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Review of the contribution of the Nimmie-Caira purchase to Basin Plan water recovery

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The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

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Executive Summary

In June 2013, the Commonwealth agreed to provide \$180 million to the NSW government to purchase land and water entitlements from eleven property owners in the Nimmie-Caira system under a *Heads of Agreement: An Agreement supporting the Nimmie-Caira System Enhanced Environmental Water Delivery Project*. The Nimmie-Caira system is an area of the Lowbidgee system in the Murrumbidgee SDL resource unit.

At the time of the purchase it was estimated that 132.6 gigalitres per year (GL/y) of the 173 GL/y of long term average diversions from the area contributed towards the Commonwealth's 'bridging the gap' water recovery target. This was because the Murray-Darling Basin Authority (MDBA) then estimated that 40.4 GL/y of long term average diversions had already been providing benefits to environmental assets of the Nimmie-Caira system (MDBA 2013). The Commonwealth Environmental Water Holder (CEWH) has received all the entitlements.

As part of the *Heads of Agreement*, the NSW and the Australian governments requested the MDBA to undertake a review of the estimated contribution of the Nimmie-Caira entitlements towards the water recovery target. In conducting the review, summarised in this paper, the MDBA considered the best available information about Nimmie-Caira system entitlements and diversions.

Key to this review is that when NSW issued entitlements for the Lowbidgee system in November 2012 under the Murrumbidgee water sharing plan, it established all of the Nimmie-Caira diversions as private. Although some of these Nimmie-Caira diversions may have previously provided local environmental benefit, as private entitlements it could not be guaranteed that they would continue to be used for the environment in the future. A private entitlement holder has the right to use the water in alternative ways including trading them.

This review found that *all* of the Nimmie-Caira entitlements acquired by CEWH met *all* of the questions underpinning the water recovery contribution assessment approach. As such, this review concluded that the 40.4 GL/y that was initially excluded should be treated as part of the baseline diversion limit (BDL) and should in fact contribute to the water recovery target.

The review has also led to an interim update to the Lowbidgee system baseline diversion estimate. However, it is noted that these volumes are subject to further refinement, as part of ongoing work by NSW to improve the BDL estimate for the Murrumbidgee as part of the development of the Murrumbidgee water resource plan (WRP). Any revised estimate will subsequently be reviewed by the MDBA as part of WRP accreditation.

1 Introduction

In June 2013, the Commonwealth agreed to provide \$180 million to the NSW Government to purchase land and water entitlements from eleven property owners in the Nimmie-Caira system under a *Heads of Agreement: An Agreement supporting the Nimmie-Caira System Enhanced Environmental Water Delivery Project* (Heads of Agreement).

Nimmie-Caira is one of three diversion areas in the Lowbidgee system, which is found at the western end of the Murrumbidgee River and is part of the Murrumbidgee SDL resource unit (Figure 1). In the Lowbidgee system, diversions made at Maude Weir go into the Nimmie-Caira, while diversions made at Redbank weir go into both the Redbank North and Redbank South (Figure 2).

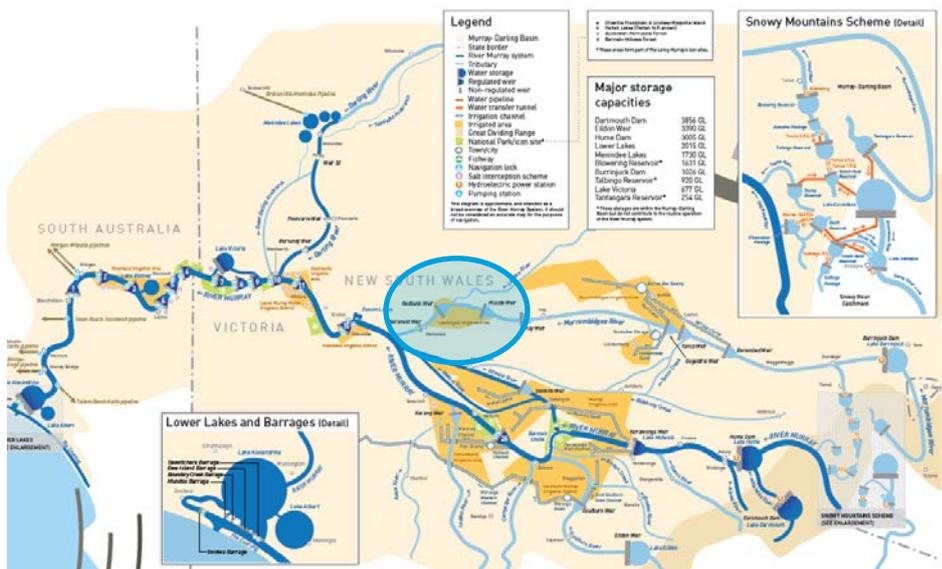


Figure 1. River Murray system with the Lowbidgee system circled and shaded in light blue

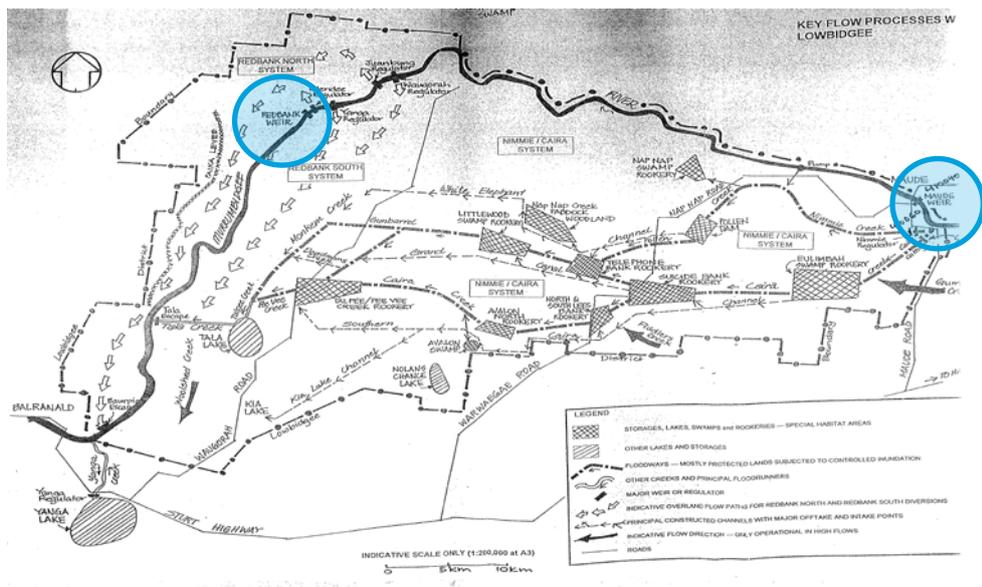


Figure 2. Lowbidgee system where diversions at Maude Weir (circled in blue) go to the Nimmie-Caira, while diversions at Redbank weir (also circled in blue) go to both Redbank North and Redbank South.

Under the Heads of Agreement, NSW was to undertake extensive infrastructure works and develop long-term land management arrangements. It was also identified as a significant water saving project

(known as the Nimmie-Caira project) that would transfer water access entitlements, which were previously used for flood irrigation, to the Commonwealth for environmental use. It was agreed the Nimmie-Caira project would:

- provide 381 GL of Murrumbidgee supplementary (Lowbidgee) water access entitlements to the Commonwealth Environmental Water Holder (CEWH) that could be used to benefit the wetlands and floodways of the Lowbidgee floodplain and beyond
- deliver a long-term average of 173 GL of water to the environment each year
- reduce the need for purchase of water entitlements from other areas in the Murrumbidgee valley where extensive permanent plantings and irrigation infrastructure already existed.

Hence, the Nimmie-Caira project was considered to be a significant contribution towards achieving the Commonwealth's water recovery target under the Murray-Darling Basin Plan, or (put another way) towards 'bridging the gap' from the baseline diversion limit (BDL) to the sustainable diversion limit (SDL).

At the time of the purchase, it was estimated that the Nimmie-Caira entitlement used 173 GL/y on average over the long-term. Of this, the MDBA estimated that 40.4 GL/y on average had already been providing benefits to local environmental assets (MDBA 2013) and therefore should not be part of the Lowbidgee component of the BDL for the Murrumbidgee SDL resource unit. Accordingly, only 132.6 GL/y of the 173 GL/y of Nimmie-Caira entitlement was treated as contributing to 'bridging the gap'.

However, NSW requested the MDBA to reconsider whether the excluded 40.4 GL/y should contribute to the water recovery target. Although the MDBA had estimated that volume was already benefitting local environmental assets, NSW considered that the 'gap-bridging' volume should be 173 GL/y, not 132.6 GL/y as the entitlements could not be guaranteed to be used for the environment in the future unless they were acquired by the Commonwealth. Given that such a decision would adjust the Lowbidgee component of the BDL for the Murrumbidgee SDL resource unit, and result in consequent changes to the SDL, in Clause 7 of the Heads of Agreement, the Commonwealth and NSW agreed to:

jointly seek a review by the MDBA of the Murrumbidgee SDL, taking into account the Nimmie-Caira Entitlement, in the context of the next available opportunity for review of SDLs. Until that review, the Commonwealth will treat the 'gap bridging' volume of the Nimmie-Caira entitlement as 132.6 GL/y.

This report is that review and is set out as follows:

- Section 2 summarises how the 2013 estimate of the Nimmie-Caira project contribution to water recovery was determined
- Section 3 outlines the approach to assess whether a project contributes to the water recovery target, and assesses the Nimmie-Caira project using this approach
- Section 4 details how the results of Section 3, along with NSW planning assumptions work and analysis by the MDBA in February 2013, has impacted the estimates of the Lowbidgee system baseline diversions and water recovery
- Section 5 summarises the findings of this review

2 Estimated contribution of Nimmie-Caira project to water recovery in 2013

The MDBA's 2013 estimate of the contribution of the Nimmie-Caira project to Lowbidgee system baseline diversions and consequently to water recovery, was based on the data and assumptions available at the time of the Commonwealth purchase. This information is summarised in Table 1 and includes the development of the Basin Plan (2008-2012), the MDBA February 2013 report about the Nimmie-Caira project, and the 2012 amendment of the NSW Murrumbidgee Water Sharing Plan (WSP), which issued entitlements in the Lowbidgee system to irrigators by June 2013. Further details about each of these elements follows.

Table 1 Information that determined the estimates for the Nimmie-Caira entitlement contribution to the water recovery target and Lowbidgee baseline diversions

Source of estimates	Estimates of long term average diversions (GL/y)	Additional information
Development of Basin Plan 2012 (from 2008-2012)	Long term average diversions for Lowbidgee system estimated to be 299 GL/y, of which 149.5 GL/y was estimated to be used for irrigation and included in the Murrumbidgee BDL. The balance was estimated to be providing environmental benefit.	No entitlements had been issued for the Lowbidgee system while the Basin Plan was developed, which largely occurred prior to the NSW 2012 amendment to the Murrumbidgee WSP.
MDBA February 2013 report about the Nimmie-Caira project contribution to water recovery	Of the 299 GL/y, Nimmie-Caira diversions were estimated to be 173 GL/y. Of Nimmie-Caira diversions, 132.6 GL/y was estimated to be used for irrigation and included in the Murrumbidgee BDL and 40.4 GL/y was estimated to be providing local environmental benefit	11 GL/y of Nimmie-Caira diversions is return flow.
NSW 2012 amendment to Murrumbidgee Water Sharing Plan (WSP), which issued entitlements to irrigators in Lowbidgee system by June 2013	The long term average annual extraction limit (maximum diversions) for Lowbidgee system was set at 296 GL/y.	Entitlements in Lowbidgee system were issued for existing take by June 2013. 20% of these were issued to the environment, but no environmental entitlements were issued in Nimmie-Caira. All Nimmie-Caira entitlements were issued to irrigators, enabling them to be traded and sold.

2.1 Development of Basin Plan 2012 estimates Lowbidgee baseline diversions

During the development of the Basin Plan (2008 – 2012), there was no WSP that operated for the Lowbidgee system. As outlined below in Section 2.2, entitlements were only issued after the commencement of the 2012 NSW amendment to the Murrumbidgee WSP. Prior to this, licences were issued under the *Water Act 1912* (NSW).

As there was no WSP, and noting that the Lowbidgee district was poorly modelled, NSW provided advice to the MDBA that the diversions were roughly split (in ‘order of magnitude’ terms) as 50% for irrigation and 50% for the environment. While this was known to be rough, it was the best information available at the time.

In determining BDL estimates for inclusion in the Basin Plan, the MDBA generally adjusted the modelled estimates of diversions for existing environmental water where it was identified. Environmental water that was deducted included, for example, the long term estimate of existing held environmental water recoveries under The Living Murray and Water for Rivers programs. It did not deduct the water recoveries made by the Australian Government.

Lowbidgee diversions under BDL modelling conditions¹ were estimated by the MDBA to be 299 GL/y. Based on the advice from NSW about the environment’s share of total diversions, it was estimated that 50% contributed to the Murrumbidgee BDL as irrigation use (149.5 GL/y), and 50% was considered to be existing environmental diversions (149.5 GL/y). This 149.5 GL/y for the environment was assumed to include the portion of water supporting Yanga National Park. On this basis, the environmental diversions were excluded from the BDL, and the ***Lowbidgee component of the Murrumbidgee SDL resource unit BDL was set at 149.5 GL/y.***

The information summarised in the following two sections (Section 2.2 and 2.3) was not available during the development of the Basin Plan.

2.2 MDBA 2013 report on Nimmie-Caira project potential contribution to water recovery

During 2012/13, in the course of the negotiations to acquire Nimmie-Caira, NSW modelling indicated that the long-term average diversions from Nimmie-Caira were estimated to be 173 GL/y (57% of the Lowbidgee consumptive and environmental diversions of 299 GL/y).

Advice was sought from the MDBA on potential water savings related to the Nimmie-Caira project. The MDBA determined the water balance components of the project, which were presented in a

¹ BDL conditions are set at 30 June 2009, as opposed to Cap conditions which were set at 1993/94 levels of development. In addition, the historic period modelled is longer under the BDL (1895-2009).

February 2013 report: “Potential water savings from the proposed Nimmie-Caira system enhanced environmental water delivery project”. It used that information as the basis of its decision, at the time, that 40.4 GL/y on average was estimated to already be providing environmental benefit, and therefore should not contribute to ‘bridging the gap’ (MDBA 2013).

At the time, in assessing the potential contribution of the Nimmie-Caira project to the water recovery target, the MDBA did not consider the issue of entitlements: that is who owned the entitlements or whether they were tradeable. This was because not all entitlements had then been issued under the NSW 2012 amendment to the Murrumbidgee WSP.

Compared to the NSW modelling estimate of 173 GL/y, the MDBA water balance estimated the long-term average diversions to be 175 GL/y (MDBA 2013). The reason for this difference was that the MDBA used the Basin Plan historical climate conditions (1895 to 2009) period in its estimate, whilst NSW modelling used a slightly different period. The difference was not considered to be material at the time, and it was assumed that it would be addressed when NSW would review its estimate of the BDL for the Murrumbidgee water resource plan. For this report, 173 GL/y has been retained, noting that it remains subject to further refinement.

The MDBA 2013 water balance report also identified that 11 GL/y of the supplementary diversions to Nimmie-Caira (a long term average estimate) is returned to the Murrumbidgee River.

Subsequent to the MDBA February 2013 report, the NSW and Australian Government agreed to the Nimmie-Caira project through the June 2013 Heads of Agreement. It indicated that of the **173 GL/y diverted into Nimmie-Caira, 132.6 GL/y had been assessed to be gap bridging, and 40.4 GL/y would not count towards the ‘bridging the gap’ water recovery target**. The Heads of Agreement states that NSW considered that all 173 GL/y should be recognised as ‘gap bridging’ and the parties agreed to seek a review by the MDBA.

2.3 NSW 2012 amendment to Murrumbidgee WSP issues Lowbidgee system entitlements

When the Murrumbidgee Regulated River Water Source WSP commenced in July 2004, it did not include the Lowbidgee system. In November 2012, NSW issued an amendment to the WSP to include the Lowbidgee. This was separate to the work that went into the development of the Basin Plan and was undertaken independently by NSW.

With the inclusion in the WSP, NSW set a long term annual average extraction limit (LTAAE limit) for the Lowbidgee system of 296 GL/y. It was not uncommon for NSW to set its WSP limits slightly below the Cap (see Appendix A for more details on Cap reporting on diversions in the Lowbidgee system). 747,000 unit shares were initially established as licensed entitlements and distributed by June 2013 in the three Lowbidgee system diversion areas as follows:

- Nimmie-Caira 381,000 unit shares
- Redbank North 211,000 unit shares
- Redbank South 155,000 unit shares

A large portion of the Redbank South diversions (approximately 148,000 unit shares, or 95% of Redbank South entitlements) support Yanga National Park, managed by NSW Office of Environment and Heritage. This represents approximately 20% of total Lowbidgee entitlements.

2.4 Reporting of water recovery between 2013 and this review

Since the Heads of Agreement, the MDBA and Department of Agriculture and Water Resources (DAWR) water recovery reporting has been consistent with the decision in the Heads of Agreement, as summarised in Table 2. The other figures in Table 2 were determined by deduction, based on the assumption made in the setting of the Basin Plan that 50% of diversion were consumptive.

Table 2. Estimates of Lowbidgee system baseline diversions made in 2013

Area in the Lowbidgee system	Entitlements (unit shares)	Total gross diversions under BDL conditions (GL/y)	Environmental diversion in baseline (GL/y)	Consumptive diversion in baseline - BDL (GL/y)
Nimmie-Caira	381,000	173	40.4	<i>132.6</i>
Redbank North	211,000	<i>126</i>	<i>109.1</i>	<i>16.9</i>
Redbank South	155,000			
Total	747,000	299	149.5	149.5

The numbers displayed in *blue italics* are derived based on sharing the diversions relative to the MDBA estimate under BDL conditions of 299 GL/y (not the NSW limit of 296 GL/y) and the assumption that 50% of diversions were consumptive.

While waiting on the outcomes of the requested review of this matter, NSW has reported the following Held Environmental Water (HEW) figures annually to the MDBA:

- recoveries associated with the Nimmie-Caira project of 132.6 GL/y long term diversion limit equivalent (LTDLE²) as ‘gap-bridging’ HEW
- the balance of the Nimmie-Caira project of 40.4 GL/y as non-‘gap-bridging’ HEW

² LTDLE is the amount of water assessed to have been recovered for the environment under the Basin Plan, using a method that allows for comparison between different types of water entitlements across the Basin.

3 Approach for assessing potential contribution to the water recovery target

This section outlines the MDBA’s approach to assess any potential contribution to the ‘bridging the gap’ water recovery target. It then outlines the application of this approach to the Nimmie-Caira project and the resulting outcome of its revised contribution to the water recovery target.

Listed in Table 3, MDBA’s approach for assessing potential contribution to the water recovery target is expressed as a series of questions that are asked when making such an assessment. This includes assessment against form, entitlement, ownership, and tradability.

Table 3 MDBA approach for assessing potential contribution to the water recovery target – the questions asked.

Questions asked to determine if potential contribution can be ‘bridging the gap’	Answers required for the potential contribution to be assessed as contributing to ‘bridging the gap’
(Q1) What form of take is the contribution from?	<p>Forms of take that are considered are:</p> <ul style="list-style-type: none"> • take from a watercourse or regulated river • take by floodplain harvesting and • take by runoff dams. <p>Take under basic rights and net take by commercial plantations are not suitable forms of take, primarily as they are not available as a surface water entitlement.</p> <p>Where the form of take is by floodplain harvesting or runoff dams, additional steps need to be undertaken to ensure the water is returned to the river (Q6).</p>
(Q2) Is the contribution in the form of an entitlement? Or can it be converted into an entitlement?	<p>Yes.</p> <p>If no, then ownership cannot be transferred to the Commonwealth (or state environmental water holder) and it cannot contribute to water recovery.</p>
If yes to the above then :	
(Q3) Was it part of the BDL as it is defined in the Basin Plan Schedule 3?	<p>Yes.</p> <p>Where the project is off-farm and recovering water losses, it must be able to be confirmed that the contribution was within the BDL, and the source of the losses are consequentially reduced in a calculation of the SDL.</p> <p>If no, then it is not part of the consumptive pool that existed at 2009. Only consumptive water at 2009 can be considered as ‘bridging the gap’.</p>
(Q4) Who is the owner?	<p>Privately owned. If it was held by an environmental water holder at 2009, then it is already supporting environmental outcomes and cannot contribute to ‘bridging the gap’.</p>

Questions asked to determine if potential contribution can be 'bridging the gap'	Answers required for the potential contribution to be assessed as contributing to 'bridging the gap'
(Q5) Is it tradeable?	Entitlement must be able to be traded to the Commonwealth (or state environmental water holder)
(Q6) Where the form of take is floodplain harvesting or runoff dams, have additional steps been taken to ensure the water is returned to the river?	Yes, this recovery effort can be accounted as 'bridging the gap' where, in addition to the above, infrastructure has been removed that would otherwise limit the water returning to the river.

As noted in Section 2.2, the status of the issue of entitlements was not addressed in the MDBA's February 2013 report on the Nimmie-Caira project's contribution to the water recovery target, as the entitlements had not then been fully issued. However, the MDBA has now considered this question as part of this review (as per Table 3, Question 4).

When NSW issued entitlements for the Lowbidgee system in November 2012 in the Murrumbidgee WSP, it established all of the Nimmie-Caira diversions as private (that is 381,000 unit shares of entitlements). Although some of these Nimmie-Caira diversions may have previously provided local environmental benefit, as private entitlements, it could not be guaranteed that they would continue to be used for the environment in the future. A private entitlement holder has the right to use the water in alternative ways in accordance with the Murrumbidgee WSP, such as selling allocations from the entitlements on the temporary trade market.

As a result, all 173 GL/y of Nimmie-Caira project long term diversions are assessed in this review as consumptive diversions that are part of Lowbidgee component of the Murrumbidgee BDL.

On that basis, all of the relevant questions in Table 3 are met, which means that the entire 173 GL/y of Nimmie-Caira entitlements are available to contribute to the 'bridging the gap' water recovery target.

Further details about how this assessment impacts the estimates of the Lowbidgee baseline diversion and water recovery estimates is provided in Section 4.

4 Updated estimate of the Lowbidgee system baseline diversions

Given the information that was collated during the review, it was considered appropriate to update the estimate for the Lowbidgee system baseline diversion limit (BDL) to be consistent with the Murrumbidgee WSP and the Cap on diversions, as well as to draw on the best available information. More specifically, the update included:

- this review's assessment of the Nimmie-Caira project contribution to water recovery (Section 3)
- MDBA's February 2013 analysis of the Nimmie-Caira project (Section 2.3), which provided an estimate of irrigation return flows and
- NSW 2018 planning assumption work³.

The updated estimate of the Lowbidgee BDL is equal to the updated estimate of net baseline diversions (that is the consumptive share of diversions less return flows⁴, outlined in Appendix B) minus the updated estimates of the diversions from held environmental entitlements (outlined in Appendix C).

Table 4 shows a comparison of estimates completed in 2012 with those updated by this review. The Lowbidgee system net baseline diversions (both consumptive and environmental diversions) are now estimated at 278.9 GL/y. This review established that the environmental benefit existing at baseline in the Lowbidgee system is 66.3 GL/y (for Yanga National Park in Redbank South). This means the updated estimate of the Lowbidgee BDL is 212.6 GL/y (consumptive only).

Figure 3 compares the updated 2018 estimate of Lowbidgee baseline diversions to the 2012 estimate. The total diversions in the 2018 estimate has decreased from the 2012 estimate, due to improvements in estimation methods and the application of return flows. However the 2018 BDL estimate is larger, as no formal environmental entitlements are attributed to Nimmie-Caira (as reviewed in Section 3) and a smaller volume of environmental entitlements has been issued from Redbank Weir for Yanga National Park (see Appendix C for more details).

³ 2018 NSW planning assumptions work was part of its water resource plans development, for subsequent MDBA review. This has led to changes in LTDLE factors, and thus achieved water recovery estimates. NSW is continuing work to improve the Murrumbidgee BDL estimate as well as its water recovery LTDLE factors, which may revise these volumes further. Further information about NSW planning assumptions work and LTDLE factors can be found at <https://www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/stakeholder/public-consultation-on-water-recovery-accounting-factors>.

⁴ Under Cap arrangements it was intended that Lowbidgee system return flows were to be deducted from Lowbidgee diversions and that the annual Cap target would reflect this approach when such data became available.

Table 4. Comparison of 2012 and 2018 estimates of Lowbidgee baseline diversions

	Area	Entitlements (unit shares)	total net diversions under BDL conditions (GL/y)	environmental diversions at baseline (GL/y)	consumptive diversions at baseline - BDL (GL/y)
2012	Nimmie-Caira	381,000	173	40.4	132.6
	Redbank North	211,000	126	109.1	16.9
	Redbank South	155,000			
	Total	747,000	299	149.5	149.5
2018	Nimmie-Caira	381,000	173.9	0	173.9
	Redbank North	213,499	36.7	0	36.7
	Redbank South	152,501	68.3	66.3	2.0
	Total	747,000	278.9	66.3	212.6

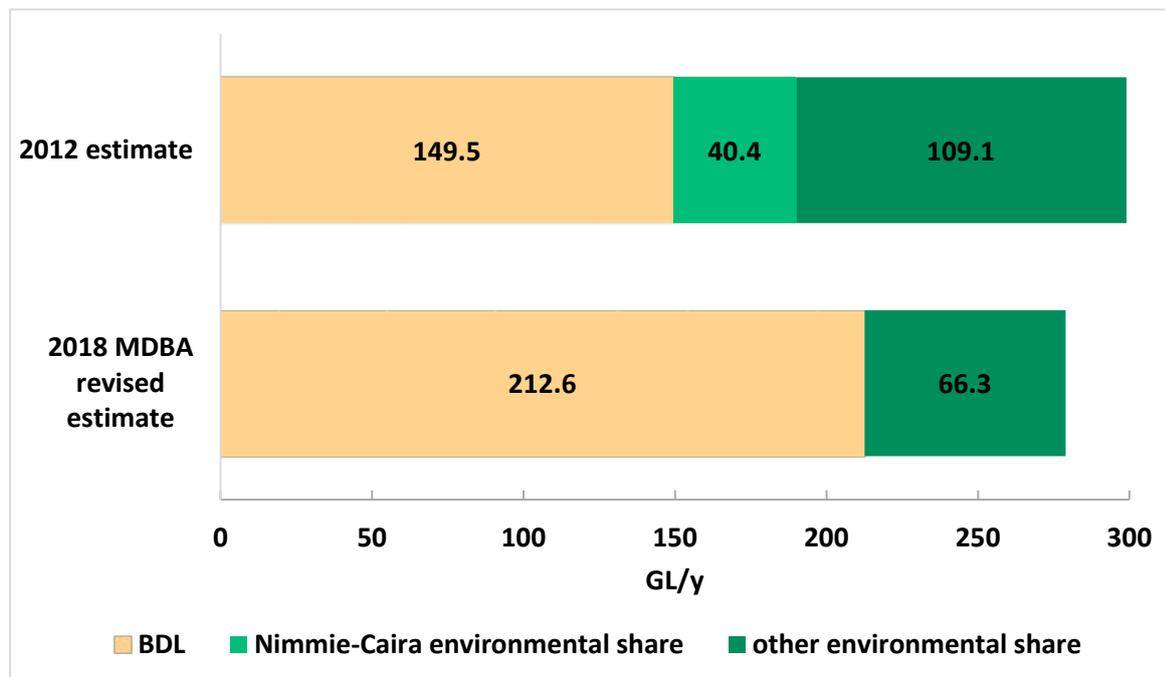


Figure 3. Comparison between the Lowbidgee system baseline diversion estimates established in 2012 and after the 2018 MDBA review

5 Summary of findings

Based on application of the approach to assessing a potential contribution to water recovery, this review finds that all the Nimmie-Caira project diversions contribute towards the ‘bridging the gap’ water recovery target.

The allocation of all Nimmie-Caira entitlements to private diverters under the NSW Murrumbidgee WSP meant that, even if some diversions previously provided an environmental benefit, such outcomes could not be guaranteed into the future. This is because the WSP provides the entitlement owner the right to use them in a range of ways in accordance with the plan, including to trade them on a temporary basis.

As a result, the MDBA agrees that all entitlements acquired by the Australian Government as part of the Nimmie-Caira purchase should contribute to the ‘bridging the gap’ water recovery target, on the basis that it was all consumptive water under NSW water management law (the WSP) at Basin Plan commencement. The contribution of the Nimmie-Caira project to water recovery is therefore 173 GL/y.

The MDBA also concluded that it would be appropriate to revise the estimate for the Lowbidgee system baseline diversions in order to be consistent with the WSP and the Cap on diversions and to draw on the best available information. Specifically, the revised BDL estimate should be drawn from an appropriate model and:

- include all diversions into Nimmie-Caira (as per the WSP), and be net of any return flows to the Murrumbidgee (as prescribed under the Cap, and for which an estimate of 11 GL/y is now available) and
- only deduct the environmental entitlements that were issued under the WSP at the time of Basin Plan commencement (or shortly thereafter) that is for Yanga National Park, noting that none were issued for Nimmie-Caira.

As the SDL is determined from the BDL, such an update would also result in an update to the SDL.

If NSW provides any further updates to the estimates given in this review, these will be reviewed by the MDBA as part of the water resource plan accreditation process.

6 References

Commonwealth of Australia and Government of New South Wales, *Heads of Agreement: An Agreement supporting the Nimmie-Caira System Enhanced Environmental Water Delivery Project*, 2013

Murray-Darling Basin Authority, *Diversion Formula Register*, June 2018

Murray-Darling Basin Authority, *Potential water savings from the proposed Nimmie-Caira system enhanced environmental water delivery project Final Report*, February 2013

NSW Department of Water & Energy, *Murrumbidgee River Valley IQQM Cap Implementation Summary Report*, August 2007

Appendix A: Cap reporting

In 1995, the Murray–Darling Basin Ministerial Council introduced the Murray–Darling Basin Cap on surface water diversions (the Cap) to protect and enhance the riverine environment and protect the rights of water users. The Cap introduced long-term limits on how much water could be taken from rivers in 24 designated river valleys.

Under the *Murray-Darling Basin Agreement Schedule E – Cap on Diversions* (Schedule E), NSW is required to establish long term diversion limits for each designated river valley by reference to a model operating under baseline conditions or 30 June 1994 (clause 5). That model is approved by the Authority (clause 11) and is known as the accredited Cap model.

The diversion locations that are included in the accredited Cap model are those nominated in the Diversion Formula Register. The Diversion Formula Register is established under clause 4 of Schedule E and records the '*Lowbidgee flood control and irrigation district diversions*' as being:

'all controlled diversions from Maude weir (Nimmie Regulator plus Caira Regulator plus Northern Caira Canal) and Redbank weir (Redbank North: Glen Dee Regulator plus Juanbung Regulator plus Redbank South: Yanga Regulator plus Waugorah Regulator) less diversion returns (Tala Escape, Yanga Escape, Wynburn Escape, Baurpie Escape and Glen Avon Escape).'

Under Cap arrangements it was intended that return flows from the Lowbidgee area were to be deducted from the Lowbidgee diversion when such data became available.

NSW submitted the Murrumbidgee River Cap model report to the MDBA in 2007 for the purposes of seeking an accredited Cap model (NSW Department of Water & Energy 2007) and the Independent Audit of the model was completed in November 2010. The audited Cap model predicted a long-term average annual Lowbidgee diversions of 302.8 GL/y⁵.

The **Cap model for Lowbidgee estimated long term diversions to be 302.8 GL/y** and this figure **does not take into account any return flows as such data was not available then**.

⁵ The audited Cap model predicted a long-term average annual diversion of 2,318.5 GL/y, composed of regulated river diversions of 2,015.7 GL/y and Lowbidgee diversions of 302.8 GL/y. When unregulated diversions of 42. 4 GL/y are added to these diversions, the results produce a long term Cap for the Murrumbidgee river valley of 2,360.9 GL/y. The current Cap register (version 31) reports a long term cap of 2,358 GL/y (2007 + 309 + 42.374). This difference is currently being investigated by the MDBA and NSW.

Appendix B: Updated estimate of Lowbidgee baseline diversions

New and updated information relating to (1) the gross baseline diversions and (2) return flows from the Nimmie-Caira entitlement, were considered in this review to update the net BDL estimate for the Lowbidgee system. These two components are described in this section.

Improved estimate of gross baseline diversions

The planning assumption work undertaken by NSW in 2018 included reviewing the BDL estimates and developing updated factors for water recovery. As part of this work, further information was provided to the MDBA to improve the 2012 estimate of the BDL included in the Basin Plan. This decreased the estimate of gross baseline diversions for the Lowbidgee system at 30 June 2009, from 299 GL/y to 289.9 GL/y. Gross diversions include both irrigation and environmental diversions.

This new estimate includes an improved understanding of the internal division of diversions within the three areas of the Lowbidgee system, as follows:

- diversions from Maude weir into the Nimmie-Caira system increased by 11.2 GL/y (to 184.9 GL/y) based on advice from NSW of an additional component of diversions; the NSW Tier 1 watering diversions and
- diversions from Redbank weir decreased by almost 21 GL/y to 105.0 GL/y due to improved estimation methods; split into the Redbank North (36.7 GL/y) and Redbank South (68.3 GL/y) systems.

The share of entitlements between the three diversion systems in the Lowbidgee was also revised. Updated gross baseline diversions are shown Table B1.

Adjustment for return flows from Nimmie-Caira

The improved estimate of Lowbidgee gross baseline diversions is also subject to a deduction given that an estimate of return flows had become available, consistent with the definition of diversions under Cap arrangements.

A value for return flows from Nimmie-Caira was determined as part of the water balance work undertaken by the MDBA in 2013 (MDBA 2013). The MDBA estimated total modelled return flows of 33 GL/y from Nimmie-Caira, of which 22 GL/y is due to flood breakout flow returns to the Murrumbidgee and a further 11 GL/y is return flows from the supplementary entitlements.

After deducting the 11 GL/y return flows value from the gross diversions for Lowbidgee (289.9 GL/y), the Lowbidgee net baseline diversions become 278.9 GL/y (Table B1).

Table B1. Estimates of Lowbidgee system gross baseline diversions and return flows with updated 2018 information that results in new net diversion estimates

Lowbidgee system diversion areas	Entitlements (unit shares) – at 2018	total gross diversions under BDL conditions (2012 estimate) (GL/y)	total gross diversions under BDL conditions (2018 estimate) (GL/y)	adjustment for return flows from Lowbidgee (GL/y)	total net diversions under BDL conditions (2018 estimate) (GL/y)
Nimmie-Caira	381,000	173	184.9	-11.0	173.9
Redbank North	213,499	126	36.7	0	36.7
Redbank South	152,501		68.3	0	68.3
Total	747,000	299	289.9	-11.0	278.9

Appendix C: Updated estimate of Lowbidgee BDL – adjusting for existing environmental water

The 2012 NSW WSP for the Lowbidgee issued 148,000 unit shares as entitlements for Yanga National Park. The diversion associated with this entitlement occurs from Redbank South and provides environmental benefits. This new information indicated that a much smaller proportion of diversions was formally set aside for environmental purposes (about 20%, based on entitlements) than the previous preliminary estimate of a 50% split between irrigation and environment uses.

In addition, the work undertaken by NSW in 2018 to improve understanding of the internal distribution of the Lowbidgee system diversions (described in Appendix B) also included new information about the actual environmental flows that were available in the Lowbidgee system at the baseline time of 2009.

The updated estimate of diversions associated with the Yanga National Park – the pre-existing held environmental water entitlements – is 66.3 GL/y. This is based on improved data for entitlements issued (revised to 148,087 unit shares), the improved water recovery factors generated by the new estimate of gross diversions, consideration of return flows and improved understanding of the long term share of diversions between Maude, Redbank North and Redbank South weirs.

Table C1 shows the updated estimate of the BDL taking into account the best available information about the pre-existing environmental water under baseline conditions.

Table C1. Updated estimate of Lowbidgee BDL with updated information on pre-existing environmental water

Area	Entitlements (unit shares)	total net diversions under BDL conditions (GL/y)	environmental diversions at baseline (GL/y)	consumptive diversions at baseline - BDL (GL/y)
Nimmie-Caira	381,000	173.9	0	173.9
Redbank North	213,499	36.7	0	36.7
Redbank South				
Yanga National Park	148,087	66.3	66.3	-
Other	4,414	2.0	-	2.0
Total	747,000	278.9	66.3	212.6

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