



# Implementing the NSW Floodplain Harvesting Policy

**Consultation paper**

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**Implementing the NSW Floodplain Harvesting Policy—Consultation paper**

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# Introduction

The NSW Floodplain Harvesting Policy 2013 (the policy) signalled an important reform in floodplain water management. The policy will apply across NSW but is currently being implemented in five northern valleys where floodplain harvesting is most prevalent: the Border Rivers, Gwydir, Namoi, Barwon–Darling and Macquarie valleys. This is being done through the NSW Healthy Floodplains project—one of five key projects where the NSW Government is investing to secure a sustainable water future for NSW.

## Background

The policy was approved by the NSW Government in May 2013 following a period of targeted consultation in 2008 and public exhibition in 2010. These consultations built on earlier statements announcing the government's intention to manage floodplain harvesting activities.

The policy provides a framework for licensing floodplain harvesting extractions. The full policy and a summary (contained within the fact sheet titled *Licensing of Floodplain Extractions*) are published on the NSW Department of Industry's website ([www.water.nsw.gov.au](http://www.water.nsw.gov.au)). This consultation paper should be read in conjunction with these documents.

## Issues for consultation

Implementation of the policy in the Gwydir and Border Rivers has revealed some issues that require further consideration and that are the subject of this consultation paper.

### Rainfall runoff

The intent of the policy is to capture all floodplain harvesting diversions within the licensing framework. Implementation of the policy has highlighted that the way floodplain harvesting is defined in the policy has led to some ambiguity in relation to the treatment of rainfall runoff.

Some stakeholders have suggested that rainfall runoff should be exempt from the licensing framework. In 2017, the NSW Department of Industry considered this issue and is now seeking your feedback on the pros and cons of how rainfall runoff should be treated.

There are two main options. Rainfall runoff could be included in the licensing framework. This means that floodplain harvesting licences will apply to both overland flows and rainfall runoff.

The alternative approach is to exempt the take of rainfall runoff from the licensing framework. This means, while the amount able to be captured would still be capped, as all take is currently capped to meet Basin Plan requirements, the take would not be recorded against a licence. Instead, any increase in rainfall runoff would be reported as an interception and would need to be offset by a reduction in another form of take.

The pros and cons of both these policy options are summarised in the table below and discussed in the following sections.

Table 1. The pros and cons of the policy options

Options	Pros	Cons
1. All floodplain harvesting managed within the licensing framework	<p>Consistent with the intent of the NSW Floodplain Harvesting Policy</p> <p>More effective management of floodplain harvesting diversions—growth in use is less likely</p> <p>Greater protection of environmental flows and reliability of supply for downstream water users</p> <p>Compensable rights that protect access to both overland flow and rainfall runoff</p>	<p>The current Independent Pricing and Regulatory Tribunal (IPART) water pricing determination is based on rainfall runoff being excluded. If this isn't addressed, it may result in increased water bills for individual irrigators</p> <p>May increase the risk of diffuse source water pollution unless there are provisions to specifically avoid or mitigate these risks (see below)</p>
2. All rainfall runoff from irrigation areas exempt from requirement to hold water access licence	<p>May improve management of diffuse source water pollution</p> <p>More consistent with current IPART water pricing determination</p>	<p>Inconsistent with the intent of the NSW Floodplain Harvesting Policy</p> <p>Less effective management of floodplain harvesting diversions - growth in use is more likely</p> <p>Lower protection of environmental flows and reliability of supply for downstream water users</p> <p>Compensable rights do not apply to rainfall runoff.</p>

Indicative modelling of the potential impacts of not including rainfall runoff in floodplain harvesting licences has been undertaken. Reports outlining what the modelling shows are attached to this paper, to provide further information.

Benefits of Option 1 would include:

- **A more robust compliance and enforcement regime**
  - In practice, it is not possible to determine rainfall runoff capture separately from overland flow capture. This means that if a licence exemption for rainfall runoff was established it would not be possible to determine whether the capture of water was occurring under the exemption or under a licence. It leaves the framework open to uncertainty and would significantly weaken its enforceability.
- **Equity of treatment**
  - All floodplain water, irrespective of whether it originated from rainfall runoff or overland flow, will be treated the same. This ensures that both these forms of take are regulated and that one cannot grow at the expense of the other. This approach provides security and business certainty for properties that rely on rainfall runoff and overland flow.
- **No change to the overall water take amounts as these are already capped**
  - Whether rainfall runoff is included or excluded from the definition of floodplain harvesting does not change the volume of water that is permitted to be taken under existing NSW water sharing plan limits or Basin Plan Sustainable Diversion Limits (SDLs); it relates only to how it is accounted for and managed.

Benefits of Option 2 would include:

- **No impact on water bills**
  - The current IPART determination is most consistent with this option. Implementation prior to the next determination period (commencing 1 July 2020) is less likely to result in more revenue being collected for this activity than that which was intended.
- **An improvement in the management of floodplain diversions relative to the past**
  - The management of water will be improved compared with the past as some components will be licensed and the rainfall runoff will be accounted for in some form.
- **Less risk of pollution**

As all rainfall runoff will be exempt from licensing requirements, the risk that agriculturally contaminated water will be allowed to discharge into waterways will be reduced.

If Option 1 is pursued, the department acknowledges that there may be rare circumstances where a reasonable licence allocation, set aside for the purpose of collecting contaminated rainfall runoff has been exhausted and when it may be desirable to prevent this runoff from being released into waterways consistent with the NSW Diffuse Source Water Pollution Strategy 2009. To that end, the department is actively working with the Office of Environment and Heritage to better understand the circumstances where this may occur. If required, the department will consider options that deliver the flexibility to retain any agriculturally contaminated water on farm whilst not increasing overall water usage.

## Questions

Should rainfall runoff be included (option 1) or excluded (option 2) in the floodplain harvesting licencing framework?

If rainfall runoff were included in the floodplain harvesting licencing framework, would you support the development of an approach that would allow agriculturally contaminated water to be retained on farm to prevent pollution of waterways?

## Monitoring of floodplain harvesting

There is currently no monitoring of floodplain harvesting diversions. The capacity to monitor floodplain harvesting diversions is one of the significant advantages of bringing these diversions into the licensing framework. In anticipation of floodplain harvesting licences, a draft floodplain harvesting monitoring strategy was placed on public exhibition during April 2017. Nine formal submissions were received as part of this process. In light of the submissions received as well as the recommendations made by Ken Matthews in his final report titled *Independent investigation into NSW water management and compliance*, a staged approach to improving the monitoring of floodplain harvesting diversions is now being recommended. This staged approach acknowledges the challenges to effective monitoring in the floodplain harvesting context but aims to improve rigour over time.

The proposed staged approach would include:

- A minimum requirement for water users to measure storage volume through gauge boards and calibrated storage curves to account for floodplain harvesting during the first three years of implementation
- Identifying alternative measurement approaches during the first two years of implementation
- Evaluating the performance of the minimum requirement against the policy objectives after the first two years of implementation
- A revised minimum requirement implemented (if required) after the third year of implementation.

Note that the initial minimum requirement is consistent with recommendation 2b in the report titled *The Murray-Darling Basin Wide Water Compliance Review*, published by the Murray–Darling Basin Authority (MDBA) in 2017 that recommends ‘95% of take by non-metered floodplain harvesting is accurately measured, for example, by calibrated storage level recorders by 30 June 2022’.

Further, the proposed staged approach (described above) sets a trajectory beyond this minimum requirement should an evaluation indicate that this is required in order to achieve stated policy objectives.

Feedback on the staged approach to improving the monitoring of floodplain harvesting diversions is being sought as part of this consultation. This feedback will be considered as part of the development of the broader Water Take Measurement Policy.

## Question

Do you support the proposed staged approach to floodplain monitoring?

## Update on proposed approach to account management rules for floodplain harvesting

The policy sets out very specific account management rules that will apply to floodplain harvesting access licences. Analysis in the Gwydir and Border Rivers valleys has shown that the implementation of these rules in a rigid way will result in unintended outcomes. These include an inability to effectively manage growth in use and a wide range of impacts on individual floodplain harvesting users.

Extensive analysis of various entitlement and account management rule combinations has been undertaken, with the results compared against multiple objectives, including;

- achieving the Baseline Diversion Limit (BDL) in total
- achieving the floodplain harvesting component of the BDL
- managing future growth in development
- achieving equal distribution of impacts amongst individuals
- effect on river flows.

This process was overseen by an NSW interagency working group including the NSW Department of Primary Industries (Fisheries), NSW Department of Primary Industries (Agriculture) and the Office of Environment and Heritage.

The assessment has led the department to recommend a more flexible approach to entitlements and account management rules for floodplain harvesting than specified in the current policy. Stakeholder modelling reports which summarise the effect of these proposed changes have been prepared for the Gwydir and Border Rivers and are attached to this paper.

Accordingly, the department is now recommending that the policy be refined to provide the flexibility for different floodplain harvesting account management rules to be developed and established on a valley by valley basis through the water sharing planning process. Note that the water sharing planning process involves a public submission process in conjunction with the development of water resource plans.

## Question

Do you support the proposal to provide flexibility through the development of different floodplain harvesting account management rules on a valley by valley basis?

## Have your say

This paper seeks your feedback on how rainfall runoff should be managed and an approach to improving the monitoring of floodplain harvesting diversions.

The comments may focus on how the policy should be implemented in the five prioritised northern valleys and in other valleys where the Policy will be implemented in future.

Your input will help to ensure that decisions about possible changes to the policy are well informed and consider the potential impacts on the environment and the reliability of water supply for downstream water users, compliance with the *Water Management Act 2000* and Basin Plan 2012, and potential impacts on the ability to meet the objectives of the National Water Initiative.

The community is encouraged to provide feedback. These responses will be due by 11.59pm on 15 April 2018 and can be submitted in a number of ways, including:

Online: [www.haveyoursay.nsw.gov.au](http://www.haveyoursay.nsw.gov.au)

Email: [water.reform@industry.nsw.gov.au](mailto:water.reform@industry.nsw.gov.au)

Website: [www.industry.nsw.gov.au/water-reform/consultation](http://www.industry.nsw.gov.au/water-reform/consultation)

Post: Water Renewal Task Force, Department of Industry, GPO Box 5477 | Sydney NSW 2001

# Attachment A—Gwydir regulated river water source: Draft revised approach to floodplain harvesting accounting rules and modelling results

March 2018

## Summary

The NSW Floodplain Harvesting Policy 2013 (the policy) will bring floodplain harvesting into the water licensing framework. Any growth in floodplain harvesting above the Water Sharing Plan Limit will be addressed through the policy. There are two main types of tools available to manage growth in floodplain harvesting; an entitlement volume and account management rules.

Draft individual floodplain harvesting entitlement volumes were determined and subsequently released to individuals for comment in the Gwydir in November 2016. Several issues with the draft entitlement and allocation and accounting framework have been identified. In response, several adjustments to the overall approach may be required.

**Table 1. Options for Adjustments**

Initial approach proposed	New proposal	Reason for change
A separate rainfall allowance and floodplain harvesting entitlement	One entitlement with rainfall runoff harvesting included	<ul style="list-style-type: none"> <li>• Clearer for users and regulators</li> <li>• Better ability to monitor and implement the framework</li> <li>• Less potential for unsustainable growth and impact on other water users</li> </ul>
Long-term climate period used for determining entitlements	Shorter more recent period used (or the long term average if that is greater)	Minimises impacts and results in fairer outcomes for irrigators
The policy says the annual usage limit for harvesting is 500% of the entitlement. In November 2016, it was proposed that this annual usage limit would be changed to 600%.	500% annual usage limit retained	In conjunction with the larger entitlements, this results in fairer outcomes for irrigators compared to the initial proposal.
Unlimited carryover; No account balance limit	Unlimited carryover however the account balance is limited to 500% of the entitlement.	This is necessary to offset the larger entitlements and prevent growth in use. Without account limits, there is a significant risk that large account balances will accrue during dry periods and this will enable further growth in use to occur.

# Background and purpose

## Purpose of the policy

Floodplain harvesting includes rainfall runoff harvesting and overland flow harvesting that is not already authorised under another licence category, a basic landholder right or a licence exemption. This means that floodplain harvesting includes the collection, extraction or impoundment of rainfall runoff flowing across floodplains except where rainfall is harvested in accordance with an approved harvestable rights order. The NSW Floodplain Harvesting Policy brings floodplain harvesting into the water licensing framework. (You can read more about this including a description of exclusions, in the policy<sup>1</sup>)

The purpose of the policy is to:

- manage floodplain water extractions more effectively to protect the environment and the reliability of water supply for downstream water users,
- ensure compliance with the requirements of the *Water Management Act 2000*
- meet the objectives of the *National Water Initiative*.

## Limits to long-term diversions

Under the policy, eligible works include approved existing works as well as proposed development which had a valid application in place as at 3 July 2008. In the Gwydir, the total eligible level of development is greater than that allowed for under the Gwydir Water Regulated River Sharing Plan which has led to growth in use. This has to be addressed as part of the Policy and to meet Basin Plan requirements.

For the Gwydir, the water sharing plan limit is based on infrastructure at 1999/00. The plan already includes an estimate of floodplain harvesting based on this level of infrastructure; however modelling limitations made this a very rough estimate. A range of additional information (for example, satellite data and hydraulic modelling) has been used to improve the quality of the hydrologic modelling, and hence the Plan Limit estimate. This new estimate is used to assess growth in use.

In the Gwydir, there has been growth in floodplain harvesting infrastructure as detailed in Attachment 1. The growth between 1999–2000 and the eligible infrastructure in 2008–09 means that the long term diversion estimate is above the Plan Limit. This means that constraints need to be placed on all applicants to reduce diversions down to the Plan Limit, that is, that all properties may have a reduction in harvesting.

Growth in use from floodplain harvesting can be managed using both the entitlement volume and account management rules. This report sometimes refers to these as ‘the framework’.

## Problems with the November 2016 draft entitlement volumes

Draft individual entitlement volumes for floodplain harvesting were released to individuals for comment in the Gwydir in November 2016. The volumes were based on providing a separate allowance for harvesting rainfall runoff from areas developed for irrigation; referred to as the rainfall allowance.

As a result of individual consultation and further data review, several refinements to the model have been made since the November 2016 draft. This report does not detail these refinements as they relate to individual properties.

The entitlement volumes and accounting rules proposed at that time would have resulted in diversions within the Plan Limit triggers for growth in use but did not reduce diversions back to the Plan Limit. Subsequent advice from the MDBA has confirmed that water resource plans will need to demonstrate that diversions are at or below the new Sustainable Diversion Limits (SDLs).

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<sup>1</sup> [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0012/548499/floodplain\\_harvesting\\_policy.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0012/548499/floodplain_harvesting_policy.pdf)

The revised entitlements and initial accounting framework is designed to ensure that total diversions are within 1% of the Plan Limit estimate. The accounting rules may need to be further refined as part of the water resource planning process to meet the Basin Plan SDL requirements.

## How are floodplain harvesting entitlements calculated?

The policy outlines the method for defining floodplain harvesting entitlements. Some key aspects of this method are outlined below. A summary of the proposed changes to the method also follows.

River system models are used to generate each individual floodplain harvesting entitlement. These models estimate floodplain harvesting that could have occurred if all the eligible infrastructure was in place over a long climatic period.

River system flows are estimated in the Gwydir from 1890 to 2013 using historic climate records. The infrastructure and management of each eligible property is represented in the model. This is supported by survey data which has been verified by the department's licensing team. The model is then able to estimate harvesting behaviour at each individual property by taking into account access to floodplain flows and ability to store the water.

### Method used for November 2016 draft entitlement volumes

The results from the model were used to determine an initial entitlement based on the unconstrained harvesting behaviour. The model was also used to determine the rainfall allowance.

**The rainfall allowance** was defined as the maximum annual runoff from developed areas—it was intended that actual rainfall runoff harvesting would be reported against this maximum allowance.

**The floodplain harvesting entitlement** was set to the long term average overland flow harvesting. Rainfall harvesting from developed areas was not included in this estimate.

### Option for an alternative approach

- to include rainfall runoff harvesting within the entitlements rather than exempting it from the licensing system. (Note rainfall runoff that is permitted to be taken in accordance with a harvestable rights order is already excluded as it is not defined as floodplain harvesting.)
- due to the removal of the rainfall allowance, the entitlement would instead be set based on all eligible floodplain harvesting activity. This is the sum of overland flow and rainfall runoff harvesting that is not already excluded under a harvestable rights order.
- rather than use a long-term average, a shorter more recent climatic period would be used to define the entitlements. For most properties, the short term average is greater than the long term average. For properties where the long term average is greater, this value would be used instead. This change results in a more equitable distribution of impacts. Further information to support this change can be found later in the paper.

## What are the accounting rules?

The policy outlines the following accounting rules:

- the maximum that can be harvested in any one year is 500% of the entitlement.
- harvesting is also limited to the balance left in the user's account. The account would be credited with 100% or 1 ML/ unit share of entitlement annually. The floodplain harvesting usage would be debited against the account.
- no overdraw of the account is permitted
- an unlimited carryover applies from one year to the next.

The following change was proposed with the draft entitlements sent out in November 2016:

- the maximum that can be harvested in any one year is 600% of the entitlement. This was suggested to better cater for individuals who have more variable access to harvesting.

What is an option for an alternative approach?

- That the maximum usage limit is set at 500%. This is consistent with the approved policy. In conjunction with the larger short term average entitlements, this would result in fairer outcomes compared to the draft proposal. This is discussed further in the following section.
- The account balance would be limited to 500% of the entitlement. This is inconsistent with the approved policy but is necessary to offset the larger entitlements and prevent growth in use. Without account limits, there is a significant risk that large account balances will accrue during dry periods and this will enable further growth in use to occur.

## Why are these changes being considered?

### Maintaining initial policy to include rainfall runoff in the entitlements

The rainfall allowance included in the draft letters in November 2016 was defined as the **maximum** annual runoff from developed areas. It was assumed at that point that the maximum volume would rarely if ever be reported as **actual** rainfall harvesting take i.e. that individuals would report only what they took from rainfall runoff against the allowance.

Confusion occurred around the accounting rules associated with the rainfall allowance whereby some individuals believed that they could claim the full maximum rainfall allowance every year. This meant that they would be reporting overland flow harvesting under the rainfall allowance and it would be very problematic monitoring this aspect as the water mixes in the same storage/s. If this type of reporting occurred, the actual volume of floodplain harvesting reported would be small (see example in Attachment B). It would mean that the entitlements and account rules would have negligible impact on irrigators, however this would be unacceptable as the Plan Limit would be exceeded. It would also be possible for further infrastructure development to take advantage of the surplus in floodplain harvesting accounts and any unused rainfall allowance, leading to future growth in use.

If users preferentially debited overland flow harvesting against the rainfall runoff allowance, floodplain harvesting entitlements would need to be reduced by about 50% in order to ensure that the Plan Limit is maintained. This reduction would result in an inequitable outcome for properties which rely mostly on overland flow harvesting. If the adjustment was calculated on an individual property basis, floodplain harvesting entitlements would range from near zero up to 74% of the original estimate. Fifteen percent of properties would either have no entitlement or less than 5ML of entitlement. This approach would mean that properties with small entitlements and large allowances would be less affected by future growth in use responses. This assumes the growth in use response would be a reduction in allocation to floodplain harvesting.

### Moving to a short-term average to calculate entitlements

Using long term averages to define entitlements results in large variations in impacts between individual irrigators. Some properties have a very small long term average compared to a more recent average. For these properties, the impacts are likely to be larger than the long term modelling indicates (see explanation below).

There was a long dry period in the 1920s to 1940s and account balances in the model accumulate to a large value during this period if no account limit is in place. This means that for many properties, there is a large account balance for the rest of the modelling period. The actual impacts on harvesting will depend on the climatic sequence that occurs once the accounting rules are introduced.

If there is not a long dry period soon after the rules are introduced, it is likely that account balances will be smaller than the long term modelling results suggest, meaning the impacts will be greater than was previously communicated. This is particularly the case for the properties which have a relatively small long term average.

To better estimate the likely impacts of the draft framework, the model was run over a shorter more recent climate period. Analysis over this period indicated that individual impacts from the draft framework vary widely. A number of options have been assessed to reduce the likely impacts. The impacts for the proposed short term average approach and the earlier long term average approach are compared below.

In both options, the entitlements are scaled down to ensure that total diversions are within 1% of the Plan Limit. Both options also include rainfall harvesting in the entitlement (that is, no rainfall allowance).

- A. 91% of the long term average (LTA) is used to define entitlements, unlimited account balance, annual limit is 600% of the entitlement<sup>2</sup>.
- B. 85% of the short term average<sup>3</sup> (STA) is used to define entitlements (or 85% of the LTA if this is greater for individual properties), account balance limits and annual limits are 500% of the entitlement<sup>4</sup>.

Option B is now being considered. The outcomes from these two options are compared in Figure 1. **This shows that the proposed short-term average approach has less impact on harvesting compared to the long-term average approach, while still keeping total diversions within 1% of the Plan Limit.**

In this figure, a value of 100% means that the framework has no impact on total diversions. A value of 90% means that after the introduction of the rules, total diversions are reduced to 90% of what it would have been. The results are based on a recent climatic period; 1998 to 2014.

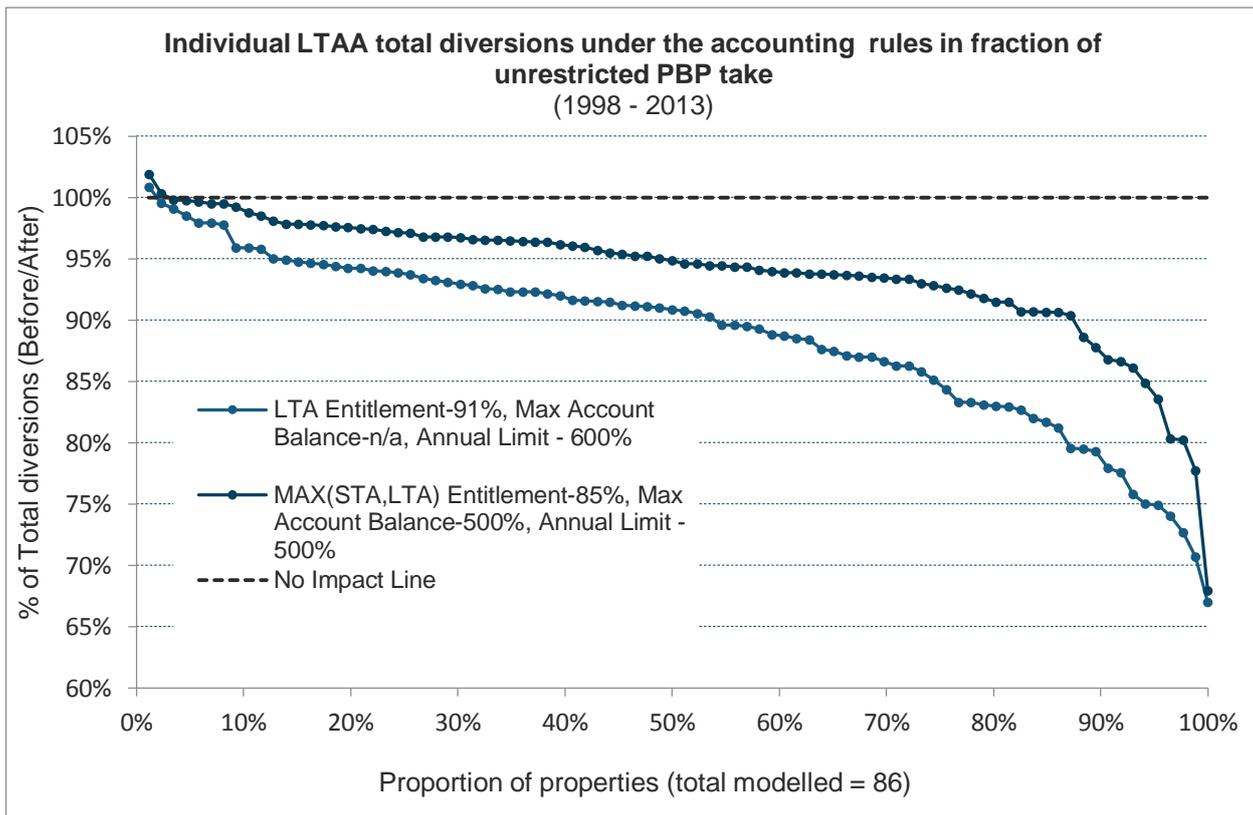
Total diversions are closer to 100% under the proposed approach, which means that there is less impact on irrigators. Some of the biggest improvements are for the most impacted users; however there is still a range of impacts. These differences are examined further later in the report.

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<sup>2</sup> Option A results in floodplain harvesting being 1.5% above Plan Limit, while total valley diversions are 1% below Plan limit

<sup>3</sup> The period from 1/7/1998-30/6/2013 has been used

<sup>4</sup> Option B results in total harvesting being 2.0% above Plan Limit, while total valley diversions are 0.8% below Plan Limit



**Figure 1. Percentage of total diversions which each property takes after the floodplain harvesting rules are applied. The most impacted property shows reduction in total diversions of about 33%. This is due to the fact that most on-farms storages at this property are not being eligible for floodplain harvesting.**

## How could water be allocated and accounted for under the new proposed approach?

Under a proposed short term average approach, the following allocation and accounting rules would initially apply. These may need to be adjusted if a growth in use response is required in later years:

- 500% of the entitlement to be credited to the account in the first year, with 100% of the entitlement to be credited to the account each year after
- The account is debited annually for all floodplain and rainfall runoff harvesting in that year
- The account balance cannot exceed 500% of the entitlement
- In the first 5 years, total usage is limited to 500% of the entitlement. After that, annual usage will be limited to 500% of the entitlement.
- Any unused allocation can be carried over into the next water year subject to the 500% account limit.

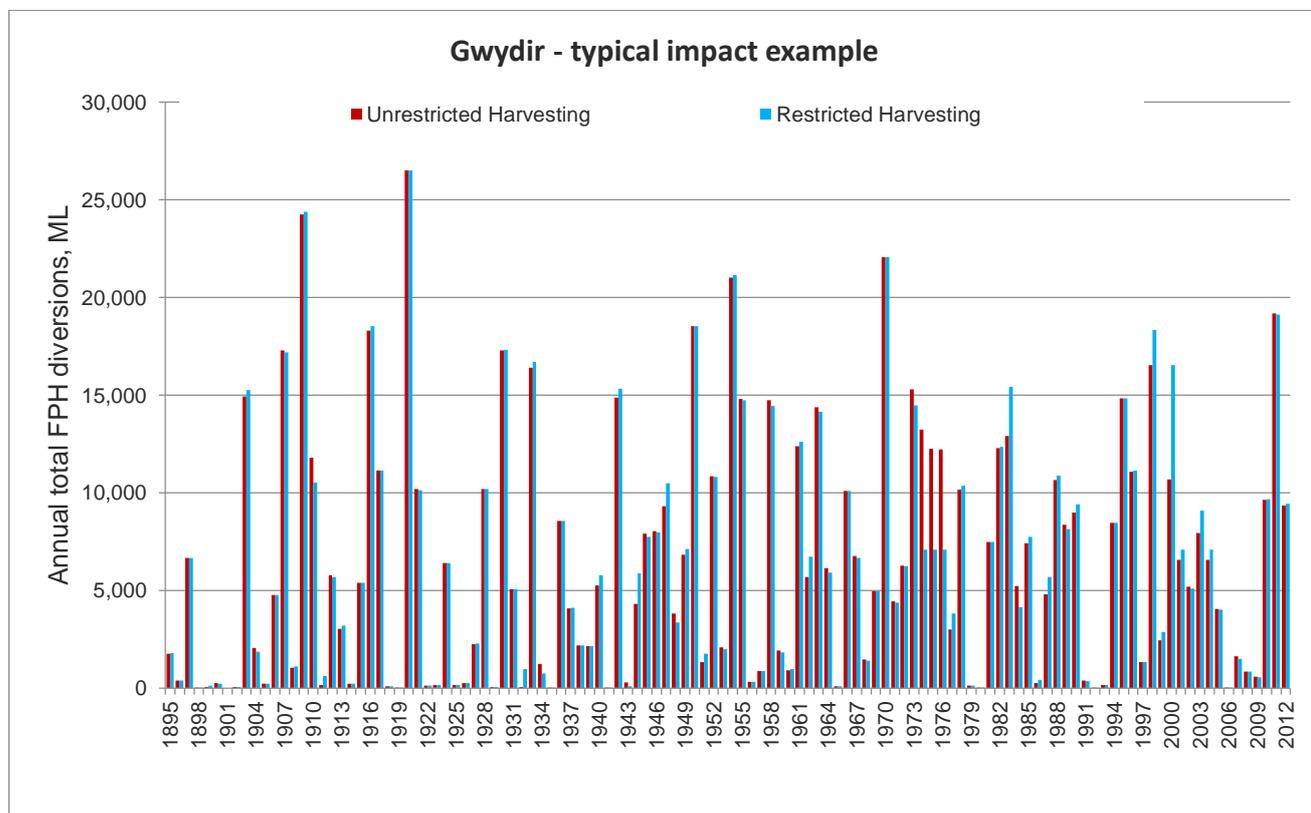
There is currently no monitoring or measurement in place for floodplain harvesting. A staged approach to improving the monitoring of floodplain harvesting diversions is being recommended.

## Why are there differences in irrigator impacts and when do they occur?

The estimated impact of the framework on diversions varies depending on the period of time assessed. During periods of small to average harvesting, there are generally no impacts. Impacts primarily occur during the biggest harvesting years and also after an extended wet period with larger than average harvesting.

An example of the timing of impacts is provided in Figure 2. This shows average annual harvesting volumes in both an unrestricted case and under the proposed accounting rules. The results show that the nature of impacts will depend on the sequence of wet and dry years. Where these periods are relatively well spaced, the accounting rules may have no impact on harvesting.

The most impacted properties are generally those which have more variability in their harvesting. These appear to be in several locations in the system. There is not a simple relationship however; in some cases neighbouring properties appear to have different levels of impact. There may be several reasons for this such as different capabilities to take large volumes during extreme years and differences in supplementary entitlement which changes the pattern of harvesting.



**Figure 2. Floodplain harvesting with and without accounting rules for typical impact example. In some periods there is an increase in harvesting which is due to restrictions occurring for upstream properties.**

## What are the environmental benefits of the new proposed approach?

- addressing current growth in use—long-term modelling indicates around 13% growth in total floodplain harvesting and 3.2% growth in total diversions between the Plan Limit and current conditions. Total diversions include general security, supplementary and floodplain harvesting diversions.
- better protection against future growth in use—the implementation of floodplain harvesting licences will significantly reduce the risk of increased diversions in response to future development.
- protecting reliability of licensed environmental water—At 31 January 2018, there was 5,757ML of high security, 106,617 ML of general security, and 21,824 ML of Supplementary environmental water holdings in the Gwydir valley. The framework ensures that growth in harvesting does not result in allocation impacts on these entitlements. Protecting the reliability of water supply for downstream water users—the implementation of floodplain harvesting licences will ensure that extractions can be more effectively managed resulting in benefits for downstream water users.

## Attachment A1—Growth in infrastructure

Information on irrigation infrastructure was collected as part of the floodplain harvesting program and this shows growth in infrastructure. Table A1 summarises the most significant changes. The on-farm storages which are eligible for a floodplain harvesting entitlement are 25% greater than the capacity estimated at 1999–2000. These include storage built in post-2008 and currently being built as well as storages yet to be constructed.

**Table A1. Total infrastructure for the Gwydir Regulated River water source**

	Best estimate of 1999–2000	Eligible for Entitlement 2008–09	Best estimate of current
Area developed for irrigation (ha)	127,600	131,500	131,500
On-farm storage capacity (GL)	520.0	600.5	614.4
Installed river pump capacity (ML/d)	20,040	22,800	22,800

## Attachment A2—Example of a potential issue with the current approach to rainfall allowance

Table B1 provides an example of annual harvesting volumes and how the misinterpretation of rainfall allowance could lead to reported harvesting being much lower than it should be. It was intended under the approach proposed in November 2016 that only rainfall harvesting from the developed area would be reported under the rainfall allowance. If it was assumed that any harvesting could be reported under the rainfall allowance, this would lead to the reported floodplain harvesting being smaller than actual. Consequently, the account balance would be larger than it should be. This makes the framework ineffective and enables growth in use to occur.

**Table B1. Example yearly accounting if all harvesting can be claimed against a rainfall allowance (ML/yr). In this example, the rainfall allowance is set at 2,483 ML.**

Year	Overland Flow Harvesting	Rainfall Harvesting	Harvesting Claimed under Allowance	Remainder Claimed under entitlement	Volume not claimed on entitlement (but should be)
1	2,400	432	2,483	349	2,051
2	3,557	930	2,483	2,005	1,552
3	178	65	242		178
4	2,049	77	2,126		2,049
5	1,549	536	2,085		1,549
6					
7		68	68		
8	1,907	1,036	2,483	460	1,447
9	2,801	1,151	2,483	1,470	1,331
10	1,500	876	2,376		1,500
11	3,000	313	2,483	830	2,170

# Attachment B—NSW Border Rivers regulated river water source: Draft revised approach to floodplain harvesting accounting rules and modelling results

March 2018

## Summary

The NSW Floodplain Harvesting Policy 2013 (the policy) brings floodplain harvesting into the water licensing framework. Any growth in floodplain harvesting above the Water Sharing Plan Limit will be addressed through the policy. There are two main types of tools available to manage growth in floodplain harvesting; an entitlement volume and account management rules.

Draft individual floodplain harvesting entitlement volumes were determined and subsequently released to individuals for comment in the Border Rivers valley in June 2017. Several issues with the draft entitlement and the allocation and accounting framework have been identified. In response, several adjustments to the overall approach may be required.

**Table 1: Option for Adjustments**

Initial approach proposed	New proposal	Reason for change
A separate rainfall allowance and floodplain harvesting entitlement	One entitlement with rainfall runoff harvesting included	<ul style="list-style-type: none"> <li>• Clearer for users and regulators</li> <li>• Better ability to monitor and implement the framework</li> <li>• Less potential for unsustainable growth and impact on other water users</li> </ul>
Long-term climate period used for determining entitlements	Shorter more recent period used (or the long term average if that is greater)	Minimises impacts and results in fairer outcomes for irrigators
The policy says the annual usage limit for harvesting is 500% of the entitlement. In June 2017, it was proposed that this annual usage limit would be changed to 600%.	500% annual usage limit retained	In conjunction with the larger entitlements, this results in fairer outcomes for irrigators compared to the initial proposal.
Unlimited carryover; no account balance limit	Unlimited carryover however the account balance is limited to 500% of the entitlement.	This is necessary to offset the larger entitlements and prevent growth in use. Without account limits, there is a significant risk that large account balances will accrue during dry periods and this will enable further growth in use to occur.

## Background and purpose

### Purpose of the policy

Floodplain harvesting includes rainfall runoff harvesting and overland flow harvesting that is not already authorised under another licence category, a basic landholder right or a licence exemption. This means that floodplain harvesting includes the collection, extraction or impoundment of rainfall runoff flowing across floodplains except where rainfall is harvested in accordance with an approved harvestable rights order. The NSW Floodplain Harvesting Policy brings floodplain harvesting into the water licensing framework. (You can read more about this including a description of exclusions, in the policy<sup>5</sup>)

The policy:

- manages floodplain water extractions more effectively to protect the environment and the reliability of water supply for downstream water users,
- ensures compliance with the requirements of the *Water Management Act 2000*, and
- meets the objectives of the *National Water Initiative*.

### Limits to long term diversions

Implementation of the Policy includes assessing which works used or proposed for floodplain harvesting will qualify for being issued with a work approval and licence to continue floodplain harvesting activities. Works that are eligible to be assessed include approved existing works as well as proposed development which had a valid application in place as at 3 July 2008. In the Border Rivers, the total eligible level of development is greater than that allowed for under the Border Rivers Water Sharing Plan which has led to growth in use. This has to be addressed as part of the Policy and to meet Basin Plan requirements.

For the Border Rivers, the water sharing plan limit is based on the infrastructure in place at 2001/02. The plan already includes an estimate of floodplain harvesting based on this level of infrastructure, however modelling limitations made this a very rough estimate. A range of additional information (for example, satellite data and hydraulic modelling) has been used to improve the quality of the hydrologic modelling, and hence the Plan Limit estimate. This new estimate is used to assess growth in use.

In the Border Rivers, there has been growth in floodplain harvesting infrastructure as detailed in Attachment 1. The growth between 2001/02 and the eligible infrastructure in 2008/09 means that the long term diversion estimate is above the Plan Limit. This means that constraints need to be placed on all applicants to reduce diversions down to the Plan Limit that may result in a reduction to floodplain harvesting for all properties undertaking this activity.

Growth in use from floodplain harvesting can be managed using both the entitlement volume and account management rules. This report sometimes refers to these as 'the framework'.

### Problems with the June 2017 draft entitlement volumes

Draft individual entitlement volumes for floodplain harvesting were released to individuals for comment in the Border Rivers valleys in June 2017. The volumes were based on providing a separate allowance for harvesting rainfall runoff from areas developed for irrigation; referred to as the rainfall allowance.

As a result of individual consultation and further data review, several refinements to the model have been made since the June 2017 draft. This report does not detail these refinements as they relate to individual properties.

The entitlement volumes and accounting rules proposed at that time, would have resulted in diversions within the Plan Limit triggers for growth in use but did not reduce diversions back to the Plan Limit. Subsequent

<sup>5</sup> [www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0012/548499/floodplain\\_harvesting\\_policy.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0012/548499/floodplain_harvesting_policy.pdf)

advice from the MDBA has confirmed that water resource plans will need to demonstrate that diversions are at or below the new Sustainable Diversion Limits (SDLs).

The revised entitlements and initial accounting framework is designed to ensure that floodplain harvesting is within 1% of the Plan Limit estimate. The accounting rules may need to be further refined as part of the water resource planning process to meet the SDL.

## How are floodplain harvesting entitlements calculated?

The Policy outlines the method for defining floodplain harvesting entitlements. Some key aspects of this method are outlined below. A summary of the proposed changes to the method also follows.

River system models are used to generate each individual floodplain harvesting entitlement. These models estimate floodplain harvesting that could have occurred if all the eligible infrastructure was in place over a long climatic period.

River system flows are estimated in the Border Rivers from 1890 to 2014 using historic climate records. The infrastructure and management of each eligible property is represented in the model. This is supported by survey data which has been verified by the Department's licensing team. The model is then able to estimate harvesting behaviour at each individual property by taking into account access to floodplain flows and ability to store the water.

### Method used for June 2017 draft entitlement volumes

The results from the model were used to determine an initial entitlement based on the unconstrained harvesting behaviour. The model was also used to determine the rainfall allowance.

**The rainfall allowance** was defined as the maximum annual runoff from developed areas - it was intended that actual rainfall runoff harvesting would be reported against this maximum allowance.

**The floodplain harvesting entitlement** was set to the long term average overland flow harvesting. Rainfall harvesting from developed areas was not included in this estimate.

### Option for an alternative approach

- To include rainfall runoff harvesting within the entitlements rather than exempting it from the licensing system. (Note rainfall runoff that is permitted to be taken in accordance with a harvestable rights order is already excluded as it is not defined as floodplain harvesting).
- Due to the removal of the rainfall allowance, the entitlement would instead be set based on all eligible floodplain harvesting activity. This is the sum of overland flow and rainfall runoff harvesting that is not already excluded under a harvestable rights order.
- Rather than use a long term average, a shorter more recent climatic period would be used to define the entitlements. For most properties, the short term average is greater than the long term average. For properties where the long term average is greater, this value would be used instead. This change results in a more equitable distribution of impacts. Further information to support this change can be found later in the paper.

## What are the accounting rules?

The Policy outlines the following accounting rules:

- the maximum that can be harvested in any one year is 500% of the entitlement.
- harvesting is also limited to the balance left in the user's account. The account would be credited with 100% or 1 ML/ unit share of entitlement annually. The floodplain harvesting usage would be debited against the account.
- no overdraw of the account is permitted
- an unlimited carryover applies from one year to the next.

The following change was proposed with the draft entitlements sent out in June 2017:

- the maximum that can be harvested in any one year is 600% of the entitlement. This was suggested to better cater for individuals who have more variable access to harvesting.

What is an option for an alternative approach?

- That the maximum usage limit is set at 500%. This is consistent with the approved policy. In conjunction with the larger short term average entitlements, this would result in fairer outcomes compared to the draft proposal. This is discussed further in the following section.
- The account balance would be limited to 500% of the entitlement. This is inconsistent with the approved policy but is necessary to offset the larger entitlements and prevent growth in use. Without account limits, there is a significant risk that large account balances will accrue during dry periods and this will enable further growth in use to occur.

## Why are these changes being considered?

### Maintaining initial Policy to include rainfall runoff in the entitlements

The rainfall allowance included in the draft letters in November 2016 was defined as the **maximum** annual runoff from developed areas. It was assumed at that point that the maximum volume would rarely if ever be reported as **actual** rainfall harvesting take i.e. that individuals would report only what they took from rainfall runoff against the allowance.

Confusion occurred around the accounting rules associated with the rainfall allowance whereby some individuals believed that they could claim the full maximum rainfall allowance every year. This meant that they would be reporting overland flow harvesting under the rainfall allowance and it would be very problematic monitoring this aspect as the water mixes in the same storage/s. If this type of reporting occurred, the actual volume of floodplain harvesting reported would be small (see example in Attachment B). It would mean that the entitlements and account rules would have negligible impact on irrigators, however this would be unacceptable as the Plan Limit would be exceeded. It would also be possible for further infrastructure development to take advantage of the surplus in floodplain harvesting accounts and any unused rainfall allowance, leading to future growth in use.

If users preferentially debited overland flow harvesting against the rainfall runoff allowance, floodplain harvesting entitlements would need to be reduced by about 50% in order to ensure that the Plan Limit is maintained. This reduction would result in an inequitable outcome for properties which rely mostly on overland flow harvesting. If the adjustment was calculated on an individual property basis, floodplain harvesting entitlements would range from near zero up to 74% of the original estimate. Fifteen percent of properties would either have no entitlement or less than 5ML of entitlement. This approach would mean that properties with small entitlements and large allowances would be less affected by future growth in use responses. This assumes the growth in use response would be a reduction in allocation to floodplain harvesting.

### Moving to a short term average to calculate entitlements

Using long term averages to define entitlements results in large variations in impacts between individual irrigators. Some properties have a very small long term average compared to a more recent average. For these properties, the impacts are likely to be larger than the long term modelling indicates (see explanation below).

There was a long dry period in the 1920s to 1940s and account balances in the model accumulate to a large value during this period if no account limit is in place. This means that for many properties, there is a large account balance for the rest of the modelling period. The actual impacts on harvesting will depend on the climatic sequence that occurs once the accounting rules are introduced.

If there is not a long dry period soon after the rules are introduced, it is likely that account balances will be smaller than the long term modelling results suggest, meaning the impacts will be greater than was previously communicated. This is particularly the case for the properties which have a relatively small long term average.

To better estimate the likely impacts of the draft framework, the model was run over a shorter more recent climate period. Analysis over this period indicated that individual impacts from the draft framework vary widely. A number of options have been assessed to reduce the likely impacts. The impacts for the proposed short term average approach and the earlier long term average approach are compared below.

In both options, the entitlements are scaled down to ensure that total diversions are within 1% of the Plan Limit. Both options also include rainfall harvesting in the entitlement (that is, no rainfall allowance).

- A. 93% of the long term average (LTA) is used to define entitlements, unlimited account balance, annual limit is 600% of the entitlement<sup>6</sup>.
- B. 90% of the short term average<sup>7</sup> (STA) is used to define entitlements (or 90% of the LTA if this is greater for individual properties), account balance limits and annual limits are 500% of the entitlement<sup>8</sup>.

Option B is now being considered. The outcomes from these two options are compared in Figure 1. **This shows that the proposed short term average approach has less impact on harvesting compared to the long term average approach, while still keeping harvesting within 1% of the Plan Limit**

In this figure, a value of 100% means that the framework has no impact on total diversions. A value of 90% means that after the introduction of the rules, total diversions are reduced to 90% of what it would have been. The results are based on a recent climatic period; 1998 to 2014.

Total diversions are closer to 100% under the proposed approach, which means that there is less impact on irrigators. Some of the biggest improvements are for the most impacted users; however there is still a range of impacts. These differences are examined further later in the report.

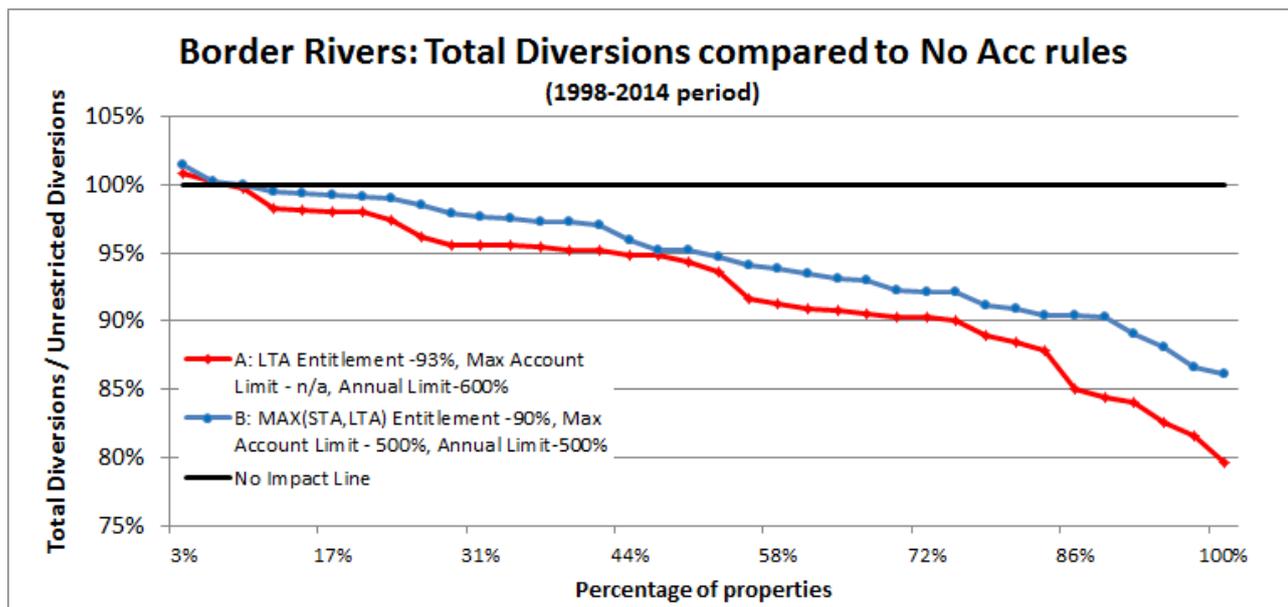


Figure 1. Percentage of total diversions which each property takes after the floodplain harvesting rules are applied

## How could water be allocated and accounted for under the new proposed approach?

Under the proposed short term average approach, the following allocation and accounting rules would initially apply. These may need to be adjusted if a growth in use response is required in later years:

<sup>6</sup> Option A results in total diversions being 0.31% above Plan Limit.

<sup>7</sup> The period from 1/7/1998-30/6/2014 has been used

<sup>8</sup> Option B results in total diversions being 0.35% above Plan Limit.

- 500% of the entitlement to be credited to the account in the first year, with 100% of the entitlement to be credited to the account each year after
- The account is debited annually for all floodplain and rainfall runoff harvesting in that year
- The account balance cannot exceed 500% of the entitlement
- In the first 5 years, total usage is limited to 500% of the entitlement. After that, annual usage will be limited to 500% of the entitlement.
- Any unused allocation can be carried over into the next water year subject to the 500% account limit.

There is currently no monitoring or measurement in place for floodplain harvesting. A staged approach to improving the monitoring of floodplain harvesting diversions is being recommended.

## Why are there differences in irrigator impacts and when do they occur?

The estimated impact of the framework on diversions varies depending on the period of time assessed. During periods of small to average harvesting, there are generally no impacts. Impacts primarily occur during the biggest harvesting years and also after an extended wet period with larger than average harvesting.

An example of the timing of impacts is provided in Figure 2. This shows average annual harvesting volumes in both an unrestricted case and under the proposed accounting rules. The results show that the nature of impacts will depend on the sequence of wet and dry years. Where these periods are relatively well spaced, the accounting rules may have no impact on harvesting.

The most impacted properties are generally those which have more variability in their harvesting. These appear to be in several locations in the system. There is not a simple relationship however; in some cases neighbouring properties appear to have different levels of impact. There may be several reasons for this such as different capabilities to take large volumes during extreme years and differences in supplementary entitlement which changes the pattern of harvesting.

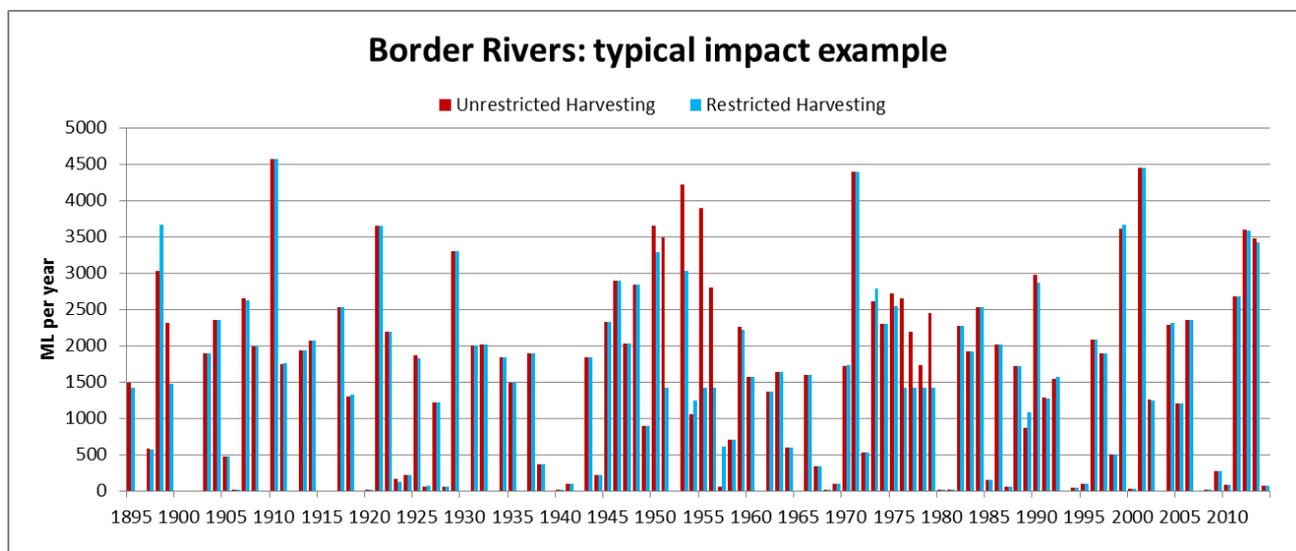


Figure 2. Floodplain harvesting with and without accounting rules for typical impact example

## What are the environmental benefits of the new proposed approach?

- Addressing current growth in use – long term modelling indicates around 8% growth in total floodplain harvesting and 1.4% growth in total diversions between the Plan Limit and current conditions. Total diversions include general security, supplementary and floodplain harvesting diversions.
- Better protection against future growth in use – the implementation of floodplain harvesting licences will significantly reduce the risk of increased diversions in response to future development.
- Protecting reliability of licensed environmental water – At 31 January 2018, there were 2,276 ML General Security and 1,300 ML Supplementary environmental water holdings in the NSW Border Rivers. The framework ensures that growth in harvesting does not result in allocation impacts on these entitlements.
- Protecting the reliability of water supply for downstream water users - the implementation of floodplain harvesting licences will ensure that extractions can be more effectively managed resulting in benefits for downstream water users.

## Attachment B1—Growth in infrastructure

Information on irrigation infrastructure was collected as part of the floodplain harvesting program and this shows growth in infrastructure. The table below summarises the most significant changes. The storages capacity at 2008/09, including one eligible storage not yet built, is 13% greater than the capacity estimated at 2001–02.

**Table A1. Total infrastructure for the NSW Border Rivers Regulated River water source**

	Best estimate of 2001/02	2008–09
Maximum irrigable area (ha)	45,485	48,251
On-farm storage capacity (ML)	187,625	207,165 (+4000 ML future storage approved)
Installed river pump capacity (ML/d)	7,074	7,774

## Attachment B2—Example of a potential issues with the current approach to rainfall allowance

Table B1 provides an example of annual harvesting volumes and how the misinterpretation of rainfall allowance could lead to reported harvesting being much lower than it should be. It was intended under the approach proposed in November 2016 that only rainfall harvesting from the developed area would be reported under the rainfall allowance. If it was assumed that any harvesting could be reported under the rainfall allowance, this would lead to the reported floodplain harvesting being smaller than actual. Consequently, the account balance would be larger than it should be. This makes the framework ineffective and enables growth in use to occur.

**Table B1. Example yearly accounting if all harvesting can be claimed against a rainfall allowance (ML/yr). In this example, the rainfall allowance is set at 2,483 ML.**

Year	Overland Flow Harvesting	Rainfall Harvesting	Harvesting Claimed under Allowance	Remainder Claimed under entitlement	Volume not claimed on entitlement (but should be)
1	2,400	432	2,483	349	2,051
2	3,557	930	2,483	2,005	1,552
3	178	65	242		178
4	2,049	77	2,126		2,049
5	1,549	536	2,085		1,549
6					
7		68	68		
8	1,907	1,036	2,483	460	1,447
9	2,801	1,151	2,483	1,470	1,331
10	1,500	876	2,376		1,500
11	3,000	313	2,483	830	2,170