

Application and assumptions used for deriving the BDL-based 2024 LTDLE factors in Belubula River

Introduction

The NSW Government is responsible for updating the 2018 Long-Term Diversion Limit Equivalence (LTDLE) factors when a water resource plan (WRP) is accredited in a river valley or the baseline diversion limit (BDL) model is revised with agreed-upon corrections and refinements. The Belubula River is part of the Lachlan River WRP, which was accredited in May 2024.

The Belubula River component of the Lachlan River IQQM model was initially separated into its own IQQM model and then recalibrated completely in 2018, with a new model of the Belubula system built using the *eWater Source* modelling platform.

This report details how NSW has updated 2024 LTDLE factors for the Belubula River Valley. LTDLE factors reference the following:

- *Consultation paper: NSW updated factors for water recovery* (June 2018)
- *Water reform technical report: Derivation of LTDLE factors in NSW* (May 2018) (please refer to this document for all inputs related to calculating the LTDLE factors, including the reference files)

Data sources

Entitlements

The entitlements under BDL conditions (usually 30 Jun 2009) were reviewed considering sources from the Water Information Reporting & Extraction (WIRE) system, General Purpose Water Accounting Report (GPWAR), and BDL scenario report of 'Lachlan Surface WRP' (Attachment C to Schedule F).

Licence information was not available until the start of the Belubula Water Sharing Plan in 2012. BDL model entitlements were based on a download of the 2012 entitlements in October 2017 from the WRA and WLS databases. Following October 2017, the WIRE system and GPWAR reporting are in close agreement with each other but differ from the BDL entitlements. The WIRE system can correct errors in earlier reports and is therefore considered to be more reliable. Entitlements in WIRE will be used in the calculation of LTDLE factors in the Belubula River, as shown in Table 1.

Table 1: Belubula River entitlements

Entitlement type	Shares (BDL WRP) (30 Jun 2012) ¹	Shares (WIRE) (30 Jun 2012) ²	Shares (GPWAR) (30 June 2012) ³
Domestic and stock	233	222	218
High Security	1,095	1,094.9	1,095
General Security	22,766	22,454	22,246
Supplementary	3,125	3,125	3,125
Total	27,219	26,895.9	26,684

1. Attachment C to Schedule F - Baseline Diversion Limit Scenario Model - Belubula Regulated River System
2. BELB_WaterAccounts_LTDLE_Factors.xlsx (Sheet "Shares") from WIRE
3. General_Purpose_Water_Accounting_Report_-_Lachlan_and_Belubula_Catchments_2012-2013.pdf

BDL diversions

The new Source Belubula BDL model was used in conjunction with the Lachlan model for the Lachlan River WRP. The Belubula BDL was initially modelled as part of the Lachlan IQQM model for BDL. This Lachlan IQQM, including the Belubula Regulated River, was provided to MDBA, and used to estimate the BDL for the Basin Plan. Subsequently, the Belubula model was separated into an independent Belubula IQQM model, but was later found not to be fit for purpose as the model was overestimating end of system flows, while underestimating storage releases. In 2018, the Belubula model was recalibrated and rebuilt as a Source model. The Belubula BDL model background is documented in the Belubula BDL scenario report of 'Lachlan Surface WRP' (Attachment C to Schedule F). The BDL model was adopted as the primary data source to describe long-term (1895-2009) diversions in the Belubula River valley. Historical usage is affected by the significant trade between General and High Security licences. Diversions estimated from the BDL model and from historical diversions are shown in Table 2.

Table 2: Belubula River BDL diversions 1895-2009

Entitlement type	Diversions 1895-2009 (ML/y)	Average historical diversion from WIRE (2012-2024) (ML/y)
Domestic and stock	174	17.59
High Security	987	233.87
General Security	3,231	3,494
Supplementary	1,567	995.52
Total	5,959	4,740.98

Historical utilisation rates

The historical utilisation rate is calculated by summing the average available determination and the net temporary trade for each class of entitlement to give the total allocation account volumes available by class. For High and General Security entitlement classes, the recorded usage is divided by the total allocation account volume available to give the level of activation by that class. For Stock and Domestic, the recorded usage appeared to be unrealistically low. It is common for Stock and Domestic usage to be unmetered, so therefore BDL modelled diversions are used for this licence class. For Supplementary use, the BDL modelled diversions were also used in line with methodology adopted by other valleys.

The historical allocation account balance summary was from the WIRE. Table 3 shows the details of average historical account usage and the activation factors. The full historical period was 2012/13-2023/24.

Table 3: Belubula River allocation account balance summary (average 20012/13 to 2023/24)

Entitlement type	Share	AWD	Trade in	Trade out	Net trade	AWD+ Net	Account usage	Use / (AWD+Net)
Domestic and stock ²	221.2	221.3	0.0	0.0	0.0	221.3	174 ²	0.7861
High security	1094.9	1094.9	43.2	814.2	-771.0	323.9	233.9	0.7220
General security ¹	22454.0	2529.1	2252.2	1481.2	771.0	3300.1	3494.0 ¹	1.0588
Supplementary ²	3125.0	3125.0	0.0	0.0	0.0	3125.0	1567 ²	0.5014

1. General Security account usage includes uncontrolled usage. This is a type of 'without debit' water where the general security holder may take water during uncontrolled flow events in excess of AWD at the time. This facility is available during low allocation periods.

2. Domestic and Stock and Supplementary usage the modelled BDL diversions are used

Allocation reliability

The MDBA has agreed that the allocation reliability indicated by the BDL model in the WRP represents the best available information to describe the reliability of allocations made to entitlements under the BDL conditions, as shown in Table 4.

Table 4: Belubula River average allocation reliability

Entitlement type	Average reliability from BDL model run	Method description
Domestic and stock	1.000	All NSW water sharing plans require that these entitlements are fully available each year. Defined as 100%.
High security	1.000	The modelled long-term average allocation at the end of the water year is used
General security	0.664	The modelled long-term average total effective allocation at the end of the water year is used. This is calculated as the sum of the volumetric allocations to General Security and Carryover in the water year. Note this figure is not directly used by the LTDLE factor calculation.
Supplementary	n/a	Note that this is not used by the LTDLE factor calculation.

Results

2018 factors

LTDLE Factors have never been calculated for the Belubula River, as this was previously modelled as part of the Lachlan River model.

2024 factors

Calculated LTDLE factors are shown in Table 5. Table 6 sets out the basis for how the updated factors were determined in 2024. The revised Basin Plan BDL for the regulated component of the Belubula River is 5,959 ML.

Table 5 Summary of 2024 LTDLE Factors

Entitlement type	2024 LTDLE Factors
Domestic and stock	0.786
High security	0.722
General security	0.153
Supplementary	0.501

Table 6: Belubula River entitlements, 2024 factors derivation and BDL shares by entitlement class*

Entitlement type	Entitlement shares	Average reliability	Utilisation factor	Factors	BDL share (ML/y)
Domestic and stock	222	1.000	0.7861	0.786	174.5
High security	1094.9	1.000	0.7220	0.722	790.5
General security	22454	0.664	n/a	0.153	3427.0
Supplementary ¹	3125	n/a	n/a	0.501	1567.0
Total	26,895.9	n/a	n/a	n/a	5,959 ²

1. For supplementary entitlements the allocation reliability is not useful for understanding the water available to the entitlement class. Utilisation is instead calculated based on modelled use.

2. The numbers in Table 6 appear to not sum correctly. For example, 3125×0.501 equals 1565.6 rather than 1567.0, as listed in the BDL share column. The actual calculations are carried out in an internal spreadsheet which uses more precision, and then numbers are rounded to the stipulated number of decimal points and transferred to Table 6. This mismatch between significant figures in entitlement shares and the factors means that we cannot align the total BDL

share of 5,959 (which is a correct figure) from the BDL model with the factors, without purposefully using less accurate numbers for the factors themselves.

Water recovery estimates

The Belubula River currently has no water recovery requirements under the Basin Plan, and therefore the LTDLE factors do not impact overall water recovery estimates for the Murray–Darling Basin.