

# Water Allocation Methodology – Paterson Regulated River Water Source

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## Introduction

This is a summary guide of the water allocation methodology for the Paterson regulated river water source (hereafter, the Paterson River). This concise document aims to provide public information on how water is allocated according to the prescribed priority and rules given in the statutory *Water Sharing Plan for the Paterson Regulated River water source 2019* (hereafter, WSP).

The Water Group of the NSW Department of Climate Change, Energy, the Environment and Water (hereafter, the department) periodically allocates water to water access licence (WAL) holders after assessing available water resources. The allocation is safe, low-risk, and provided at a licence category level for each water source. The resource assessment identifies the conservative volume of water available for sharing. Water users can expect to rely on the water allocated and credited to their accounts, and plan for its use accordingly. The process of allocation is formally known as an Available Water Determination (AWD)<sup>1</sup>. The results of the resource assessment and allocation process are advised through water allocation statements published on the department's website.

The water allocation statement announces the water allocated as a percentage of entitlement for each category of WAL. The volume of water, credited to respective WAL holder's accounts, is subject to individual account rules and limits specified in the WSP.

Although monthly resource assessments will be undertaken to monitor conditions, the water allocation statement in this water source is likely to be published quarterly as an information update rather than an allocation announcement because full allocation to all license categories is typically announced on 1 July each year.

This summary guide presents the key components of the water resource assessment and allocation announcement, followed by an example of a past announcement (21 April 2023) on page 10.

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## Water users

There are different categories of water use including environmental, basic rights as well as WAL holders. The principles and hierarchy of allocating available water to the different categories of licences and rights are prescribed in the *Water Management Act 2000* (hereafter, the Act) and the

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<sup>1</sup> *Water Management Act (2000)*, Clause 59

WSP. The Act states<sup>2</sup> that sharing of water from a water source must protect the water source, its dependent ecosystems, and basic landholder rights.

The volumes equivalent to 100% allocation to rights, allowance, and licence categories in megalitres (ML) per water year are listed below:

• Basic rights <sup>3</sup>	548 ML
• Environmental water allowance	2,000 ML
• Domestic and stock <sup>4</sup> WAL	49 ML
• High security (town water) <sup>5</sup> WAL	75 ML
• High security (HS) <sup>6</sup> WAL	190 ML
• General security (GS) <sup>7</sup> WAL	9,565 ML

There is also a Supplementary WAL<sup>8</sup> with full entitlement of 756 ML. Supplementary water users can only use their entitlement to access water in periods of announced supplementary flow, typically from surplus tributary inflow and/or spillage from dams. Supplementary water is surplus to all other needs and cannot be ordered from Lostock Dam (regulated water), therefore does not compete for allocations with regulated river licence categories.

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## Opening allocations

New allocations are announced at the beginning of each water year on 1 July. This is particularly important for higher (than GS WAL) priority licenses<sup>9</sup> as the unused account balance from the previous year is forfeited leaving the account empty. The following allocations are required by the WSP<sup>10</sup> for all higher priority users at the beginning of each water year whenever possible:

- Full (100%) allocation for domestic and stock, high security (town water), and high security access licence categories.
- Full 2,000 ML credit to environmental water allowance.

If a year starts with insufficient water to make these higher priority allocations, then they are met with the next available resource improvements. Only when these opening allocations have been

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<sup>2</sup> WMA (2000), Clause 5(3)

<sup>3</sup> WSP, Clause 18,19

<sup>4</sup> WSP, Clause 20. Latest record is 41 ML, used in Table 1.

<sup>5</sup> WSP, Clause 22

<sup>6</sup> WSP, Clause 21

<sup>7</sup> WSP, Clause 23

<sup>8</sup> WSP, Clause 24

<sup>9</sup> WSP, Clause 37(1)

<sup>10</sup> WSP, Clauses 30, 31, 32(2)

made, can allocations then be made to GS WAL holders up to the maximum of 100% of their entitlement<sup>11</sup>.

Supplementary WALs usually receive full 100% allocation<sup>12</sup> at the beginning of each water year unless a reduction is necessary to address exceedance of long-term average annual extraction limits. Note that sustained exceedance of the long-term limit can theoretically affect the reliability of allocations to other licence types, but this would be unusual and is beyond the scope of this summary guide.

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## Major steps in water allocation

The major steps in the resource assessment resulting in a water allocation include:

- 1) Identifying the accessible water in storages.
- 2) Add minimum (design) future inflows (into storage and in some systems from tributaries).
- 3) Deduct all existing commitments, including water for future higher priority needs.
- 4) Set aside water for system overheads to store and deliver allocated water.
- 5) Distribute unassigned water for allocation as directed by the WSP.

This can be further illustrated using Equation (1) below.

$$\text{Water for Allocation} = \text{Current Resource} + \text{Future Inflow} - \text{Commitments} - \text{System Overheads} \quad (1)$$

Water available for allocation first goes to meet any unmet opening allocations as listed earlier. Then available water is allocated to lower priority including general security accounts until full.

Every river system has its own way of arranging the line items of its balance sheet. The line items of the balance sheet for the Paterson Regulated River are shown in Table 3. In broad terms, the balance sheet reflects Equation (1), as explained next.

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## Current resource

This water source is regulated by one main headwater storage which is Lostock Dam. The system receives reliable coastal rainfall and runoff. The dam delivers water for 4,700 Ha of irrigated land among other demands. The dam is situated on the Paterson River, a major tributary of the Hunter River, about 65 km from Singleton and Maitland. Construction of Lostock Dam began in 1969 and was completed in 1971. When full, Lostock Dam holds 20,000 ML of water with surface area of about 206 Ha. The volume of water below the outlet and cannot be released by gravity is known as dead storage. A dead storage volume of 200 ML is deducted from the total resource volume available from Lostock Dam. This may be revised after the next storage bathymetry survey is finalised.

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<sup>11</sup> WSP, Clause 33 (2)

<sup>12</sup> WSP, Clause 34

Small volumes of water held in weir pools and natural pondages have little bearing on bulk resource availability in this system and are not considered in the resource assessment.

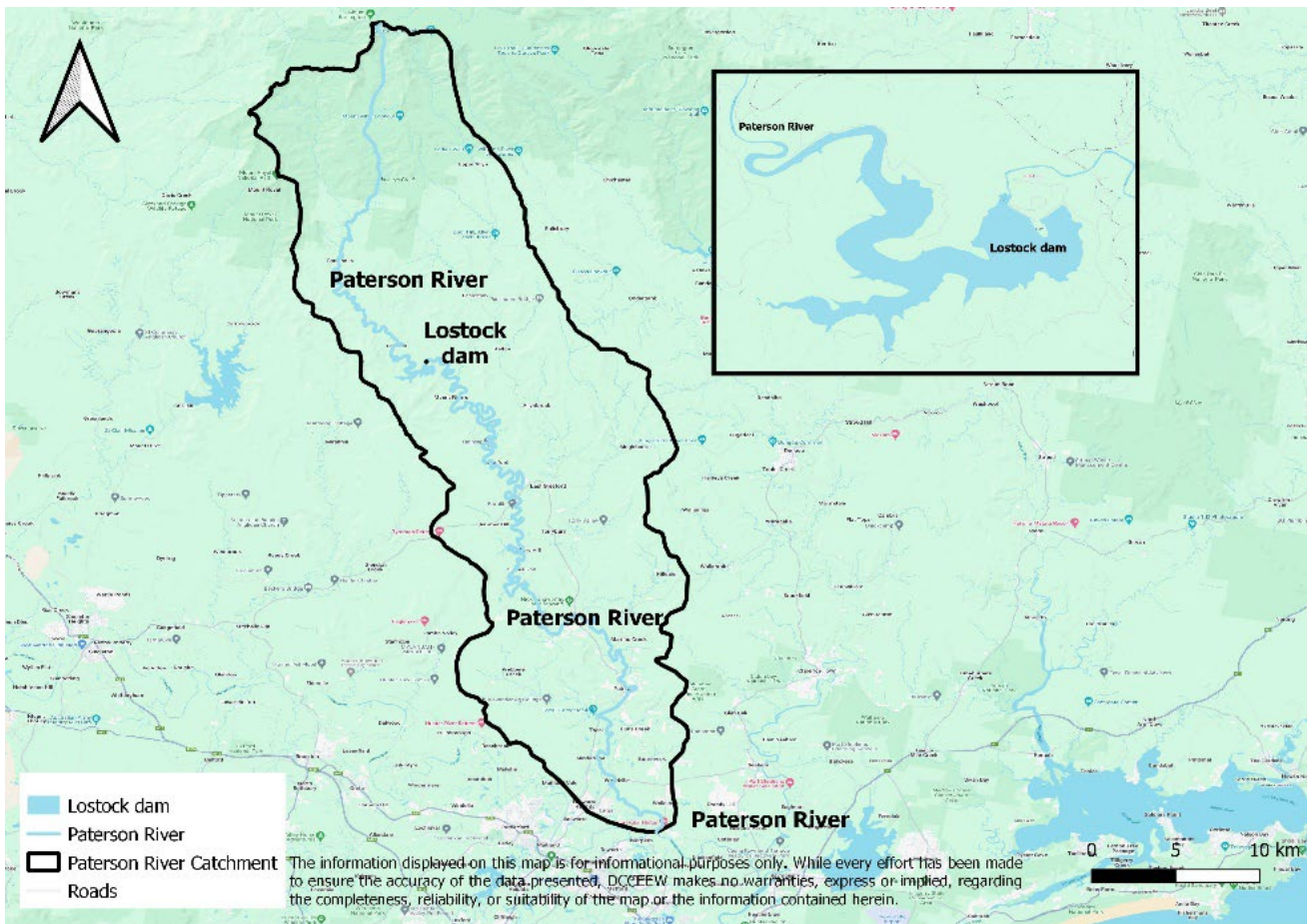


Figure 1: Map of the Paterson River catchment

## Future inflow

The resource assessment budgets for a future inflow which has yet to eventuate. The key principle in the resource assessment is that enough water must be available to meet higher priority needs (see **Table 2**) through a repeat of the driest observed inflow period to the water source known at the commencement of the inaugural plan in 2007. Therefore this ‘design’ drought, which delivers a small inflow sequence and volume, is assumed will occur. This is a statutory obligation that has been outlined in the WSP<sup>13</sup> under maintenance of supply clauses and balances the risk between allocating water for productive use and retaining water for security in the event of a drought. Clearly a more conservative approach, adopting a more severe drought, would result in less water for allocation and productive use but likely improved system security.

<sup>13</sup> Clause 51

The assessment conservatively considers only inflows to Lostock Dam. No use of tributary inflow is assumed for since the contribution is difficult to predict in these fast-moving coastal tributaries and the short period of usable flow provided by unregulated tributaries is likely to be small. Further, in small coastal systems, the rainfall that caused the tributaries to flow is likely to have dampened irrigation demand meaning that the downstream tributary flow adds little to this regulated system.

The period of measured flow at Lostock Dam site has been 1940 to 2007. The derivation time stamp of this flow sequence can be traced back to 26/2/2014, but the origin of this time series is unclear. The July to June 12-month minimum inflow into the storage is 11,300 ML, observed during July 1964 to June 1965. The 24-month minimum inflow starting on July is 37,400 ML, observed during the same severe dry spell of July 1964 to June 1966.

**Table 1. Minimum inflow volume within 1940 to 2007 period**

Months	Historical Years	Minimum Inflow
One water year	July 1964 to June 1965	11,300 ML
Two water years	July 1964 to June 1966	37,400 ML

## Commitments

Each assessment accounts for commitments for the remainder of the current water year plus next year’s reserve for higher priority users. The reserve is net of the budgeted future inflow. Current water year commitments include water for rights, Gostwyck flow target and the remaining balances of the allocated water. The reserve has been explained next.

### Higher priority reserve: 2,100 ML

A storage reserve is maintained for system overheads, flow targets and higher priority needs for future years. The reserve ensures that the prescribed full opening allocations (see, page 2) can be made at the next 1 July. The reserve is offset by the minimum inflows expected over next water year. The line items considered to estimate the reserve volume are shown in [Table 2](#) below.



**Table 2. Higher priority reserve for a 12-month period (in ML)**

Items	Budget	Notes
Basic Landholder Rights	548	WSP, clause 18
Domestic and stock WAL <sup>14</sup>	41	
High security (town water) WAL	75	WSP, clause 22
High security licence	190	WSP, clause 21
Environmental water allowance	2,000	WSP, clause 49
Flow target at Gostwyck <sup>15</sup>	200	
<b>Total annual demands, sum of above</b>	<b>3,054</b>	
Evaporation	3,016	Assumed full storage
Transmission loss	5,530	
Operational surplus	1,800	
<b>System overhead, sum of above</b>	<b>10,346</b>	See, page 7
Less minimum inflow	(11,300)	See, <a href="#">Table 1</a>
<b>Total reserve for next water year</b>	<b>2,100</b>	

As shown in [Table 2](#), the assessment reserves 2,100 ML for the next water year. A reserve of two years or more is generally found suitable for inland regulated rivers in NSW based on their respective inflow sequences. However, the reliable coastal rainfall means that the one-year inflow sequence is more appropriate and provides adequate security for this system. No water needs to be set aside for the second water year as the assumed second-year inflow is more than sufficient as demonstrated below:

Additional inflow for the 2<sup>nd</sup> water year = 37,400 ML – 11,300 ML = 26,100 ML

Annual delivery commitments and overhead demands = 3,054 ML + 10,346 ML = 13,400 ML

Inflow 26,100 ML > Demand 13,400 ML. Conclusion: no second-year reserve is necessary.

<sup>14</sup> Clause 20, plan reference 49 ML, current WAL volume is 41 ML.

<sup>15</sup> Clause 46 varies 10 to 20 ML/d depending on the quarter. Estimated top up of 2 ML/d x 100 d per year.

## System overheads

System overheads are volumes that are required to operate the river; the unavoidable losses. The system overheads are explained below under three key components: evaporation loss, transmission loss, and operational surplus.

### Storage evaporation loss

Evaporation loss is the estimated volume of water that is lost from the storage due to evaporation over the assessment period. Strictly, the amount of loss varies by season, wind, water temperature and surface area of the storage. Evaporation loss varies and is a direct function of storage level, the time of the year and the drawdown pattern over the planning horizon. However, the assessment assumes a conservative maximum annual evaporation loss of 3,016 ML based on Lostock Dam remaining full all year. The department validated the prior use of this value by applying historical evaporation heights<sup>16</sup> on a near full Lostock surface area<sup>17</sup> of 206 Ha. This returned an annual average evaporation of 3,200 ML for the period of 2012 to 2022 and sufficiently validated the volume historically used. Therefore, this simple and safe estimate continues to be used.

During routine monthly assessments the evaporation demand for the remainder of the year is based on the annual 3,016 ML evaporation budget reduced linearly in proportion to the number of months remaining in the water year.

### Transmission loss

Transmission loss is water lost through seepage (and evaporation) in the river system when water is released from the headwater storage. The resource assessment budgets for an annual transmission loss of 5,530 ML. During routine monthly assessments this is reduced linearly based on the fraction of months remaining in the water year. The annual budget is based on decades of prior practise and continues to be used without any observed difficulties.

### Operational surplus

Operational surplus occurs when river operators err on the side of over-release to meet demands to safely avoid under-delivery, particularly when targeting end-of-system flows. Only skilled operators and predictable conditions can minimise these losses. They cannot be eliminated because weather conditions and water user behaviours are quite variable and not entirely predictable. Therefore, inevitably there is a flow at the end-of-system that exceeds the minimum target meaning, technically, too much water was released from storage – an operational surplus.

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<sup>16</sup> From WNSW Realtime daily evaporation from 2012 to 2022.

<sup>17</sup> surface area using Google Earth picture of 22/11/2022 when the dam was 20,287 ML or 100% full.

On 1 July each year the resource assessment allows for an operational surplus of 1,825 ML for the next 12 months. During routine monthly assessments this is reduced linearly based on the fraction of months remaining in the water year. As previously, this annual budget is based on decades of prior practise and continues to be used without any observed difficulties.

## Water allocation example of 21 April 2023

Table 3, below, shows the water allocation computations behind the statement published on 21 April 2023. The assessment returned a surplus of 4,371 ML. This is an example of the resource assessment where all the entitlement including general security allocations had earlier received their maximum allocation for the water year. Hence this surplus remained unallocated improving allocation reliability of the next year.

Table 3. Detailed allocation computation for 21 April 2023

Assessment Items as of 1/04/23	Volume (ML)	Balance (ML)
<b>Available Storage and future inflow</b>	<b>20,500</b>	
Lostock active storage volume (as at 1/04/2023)	19,800	
Minimum storage inflows (5/23 to 6/23)	700	
Total		<b>20,500</b>
<b>Losses (5/23 to 6/23)</b>	<b>1,725</b>	
Evaporation from Lostock Dam	503	
Transmission	922	
Operation	300	
		<b>18,775</b>
<b>Higher priority use balances as of 1/04/23</b>	<b>2496</b>	
Basic landholder rights	137	
Domestic and stock	32	
HS (town water)	52	
High security account balance	93	
Gostwyck target, river continuity (2ML/d x 91 days)	182	
Environmental water allowance balance	2,000	
		<b>16,279</b>
Higher priority reserve for 2023/24 (see, Table 2)	2,100	
General Security balance as of 31/3/23	9,808	
<b>Balance available for allocation</b>		<b>4,371</b>



## Disclaimer

Allocations are based on a very conservative future inflow budget. However, during extended dry periods, inflow may be less, and delivery losses could be higher than that budgeted, creating a shortfall in being able to meet the allocated resources. Often the shortfall is temporary and is resolved after a month or two, but if it persists and a dry outlook continues, drought contingency measures will be considered for implementation to protect high priority water needs. The management of an allocation deficit during extreme drought is beyond the scope of this summary guide. Readers are referred to the NSW Extreme Events Policy for details.

For example, in the unlikely event of a shortfall where there is insufficient physical water to match all water in accounts, and if it is in the public interest to do so, a temporary water restriction may be imposed to prevent access to account water. In this way, general security water is effectively borrowed to secure high priority commitments. This is one drought management tool, akin to a negative water allocation, used to protect and prioritise supplies for critical needs.

The routine water allocation computation, while broadly following this guideline, is subject to wider hydrological considerations not covered in this summary document. This is a guide only and subject to improvements and changes over time. Water users should use this information with caution and are encouraged to seek their own expert advice as needed.

### Version History

First edition (PUB21/597)	July 2021	V Gupta
Second edition	July 2023	L Elangovan
This edition	June 2024	S Chowdhury

ANNEX

WATER ALLOCATION STATEMENT EXAMPLE

21 April 2023

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21 April 2023

# Paterson Regulated River Water Source

## Water allocation update

Allocations for the current 2022/23 water year **remain unchanged** because all entitlements, including general security, received their maximum allocation for the year on 1 July 2022.

This quarterly statement provides information on the current water sharing and regulated resource conditions as well as an outlook for opening allocations on 1 July 2023 for the 2023/24 water year.

As of 20 April, Lostock Dam was full, holding 20,245 megalitre (ML) of water. This time last year, the storage was also full.

General security usage to 1 April 2023 has been minimal (about 7% of entitlement) due to generally wet conditions this water-year. The current resource assessment results in a surplus of 4,372 megalitres (ML) but with all licences already fully allocated it means this water remains unassigned and will contribute to future allocations and system reliability.

## Current allocation and average account balance

2022/23	General Security	Average Account Balance
Paterson Regulated River water source	100%*	approx. 102%^

\* Maximum allowable.

^ Current average account balance (includes carryover).

## Resource outlook for 2023/24

This outlook for the likely 1 July 2023 water availability is based on several assumptions therefore water users should use this forecast information with caution.

- Water for all critical consumptive and non-consumptive needs are expected to be secure for the 2023/24 water year.
- Higher priority water access licence holders including **domestic and stock, town water supply** and **high security** can expect to receive a maximum (100%) allocation on 1 July.

- The allocation for **general security** entitlement holders will depend on factors including inflows and usage for the remainder of this water year. However, indications suggest a high opening **general security** allocation is likely, potentially up to 100% of entitlement.
- Full allocation (100% of entitlement) can be expected for supplementary access entitlements, however; access to this water is subject to periods of declared supplementary flow events.

## Resource assessment data sheet

Resource Distribution – April 2023	(ML)	(ML)
Lostock Dam active storage volume (as at 1/04/2023) <sup>1</sup>		19,800
Minimum storage inflows (May 2023 to June 2023) <sup>2</sup>		700
<i>less</i>		
Basic Land Holder Rights	137	
Domestic and Stock	32	
Local Water Utility <sup>3</sup>	52	
Minimum storage releases	182	
High Security (HS) account balance <sup>3</sup>	93	
Environmental Water Allowance (EWA)	2,000	
Losses (evaporation, transmission, operation) <sup>4</sup>	1,724	
Essential supplies reserve for 2023/24 <sup>5</sup>	2,100	
General Security (GS) account balance <sup>3</sup>	9,808	
<i>equals</i>		
Surplus (or deficit) <sup>6</sup>		4,372

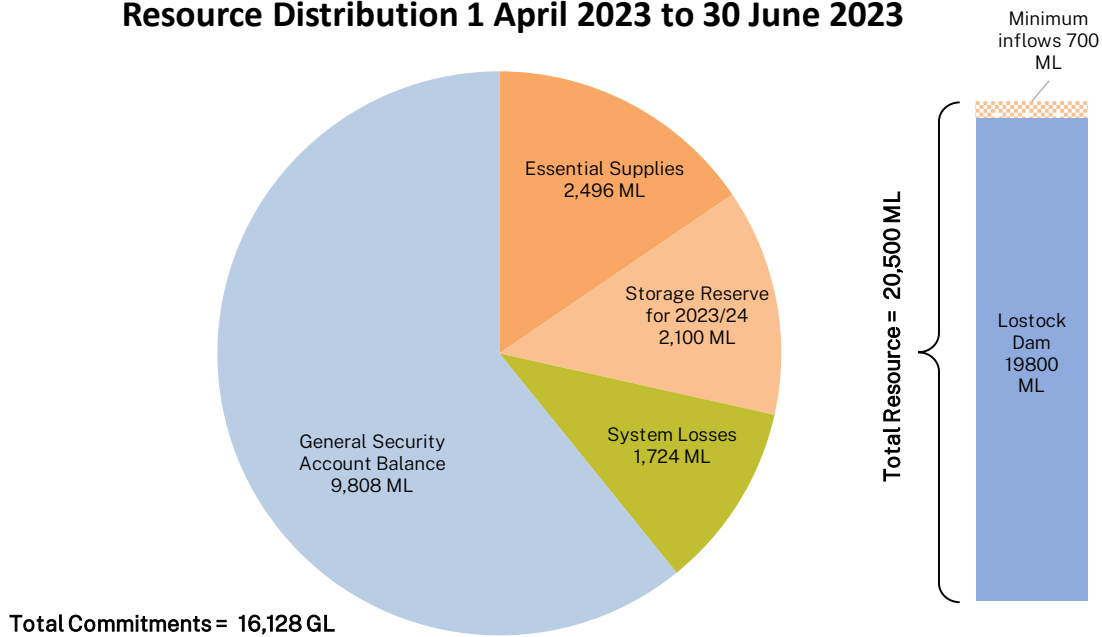
### Notes:

- (1) This is the active storage volume in Lostock as of 1 April 2023, capped at active full supply volume of 19,800 ML. Higher volumes of storage surcharge and spill are not counted as available resource for allocation.
- (2) Minimum inflow sequence from 1 May 2023 to 30 June 2023 as the storage is currently full and unable to capture April inflows.
- (3) Estimated. Actual usage for 2022/23 may be lower if wet conditions continue.
- (4) Storage evaporation loss, transmission loss and operation loss pro-rated for the remaining months of the water year and from 1 May 2023 to 30 June 2023. Storage evaporation loss, transmission loss and operation loss are assumed from May 2023 as the storage is spilling and unregulated flows are covering April losses.
- (5) Water required to be set aside in the storage as reserve to meet system losses of 10,346 ML plus essential requirements of 3,054 ML minus 11,300 ML of minimum storage inflows for the 2023/24 water year. That is,  $10,346 + 3,054 - 11,300 = 2,100$  ML needs to be reserved for the 2023/24 water year essential requirements and system losses. For the 2024/25 water year, no reserve is currently required as the future minimum inflows are expected to cover the system losses and essential requirements.
- (6) Surplus (or deficit) of water available after accounting for all commitments. The surplus signifies the additional resources available. As all accounts are allocated in full, this volume remains unallocated, improving the allocation reliability for the next water year.





**Paterson Regulated River Water Source  
Resource Distribution 1 April 2023 to 30 June 2023**



**Table 1. Water Allocations for the Paterson Regulated River Water Source in 2022/23**

Date	License Category	Increment	Total 2022/23
1-Jul	Domestic & Stock	100%	100%*
1-Jul	Local Water Utility	100%	100%*
1-Jul	High Security	1.00 ML/unit share	1.00 ML/unit share*
1-Jul	General Security	1.00 ML/unit share	1.00 ML/unit share*
1-Jul	Supplementary	1.00 ML/unit share	1.00 ML/unit share*

\* Maximum allowable

**Further information**

The next water allocation statement for the Paterson regulated river water source will be included in the state-wide opening water allocation statements on 1 July 2023.

Information on available water determinations and water sharing plans is available on the Department of Planning and Environment website - [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

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