.	Wed 12 Feb 2020	*Temporary Water Restriction (Northern Basin) (Floodplain Harvesting) Amendment Order 2020* (pg 4-9) extends floodplain harvesting restriction (except for Basic Landholder Rights and passive take, see item 21) to additional floodplains: • Lower Macintyre River, Whalan Creek, & Boomi River Floodplain (from Yelarbon Crossing to Barwon – Boomi Rivers confluence) • Lower Macquarie Valley Floodplain Expires 28 February 2020.	Reasons for decision published on DPIE website. See also WNSW media release . Link on Twitter.
34.	Wed 12 Feb 2020	*Temporary Water Restriction (Bega and Brogo Regulated Rivers Water Source) Repeal Order 2020* (pg 1-3) repeals the *Temporary Water Restriction (Bega and Brogo Regulated Rivers Water Source) Order 2020* (see item 5)	Reasons for decision published on DPIE website. See also WNSW media release.
35.	Thu 13 Feb 2020	DPIE issues Fact Sheet on Temporary water restrictions on river and overland flows in the northern Basin.	See also WNSW media release directing stakeholders to the fact sheet.
36.	Fri 14 Feb 2020	WNSW provided an operations update advising landholders that the Lower Namoi Pian Replenishment is underway.	
37.	Fri 14 Feb 2020	WNSW provided an operations update on rainfall affecting the Barwon-Darling system and flows forecasted.	
38.	Fri 14 Feb 2020	*Temporary Water Restriction (Northern NSW Murray Darling Basin) Amendment (No 2) Order 2020* extends the duration of the restrictions in the *Temporary Water*	Reasons for decision published on DPIE website.

	Date	Decision	Public Supporting information
		Restriction (Northern NSW Murray Darling Basin) Order 2020 (see item 6, initially extended by item 14 to 17 February 2020) to 28 February 2020. Continues to allow the take of water by regulated river (high security) licence holders to take water as approved in item 25 from: ● Namoi Water Source ● Upper Namoi Water Source ● Peel Water Source.	See also WNSW media release . Link on Twitter.
39.	Mon 17 Feb 2020	Nil - WNSW provided summaries of the current forecast estimates of flow along the Barwon-Darling system in an operations update.	
40.	Mon 17 Feb 2020	Lift of restrictions on regulated river (high security) licence holders taking water from the Border Rivers Regulated Water Source (17 to 28 February 2020). Relates to restriction in item 6 as extended to 17 February 2020 (item 15) and then again to 28 February 2020 (item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.
41.	Mon 17 Feb 2020	Lift of restrictions (item 6, extended by item 15 to 17 February 2020) on unregulated licence holders from taking water from the Gwydir Unregulated Water Source on 17 February 2020 in relation to the following water sources: ● Thalaba Creek ● Millie Creek	'Reasons for Approval' section of the approval document. Link from WNSW media release.
42.	Mon 17 Feb 2020	Lift of restrictions (see item 6, extended by item 15 to 17 February 2020) on unregulated licence holders from taking water from the Namoi Unregulated Water Source on 17 February 2020 in relation to the following water sources: ● Upper Macdonald River Water Source ● Mid Macdonald River Water Source ● Upper Namoi Water Source ● Werris Creek Water Source ● Rangira Creek Water Source ● Bluevale Water Source ● Coxs Creek Water Source ● Maules Creek Water Source ● Eulah Creek Water Source ● Bohena Creek ● Spring and Bobbiwaa Creeks Water Source ● Mooki River Water Source ● Quirindi Creek Water Source ● Warrah Creek Water Source	'Reasons for Approval' section of the approval document, published on DPIE website Link from WNSW media release.
43.	Mon 17 Feb 2020	Nil – but DPIE issued an update on temporary water restrictions on river and overland flows in the northern Basin and a statement on storms in the Namoi 17 February 2020 – maintaining the embargo on pumping.	
44.	Tue 18 Feb 2020	Lift of restrictions for unregulated licence holders to take water from the Namoi Unregulated Water Source (from 18 February 2020) in relation to the Yarraman Creek with the Lake Goran Water Source.	'Reasons for Approval' section of the approval document, published on DPIE website.

	Date	Decision	Public Supporting information
		Substantially extends the lift in item 12 following the second extension of the restriction in item 6 from 17 to 28 February 2020 (by item 41).	
45.	Tue 18 Feb 2020	WNSW provided an operations update advising landholders that the replenishment flow for the unregulated Pian Creek that commenced 9 February 2020 had ceased earlier than planned.	
46.	Wed 19 Feb 2020	WNSW provided an operations update advising that the flows in the Peel River and Upper Namoi are only able to be extracted by high security licences or for stock and domestic purposes.	
47.	Wed 19 Feb 2020	Nil - WNSW provided an operations update on rainfall affecting the Barwon-Darling system and flows forecasted.	
48.	Wed 19 Feb 2020	WNSW provided an operations update advising landholders that the replenishment flow for the unregulated Pian Creek had recommenced.	
49.	Wed 19 Feb 2020	WNSW provided an operations update advising that high security licence holders accessing water from the NSW Border Rivers were able to access water in their high security accounts.	
50.	Wed 19 Feb 2020	Nil - Maps of floodplains uploaded to DPIE website and WNSW issued a media release regarding inflows into Central West dams. See also outcomes of Barwon-Darling/Lower Darling Critical Water Advisory Panel.	
51.	Fri 21 Feb 2020	Lift of restrictions on unregulated licence holders taking water from all unregulated water sources (21 to 28 February 2020) in the: • Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 • Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources 2012 • Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012 • Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012 • Water Sharing Plan for the Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010 • Water Sharing Plan for the Castlereagh River Unregulated and Alluvial Water Sources 2011 Relates to restriction in item 6 as extended to 17 February 2020 (item 15) and then again to 28 February 2020 (item 41).	'Reasons for Approval' section of the approval document, published on DPIE website. See also DPIE media release.
52.	Fri 21 Feb 2020	Lift of floodplain harvesting restrictions (21 to 28 February 2020) on: • Gwydir Valley Floodplain • Narromine to Oxley Station Floodplain • Upper Namoi Valley Floodplain • Lower Macquarie Valley Floodplain Relates to restriction in item 21, as extended to 28 February 2020 (item 38).	'Reasons for Approval' section of the approval document, published on DPIE website. See also DPIE media release and WNSW media release regarding Barwon-Darling river system flows.
53.	Fri 21 Feb 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	

	Date	Decision	Public Supporting information
54.	Sun 23 Feb 2020	Lift of floodplain harvesting restrictions (23 to 28 February 2020) on: • Lower Namoi Valley Floodplain • Narrabri – Wee Waa Floodplain • Lower Macintyre River, Whalan Creek & Boomi River Floodplain Relates to restriction in item 15, as extended to 28 February 2020 (item 38).	'Reasons for Approval' section of the approval document, published on DPIE website.
55.	Sun 23 Feb 2020	Lift of restrictions on general security regulated river licence holders taking water from the NSW Border Rivers Regulated Water Sources (23 to28 February 2020). Relates to restriction in item 6 as extended to 17 February 2020 (item 15) and then again to 28 February 2020 (item 41).	'Reasons for Approval' section of the approval document, published on DPIE website.
56.	Mon 24 Feb 2020	Nil – but DPIE issues update on temporary water restrictions on river and overland flows in the northern Basin.	
57.	Mon 24 Feb 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	
58.	Tue 25 Feb 2020	*Temporary Water Restriction (Upper and Lower Namoi Regulated River Water Sources and NSW Border Rivers) Repeal Order 2020* repeals restrictions to permit general security regulated licence holders to take water from: • Border Rivers Regulated River Water Sources (item 1) • Upper and Lower Namoi Regulated Water Sources (item 4)	Reasons for decision published on DPIE website. WNSW media release. WNSW operations update.
59.	Wed 26 Feb 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	
60.	Thu 27 Feb 2020	Nil -WNSW provided an operations update advising that river levels in the Murrumbidgee are forecast to remain low for the rest of the season.	
61.	Thu 27 Feb 2020	Lifts restrictions on unregulated river licence holders (A-C class) taking water from Barwon-Darling upstream of the Culgoa Junction (Management Zones 1 to 9) (27 to 28 February 2020). Relates to restriction in item 6 as extended to 17 February 2020 (item 15) and then again to 28 February 2020 (item 41).	'Reasons for Approval' section of the approval document, published on DPIE website..
62.	Fri 28 Feb 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	
63.	Fri 28 Feb 2020	Restrictions expire (see items 21 and 41) but a new Barwon-Darling order is made effective the following day (see next).	DPIE media release
64.	Sat 29 Feb 2020	*Temporary Water Restriction (Barwon-Darling) Order 2020* restricts access to unregulated access licence holders (A – C class) in • Culgoa River Junction to Bourke Management Zone • Bourke to Louth Management Zone • Louth to Tilpa Management Zone	Reasons for decision published on DPIE website. WNSW media release. Link on Twitter.

	Date	Decision	Public Supporting information
		• Tilpa to Wilcannia Management Zone • Wilcannia to Upstream Lake Wetherell Management Zone Also restricts floodplain harvesting from the Barwon-Darling Valley Floodplain (except for Basic Landholder Rights and passive take). Expires 17 April 2020.	
65.	Mon 2 Mar 2020	Nil - but WNSW issues media release stating quarter of NSW still in 'intense drought'.	
66.	Mon 2 Mar 2020	Nil - WNSW provided an operations update on rainfall and flow forecasts for the Barwon-Darling river system.	
67.	Wed 4 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
68.	Thu 5 Mar 2020	Nil – but DPIE issues update on temporary water restrictions on river and overland flows in the Barwon-Darling.	
69.	Thu 5 Mar 2020	Nil - WNSW provides an operations update requesting expressions of interest for Supplementary Access to Lower Namoi systems.	
70.	Thu 6 Mar 2020	Nil - WNSW provides an operations update on rainfall and flows for the Barwon-Darling river system.	
71.	Fri 6 Mar 2020	Lift of restriction on unregulated access licence holders (A – C class) taking water downstream of the Culgoa Junction Barwon-Darling Unregulated River Water Source (Management Zones 10 to 14) (6 March to 17 April 2020). Relates to restriction in item 64 which expires 17 April 2020.	'Reasons for Approval' section of the approval document, published on DPIE website . Link on Twitter.
72.	Mon 9 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
73.	Wed 11 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
74.	Thu 12 Mar 2020	Nil - but WNSW issues media release regarding water arriving in Menindee Lakes.	
75.	Fri 13 Mar 2020	Nil - but see DPIE Barwon-Darling/Lower Darling Critical Water Advisory Critical Water Advisory Panel meeting communique.	
76.	Fri 13 Mar 2020	WNSW provided an operations update advising that water release from Menindee Lakes system will commence on 16 March 2020.	
77.	Fri 13 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
78.	Mon 16 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
79.	Tues 17 Mar 2020	Nil - but WNSW issues media release regarding Keepit Dam release.	

	Date	Decision	Public Supporting information
80.	Wed 18 Mar 2020	WNSW provided an operations update advising of a water release from Menindee Lakes. The release was delayed after a fish kill occurred over the period Thursday 12 March to Saturday 14 March.	
81.	Wed 18 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
82.	Thu 19 Mar 2020	Nil - but DPIE issues Lower Darling releases 2020 fact sheet No. 1.	
83.	Fri 20 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
84.	Fri 20 Mar 2020	Nil - but see DPIE Barwon-Darling/Lower Darling Critical Water Advisory Critical Water Advisory Panel meeting communique.	
85.	Fri 20 Mar 2020	Nil - WNSW provided an operations update on releases from Menindee Lakes.	
86.	Mon 23 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
87.	Mon 23 Mar 2020	Nil - but see DPIE combined Inland Critical Water Advisory Panels meeting communique	
88.	Tue 24 Mar 2020	Nil - WNSW provided an operations update on releases from Menindee Lakes.	
89.	Wed 25 Mar 2020	Nil - WNSW provided an operations update advising that flows through the Wallamundry Creek system of the Lachlan River will be lower.	
90.	Wed 25 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
91.	Thu 26 Mar 2020	Nil - WNSW provided an operations update on releases from the Menindee Lakes.	
92.	Thu 26 Mar 2020	Nil - but DPIE issues Lower Darling releases 2020 fact sheet No. 2	
93.	Fri 27 Mar 2020	WNSW provided an operations update advising that releases from Split Rock Dam in the Upper Namoi will recommence 30 March 2020.	
94.	Fri 27 Mar 2020	Nil - but WNSW issues media release regarding Weir 32 releases into the Lower Darling. DPIE issues Lower Darling water quality update No. 1. See also Barwon-Darling/Lower Darling Critical Water Advisory Critical Water Advisory Panel meeting communique.	
95.	Fri 27 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
96.	Mon 30 Mar 2020	*Temporary Water Restrictions (Lower Darling Regulated River Water Source) Repeal Order 2020* repeals the restriction on take of water from Lower Darling Regulated River Water Source in item 2.	Reasons for decision published on DPIE website. See also DPIE media release

	Date	Decision	Public Supporting information
97.	Mon 30 Mar 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
98.	Tue 31 Mar 2020	Lift of restriction on floodplain harvesting on the Barwon-Darling Valley Floodplain (31 March to 17 April 2020). Relates to restriction in item 64 which expires 17 April 2020.	'Reasons for Approval' section of the approval document, published on DPIE website.
99.	Tue 31 Mar 2020	Nil - WNSW provided an operations update advising that due to the continued drought conditions in the Lachlan catchment, water delivery operations in the regulated Willandra Creek will continue to be ceased.	
100.	Wed 1 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
101.	Fri 3 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
102.	Fri 3 April 2020	Nil - but see DPIE Barwon-Darling/Lower Darling Critical Water Advisory Panel meeting communique.	
103.	Sat 4 Apr 2020	WNSW provided an operations update advising that DPIE had approved access to uncontrolled flows in the Belubula River from 4 April 2020 until 6 April 2020.	
104.	Sun 5 Apr 2020	WNSW provided an operations update advising that access to uncontrolled flows in the Belubula River (see above) had been extended to 8 April 2020.	
105.	Mon 6 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
106.	Mon 6 April 2020	Nil - but DPIE issues Lower Darling releases 2020 fact sheet No. 3 and water quality update No. 2.	
107.	Tue 7 Apr 2020	Nil - WNSW provided an operations update on releases from the Menindee Lakes.	
108.	Tue 7 Apr 2020	WNSW provided an operations update advising that access to uncontrolled flows in the Belubula River had been extended to 10 April 2020	
109.	Wed 8 Apr 2020	Nil - WNSW provided an operations update advising of forecasted low river levels in the Murray-Edward river system.	
110.	Thu 9 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
111.	Thu 9 April 2020	Nil - but DPIE issues Lower Darling releases 2020 fact sheet No. 4 and water quality update No. 3. See also Barwon-Darling/Lower Darling Critical Water Advisory Panel meeting communique.	
112.	Sat 11 Apr 2020	Nil - WNSW provided an operations update advising of changes to Trade Application Processing.	
113.	Tue 14 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
114.	Fri 17 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	

	Date	Decision	Public Supporting information
115.	Fri 17 Apr 2020	Nil - WNSW provided an operations update on releases from the Menindee Lakes.	
116.	Fri 17 April 2020	Nil - but DPIE issues Lower Darling releases 2020 fact sheet No. 5 and water quality update No. 4. See also Barwon-Darling/Lower Darling Critical Water Advisory Panel meeting communique.	
117.	Mon 20 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
118.	Wed 22 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
119.	Fri 24 April 2020	Nil - but DPIE issues Lower Darling water quality update No.5. See also Barwon-Darling/Lower Darling Critical Water Advisory Panel meeting communique.	
120.	Mon 27 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
121.	Tue 28 Apr 2020	Nil - WNSW provided an operations update on releases from the Menindee Lakes.	
122.	Thu 30 Apr 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
123.	Mon 4 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
124.	Thu 7 May 2020	Nil - WNSW provided an operations update advising that flows in the Murrumbidgee River below Gogeldrie Weir would increase in the coming days due to a system failure at Gogeldrie weir.	
125.	Thu 7 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
126.	Mon 11 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
127.	Thu 14 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
128.	Mon 18 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
129.	Thu 21 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
130.	Mon 25 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
131.	Wed 27 May 2020	Nil - WNSW provided an operations update advising of critical maintenance works to reduce flows in the Lachlan River system.	

	Date	Decision	Public Supporting information
132.	Thu 28 May 2020	Nil - WNSW provided an operations update on rainfall and flows for the Barwon-Darling river system.	
133.	Wed 3 Jun 2020	Nil - WNSW provided an operations update on water orders for Hunter Valley regulated rivers operations.	
134.	Thu 4 Jun 2020	WNSW provided an operations update announcing the planned commencement of an Environmental Flow Event in the Hunter River on 5 June 2020.	
135.	Wed 10 Jun 2020	WNSW provided an operations update advising the Stevens Weir pool level will vary between the current level of 4.5 m and 3.9 m during winter.	
136.	Fri 12 Jun 2020	Nil - WNSW provided an operations update on releases from the Menindee Lakes.	

Appendix K – NRAR observation flight report

SUBJECT: **INTERIM REPORT:**

Floodplain Harvesting Observation Flight

DATE: **11 February 2020**

TO: [redacted]

FROM: [redacted]

FLIGHT PATH:

From Tamworth to Boggabri, Narrabri, North West along Galathera Creek towards Bullarah. Then followed Thalaba Creek to property "Eiffley" owned by Ken Harris, then North West to the Mihi and back along Mallawa Creek. From there, around Collie Farm to Collarenebri, along Darling River past "Callinan" then on to Walgett.

From Walget to Pilliga to Wee Waa to see main areas of flooding. Final trip from Narrabri to Tamworth.

OBSERVATIONS:

There was surprising little infrastructure damage with the amount of flood water across the flood plains/country. It appears most properties managed the volume of water in this recent rainfall/flood event. Small breaks in channels were viewed which would be expected in a flood event of this volume. No significant infrastructure damage was identified.

Taroo/Collymongle Farms: A channel blow out was observed on their main supply channel across a major floodway. More investigation is required to determine whether the channel is licensed to be above ground. Photo 3587

Callinan: No infrastructure damage was observed, there was a lot of flood water across the property. Water is ponded on some fields and upstream areas. The lagoon at the bottom of the property is full in capacity. It appears the ponded water is held up ready to be diverted by gravity into storage. Photo 3632

Areas of extensive flooding after falls of over 100mm in a number of places and reported falls of up 300mm by Collie Farms. The areas with the most water included Galathera Creek in Spring Plains down to Thalaba Creek. There was a lot of water around Mallawa Creek and the Mehi Floodplain between Kurrabooma and Bronte.

A further report covering potential floodplain harvesting activity will be developed and forwarded with a collection of photos.

Appendix L - Suggested timetable for actions to implement recommendations

The need for timely implementation of reforms was raised by members on the Water User Reference Group, and during the public webinar held for this assessment. Therefore, the table below sets out the Panel's suggestions as to when various actions could be taken to implement the Panel's recommendations, if accepted by the NSW Government. While the Panel would prefer to see some of these actions start earlier, the timetable has been conditioned by advice about the current activity underway in the water reform program and the capacity of the Department to undertake additional tasks.

No.	Action
By end-2020	
1.	Undertake and publish the Water Sharing Plan vs s324 scenarios comparison analysis (Recommendation 2)
2.	Consequent on the publication of the scenario comparison at (1), begin consultation, including in the context of connectivity, to determine: ● a clear definition of 'critical water needs', ● triggers that will determine when first flush management arrangements commence, and when they cease to apply (reverting back to other water sharing rules) ● the various valley, system flow and storage targets of a first flush event, and the principles to determine which of these targets will apply in a particular circumstance ● principles that will be used to determine when access to flows is permitted during a first flush event. This consultation should inform and begin a process to reassess the objectives, principles and targets used for the 2020 Northern Basin First Flush event. (Recommendation 1, 2)
3.	Begin a conversation with Traditional Owners and Indigenous communities to better understand: ● the information needs and engagement protocols of Traditional Owners and Indigenous communities, and ● Traditional Owner and Indigenous community values, uses and objectives for water, including those impacted by first flush event management. (Recommendation 3)
4.	Put in place formal procedures to enable NSW to obtain timely forecasts of flows expected across the Queensland/NSW border (Recommendation 8)

No.	Action
5.	Adopt a practice of proactively making any temporary water restriction required to manage a first flush event (Recommendation 6)
6.	Publish the first progress report on implementation of water reform projects (reports to be published every six months) (Recommendation 9)
By mid-2021	
7.	Develop and publish an implementation plan to improve the effectiveness of communications regarding water management issues (Recommendation 10)
8.	Establish a peak water reform engagement group (Recommendation 10)
9.	Publish guidance materials which outline how the NSW Government will use temporary water restrictions to manage first flush events (Recommendation 5)
10.	Publish the second progress report on implementation of water reform projects (reports to be published every six months) (Recommendation 9)
By end-2021	
11.	Review, update and document incident management processes and other systems to support first flush management, including to: ● ensure DPIE-EES is involved in the future management of first flush events (Recommendation 2) and ● develop an improved communications plan for first flush management (Recommendation 4)
12.	Publish the evidence base that will be used to assist decision-making in first flush management, such as: ● an outline of how flow forecasting is carried out, ● those aspects of flow forecasting and modelling that rely on imperfect information, and what steps (if any) can be taken to address those imperfections, ● approximate contribution of upstream valley flows to flows in the Barwon-Darling, and ● potential volumes of extraction for each river reach and floodplain (as available and progressively kept up to date) (Recommendation 3, 4)
13.	Update flow forecasting models with information from the 2020 Northern Basin First Flush event (Recommendation 2, 8)

No.	Action
14.	Publish the third progress report on implementation of water reform projects (Recommendation 9)
By mid-2022	
15.	Implement a strategy, developed in consultation with Traditional Owners and Indigenous communities, to better understand and address barriers to effectively practicing cultural activities during first flush events, particularly in relation to statutory and other barriers to accessing water. (Recommendation 3)
16.	Finalise update of the objectives, principles and targets to be used for future first flush events (Recommendation 2)
17.	Update incident response guides and extreme events policies to include information about how future first flush events will be managed (Recommendation 7)
18.	Publish the fourth progress report on implementation of water reform projects (Recommendation 9)
By end 2022	
19.	Quantify and publish the native title rights and cultural flow water requirements to be protected in first flush events (Recommendation 1, 3)
20.	Complete consultation about provisions that could be inserted into legislation and Water Sharing Plans to support the process of first flush management (Recommendation 7)
21.	Update flow forecasting models with any improved measurement and monitoring data obtained from: ● any new gauges installed in large local contributory sub-catchments of the northern valley; ● linking information on real-time extractions, future orders, and installed or authorised pump capacities to the forecast model; ● the rollout of measurement and monitoring reforms, including in Queensland ● modelling platform enhancements. (Recommendation 8)
22.	Publish the fifth progress report on implementation of water reform projects. (Recommendation 9)