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Headworks Utilisation Factors for the Central Lockyer, Logan River and Warrill Valley Water Supply Schemes

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1 Introduction

1.1 Context

A Headworks Utilisation Factor (HUF) describes the percentage of a WSS's storage headworks volumetric capacity that is effectively utilised by each priority group of water entitlements in that scheme. This factor is a key consideration in, and input to, the allocation of the relevant capital costs (i.e. asset value and renewal costs) associated with Seqwater's bulk water assets.

In January 2020 the Queensland Competition Authority (QCA) recommended the adoption of HUFs[1] for the Logan River, Warrill Valley and Central Lockyer Water Supply Schemes (WSSs) as follows:

- Logan WSS – 2% for medium priority and 98% for high priority[2]
- Warrill Valley WSS – 10% for medium priority and 90% for high priority[2]
- Central Lockyer WSS – 98.9% for medium priority and 1.1% for high priority[3].

In June 2023, Badu Advisory was engaged to assist Seqwater in reviewing and updating HUFs for the Logan River, Warrill Valley and Central Lockyer WSSs in preparation for QCA's next review of irrigation water pricing[4].

1.2 Purpose of this report

The purpose of this report is to:

- summarise the key changes in data inputs since 2020 that are material to the review and updating of HUFs for the Central Lockyer, Logan River and Warrill Valley WSSs
- present recommendations re HUFs for the three WSSs.

2 Logan WSS

2.1 Key changes in data inputs

The following is a list of the key changes in HUF data inputs (since 2020), and commentary about the relative materiality of those changes to updated HUFs for the Logan WSS:

- On 3 March 2023, the provisions of the Logan Basin resource operations plan were recast into contemporary documents under provisions of the Water Act 2000. A water management protocol, an updated resource operations licence and its respective operations manual were published. These documents did not amend the intent or effective operation of the water sharing rules in the previous ROP

[1] *Final report – Rural irrigation price review 2020–24 Part C: Seqwater*, Table 36, QCA, January 2020.

[2] QCA derived HUFs by applying the technical methodology as outlined *in Headworks Utilisation Factors: Technical Paper, Seqwater & Sunwater*, 24 April 2018.

[3] QCA allocated fixed costs using water access entitlement volumes (WAEs).

[4] The HUF data inputs – and HUFs – for Seqwater's other Water Supply Schemes (e.g. the Mary Valley WSS) are unchanged since the previous HUF assessment in 2020.

- Since the previous assessment an additional 37,000 ML of unallocated water has been released as high priority water allocations. This was previously accounted for in the HUF as unallocated water.
- The Transmission and Operational Allowance (TOA) parameters applied within the water sharing rules in the Logan WSS Operations Manual also reflect the increased volume of high priority water allocations (i.e. 46,856 ML) now in the scheme. This means that the TOAs in Table 8 of the Logan WSS Operations Manual are used.
- Bromelton Offstream Storage is now accounted for as a contributing storage within the water sharing rules for medium and high priority water allocations.
- On the 16th of May 2023, the Minister for Regional Development and Manufacturing and Minister for Water gave notice of the Proposed replacement of the Water Plan (Logan Basin) 2007. It is not expected that the current Water Plan will be finalised or replaced prior to the commencement of this price path.

2.2 Updated HUFs

Appendix 1 presents a data worksheet for deriving updated HUFs for the Logan WSS.

The recommended updated HUFs for the Logan WSS are 1% for medium priority water allocations and 99% for high priority water allocations.

3 Warrill Valley WSS

3.1 Key changes in data inputs

The following is a list of the key changes in HUF data inputs (since 2020), and commentary about the relative materiality of those changes to updated HUFs for the Warrill Valley WSS:

- On 13 December 2019, section 47 of the Moreton water plan was amended to correct an administrative error relating to Seqwater's authorisation to take water from the Warrill Valley WSS. This did not have any bearing on the HUFs.
- In October 2020, the Warrill Valley WSS Operations Manual was modified to include the following changes:
    - A new cut-off rule: "When the water level in Moogerah Dam is at or below EL 138.94 the licence holder must not release water from Moogerah Dam (i) to supply medium priority water allocations and (ii) to supply 'High Priority C' water allocations in Zone F and
    - A change to the reserve volume for high priority.

  The MP HUF calculations were updated to account for the effect of these changes.
- Seqwater also sold 200 ML of its HP water allocations to an irrigator in zone F. This did not have any impact on the MP HUF calculation.

3.2 Updated HUFs

Appendix 2 presents a data worksheet for deriving updated HUFs for the Warrill Valley WSS.

The recommended updated HUFs for the Warrill Valley WSS are 9% for medium priority water allocations and 91% for high priority water allocations.

4 Central Lockyer WSS

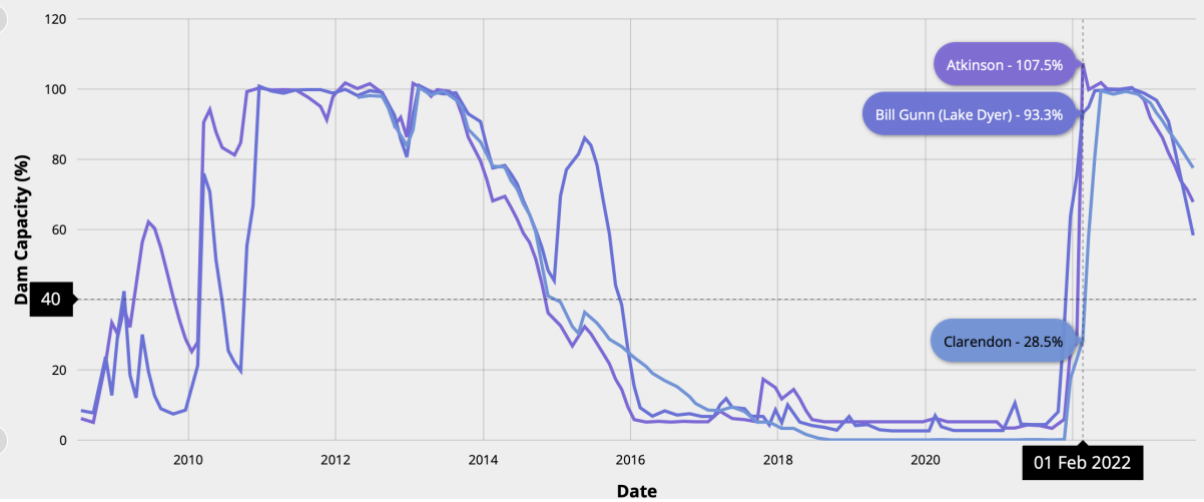
4.1 Key considerations

The following is a list of the key changes in HUF data inputs (since 2020), and commentary about the relative materiality of those changes to updated HUFs for the Central Lockyer WSS:

- On 2 October 2020, the Moreton water plan was amended to provide for the conversion of supplemented and unsupplemented water entitlements to volumetrically specified water allocations. The water plan included a general outcome in section 11(4)(b) that specifically recognised the different contributions that natural recharge and recharge through infrastructure make to the availability of groundwater within the Central Lockyer Valley WSS. Sections 84E and 84F provided for each water licence in the water supply scheme to be split and converted into two water allocations, and section 84H specified that the second of each of these pair of water allocations is to belong to the low priority group. The low priority water allocations effectively represent the set of water entitlements in the scheme that relate to natural recharge rather than recharge through infrastructure[5].
- The water plan also included outcomes in 11(4) (c) and (d) and measures in section 12A (1) that provide for further information to be gathered to support future decision making and improvements to the plan. This reflected the need for further information to be gathered about the scheme's groundwater resources including trends in the levels of the groundwater, the volume of groundwater used, the recharge characteristics of the groundwater, and the quality of the groundwater.
- The water sharing rules for the water supply scheme were updated and are set out in Section 3 the Central Lockyer Valley WSS Operations Manual (dated 27 February 2020). These are considered to only be interim or trial water sharing rules that effectively are being applied whilst further monitoring and assessment is being undertaken – and hydrologic models are being developed – in order to better understand the dynamics of the groundwater and surface water system over time.
- The water sharing rules in this scheme typically involve the releases of water to time to top up flows through the system for underground water recharge or operational purposes rather than being stored and delivered to meet specific downstream water orders. Announced allocations for underground water are set based on the prevailing levels observed in a set of monitoring bores. Announced allocations for surface water are calculated based on an assessment of the water stored in Lake Clarendon and Lake Dyer but with the only high priority water allocations being distribution loss allocation associated with recharging of the Morton Vale Pipeline.
- It is also noted that the surface water storages in this scheme have been virtually empty for several years at a time (see plot of storage levels below). This means that the standard methodology for calculating HUFs would return inappropriate results due to the very low probabilities of the dams storing water in this scheme.

[5] The QCA Referral Notice (10 March 2023) notes that "For the Central Lockyer Valley WSS, the costs of Seqwater supplying the low priority groundwater product are not to be recovered in prices."

- Based on the above, it is not considered warranted or appropriate to replace the approach previously used by QCA i.e. simply using water access entitlement (WAE) volumes to allocate fixed costs.
- Applying the WAE approach using the updated total medium priority nominal volume (now 19,849ML) and the high priority nominal volume (i.e. loss allocation of 185ML) results in an updated HP WAE of 185/(185 + 19849) x 100% = 0.92% and a MP WAE of 99.08%.



5 Recommendations

It is recommended that the HUFs for the Logan, Warrill Valley and Central Lockyer WSSs be updated as per Table 1 below.

Table 1 - Updated Headworks Utilisation Factors

Water Supply Scheme	Previous Headworks Utilisation Factors		Updated Headworks Utilisation Factors		Rationale
	Medium Priority	High Priority	Medium Priority	High Priority	
Logan	2%	98%	1%	99%	Reduction in MP HUF is attributable to increased High Priority water allocations included in the water sharing rules and supplied by the scheme.
Warrill Valley	10%	90%	9%	91%	Reduction in MP HUF is attributable to inclusion of a new cut-off rule plus a change to the high priority reserve term in the water sharing rules.
Central Lockyer	98.9%	1.1%	99.08%	0.92%	New WAE calculation based on updated proportions of total nominal volumes of high and medium priority water allocations.
Mary Valley	11%	89%	No change		No changes to rules or data inputs since 2020.

Appendix 1 – Logan Water Supply Scheme

A. INPUT DATA FROM WATER ALLOCATION REGISTER (DRDMW)

Water Entitlement Priority Group (in WP):	Nominal Volume:		Water entitlement grouping (in HUF calc.) :	Conversion Factor	
Medium Priority	13555 ML	→	= MPA 13555 ML	Although changes between priority groups are allowed under s15(1)(b) of the Logan WMP, conversion factors are not specified. Assume value of 2.5 when converting from MP to HP, but with MPAmin not less than 4070 as specified in column 4 Table 2, Logan WMP, February 2023	MPAmin = 4070 ML
High Priority	46856 ML	→	= HPA 46856 ML	HPAmax taken from column 3 Table 2, Attachment 5, Logan WMP, February 2023	HPAmax = 55081 ML

B. WATER SHARING RULES & OPERATIONAL REQUIREMENTS (ROP)

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year and with inflows equal to zero. Assume Maroon Dam, Wyaralong Dam, Bromelton Offstream Storage and Cedar Grove Weir are drawn down proportionally (balanced percentages).	
Adjustments	• None	
MP0	= max {MP0 AA , CWSA Adjustment}	77182 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment Volume)	83914 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme Wyaralong 102883 | Maroon 44319 | Bromelton O 8210 | Cedar Grove 1144	156556 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme Wyaralong 264 | Maroon 2190 | Bromelton O 1131 | Cedar Grove 100	3685 ML

C. PROBABILITY OF UTILISATION

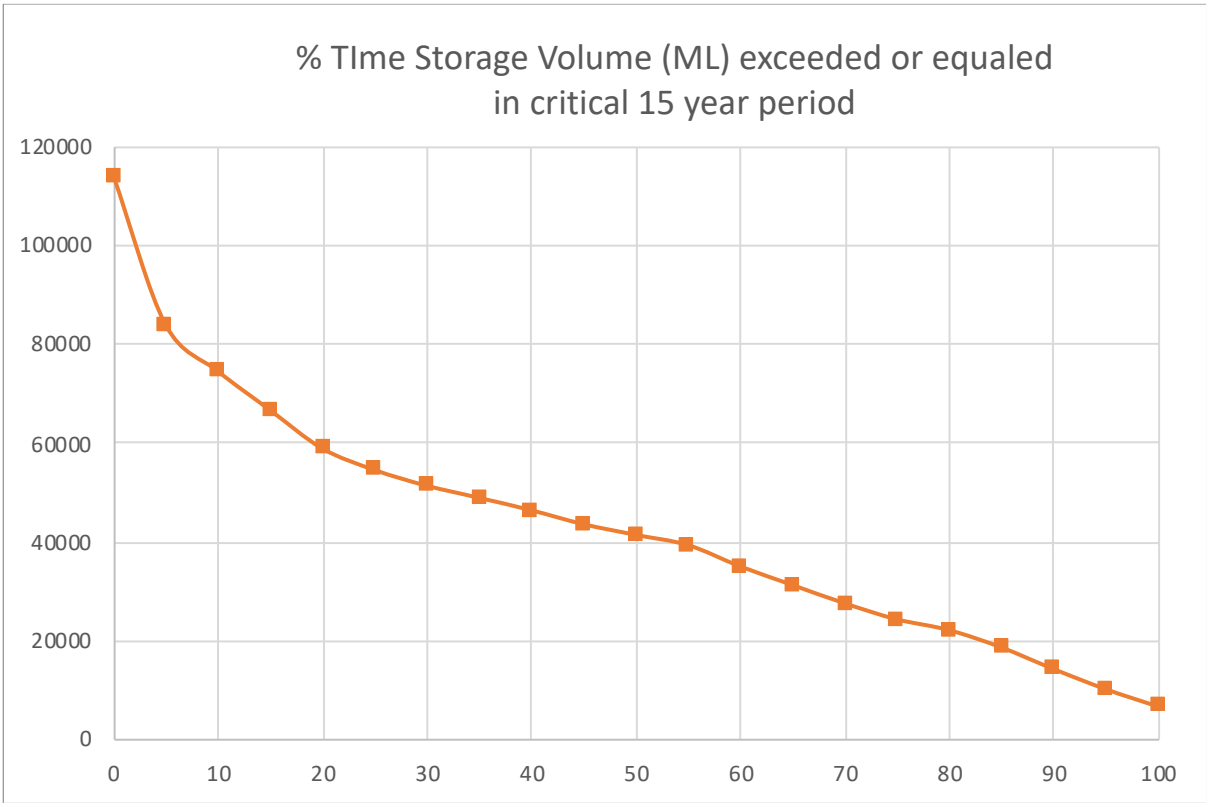
Storage component capacity volumes:		Probability of Utilisation	Utilised storage component volumes	
MP2 = 4998 ML	HP2 = 67644 ML	P3 = 1%	MP2util = 52 ML	HP2util = 703 ML
MP1 = 6732 ML		P 2 = 7%	MP1util = 459 ML	
HP1 = 73497 ML		P1 = 52%	HP1util = 37927 ML	

D. HUF RESULTS

Water entitlement grouping (in HUF calc.) :	Headworks Utilisation Factor for Grouping	Water Entitlement Priority Group (in OM or ROL):	Headworks Utilisation Factor for priority group
MPA	1%	Medium Priority	1%
HPA	99%	High Priority	99%

IQQM STORAGE EXCEEDENCE CURVE – COMBINED MAROON DAM, WYARALONG DAM, CEDAR GROVE WEIR AND BROMELTON OFF-STREAM STORAGE

15 YEAR CRITICAL PERIOD from 01/07/1906 to 30/06/1921



Appendix 2 – Warrill Valley Water Supply Scheme

A. INPUT DATA FROM WATER ALLOCATION REGISTER (DRDMW)

Water Entitlement Priority Group (in WP):	Nominal Volume:	Water entitlement grouping (in HUF calc.) :	Conversion Factor	
Medium Priority – river losses	3714 ML	= MPA 23883.5 ML	Although changes between priority groups are not explicitly permitted or prohibited under Part 2 Division 2 of the Moreton WMP, s 20 of the WMP provides for changes to be made in accordance with part 5, division 3, subdivision 4 of the Water Regulation 2016. Although conversion factors are not specified a value of 2.5 has been assumed when converting from MP to HP. HPAmax is based on the sum of the max HP volumes in Table 3 of the WMP.	MPAmin = 22943.5 ML
Medium Priority – purpose = "any"	20169.5 ML			
High Priority C	5950* ML	= HPA 5950 ML	HPAmax is based on the sum of the max HP volumes in Table 3 of the WMP.	HPAmax = 6326 ML

*This includes the volume of HPC allocations in zone F = 3876 ML.

B. WATER SHARING RULES & OPERATIONAL REQUIREMENTS

MP0 AA	• Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year assuming zero inflows= 15128 ML	
	• Add 3714 ML river losses as this volume must be available first before water can be delivered from storage to other MP water allocations	18842 ML
MP0 nom	This is the maximum headworks storage volume at the start of the water year below which the headworks storage volume is forecast to reach the medium priority cut-off level (EL 138.94 or ~5998 ML) on the last day of that water year (based on applying rate of storage drawdown of 22406 ML / year observed for Moogerah Dam between 18/3/2020 to 18/3/2021) **This parameter is only relevant to storages that have an MP cut-off rule[6].**	28404 ML
MP0	= max {MP0 AA, MP0 nom}	28404 ML

6 When the water level in Moogerah Dam is at or below EL 138.94 (5,998 ML or ~7.2% of FSV) the licence holder must not release water from Moogerah Dam to supply medium priority water allocations or 'High Priority C' water allocations in Zone F.

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year with zero inflows = 43451 ML	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment Volume)	43451 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	83765 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	1200 ML

C. PROBABILITY OF UTILISATION

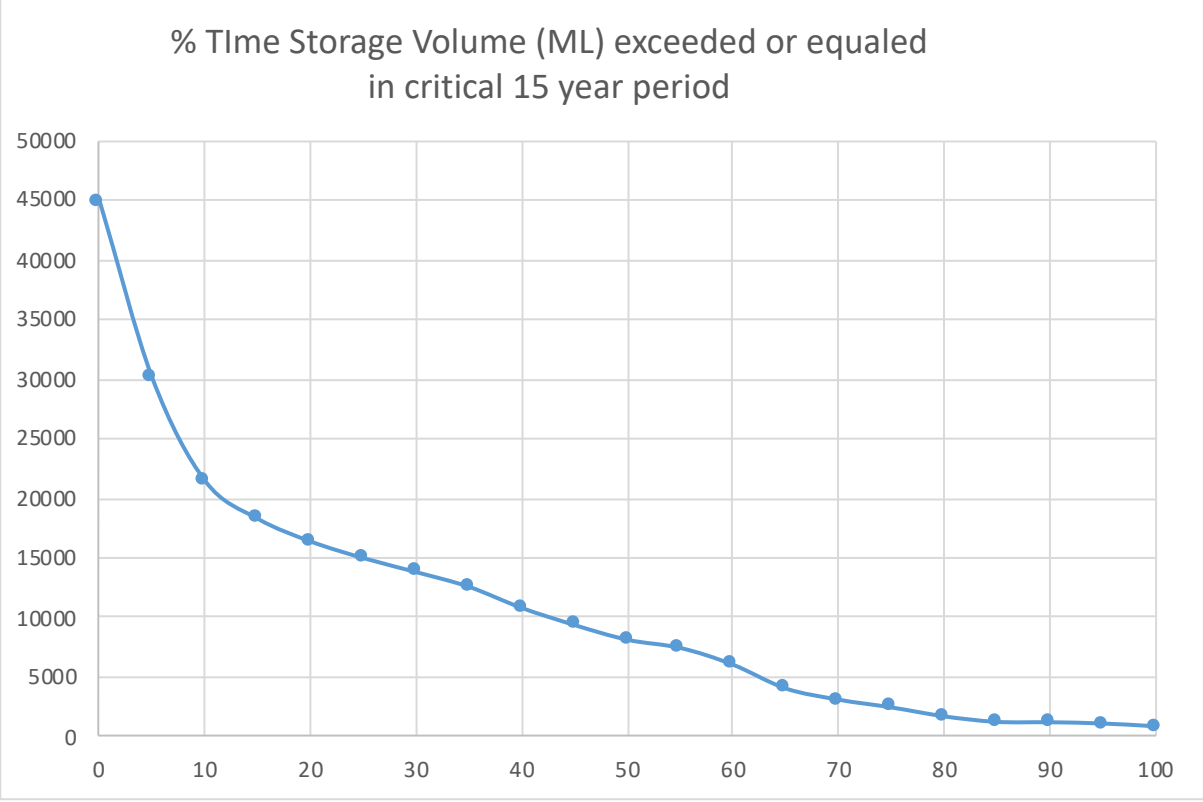
Storage component capacity volumes:		Probability of Utilisation	Utilised storage component volumes	
MP2 = 31601 ML	HP2 = 8713 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1-B = 24609 ML		P2-B = 3%%	MP1-B_util = 453 ML	
MP1-A = 4781 ML	HP1-A = 4781 ML	P2-A = 8%	MP1-A_util = 402 ML	HP1-A_util = 402 ML
HP1 = 17642 ML		P1 = 44%	HP1util = 7772 ML	

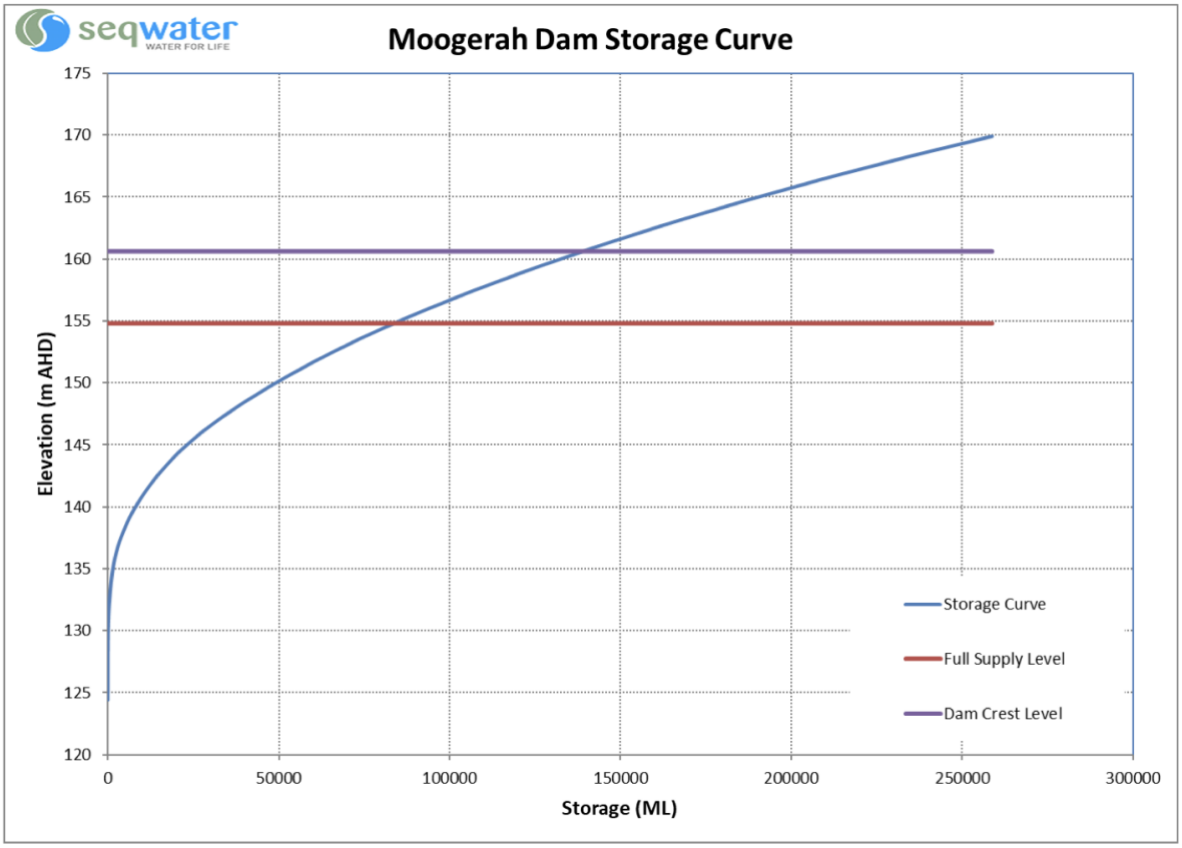
D. HUF RESULTS

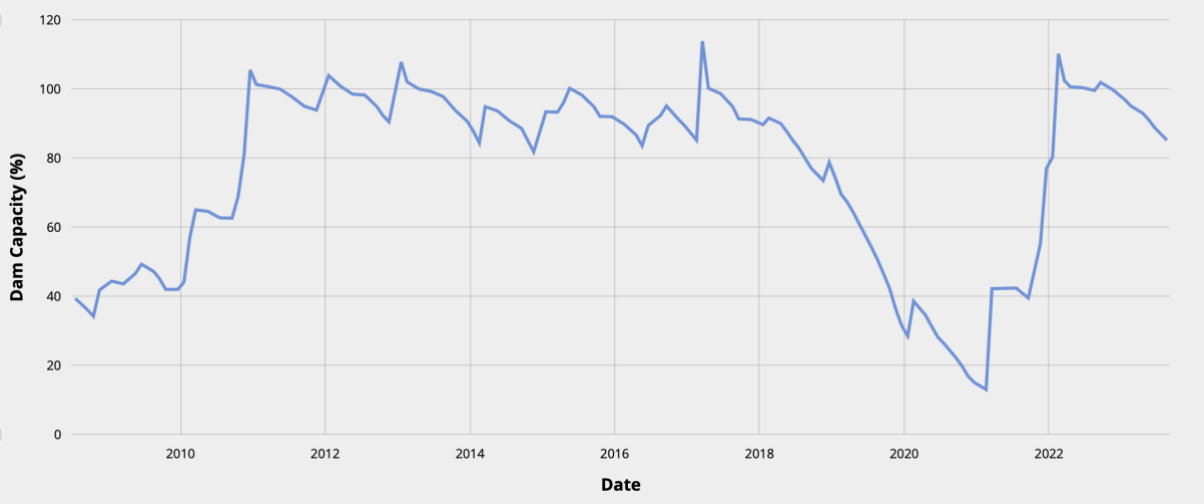
Water entitlement grouping (in HUF calc.) :	Headworks Utilisation Factor for Grouping	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for priority group
MPA	9%	Medium Priority	9%
HPA	91%	High Priority C	91%

IQQM STORAGE EXCEEDENCE CURVE – MOOGERAH DAM

15 YEAR CRITICAL PERIOD from 01/07/1911 to 30/06/1926




seqwater
WATER FOR LIFE
Moogerah Dam Storage Curve
Elevation (m AHD)
175
170
165
160
155
150
145
140
135
130
125
120
0
50000
100000
150000
200000
250000
300000
Storage (ML)
Storage Curve
Full Supply Level
Dam Crest Level


Dam Capacity (%)
120
100
80
60
40
20
0
2010
2012
2014
2016
2018
2020
2022
Date