

# Analysis of Impacts of Reduced Inflow to Carcoar Dam Due to Mine Establishment on Belubula Regulated System

## Purpose

This report is intended primarily to present the analysis of the expected impact of the reduced inflows to Carcoar storage due to a proposed tailings dam to be constructed as part of a mine establishment upstream of Carcoar Dam on the Belubula regulated river system. The purpose of the report is to describe the changes to downstream water extraction, and effective allocation under a number of selected scenarios of reduced inflow to Carcoar Dam. The proposed tailings dam will be designed to never discharge water to prevent contaminants flowing downstream. This will reduce the effective catchment area of Carcoar Dam.

## Model and Input Data

The Beubula River System model, developed using eWater Source Modelling Platform in 2018 by DPE Water, has been used for undertaking this work. The current condition scenario (LTAAEL scenario) of Source Belubula Model is as the baseline model.

An assessment of changes to daily Inflows into Carcoar Dam were provided by EMM. The inflows included a baseline inflow under current condition (produced by EMM) and the reduced inflows due to the mine establishment. These inflows were used as input sets into Carcoar Storage in the Source Belubula Model.

The following three cases were simulated using the inflow time series provided EMM.

- Case 1: Simulation of Source Belubula Model for the period of 1/1/1889 to 30/06/2021 using inflow provided by EMM (for current condition)
- Case 2: Simulation of Source Belubula Model for the period of 1/1/1889 to 30/06/2021 using inflow provided by EMM (with removed catchment inflows of the tailings dam (TSF) and smaller dam (WMF6))
- Case 3: Simulation of Source Belubula Model for the period of 1/1/1889 to 30/06/2021 using inflow provided by EMM (with removed catchment inflows of the tailings dam (TSF))

## Results

The following simulated outputs of the regulated Belubula System were analysed using the outputs from the three model runs. The period of the analysis was 01/07/1895 to 30/06/2021.

- i) Inflows into Carcoar Dam
- ii) Allocation to general security (GS), and high security (HS) entitlements
- iii) Average annual (Water Year) extraction and utilisation rates

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## Inflows into Carcoar Dam

The differences in inflows under the two development cases compared to the baseline are presented in Tables 1 & 2.

**Table 1. Daily Exceedance Table of Carcoar Dam Inflows [01/07/1895-30/06/2021]**

| Daily Exceedance Percentile [%] | Case 1 [ML/d] | Case 2 [ML/d] | Case 3 [ML/d] |
|---------------------------------|---------------|---------------|---------------|
| 1                               | 606.1         | 593.6         | 595.0         |
| 5                               | 207.2         | 202.9         | 203.4         |
| 10                              | 68.2          | 66.8          | 67.0          |
| 20                              | 24.6          | 24.1          | 24.2          |
| 30                              | 16.3          | 16.0          | 16.0          |
| 50                              | 7.9           | 7.7           | 7.7           |
| 70                              | 3.1           | 3.0           | 3.0           |
| 80                              | 1.4           | 1.4           | 1.4           |
| 90                              | 0.3           | 0.3           | 0.3           |
| 99                              | 0.0           | 0.0           | 0.0           |

**Table 2. Impact of Mine Storages in Carcoar Dam yearly inflows [1895/96-2020/21]**

| Key Statistic (WY)                                                           | Impact of (2) to (1) [ML] | Impact of (3) to (1) [ML] |
|------------------------------------------------------------------------------|---------------------------|---------------------------|
| Average Difference                                                           | 282                       | 252                       |
| 20 <sup>th</sup> Percentile Difference (difference is exceeded 20% of years) | 492                       | 440                       |
| Maximum Difference                                                           | 1,569                     | 1,403                     |

## General Security Allocation

Figures 1& 2 present the exceedance plots of allocation for the entire period simulations under the three case for high security and general security users, respectively.

Figure 1 shows material reductions in allocations available to high security entitlement holders in the driest 10% of years.

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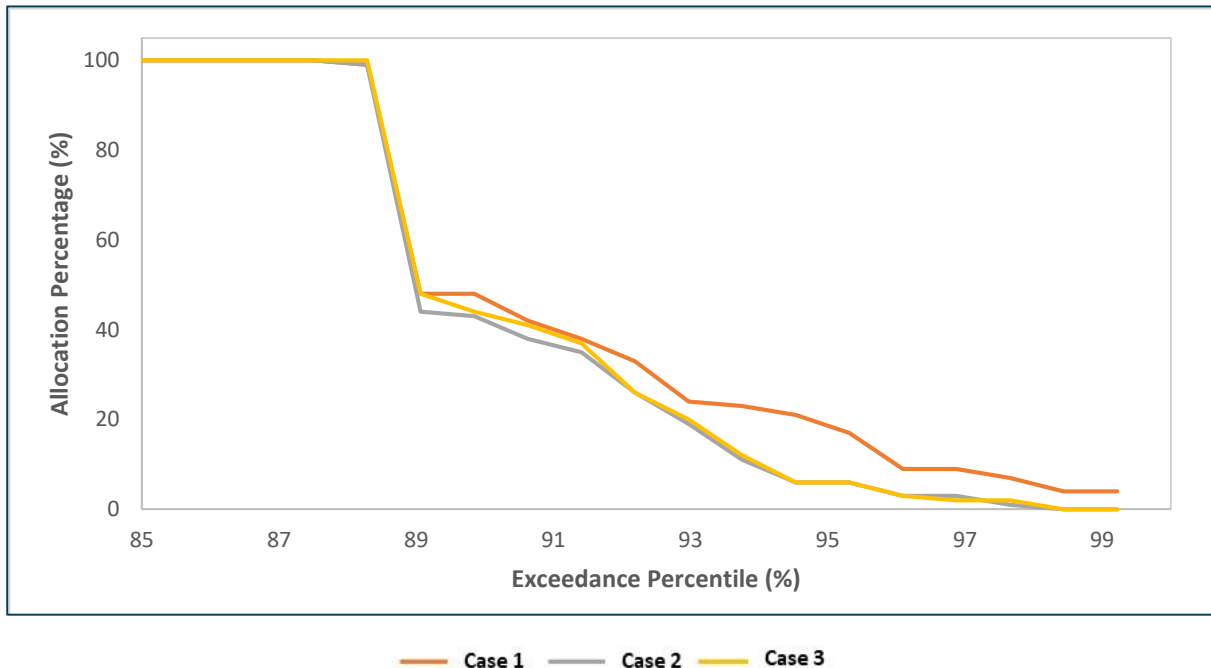


Figure 1 Effective End-of-Water Year High Security allocation for three scenarios [1895/96-2020/21]

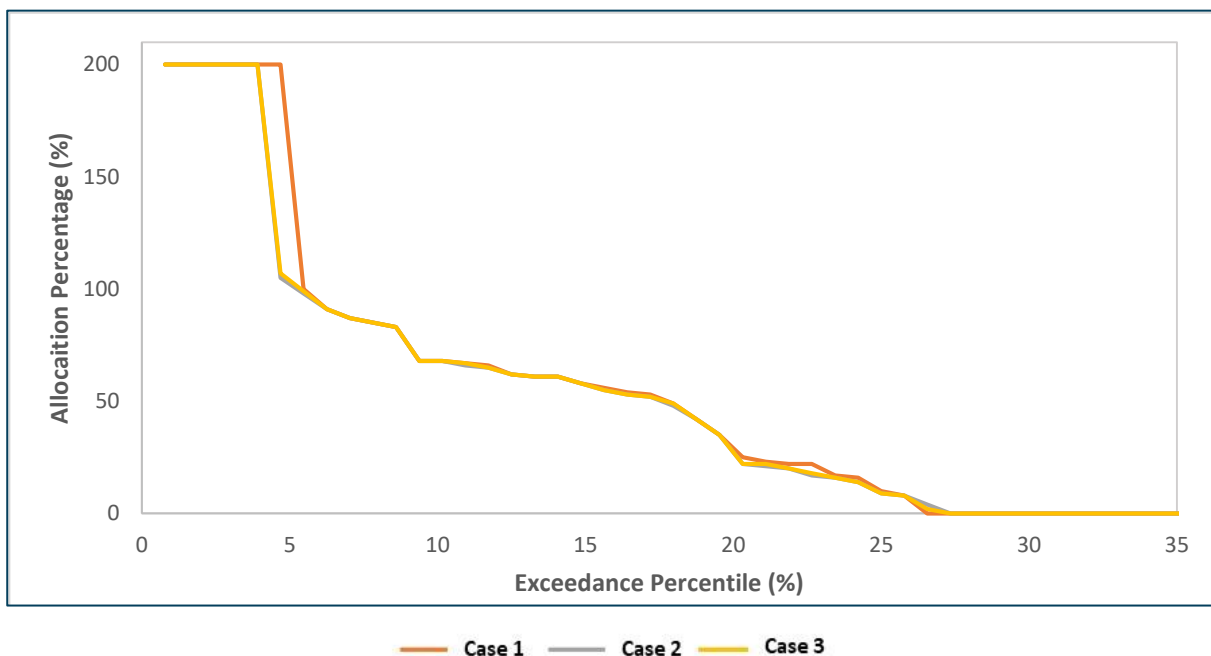


Figure 2 Effective End-of-Water Year General Security allocation for three scenarios [1895/96-2020/21]

## Average Annual Extraction

Table 3 presents the long-term average annual extractions of different usage categories for the three case. The utilisation percentage of different usage categories for three cases are presented in Table 4.

**Table 3. Average annual extraction for different usage types for three scenarios [1895/96-2020/21]**

| Usage category   | Scenarios                   |        |        |
|------------------|-----------------------------|--------|--------|
|                  | Case 1                      | Case 2 | Case 3 |
|                  | Average annual usage (ML/y) |        |        |
| Stock & Domestic | 163                         | 162    | 162    |
| High Security    | 972                         | 964    | 965    |
| General Security | 1,707                       | 1,690  | 1,693  |

**Table 3. Utilisation factors for three scenarios [1895/96-2020/21]**

| Usage category   | Entitlement (ML) | Scenarios                  |        |        |
|------------------|------------------|----------------------------|--------|--------|
|                  |                  | Case 1                     | Case 2 | Case 3 |
|                  |                  | Utilisation percentage (%) |        |        |
| Stock & Domestic | 222              | 73.5                       | 73.0   | 73.0   |
| High Security    | 1,191            | 81.6                       | 81.0   | 81.0   |
| General Security | 21,688           | 7.9                        | 7.8    | 7.8    |

## Sustainable Diversion Limit Compliance Considerations

It is expected that the construction of a tailings dam that is designed to never discharge water would be considered as a form of interception take under the Commonwealth Water Act 2007.

It is also likely that the level of take for Sustainable Diversion Limit (SDL) compliance purposes would be assessed as the reduction of inflow to Carcoar Dam.

To offset the effects of this growth in usage against the SDL, it should be expected that for case 3 the amount of high security entitlement that will need to be purchased is 252 ML of reduced inflow divided by 0.81 utilisation rate = 311 High Security entitlement shares.

A likely secondary consequence of this purchase is that the remaining entitlement holders would experience an increase in allocation reliability as roughly  $\frac{1}{4}$  of the high security demand is removed

from the regulated system serviced by Carcoar Dam. This increased access may also stimulate further growth in use, however this is not attributable to the proposed tailings dam.

## Summary

For Case 2, each year (compared to Case 1) the total annual flow into Carcoar Dam is reduced by 2.1% or 282 ML/year. For Case 3, each year (compared to Case 1) the total annual flow into Carcoar Dam is reduced by 1.8% or 252 ML/year.

The reduced inflows into Carcoar results in a reduction of the water allocated to the regulated users (a more pronounced reduction in HS water allocated) and there is a reduction in S+D, HS and GS usage. The average annual reduction for case 2 is 8 ML for high security and 17 ML for GS. These are equivalent to 10 units of HS and 225 units of GS entitlements.

## Recommendations

In the Belubula System, General Security allocations are not as reliable as those typically experienced in regulated system around NSW, as there is typically only General Security allocations made in around 30% of years. The reduction in inflows due to the mine establishment was present in all years and Carcoar Dam does not have sufficient capacity to store additional water during wet periods.

It is recommended that any purchases of existing entitlements to offset the construction of the proposed tailings dam should focus on the purchase of high security entitlements. Purchases of General security entitlements for case 2 and case 3 is unlikely to improve the reliability of allocation of High Security entitlements to the basecase level due to the low levels of typical general security allocations and limited storage capacity of Carcoar Dam.

The inflow data provided by Regis Resources to DPE Water in 2020 demonstrated up to a 4.13% reduction of inflows to Carcoar storage for the mine establishment. The impact of that on the usages on Belubula regulated system is significantly higher under that inflow scenario. The reduction of inflow is halved in the updated time series provided by EMM for Case 2. The veracity of the updated modelling of storage inflows should be independently assessed and this has not be considered in this study.