Reasonable Excuse Report – Barwon-Darling 2019/20 Sustainable Diversion Limit Compliance

A report to the Murray Darling Basin Authority setting out reasons for actual take exceeding permitted take by more than 20% for the 2019/20 compliance period.

Executive Summary

NSW has completed the 2019/20 annual assessment of compliance with the Sustainable Diversion Limit (SDL) in the Barwon-Darling. The Annual Actual Take (AAT) exceeds the Annual Permitted Take (APT) by 32% which is higher than the 20% exceedance trigger specified by the Basin Plan. The majority of the take during this reporting period is from B class and C class licences, which access medium to higher flows.

NSW claims reasonable excuses RE1.1 (Discover) and RE4 (incomplete recovery) under the *Sustainable Diversion Limit Reporting and Compliance Framework* published by the Murray Darling Basin Authority (MDBA) in November 2018[1].

NSW has identified two main causes for the exceedance:

1. The submitted APT model includes an outdated method to represent historical embargo measures. The modelling is proposed to be updated for future compliance reporting to more accurately reflect current methods and intentions for the application of temporary water restriction orders. The outcome of the modelled historical embargo is that the APT model predicted that there would be 17,122ML less take in 2019/20 compared to the real temporary restriction orders that applied.
2. New meters have been fitted to all major Barwon-Darling works and these meters are reported to generally read higher than previous meters over equivalent pumping events. The model used in the APT method was calibrated to match the figures returned by the previous meters so there is an inconsistency between modelled and actual take. This could substantially increase the APT, reducing the exceedance.

In addition to these two major issues, the Commonwealth has not completed 1.6 GL of the planned 32 GL recovery target in the Barwon-Darling.

NSW will move quickly to address the problems identified in this report and will work closely with the MDBA to ensure that the agreed compliance framework continues to be closely adhered to in a transparent manner.

NSW will recalibrate the APT model and update the embargo behaviour prior to our 2020/21 SDL compliance assessment which is expected to reduce the cumulative balance to zero. If still in exceedance of the 20% trigger, NSW will curtail the Available Water Determination (AWD) in the event that an acceptable reasonable excuse is not available. NSW may also undertake discretionary measures in advance, or in addition to, the required actions to bring take in the Barwon-Darling within the relevant limits.

[1] https://www.mdba.gov.au/publications/policies-guidelines/sustainable-diversion-limit-reporting-compliance-documents

2019/20 Reasonable Excuse Report

Barwon-Darling Sustainable Diversion Limit Compliance

Current Situation

Barwon-Darling AAT for 2019/20 is higher than the SDL. NSW has identified the causes for the exceedance as:

1. The submitted APT model includes an estimation of past embargo practices of Barwon-Darling diversions. There are new rules and practices in place in the Barwon-Darling meaning that the embargo estimation is not current and should be updated in the model included in the APT method.
2. New meters were rolled out across the Barwon-Darling system in the last 10 years. The new meters are reported to generally read higher than previous meters over equivalent pumping events. The model used in the APT method was calibrated to match the figures returned by the previous meters. This results in inconsistencies between the current recorded diversion volumes and what is reflected in the model.
3. The Commonwealth has not completed 1.6 GL of the planned 32 GL recovery target in the Barwon-Darling. NSW has placed no restrictions or limitations on Commonwealth water purchases in this system and hence the incomplete recovery is beyond NSW control.

The SDL exceedance is summarised as follows:

- The long-term SDL is 176,228 ML for the Basin Plan assessment period of 1895 to 2009, and the 20% exceedance trigger is 35,246 ML.
- The difference between the AAT and APT is 56,844 ML or 32% of the long term sustainable diversion limit.

Table 1 compares the actual measured and estimated take with the modelled permitted take.

Summary of Compliance Accounting Outcomes

Type	Annual Actual Take (ML)	Available account at end of year (ML)	Annual Permitted Take (ML)
A class	1,053[1]	27,318	9,969
B class	187,672[1]	205,380	132,582
C class	45,069[1]	92,168	25,467
(Total Watercourse)	(233,794)	(324,866)	(168,018)
Local Water Utility	3,051	2,178	2,333
Domestic & Stock	38	867	2,660
Floodplain Harvesting	22,200[2]	N/A	29,228
Basic Rights	826	N/A	826
Total	**259,909**		**203,065**

Table 1 - Comparison of AAT and APT volumes for the 2019/20 water year

Table note 1 As extracted from the Water Accounting System on 14/09/2020.

Table note 2 Floodplain harvesting usage is estimated as the long-term average modelled take in any year that floodplain harvesting occurs, according to the interim method agreed with MDBA. It is expected that the metering of actual take will occur as the Healthy Floodplains program is completed in the Barwon-Darling.

The take from the River by A, B and C entitlement class water users was under the *Water Sharing Plan for the Barwon Darling Unregulated Water Source 2012*. The water sharing plan allows water users to take a maximum volume of three times the number of entitlements of each class that they hold in a water year, provided that they have a sufficient account balance.

Background

The 2019/20 water year commenced with cease to flow conditions across the entire system as part of an ongoing severe drought. From late January to the end of April 2020, widespread rain fell across various parts of northwest NSW and southern Queensland (Figure 1), with some parts receiving more than 200 mm of rain in just a couple of days. 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.

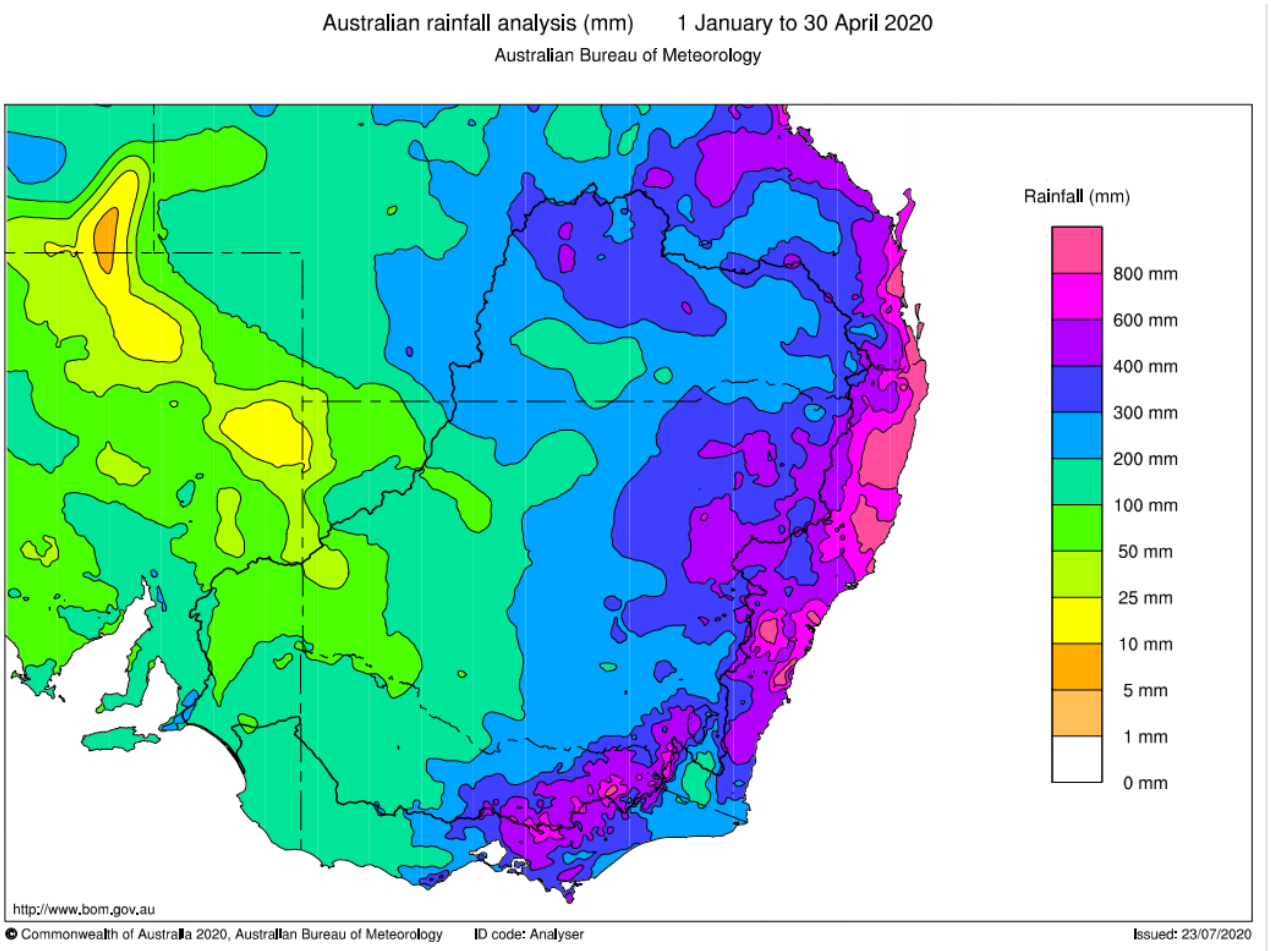

Figure 1 - Cumulative heavy rainfall events in the Barwon-Darling catchment during early 2020

The resulting flows in the Barwon-Darling (e.g. Figure 2) exceeded all cease to pump flow thresholds for entitlements in system. However, during the start of the flow event NSW issued a temporary water restriction order under section 324 of the NSW *Water Management Act 2000* to

suspend access until we were satisfied that sufficient water would reach Menindee Lakes to provide for critical water needs.

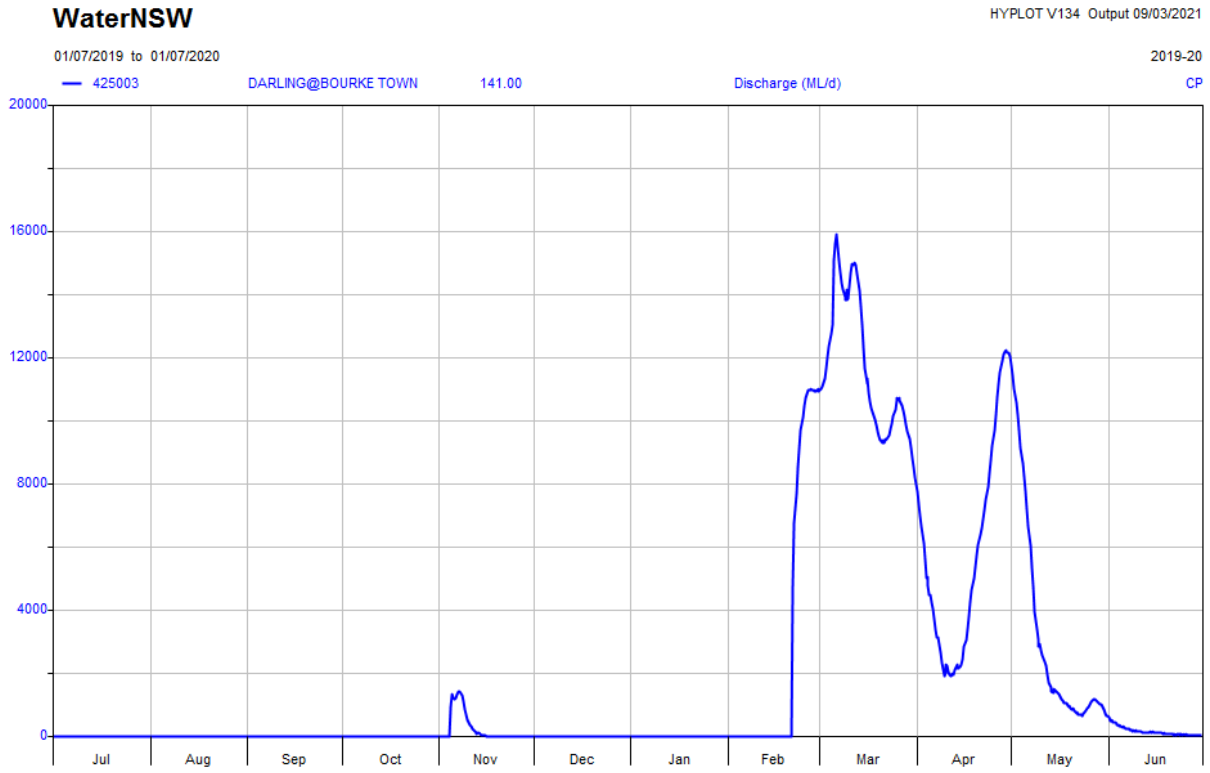

Figure 2 - Flows at Bourke for the 2019/20 water year

Details of the suspensions and subsequent reports and external independent reviews are published here: https://www.industry.nsw.gov.au/water/allocations-availability/northern-basin-first-flush-assessment.

After the suspensions were lifted, anecdotally all active farms pumped at their maximum allowable rates to fill on farm storages and in many cases to pre-water their fields for a winter crop.

Feedback during this period from several entitlement holders was that they had exhausted their 300% annual usage limits and that the newly installed meters gave very different daily usage figures to the previously installed units as they were not able to pump for as many days as they had in the past.

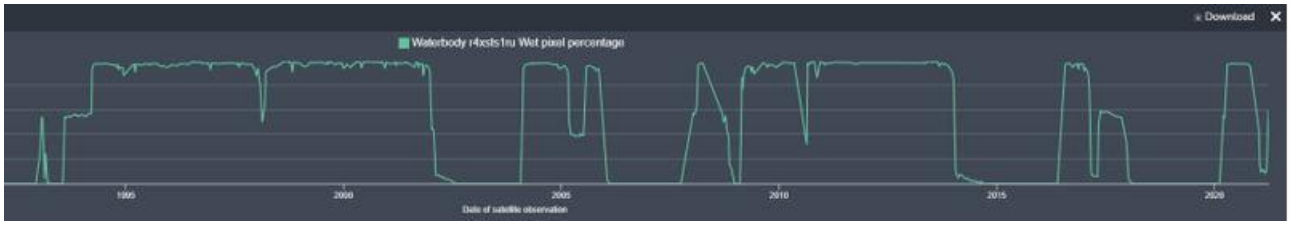

Figure 3 - Filling of on farm storages during early 2020 at a large Barwon-Darling irrigation farm

Spot checks of some farms using the Digital Earth Australia water bodies remote sensing product[2] shows that they had harvested substantial volumes into their on -farm storages during the event.

[2] https://www.ga.gov.au/dea/products/dea-waterbodies

Remote sensing published by the department confirms this. Figure 3 above shows a typical spot check. The trace at the bottom of the image represents changes to the water body surface area over time and the change from empty to full is clearly visible in 2020.

Reasonable Excuses Claimed

The *Sustainable Diversion Limit Reporting and Compliance Framework* published by MDBA in November 2018 requires a specific claim of reasonable excuse to be made.

NSW claims a reasonable excuse classification RE1.1 on the basis that the WRP was in operation during the 2019/20 water year and this is the first year of the SDL register of take exceeding the 20% trigger.

The Barwon-Darling was managed for the entire 2019/20 water year in accordance with the Bi-lateral Agreement between NSW and the MDBA and the proposed Water Resource Plan (WRP) submitted to MDBA for accreditation and published at: https://www.mdba.gov.au/publications/mdba-reports/barwon-darling-watercourse-water-resource-plan. This makes the Barwon-Darling eligible to access the reasonable excuse provisions established through the compliance framework published by MDBA.

Investigations of the underlying technical issues are already underway and there is a clear path to review the APT method/model for submission in a future WRP.

NSW claims a reasonable excuse classification RE4 on the basis that Commonwealth led water recovery was incomplete during the 2019/20 water year as advised by MDBA. NSW continues to support Commonwealth water recovery in this system and has processed all relevant trade applications.

Steps NSW will take to reduce the cumulative balance to zero

The *Sustainable Diversion Limit Reporting and Compliance Framework* requires that a claim for reasonable excuse outlines the steps that will be taken to reduce the cumulative balance to zero.

The results of the SDL compliance assessment reflect an outdated method to represent historical embargo measures in the submitted APT model and changes resulting from a metering upgrade program. NSW is undertaking the following steps to reduce the cumulative balance to zero by first rectifying these two causes.

Removal of historical embargo behaviour

During the summer of the 2002/03 water year, the Menindee Lakes system that supplies water to Broken Hill nearly ran out of water. During and since that experience, the NSW government has imposed various embargos on diversions in upstream systems that typically suspended access to B and C class entitlements in the Barwon-Darling and/or Supplementary access events in northern tributary valleys to secure water through to the Menindee Lakes for Broken Hill.

In his interim independent review of the Barwon-Darling Cap model submitted to MDBA (then MDBC), Mr Drew Bewsher proposed that although no embargoes had been imposed prior to the 1993/94 Cap reference year, NSW had a long standing practice to prioritise access for town water supplies and it could be reasonably expected that NSW would have embargoed access to protect Broken Hill supplies if a severe enough drought had occurred prior to 1993/94. Mr Bewsher recommended including this practice in the model to estimate Cap diversions.

NSW accepted this recommendation and upgraded the Barwon-Darling model to represent Broken Hill embargos as documented in our *Technical Report on the Impacts of Restricting Diversions on the Barwon-Darling River.*

Ongoing difficulty with securing water for Broken Hill eventually led NSW to invest in a long term solution based on building a pipeline from the Murray which was completed in February 2019. Updated rules developed in the water sharing plan and water resource plan, along with the use of temporary water restriction orders under section 324 of the *Water Management Act* 2000 are now used to protect river connectivity, town water, cultural, social and environmental outcomes, along with water volumes in the Menindee Lakes. The updated water sharing plan rules are included in the APT model, however the current approaches to using temporary restrictions under section 324 has changed since the model was finalised and these should be updated in the APT model.

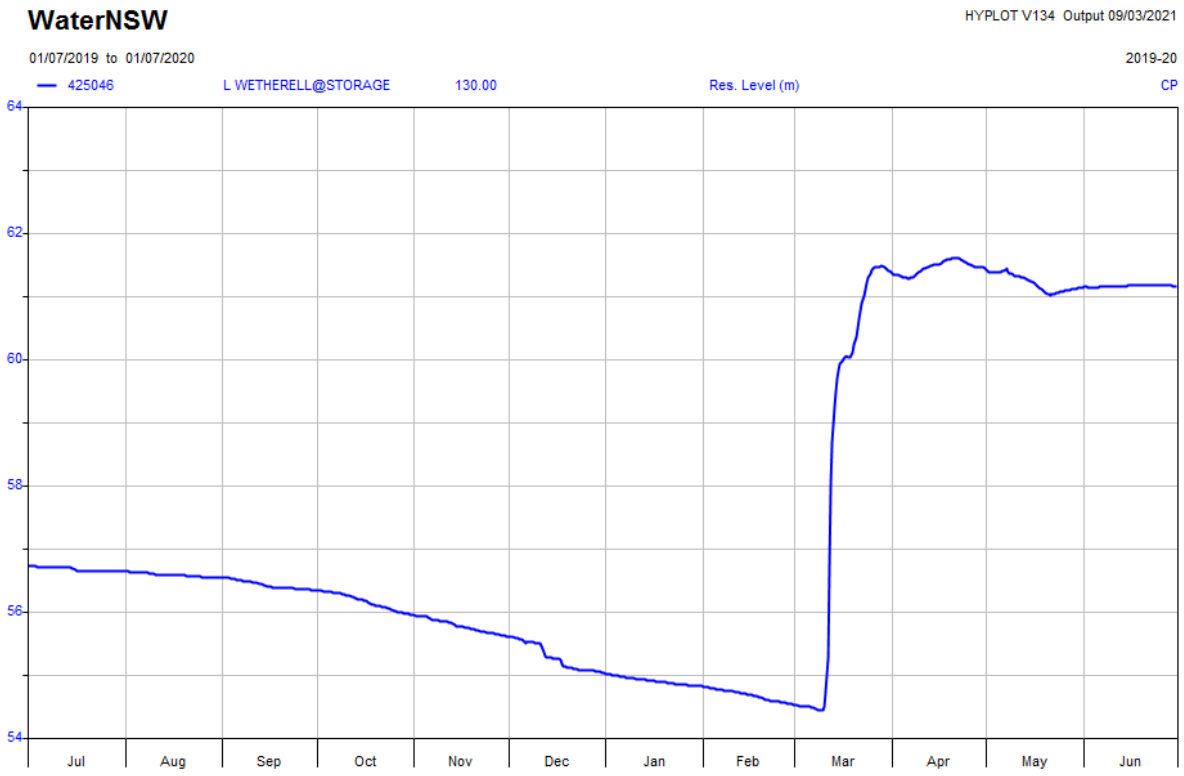

Figure 4 - Critical storage levels at Lake Wetherell in 2019/20

Figure 4 shows Lake Wetherell nearly empty during 2019/20 before flows protected by a s324 order arrived during March 2020. NSW issued s324 orders to protect the first flush event that broke the long period of cease to flow conditions.

NSW has proposed to work collaboratively with MDBA staff to remove the historical embargo modelled behaviour in a resubmitted WRP for the Barwon-Darling and replace it with an agreed estimate of future first flush protection interventions that may take place. It is expected that a resubmitted WRP will also incorporate concurrent improvements resulting from model harmonisation programs and the implementation of floodplain harvesting entitlements.

The impact of the historical embargo modelled behaviour on our APT assessment can be summarised as:

- The model embargo suspended access until the 24/03/2020, whereas the s324 orders were lifted 18-25 days earlier on the 27/02/2020 above the Culgoa junction and by the 06/03/2020 below the Culgoa junction
- The temporal difference in access materially reduced the volume of water that the modelled irrigators were able to pump

- The modelled estimate of lost access is 17,122 ML or 10% of the SDL.

Planned Actions and Timelines

NSW has worked with the MDBA to develop the following indicative timelines and agreed actions to resolve the issue of historical embargo behaviour. The process will also require an iterative approach as the MDBA has an assessment obligation under the Basin Plan's water resource plan requirements. NSW would prefer to work this way to ensure the best use of resources will achieve the best possible outcomes.

Task	Description	Completion date	Apply to SDL compliance report
1.	Barwon-Darling Watercourse (BDW) APT model development (restrictions) • Remove historical (Broken Hill) embargo behaviour, method to represent current temporary restrictions	As at May 2021, well advanced	
2.	Model to MDBA for review / revise as required for submission of revised method for the 2020-21 water year	Ahead of date agreed in bilateral agreement (BA) amendment	2021-22
3.	Include revised method in re-submitted WRP for accreditation.	Included in resubmitted Barwon-Darling water resource plan	2021-22 & ongoing

Table 2 Tasks and timeframes for removal of historic embargo behaviour and inclusion of current restrictions

NSW proposes to MDBA that this specific instance has identified a broader issue across multiple systems with annual permitted take methods that generally do not consider temporary water restrictions. In this case, the wrong temporary restriction has been applied in the APT model and the difference in outcome was large enough to be noticeable in the first year of SDL compliance. The same restriction event also occurred in the Namoi Valley and was not detected by 2019/20 SDL compliance monitoring. Similar restrictions were applied during the millennium drought and these were not flagged as problematic either through Cap compliance monitoring or transitional diversion limit reporting.

NSW will work with the MDBA to further technical and policy discussions on the temporary restriction issue. As this type of action may occur in the other states, we suggest that there is a need to undertake multi-lateral development work for all water resource plans where states that have a legislated ability to impose temporary restrictions to water access. This could include a mechanism within all applicable APT methods to reflect actual restriction events that occur in a SDL compliance period.

Without such a mechanism, APT methods across the basin will over state what could be taken in some years. A mechanism that NSW recommends includes a time series of binary on/off flags populated with announced actual restrictions to set daily extraction rates to zero as required be included in applicable APT methods. This approach has been developed and implemented in a new draft of the existing Barwon-Darling APT model and will be made available to MDBA.

If MDBA agrees with the NSW recommended approach, it can be applied immediately via a bilateral agreement to use the draft APT model for the 2020/21 compliance period. Alternatively, the updated temporary restriction method will be included when the Barwon-Darling WRP is submitted for final accreditation, which is planned for later in 2021.

Metering Recalibration Project

A metering recalibration project is underway to upgrade the accuracy of metered diversion records that were captured prior to the new pattern approved metering rollout program.

A comparison of daily pumping records between the different meters on the same installed pumping equipment is expected to improve our understanding of diversions that have occurred historically and lead to model improvements that will ultimately result in better estimates of the Cap, Baseline Diversion Limits (BDL), and SDL.

NSW engaged technical independent advice on the most robust and practical method to undertake this recalibration. The final report *Existing Analysis and Reports on Historical Water Extraction Data in the Barwon-Darling Water Source* identifies a procedure that uses “agreed rates” to be compared with current pumping records to determine conversion factors. NSW is currently securing suitable resourcing for the next stage of the project and working collaboratively with MDBA to ensure a transparent and robust delivery outcome.

No advance estimates of the effects of metering accuracy upgrades are available, however anecdotal reports from individuals suggest that there is a discrepancy of up to 10% between the older agreed rates and the newer meters. If so, this means the effects of this metering recalibration project are likely to have some impact on resolving the issue.

Planned Actions and Timelines

The planned metering recalibration project is still in an early phase and will be subject to detailed consultative work with MDBA. At present a consultant is undertaking a first analysis of previous agreed pumping rates and recent recorded daily pumping rates with the new meters. This piece of work will be completed by the end of financial year (30/06/2021). These two rates are expected to produce a ratio that can be used to approximate the relationship between annual actual take as recorded by the new meters and the annual permitted take modelled components that were calibrated to the old meters in July 2021.

The report and ratio will be provided to MDBA as part of the ongoing consultative program which will include agreement on next steps. The new metering rollout in the Barwon Darling is not complete as not all sites have new meters installed. There are also sites have been certified as correctly installed but have not been certified for accuracy. It is expected that as the move to AS4747 meters is completed that the recalibration process may be repeated.

There are two options for using the information from the meter calibration project, Option 1is to use the new information and simply apply the site by site ratios to the existing Cap models and related BDL and APT models to post process the model outputs to reflect the new metering. This approach would be implementable in time for the 2020/21 SDL compliance assessment.

Option 2 would be to reprocess historical observed data stored in the NSW databases, then recalibrate all the relevant models for submission to MDBA for accreditation through both Schedule E of the MDB Agreement (cap conditions) and WRP process. It is likely a year will be required to replace all the relevant models and create satisfactory documentation to meet the Schedule E and WRP requirements. Previously the Schedule E process has taken a number of years to be finalised. The Schedule E (MDB cap) step is required as the Barwon Darling BDL is described in

the Basin Plan as 'the long-term annual average limit on the quantity of water that can be taken calculated by:

(i) summing the quantity of water that would have been taken in accordance with Schedule E to the Agreement as at 30 June 2009 for each year of the historical climate conditions; and

(ii) dividing that quantity by all the years of the historical climate conditions.'

A hybrid approach could also be adopted in which an initial correction was made using available ratios and applied each year for SDL compliance purposes. The corrections would be updated or confirmed annually to capture data from new pumping events that occur. At the same time, the existing modelling work to build a replacement Source model for the Barwon-Darling will be completed and the Healthy Floodplains work will become available and the new "universal" model that draws together the multiple work streams will be created and submitted to MDBA for accreditation as the new Cap model and new APT method.

NSW intends that MDBA will continue to be consulted through all these process in recognition of the sensitivities around Barwon-Darling water management. The following table

Task Description		Completion Date	Apply to SDL compliance report
1.	Collate data sets from the NSW Metering Recalibration Program for the old (time and event meters) and the newer flow meters (mostly MACE meters, also some AS4747-compliant meters). Calculate ratio between recorded flow volume in the old and the newer meters and use to improve estimates of diversions (as recommended by reviewer)	30/06/2021	
2.	*Post process APT model results* with site by site ratios between new and old meters applied to model diversions. NSW will provide the adjustment spreadsheet to MDBA to inform a 20/21 reasonable excuse application if required.	Ahead of date agreed in BA amendment	
3.	Provide MDBA a report based on the metering adjustment data that estimates the difference in metering outcomes for 19/20 and 20/21	31/10/2021	
4.	Barwon Darling watercourse cap model development: • Use the recalibrated pumping rates of all the irrigators in the Cap model and run it for the cap period to determine the individual irrigators cap share and the total valley cap value	Before March 2022*	
5.	BDW Cap/BDL/APT model development (metering): Step 2: reprocess historical observed data stored in the NSW databases then recalibrate all the relevant models with adjusted diversion rates for submission to MDBA for accreditation through both Schedule E of the MDB Agreement (Cap conditions)	June 2022*	
6.	Amend Barwon Darling water sharing and water resource plans • Present Cap, BDL and APT models to MDBA for review	Before Oct 2022*	Indicative 2022-23 SDL

Task Description		Completion Date	Apply to SDL compliance report
	• Re-issue entitlements and amend WSP and WRP		compliance reporting
7	MACE meters replaced with AS4747-compliant meters. Update models and update WSP and WRP	June 2028^	

Table 3 Tasks and timeframes for metering recalibration and adjustment of Barwon-Darling water source models

* Timing for these activities may be modified as the modelling process will be iterative as feedback and issues identified by the MDBA and NSW are addressed and regulatory processes.

^ Further updates to models based on AS4747 compliant meters will be determined by the number of flow and pumping events and resource availability.

Incomplete recovery

Estimates of relevant Basin Plan recovery for Barwon-Darling in 2019/20 supplied by the MDBA show that the Commonwealth is 1.6 GL short of the 32 GL target. Applying the scaling factor methodology described in the APT method report of the submitted WRP results in an adjustment of 2,003 ML being applicable for the 2019/20 SDL compliance period.

Planned Actions and Timelines

NSW has no ability to influence Commonwealth recovery programs and hence cannot provide any guidance on when recovery may be completed.

NSW will continue facilitate purchases as we have done many times to date.

Review Other Forms of Take

The *Sustainable Diversion Limit Reporting and Compliance Framework* requires a review of other forms of take in part 5.4.1.

Table 1 in this report contains the best available information at the time of writing to describe the components of take.

The major differences are related to watercourse take by A, B and C class entitlements, and floodplain harvesting, where take through A class and floodplain harvesting is less than was expected by the APT method, and B class and C class are greater than was expected by the APT method. Differences in other components are not material to the outcome.

It is noted that floodplain harvesting estimates will be upgraded through the Healthy Floodplains Program, and upgrades to the estimates for local water utilities and domestic & stock usage are expected to be delivered through a Barwon-Darling source model build.

Test Growth-in-use Response

The *Sustainable Diversion Limit Reporting and Compliance Framework* requires a test of the growth-in-use response in part 5.4.1.

As part of the 2012 Water Sharing Plan, NSW reissued all entitlements in the Barwon-Darling as individual shares of the long-term Cap limit which forms the basis of subsequent BDL and SDL.

Previously the sum of entitlements on the Barwon-Darling was approximately 540 GL which allowed for the potential that irrigation businesses could develop more infrastructure over time and use greater portions of their entitlements during years with sufficient access to flows, and hence grow the long term average consumption in a similar fashion to growth in use in other valleys across the Murray Darling Basin.

Instead, NSW issued entitlements that sum to the long-term Cap of ~189 GL/year with full carryover of account balances permitted. This means that growth is use is curtailed by the licencing framework, because although irrigators can catchup on foregone opportunities, they cannot take more than the expected long-term average over time.

In addition to this limitation, NSW has observed that accumulated account balances at a valley scale have trended up since 2012 which indicates systemic underuse of allocations that are designed to be at the limit for Cap. At the commencement of the WSP on 4/10/2012 the total account balances for the system was 798,555 ML and at 1/7/2020 the total account balances for the system was 1,331,659 ML, meaning a reduction in use of 533,104 ML.

Compliance Response

The current Water Sharing Plan for the Barwon-Darling Unregulated River Water Source published at https://legislation.nsw.gov.au/view/html/inforce/current/sl-2012-0488 includes growth in use provisions at clause 36 which have the effect of reducing announcements for Available Water Determinations (AWDs) made to entitlement classes A, B and C.

Following the metering review, NSW will recalibrate the APT model and update the representation of temporary water restrictions prior to our 2020/21 SDL compliance assessment. If still in exceedance of the 20% trigger and no acceptable reasonable excuse is available, NSW will curtail the AWD to bring Barwon-Darling take within the relevant limits in accordance with the rules of the water sharing plan. NSW may undertake other discretionary actions in support of the mandated growth in use action.

For example:

- The current unit shares of these entitlements are 190,159 shares
- The cumulative difference, that is the current exceedance of SDL on the register of take is 56,844 ML
- An AWD of 70% could be made in a future water year and beyond should the exceedance remain beyond the trigger without a reasonable excuse
- This should return the system to a zero balance within 5 years of normal or average conditions.

Conclusions

The SDL compliance assessment for the 2019/20 water year on the Barwon-Darling has identified a 32% cumulative balance on the compliance register in the first year of operation.

This exceedance results from a combination of technical deficits in the APT method and incomplete recovery by the Commonwealth. NSW is applying for reasonable excuse to provide sufficient time to correct the issues that have been identified in this first assessment by the APT method.

NSW takes seriously the exceedance of the Barwon-Darling SDL in the first year of its application and will move quickly to address the problems identified. That is:

- Update the embargo behaviour in the APT model that reduced the APT by 17,122 ML

- Recalibrate the APT model to make it consistent with the current metering, which may result in a substantial increase to the APT, and a corresponding reduction of the exceedance.

NSW will work closely with the MDBA to ensure that the agreed compliance framework continues to be closely adhered to in a transparent manner and that a zero cumulative balance is returned.