

### Reach 1: Upstream of Hume

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column (TYPE)	Column Value
401224A	Dartmouth storage	H	H > 484.78 m Month = April, May or June	Soft	RO_H_SOFT_1	484.78
			H > 484.93 m Month = July	Soft	RO_H_SOFT_2	484.93
			H > 485.39 m	Soft	RO_H_SOFT_3	485.39
			H > 486.0 m	FSL	RO_H_FSL	486
	Dartmouth airspace	V	3756381 < V < 3817439 ML	Soft	RO_H_SOFT_1	3756381
			V > 3817440 ML	Hard	RO_V_HARD_1	3817440
401204A	Mitta Mitta River @ Tallandoon	H	H > 3.449 m	Hard	SO_H_HARD_1	3.4
401211A	Mitta Mitta River @ Colemans	H	When H > 1.754 m, $\Delta H$ (rate of fall) > 20 mm/hour Note: Use hourly data	Hard	SO_dH_HARD_1	20 mm
			When H ≤ 1.754 m, $\Delta H$ (rate of fall) > 60 mm/hour Note: Use hourly data	Hard	SO_dH_HARD_2	60 mm
			When H ≤ 1.754 m, $\Delta H$ (rate of fall) > 720 mm/24 hours rolling Note: Use hourly data	Hard	SO_dH_HARD_3	720 mm
			When H < 1.250 m, $\Delta H$ (rate of rise) > 150 mm/hour Note: Use hourly data	Hard	SO_dH_HARD_4	150 mm
			When 1.250 ≤ H ≤ 1.750 m, $\Delta H$ (rate of rise) > 100 mm/hour Note: Use hourly data	Hard	SO_dH_HARD_5	100 mm
			When H > 1.750 m, $\Delta H$ (rate of rise) > 50 mm/hour Note: Use hourly data	Hard	SO_dH_HARD_6	50 mm
		Q	Q < 200 ML/d	Hard	SO_Q_HARD_1	200

## Reach 2: Hume to Yarrawonga

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column (TYPE)	Column Value
409016	Murray @ Heywoods	H	Q (at 409017) < 25,000 ML/day, ΔH (rate of fall) > 0.225 m	Hard	SO_dH_S_HARD_2	0.225
			When Q (at 409017) < 25,000 ML/day, ΔH (rate of fall) (6 day rolling average) > 0.249m	Hard	SO_dH_S_HARD_1	0.249
		Q	Q < 600 ML/d	Hard	SO_Q_HARD_1	600
409017	Murray @ Doctors Point	H	When Q < 25,000 ML/day, ΔH (rate of fall) > 0.225 m	Hard	SO_dH_S_HARD_2	0.225
			When Q < 25,000 ML/day, ΔH (rate of fall) (6 day rolling average) > 0.154 m	Hard	SO_dH_S_HARD_1	0.154
		Q	Q < 1,200 ML/d	Hard	SO_Q_HARD_1	1200
			Q > 25,000 ML/day	Hard	SO_Q_HARD_2	25000
409026	Mulwala Canal diversion (off Yarrawonga Weir)	Q	-500 ML/d > Q – QORD > 500 ML/d	Soft	RO_Q_SOFT_1	500
			If Q (409026) > related water @ 409216A (See note 1 below)	Hard	SO_Q_HARD_1	
409722A	Yarrawonga Main Canal diversion	Q	-500 ML/d > Q – QORD > 500 ML/d	Soft	RO_Q_SOFT_1	500
			If Q (409722A) > related water @ 409216A (See note 1 below)	Hard	SO_Q_HARD_1	
409216A	Yarrawonga storage	H	H < 124.695 m (between 26 December and 31 January)	Soft	SO_H_S_SOFT_1	124.695
			H > 124.9m	FSL	RO_H_FSL	124.9
409025	Murray @ Downstream of Yarrawonga	H	When Q < 10,000 ML/day, ΔH (rate of fall) > 0.2 m/d	Soft	RO_dH_SOFT_1	0.2
		Q	Q > 10,000 ML/d	soft	RO_Q_SOFT_1	10,000
		Q	Q < 1,800 ML/d	Hard	SO_Q_HARD_1	1800
403234A	Lake William Hovell storage	H	H >= 408.14 m	FSL	RO_H_FSL	408.14

Note 1: Diversion into 409722A and 409026 is dependent on the level rating curve for the Yarrawonga storage (409216A) as shown below;

409216A (H)	Flow/Order @ 409722A
122.52	0
123.42	500

409216A (H)	Flow/Order @ 409026
122.12	0
122.52	500

123.86	1000
124.16	1500
124.38	2000
124.57	2500
124.74	3000

122.78	1000
122.97	1500
123.16	2000
123.32	2500
123.46	3000
123.6	3500
123.73	4000
??	Rest of flows?

Reach 3: Yarrawonga to Euston

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column (TYPE)	Column Value
409202A	Murray @ Tocumwal	H	H > 3.049	Soft	SO_H_HARD_1	3.049
			H > 3.349	Hard	SO_H_HARD_1	3.349
409008	Edward River @ Edward Offtake	H	H > 2.464 m	Hard	SO_H_HARD_1	2.464
			When H <= 2.46 m, ΔH (rate of fall) > 0.15 m	soft	RO_dH_S_SOFT_1	-0.15
			When H <= 2.46 m, ΔH (rate of rise) > 0.3 m	soft	RO_dH_S_SOFT_2	0.3
		Q	Q < 100 ML/d	Hard	SO_Q_HARD_1	100
409030	Gulpa Creek @ Gulpa Offtake	H	H > 2.54m	Hard	SO_H_HARD_1	2.54
			When H <= 2.5 m, ΔH (rate of fall) > 0.15 m	soft	RO_dH_S_SOFT_1	-0.15
			When H <= 2.5 m, ΔH (rate of rise) > 0.3 m	soft	RO_dH_S_SOFT_2	0.3
		Q	Q < 80 ML/d	Hard	SO_Q_HARD_1	80
409047	Edward River at Toonalook	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409003	Edward River at Deniliquin	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409023	Edward River @ downstream Stevens Weir	Q	Q > 2,700 ML/d	Hard	SO_Q_HARD_1	2700
409014	Edward River at Moulamein	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409006	Murray @ Gulpa (picnic point)	H	2.495 m < H < 2.604 m	Soft	SO_H_SOFT_1	2.495
			H >= 2.604 m	Hard	SO_H_HARD_1	2.604
409013	Wakool @ Stoney Crossing	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409048	Niemur @ Barham-Moulamein	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409086	Niemur @ Mallan School	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409044	Merran @ Franklins Bridge	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409036	Merran @ U/S Wakool Junction	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409062	Wakool @ Gee Gee Bridge	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409005	Murray @ Barham	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
405232C	Goulburn River @ McCoys Bridge	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409701E	National Channel diversion	Q	-500 ML/d > Q – QORD > 500 ML	Soft	RO_Q_SOFT_1	500
409207B	Murray @ Downstream Torrumbarry	Q	Q < 2,000 ML/d	Soft	RO_Q_SOFT_1	2000
409204C	Murray @ Swan Hill	H	H < 0.595 m	Hard	SO_H_HARD_1	0.595
414200A	Murray @ below Wakool Junction	EC	EC > 400	Salinity	RO_EC_SAL	400

410130	Murrumbidgee River @ Balranald Weir D/S	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
414201B	Murray @ Boundary Bend	EC	EC > 400	Salinity	RO_EC_SAL	400
414203C	Murray @ Euston Weir	EC	EC > 400	Salinity	RO_EC_SAL	400

#### Reach 4: Euston to SA border

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column (TYPE)	Column Value
414207A	Murray@colignan	H	1.2 m < H < 1.35 m	Soft	RO_H_SOFT_1	1.2,3.5
			H < 1.2 m	Hard	RO_H_HARD_1	1.2
414202	Murray River @ d/S Mildura Weir	H	H<= sill level + 1.4 m	Navigat ion	RO_H_HARD_1	30.6
414206	Murray River @ Merbein	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
425007	Darling @ Burtundy	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
WENTMR (parent site WENTUS)	Wentworth Weir – Murray Component of Inflow	Q	Q < 700 ML/d	Hard	SO_Q_HARD_1	700
425010	Murray River @ d/S Wentworth Weir	H	H<= sill level + 1.4 m	Navigat ion	RO_H_HARD_1	11.4
A4260505	Murray @ Lock 9	Q	Q < 500 ML/d	Soft	SO_Q_SOFT_1	500
A4260501	Murray @ Lock 9	EC	EC > 400	Salinity	RO_EC_SAL_1	400
A4260505	Murray @ Downstream Lock 9	H	H<= 23.17 m (lock sill level + 1.4 m)	Navigat ion	RO_H_HARD_1	24.57
A4260506	Murray @ Lock 8	EC	EC > 400	Salinity	RO_EC_SAL	400
A4260507	Murray @ Downstream Lock 8	H	H<= 20.86 m (lock sill level + 1.4 m)	Navigat ion	RO_H_HARD_1	22.26
A4260508	Murray @ Lock 7	EC	EC > 400	Salinity	RO_EC_SAL	400
A4260509	Murray @ Downstream Lock 7	H	H<= 18.35 m (lock sill level + 1.4 m)	Navigat ion	RO_H_HARD_1	19.75
A4260500	Frenchmans Creek @ Inlet regulator	Q	7,000 ML/d < Q <= 10,000 ML/d	Soft	SO_Q_SOFT_1	7000
			Q >10,000 ML/d	Hard	SO_Q_HARD_1	10000
			Q <200 ML/d	Soft	RO_Q_Soft_1	200
A4261093 (use LVIC data)	Lake Victoria storage	H	H > 27.049 m	Hard	SO_H_HARD_1	27.049
			24.45 m < H < 24.55 m	soft	RO_H_SOFT_1	24.45
					RO_H_SOFT_2	24.55
			When 25.950 m < H < 27.049 m, ΔH (rate of rise) > 0.054 m	Hard	SO_dH_HARD_1	0.054
A4260502	Lake Victoria @ outlet regulator	Q	Q < 700 ML/d	Hard	SO_Q_HARD_1	700
			Q > 10,000 ML/day	Hard	SO_Q_HARD_2	10000

A4260641	Rufus River	EC	EC > 400	Salinity	RO_EC_SAL	750
426200A	Murray @ downstream Rufus River	EC	EC > 450	Salinity	RO_EC_SAL	450
MENINDEE	Menindee Lake	V	V > 1,730,000 ML Month = November, December, January and February	soft	RO_V_SOFT_1	1730000
			V >= 2,050,000 ML	Hard	RO_V_FSL	2050000
425012	Lower Darling @ Weir 32	Q	When Q <= 5000 ML/d, ΔQ (rate of fall) > 250 ML/d	Hard	SO_dQ_HARD_1	250
			When 5000 < Q <= 9000 ML/d, ΔQ (rate of fall) > 500 ML/d	Hard	SO_dQ_HARD_2	500
			When Q <= 1000 ML/d, ΔQ (rate of rise) > 500 ML/d	Hard	SO_dQ_HARD_3	500
			When 1000 < Q <= 5000 ML/d, ΔQ (rate of rise) > 1000 ML/d	Hard	SO_dQ_HARD_4	1000
			When 5000 < Q <= 9000 ML/d, ΔQ (rate of rise) > 2000 ML/d	Hard	SO_dQ_HARD_5	2000
425020	Lake Wetherell	H	H > 62.3 m	Hard	RO_H_HARD_1	62.3
			H > 61.67 m Month = November, December, January and February	soft	RO_H_SOFT_1	61.67
425021	Lake Pamamaroo	H	H > 61.5 m	Hard	RO_H_HARD_1	61.5
			H > 60.45 m Month = November, December, January and February	soft	RO_H_SOFT_1	60.45
425040	Lake Menindee + Cawndilla	H	H > 60.45 m	Hard	RO_H_HARD_1	60.45
			H > 59.84 m Month = November, December, January and February	soft	RO_H_SOFT_1	59.84
425012	Lower Darling @ Weir 32	H	H > 3.349 m	Hard	SO_H_HARD_1	3.349
		Q	Q < 350 ML/d Month = Jan, Feb and Mar, When Menindee Lakes total volume > 640 GL	Hard	SO_Q_HARD_1	350
			Q < 300 ML/d Month = Apr, Nov and Dec, When Menindee Lakes total volume > 640 GL	Hard	SO_Q_HARD_2	300
			Q < 200 ML/d Month = May, Jun, Jul, Aug, Sep and Oct, When Menindee Lakes total volume > 640 GL	Hard	SO_Q_HARD_3	200
			Q < 350 ML/d Month = Jan, Feb and Mar, When Menindee Lakes total volume > 480 GL	Soft	SO_Q_Soft_1	350
			Q < 300 ML/d Month = Apr, Nov and Dec, When Menindee Lakes total volume > 480 GL	Soft	SO_Q_Soft_2	300
			Q < 200 ML/d Month = May, Jun, Jul, Aug, Sep	Soft	SO_Q_Soft_3	200

			and Oct, When Menindee Lakes total volume > 480 GL			
			Q < 500 ML/d when Menindee Lakes Total Volume > FSV (1,731 GL)	Hard	SO_Q_HARD_4	500
425007	Lower Darling @ Burtundy	EC	EC > 830	Salinity	RO_EC_SAL	830

#### **Reach 5: SA border to Murray Mouth**

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column (TYPE)	Column Value
A4260510	Murray @ Lock 6	EC	EC > 580	Salinity	RO_EC_SAL	580
A4260511	River Murray @ Lock 6 Downstream	H	H<= 15.32 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	16.72
A4260513	River Murray @ Lock 5 Downstream	H	H<= 12.02 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	13.42
A4260515	River Murray @ Lock 4 Downstream	H	H<= 8.99 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	10.39
A4260517	River Murray @ Lock 3 Downstream	H	H<= 5.21 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	6.61
A4260519	River Murray @ Lock 2 Downstream	H	H<= 1.89 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	3.29
A4260903	River Murray @ Lock 1 Downstream	H	H<= 1.05 m (lock sill level + 1.4 m)	Navigation	RO_H_HARD_1	2.45
A4260554	Murray @ Morgan	EC	EC > 800	Salinity	RO_EC_SAL	800
A4261162	Murray @ Murray Bridge	EC	EC > 830	Salinity	RO_EC_SAL	830
A4260524	Milang Jetty	EC	EC > 1,000	Salinity	RO_EC_SAL	1000

#### **References**

**Objectives and Outcomes for River Operations in the River Murray System.**

**<http://www.mdba.gov.au/media-pubs/publications/objectives-and-Outcomes-for-River-Operations>**