Appendix

Reach 1: Upstream of Hume

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column	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 > 3.4 m	Hard	SO_H_HARD_1	3.4
401211A	Mitta Mitta River @ Colemans	H	When H > 1.75 m, ΔH (rate of fall) > 20 mm/hour Note: Use hourly data	Soft	SO_dH_SOFT_1	20 mm
			ΔH (rate of fall) > 60 mm/hour Note: Use hourly data	Soft	SO_dH_SOFT_2	60 mm
			ΔH (rate of fall) > 720 mm/24 hours rolling Note: Use hourly data	Soft	SO_dH_SOFT_3	720 mm
			When H < 1.25 m, ΔH (rate of fall) > 150 mm/hour Note: Use hourly data	Soft	SO_dH_SOFT_4	150 mm
			When 1.25 <= H <= 1.75 m, ΔH (rate of fall) > 100 mm/hour Note: Use hourly data	Soft	SO_dH_SOFT_5	100 mm
			When H > 1.75 m, ΔH (rate of fall) > 50 mm/hour Note: Use hourly data	Soft	SO_dH_SOFT_6	50 mm
		Q	Q < 200 ML/d	Hard	SO_Q_ HARD_1	200
			When 60% < V (401224A) <= 70%, Q (Weekly rolling average) < 300 ML/d	Soft	SO_Q_SOFT_2	300
			When 70% < V (401224A) <= 80%, Q (Weekly rolling average) < 400 ML/d	Soft	SO_Q_SOFT_3	400
			When V (401224A) > 80%, Q (Weekly rolling average) < 500 ML/d	Soft	SO_Q_SOFT_5	500

401027	Hume storage	H	H > 192.0 m	FSL	RO_H_FSL	192
401027	Hume storage	V	2619015 < V < 2974949 ML	Soft	RO_V_SOFT_1	2619015
		V	V > 2974950 ML	Hard	RO_V_ HARD_1	2974950

Reach 2: Hume to Yarrawonga

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column	Column Value
409016	Murray @ Heywoods	H	ΔH (rate of fall) > 0.2 m	Soft	SO_dH_SOFT_1	0.2
		Q	Q < 600 ML/d	Hard	SO_Q_HARD_1	600
409017	Murray @ Doctors Point	H	ΔH (rate of fall) > 0.15 m	Soft	SO_dH_SOFT_1	0.15
		Q	Q <1,200 ML/d	Hard	SO_Q_HARD_1	1200
			Q > 25,000 ML/day	Hard	SO_Q_HARD_2	2500
WCORPUM	West Corurgan diversion	Q	Q – QORD > 100 ML	Soft	RO_Q_SOFT_1	100
409026	Mulwala Canal diversion (off Yarrawonga Weir)	Q	Q – QORD > 1000 ML	Soft	RO_Q_SOFT_1	1000
			If Q (409026) > related water @ 409216A (See note 1 below)	Hard	RO_Q_HARD_1	
409700A	Yarrawonga Main Canal diversion	Q	Q – QORD > 500 ML	Soft	RO_Q_SOFT_1	500
			If Q (409722A) > related water @ 409216A (See note 1 below)		RO_Q_HARD_1	
409216A	Yarrawonga storage	H	H < 124.2m	Hard	SO_H_HARD_1	124.2
			124.2 < H < 124.6	Soft	SO_H_SOFT_1 SO_H_SOFT_2	124.2 124.6
			H >= 124.9m	FSL	SO_H_ FSL	124.9
409025	Murray @ Downstream of Yarrawonga	H	ΔH (rate of fall) > 0.3 m	Soft	SO_dH_SOFT_1	0.3
		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**
123.86	**1000**
124.16	**1500**
124.38	**2000**
124.57	**2500**
124.74	**3000**

409216A (H)	Flow/Order @ 409026
122.12	**0**
122.52	**500**
122.78	**1000**
122.97	**1500**
123.16	**2000**
123.32	**2500**
123.46	**3000**
123.6	**3500**
123.73	**4000**

Reach 3: Yarrawonga to Euston

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column	Column Value
409008	Edward River @ Edward Offtake	H	H > 2.46 m	Soft	SO_H_SOFT_1	2.46
		Q	Q < 100 ML/d	Soft	SO_Q_SOFT_1	100
409030	Gulpa Creek @ Gulpa Offtake	H	H > 2.5m	Soft	SO_H_SOFT_1	2.5
		Q	Q < 80 ML/d	Soft	SO_Q_SOFT_1	80
409029	Edward Escape	Q	Q > Q (409103)	Soft	RO_Q_SOFT_1	
409023	Edward River @ downstream Stevens Weir	Q	Q >= 2,700 ML/d	Hard	SO_Q_HARD_1	2700
409014	Edward River @ Moulamein	Q	Q <= 650 ML/d	Soft	RO_Q_SOFT_1	650
409006	Murray @ Gulpa (picnic point)	H	2.50 m < H < 2.59 m	Soft	SO_H_SOFT_1	2.5
			H >= 2.60 m	Hard	SO_H_HARD_GT	2.6
409005	Murray @Barham	DO%	DO% <= 50%	DO%	RO_DO%_DO	50
409701D	National Channel diversion	Q	Q – QORD > 100 ML	Soft	RO_Q_SOFT_1	100
409219	Torrumbarry storage	H	85.65 m < H < 85.90 m	Soft	RO_H_SOFT_1	85.9
			H <= 85.65 m	Hard	RO_H_HARD_1	85.65
409207B	Murray @ Downstream Torrumbarry	Q	Q < 2,000 ML/d	Soft	RO_Q_HARD_1	2000
409204C	Murray @ Swan Hill	H	0.6 m < H < 0.69 m	Soft	SO_H_SOFT_1	0.69
			H <= 0.6 m	Hard	SO_H_HARD_1	0.6
SWHPUMP	Swan Hill Pumps diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
414200A	Murray @ below Wakool Junction	EC	EC > 400	Salinity	RO_EC_SAL	400
414201B	Murray @ Boundary Bend	EC	EC > 400	Salinity	RO_EC_SAL	400
414203C	Murray @ Euston Weir	EC	EC > 400	Salinity	RO_EC_SAL	400
414209	Euston Weir storage	H	H <47.60 m or H > 47.80 m	Soft	RO_ H_SOFT_1 RO_ H_SOFT_2	47.6 47.8

Reach 4: Euston to SA border

ROWS_ID	Site	Parameter	Rule	Warning	Metadata Column	Column Value
414207A	Murray @ Colignan	H	1.2 m < H < 1.35 m	Soft	RO_H_SOFT_1	1.2
			H <= 1.2 m	Hard	RO_H_HARD_1	1.35
REDCPUM	Redcliffs Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
FMITPUM	FMIT Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
BURPUMP	Buronga	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100

	Diversions					
MILDINF (Parent site 414210A)	Mildura Weir	Q	Q < 1,200 ML/d	Hard	RO_Q_SOFT_1	1200
MERBPUM	Merbein Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
COOMPUM	Coomealla Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
CURLPUM	Curlwaa Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
WENTINF (parent site WENTUS)	Wentworth Weir	Q	Q < 1,500 ML/d	Hard	RO_Q_HARD_1	1500
WENTMR (parent site WENTUS)	Wentworth Weir – Murray Component of flow	Q	Q < 700 ML/d	Hard	SO_Q_HARD_1	700
425010	Murray @ Wentworth	Q	Q <1,500 ML/d	Hard	RO_Q_HARD_1	1500
MILLPUM	Millewa Diversions	Q	Q - QORD > 100 ML	Soft	RO_Q_SOFT_1	100
A4260505	Murray @ Lock 9	Q	Q < Q (414211A)	Hard	RO_Q_HARD_1	
			Q < 500 ML/d	Soft	RO_Q_SOFT_1	500
A4260501	Murray @ Lock 9	EC	EC > 400	Salinity	RO_EC_SAL_1	400
A4260507	Murray @ Lock 8	EC	EC > 400	Salinity	RO_EC_SAL	400
A4260509	Murray @ Lock 7	EC	EC > 400	Salinity	RO_EC_ SAL	400
A4260500	Frenchmans Creek @ Inlet regulator	Q	7,000 ML/d < Q < 10,000 ML/d	Soft	SO_Q_SOFT_1	7000
			Q <200 ML/d OR Q >= 10,000 ML/d	Hard	SO_Q_HARD_1 SO_Q_HARD_2	200 10000
A4261093	Lake Victoria storage	H	H >= 26.95 m	Soft	SO_H_SOFT_1	26.95
			24.45 m < H < 24.55 m	Hard	SO_H_HARD_1 SO_H_HARD_2	24.45 24.55
			When 26 m < H < 27 m, ΔH (rate of rise) > 0.05 m	Hard	SO_dH_HARD_3	0.05
		EC	EC > 400	Salinity	SO_EC_SAL	400
A4260502	Lake Victoria @ outlet regulator	Q	Q < 700 ML/d OR > 10,000 ML/day	Hard	SO_Q_HARD_1 SO_Q_HARD_2	700 10000
			Q.capacity – Q < 0	Hard	SO_Q_HARD_1	0
			Q.capacity – Q < 1,000 ML/d	Soft	SO_Q_SOFT_1	1000
A4260641	Rufus River	EC	EC > 750	Salinity	RO_EC_SAL	750
426200A	Murray @ downstream Rufus River	EC	EC > 750	Salinity	RO_EC_SAL	750

MENINDE	Menindee Lake	V	V >= 1,730,000 ML	Hard	SO_V_HARD_1	1730000
			V >= 2,050,000 ML	FSL	SO_V_FSL	2050000
		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	V	V >= 192,910 ML	Hard	RO_V_HARD_1	192910
			V >= 262,150 ML	FSL	RO_V_ FSL	262150
425021	Lake Pamamaroo	V	V >= 269,610 ML	Hard	RO_V_HARD_1	269610
			V >= 345,330 ML	FSL	RO_V_FSL	345330
425040	Lake Menindee + Cawndilla	V	V >= 1,141,130 ML	Hard	RO_V_HARD_1	1141130
			V >= 1,308,120 ML	FSL	RO_V_FSL	1308120
425012	Lower Darling @ Weir 32	H	H >= 3.3 m	Hard	SO_H_HARD_1	3.3
		Q	Q < 350 ML/d Month = Jan, Feb and Mar	Hard	SO_Q_HARD_1	350
			Q < 300 ML/d Month = Apr, Nov and Dec	Hard	SO_Q_HARD_2	300
			Q < 200 ML/d Month = May, Jun, Jul, Aug, Sep and Oct	Hard	SO_Q_HARD_3	200
			Q < 500 ML/d when H >= FSL	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	Column Value
A4260510	Murray @ downstream Lock 6	EC	EC > 580	Salinity	RO_EC_SAL	580
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