

Water Quality Management Plan: Supporting Information and Measures

Queensland Border Rivers-Moonie Plan Area

Prepared by: Catchments and Coasts, Department of Environment and Science, Queensland Government

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Introduction

The Water Quality Management Plan (WQM Plan) is not a single document, but rather a compilation of all relevant sections of Queensland plans, strategies and policies that address water quality. A key document referred to by the WQM Plan for the Queensland Border Rivers-Moonie plan area is the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins). The purpose of this document is to support the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) by providing additional information to fulfil the requirements of the following sections of the Basin Plan:

- Section 10.31 – Measures addressing risks arising from water quality degradation
- Section 10.32 – WQM Plan to identify water quality target values
- Section 10.33 – WQM Plan to identify measures
- Section 10.35 – Impact of WQM Plan on another Basin State
- Section 10.35B (3) – WQM Plan to identify water quality target values (alternative groundwater target values)
- Section 10.35C – Consideration to be given to rules or measures.

The water quality target values for the Queensland Border Rivers-Moonie plan area are contained in the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Part 1A of this document explains the water quality target values developed under Basin Plan section 10.32 for fresh water-dependent ecosystems (other than declared Ramsar wetlands). This includes identifying which water quality target values in the plan area are either the same as those identified in the Basin Plan under 10.32 (2) or better than the target values identified in the Basin Plan, consistent with Basin Plan section 10.32 (3). **Part 1A** and **Part 1B** of this document also identifies where the alternative water quality target values included in the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) for fresh water-dependent ecosystems (other than declared Ramsar wetlands) have been developed under section 10.32 (4) and Section 10.35B (3) of the Basin Plan.

Part 2 of this document provides the justification for the accreditation of the water quality target values developed under section 10.32 (3) of the Basin Plan.

Part 3 of this document provides the justification for the accreditation of the water quality target values developed under section 10.32 (4) and section 10.35B (3) of the Basin Plan.

Part 4A of this document fulfils section 10.31 of the Basin Plan by explaining why measures addressing risks arising from elevated levels of salinity or other types of water quality degradation have or have not been included in the water resource plan.

Part 4B of this document fulfils section 10.33 of the Basin Plan by specifying the measures to be undertaken in, or in relation to, the water resources of the plan area that contribute to the achievement of the following objectives for surface waters:

1. Objectives of water-dependent ecosystems (Basin Plan Section 9.04);
2. Objectives for raw water for treatment for human consumption (Basin Plan Section 9.05);
3. Objective for irrigation water (Basin Plan Section 9.06);
4. Objective for recreational water quality (Basin Plan Section 9.07); and
5. Objective to maintain good levels of water quality (Basin Plan Section 9.08).

The measures were prepared having regard to the following matters:

- the causes, or likely causes, of water quality degradation (identified in accordance with section 10.30 of the Basin Plan);
- target values identified in accordance with section 10.32 and section 10.35B of the Basin Plan; and
- the salinity targets for the purposes of long-term salinity planning and management in Division 4, Part 4 of Chapter 9 of the Basin Plan.

Part 5 of this document describes how regard was had to whether it was desirable for the WQM Plan to include rules or measures that support the maintenance of water quality within groundwater SDL units against the effects of elevated levels of salinity and other types of water quality degradation, taking into account the causes, or likely causes, of water quality degradation identified under section 10.35A and the water quality target values identified under section 10.35B. This is intended to fulfil the requirements of section 10.35C of the Basin Plan.

Part 6 of this document details the consultation undertaken with New South Wales in accordance with section 10.32 (4) (d) and 10.35 of the Basin Plan.

Part 1A: Water quality target values developed under Basin Plan section 10.32 for fresh water-dependent ecosystems (other than declared Ramsar wetlands)

Section 10.32 of the Basin Plan requires a WQM Plan to identify water quality target values for the water resource plan area. The aim of **Part 1A** is to identify which water quality target values will be accredited under Section 10.32 (2)(a), 10.32 (3) and 10.32 (4) of the Basin Plan.

Table 1 presents a comparison between the objectively determined, locally-derived water quality target values for the eleven different water types in the Queensland Border Rivers-Moonie plan area and the target values specified in Schedule 11 of the Basin Plan for fresh water-dependent ecosystems (other than declared Ramsar wetlands). The water quality target values apply to low flow conditions and high flow conditions where data was available.

Note that there are no Declared Ramsar wetlands in the Queensland Border Rivers-Moonie plan area and therefore the water quality target values for these types of water-dependent ecosystems are not applicable.

Values highlighted grey in **Table 1** are the water quality target values for accreditation under section 10.32(2)(a) of the Basin Plan. They are the same values as specified in section 9.16 and Schedule 11 of the Basin Plan for fresh water dependent ecosystems (other than declared Ramsar wetlands). Although a comparison is not shown in **Table 1** for salinity (End-of-valley targets), temperature, and pesticides, heavy metals and other toxic contaminants, the water quality target values included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) reflect section 9.16 and Schedule 11 of the Basin Plan for fresh water-dependent ecosystems (other than declared Ramsar wetlands).

Values highlighted blue in **Table 1** are the water quality target values for accreditation under section 10.32 (3) of the Basin Plan. These values are *better than* the target values listed in section 9.16 and Schedule 11 of the Basin Plan. The justification for the inclusion of water quality target values in the Queensland Border Rivers-Moonie plan area under section 10.32 (3) of the Basin Plan is provided in **Part 2** of this document.

Values highlighted yellow in **Table 1** are the *alternative* water quality target values for accreditation under section 10.32 (4) of the Basin Plan. The justification for the inclusion of water quality target values for the Queensland Border Rivers-Moonie plan area under section 10.32 (4) of the Basin Plan is provided in **Part 3** of this document.

The water quality target values presented in **Table 1** are included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Table 1 Water quality targets for fresh water-dependent ecosystems (other than declared Ramsar wetlands) – Surface water

Values highlighted grey are water quality target values for accreditation under section 10.32 (2) (a) of the Basin Plan (as well as salinity (End-of-valley targets) temperature, and pesticides, heavy metals and other toxic contaminants – not shown in Table 1 but included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Values highlighted blue are water quality target values for accreditation under section 10.32(3) of the Basin Plan. These values are included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Values highlighted yellow are water quality target values for accreditation under section 10.32(4) of the Basin Plan. These values are included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Note: ID = insufficient data to derive a water quality target value.

Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan		Basin Plan		WQM Plan	Basin Plan
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
Border Rivers Basin												
CANNING CREEK catchment waters (B2 Basin Plan Water Quality Zone)	Base Flow											
	35	30	30	80	520	750	ID	60-110	-	60-110	7.2-7.8	7.5-8.5
	Event Flow											
	50	30	40	80	600	750	ID	60-110	-	60-110	6.9-7.9	7.5-8.5
DUMARESQ FLOODPLAIN catchment waters (B2 Basin Plan Water Quality Zone)	Base Flow											
	8	30	40	80	490	750	ID	60-110	-	60-110	7.4-8.1	7.5-8.5
	Event Flow											
	35	30	60	80	800	750	ID	60-110	-	750	7.1-7.8	7.5-8.5
GRANITE BELT	Base Flow											

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Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan		Basin Plan		WQM Plan	Basin Plan
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
catchment waters (B2 and C2 Basin Plan Water Quality Zones)	5	25	35	20	650	250	ID	60-100 (B2) 90-110 (C2)	-	60-100 (B2) 90-110 (C2)	6.6-7.5	6.5-7.5
	Event Flow											
	12	25	50	20	1000	250	ID	60-100 (B2) 90-110 (C2)	-	60-100 (B2) 90-110 (C2)	6.6-7.3	6.5-7.5
LOWER MACINTYRE BROOK catchment waters (B2 Basin Plan Water Quality Zone)	Base Flow											
	11	30	55	80	710	750	ID	60-110	-	60-110	7.4-8.0	7.5-8.5
	Event Flow											
	25	30	70	80	910	750	ID	60-110	-	60-110	7.2-8.0	7.5-8.5
LOWER WEIR RIVER catchment waters (A2 and B2 Basin Plan Water Quality Zones)	Base Flow											
	400	200	190	200	1300	1000	>5 (A2) ID (B2)	65-110 (A2) 60-100 (B2)	>5 (A2)	65-110 (A2) 60-100 (B2)	6.9-7.6	7.0-8.3

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Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan		Basin Plan		WQM Plan	Basin Plan
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
	Event Flow											
	285	200	210	200	1200	1000	>5 (A2) ID (B2)	65-110 (A2) 60-100 (B2)	>5 (A2)	65-110 (A2) 60-100 (B2)	6.8-7.3	7.0-8.3
MACINTYRE BARWON FLOODPLAIN catchment waters (A2 and B2 Basin Plan Water Quality Zones)	Base Flow											
	30	30	70	80	575	750	>5 (A2) ID (B2)	65-110 (A2) 60-100 (B2)	>5 (A2)	65-110 (A2) 60-100 (B2)	7.4-8.0	7.5-8.5
	Event Flow											
	110	30	150	80	900	750	>5 (A2) ID (B2)	65-110 (A2) 60-100 (B2)	>5 (A2)	65-110 (A2) 60-100 (B2)	7.0-7.5	7.5-8.5
TRAPROCK catchment waters (B2 and C2 Basin	Base Flow											
	4	30	30	80	520	750	ID	60-100	-	60-100	7.1-8.0	7.5-8.5

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Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan		Basin Plan		WQM Plan	Basin Plan
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
Plan Water Quality Zones)							(B2)		(B2)			
							90-110		90-110			
							(C2)		(C2)			
Event Flow												
	9	30	40	80	600	750	ID	60-100 (B2) 90-110 (C2)	-	60-100 (B2) 90-110 (C2)	6.9-7.7	7.5-8.5
UPPER WEIR RIVER catchment waters (B2 Basin Plan Water Quality Zone)	Base Flow											
	200	30	290	80	1750	750	ID	60-110	-	60-110	7.0-7.7	7.5-8.5
	Event Flow											
	350	30	ID	80	750	750	ID	60-110	-	60-110	6.8-7.4	7.5-8.5
Moonie Rivers Basin												
LOWER MOONIE catchment waters (A1, A2 and B2 Basin Plan Water Quality Zones)	Base Flow											
	400	200	425	200	1700	1000	>5 (A1,A2) ID (B2)	65-110 (A2) 60-100 (A1, B2)	>5 (A1,A2)	65-110 (A2) 60-100 (B2)	7.1-7.7	7.0-8.3

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Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan		Basin Plan		WQM Plan	Basin Plan
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
	Event Flow											
	320	200	315	200	1660	1000	>5 (A1,A2) ID (B2)	65-110 (A2) 60-100 (A1, B2)	>5 (A1,A2)	65-110 (A2) 60-100 (B2)	6.8-7.5	7.0-8.3
MIDDLE MOONIE catchment waters (A2, B1, B2 Basin Plan Water Quality Zone)	Base Flow											
	385	30	470	80	1905	750	>5 (A2) ID B1,B2)	65-110 (A2) 60-100 (B1,B2)	>5 (A2)	65-110 (A2) 60-100 (B1,B2)	7.1-7.6	7.5-8.5
	Event Flow											
	30	30	80	80	750	750	>5 (A2) ID (B1,B2)	65-110 (A2) 60-100 (B1,B2)	>5 (A2)	65-110 (A2) 60-100 (B1,B2)	7.5-8.5	7.5-8.5
UPPER MOONIE River catchment waters	Base Flow											
	205	30	375	80	1740	750	ID	60-110	-	60-110	7.0-7.6	7.5-8.5

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Water type	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan	WQM Plan	Basin Plan		
	Turbidity		Total Phosphorus		Total Nitrogen		Dissolved Oxygen				pH	
	NTU		µg/L		µg/L		mg/L	% sat.	mg/L	% sat.	(Annual median within the range)	
	(Annual median)		(Annual median)		(Annual median)		(Annual median within the range)					
(B2 Basin Plan Water Quality Zone)	Event Flow											
	275	30	ID	80	ID	750	ID	60-110	-	60-110	6.0-7.2	7.5-8.5

Part 1B: Water quality target values developed under Basin Plan section 10.35B (3) for fresh water-dependent ecosystems (other than declared Ramsar wetlands)

Table 2 presents the objectively determined, locally-derived alternative water quality target values for the sixteen different sub-aquifer chemistry zones within the four relevant groundwater aquifer units in the Queensland Border Rivers-Moonie plan area. The justification for the inclusion of alternative groundwater quality target values for the Queensland Border Rivers-Moonie plan area under Section 10.35B (3) of the Basin Plan is provided in **Part 3** of this document. The water quality target values presented in **Table 2** are included in **Tables 35, 36, 37** and **43** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Table 2 Water quality target values for fresh water-dependent ecosystems (other than declared Ramsar wetlands) - Groundwater

The values presented in Table 2 are groundwater water quality target values for accreditation under section 10.35B (3) of the Basin Plan. These values are included in **Table 35, Table 36, Table 37** and **Table 43** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

The ANZECC Guidelines (ANZECC/ARMCANZ, 2000) recommend that the highest level of protection should be provided to underground aquatic ecosystems, given their high conservation value.																												
The management intent is to maintain the existing water quality distribution (20th, 50th and 80th percentiles).																												
ANZECC Guidelines (ANZECC/ARMCANZ, 2000) trigger values for freshwater for pesticides, heavy metals and other toxic contaminants that protect 99% of species must not be exceeded.																												
The target for temperature specified in Schedule 11 of the Basin Plan applies to all aquifer zones. The specified target is: monthly median temperature within the range between the 20%ile and 80%ile of natural monthly water temperature.																												
ID = insufficient data to derive a water quality target.																												
Zone	%ile	Na		Ca		Mg		HCO ₃		Cl		SO ₄		NO ₃		EC	Hard	pH	Alk	SiO ₂	F	Fe	Mn	Zn	Cu	SAR	TN	TP
		mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
S1.Alluvial																												
11 - Border Rivers	20th	150	57	13	4	10	6	110	2	117	36	15.1	3	0.27	0	531	78	6.5	104.4	31.0	0.16	0.000	0.005	0.005	0.013	4.95	0.085	0.000
	50th	329	75	34	11	23	14	253	28	381	64	64.5	7	1.90	0	1800	169	7.3	214.0	60.0	0.30	0.010	0.040	0.020	0.015	17.00	0.543	0.049
	80th	4589	89	710	19	569	22	489	57	8723	90	1100.0	10	12.50	0	23910	4399	8.0	413.8	81.0	0.90	0.056	9.740	0.160	0.070	35.70	2.717	1.235
11 - Border Rivers near stream	20th	71	46	13	5	9	6	126	9	69	30	16.2	5	0.00	0	331	70	7.0	123.8	35.9	0.18	0.000	0.009	0.020	0.005	2.83	0.060	ID
	50th	235	65	24	13	17	18	257	34	180	42	53.5	8	1.30	0	820	125	7.5	220.0	55.0	0.25	0.008	0.105	0.070	0.015	9.20	0.913	ID
	80th	1893	89	430	28	334	27	514	64	3871	81	808.1	14	12.50	1	14150	2423	8.0	422.9	71.7	0.69	0.041	5.240	0.160	0.073	21.52	2.717	ID
13 - Upper Dumaresq	20th	58	49	18	18	9	15	140	38	42	22	4.9	2	0.00	0	504	83	7.1	115.0	20.3	0.30	0.000	0.000	0.000	0.012	2.29	0.000	0.000
	50th	112	59	33	23	16	18	248	63	86	33	15.5	4	0.50	0	843	153	7.7	207.0	34.0	0.50	0.010	0.020	0.010	0.015	3.91	0.109	0.000
	80th	147	66	58	29	27	22	412	73	152	53	34.0	8	2.26	1	1104	250	8.1	343.4	46.7	0.60	0.050	0.130	0.020	0.080	4.50	0.491	0.000
13 - Upper Dumaresq near stream	20th	58	49	18	18	9	15	140	38	41	22	4.9	2	0.00	0	498	83	7.1	115.0	20.1	0.30	0.000	0.000	0.000	0.012	2.29	0.000	0.000
	50th	112	59	32	23	16	18	249	63	86	33	15.5	4	0.50	0	833	151	7.7	207.0	34.0	0.50	0.010	0.020	0.010	0.015	3.91	0.109	0.000
	80th	147	66	58	29	27	22	416	73	151	52	32.5	7	2.17	1	1103	250	8.1	349.2	46.0	0.60	0.050	0.130	0.020	0.080	4.47	0.472	0.000

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14 - Macintyre Brook	20th	44	47	3	2	1	2	145	32	46	27	1.1	1	0.03	0	410	16	7.5	132.3	10.3	0.20	0.005	0.005	ID	ID	1.80	ID	ID	
	50th	124	91	19	14	11	20	295	54	115	34	7.9	3	0.80	0	1178	76	7.9	243.3	39.5	0.41	0.005	0.005	ID	ID	8.92	ID	ID	
	80th	412	97	32	26	28	27	610	68	270	56	30.2	6	6.40	1	1700	203	8.6	558.8	43.7	0.89	0.121	0.834	ID	ID	31.59	ID	ID	
14 - Macintyre Brook near stream	20th	44	47	4	3	1	3	162	32	45	29	1.3	1	0.07	0	412	17	7.4	132.9	10.9	0.20	0.005	0.005	ID	ID	1.80	ID	ID	
	50th	113	91	20	18	14	20	295	53	102	34	6.5	3	0.53	0	1178	111	7.8	243.3	39.5	0.41	0.005	0.013	ID	ID	8.92	ID	ID	
	80th	333	94	35	26	39	27	610	67	270	53	30.8	6	6.40	1	1700	266	8.5	503.0	44.6	0.87	0.154	0.838	ID	ID	28.88	ID	ID	
17 - Moonie	20th	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	26460	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
	50th	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	46150	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
	80th	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	56280	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID

Zone	%ile	Na		Ca		Mg		HCO ₃		Cl		SO ₄		NO ₃		EC	Hard	pH	Alk	SiO ₂	F	Fe	Mn	Zn	Cu	SAR	TN	TP
		mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%													

s2. Fractured Rock

6 - Border Rivers Headwaters	20th	75	42	17	9	13	16	164	19	92	42	9.1	2	0.00	0	648	104	7.0	138.8	20.1	0.20	0.000	0.000	0.007	0.003	2.60	0.000	ID
	50th	189	57	67	20	45	22	351	37	305	56	36.0	6	1.00	0	1550	366	7.7	294.5	30.0	0.33	0.010	0.020	0.039	0.015	4.40	0.109	ID
	80th	437	70	127	27	115	30	602	51	1033	72	145.2	11	9.10	1	4212	772	8.2	497.1	39.9	0.59	0.093	0.086	0.097	0.019	7.84	0.652	ID
7 - Glenlyon	20th	26	32	11	22	6	20	65	30	15	16	4.2	3	0.45	0	230	50	7.0	50.5	33.6	0.20	0.005	0.000	0.005	0.000	1.27	0.000	ID
	50th	117	43	113	35	57	25	345	46	109	25	220.0	32	2.40	0	2014	498	7.4	119.5	37	0.23	0.041	0.01	0.01	0.015	2.39	0.272	ID
	80th	191	60	159	37	69	29	568	67	174	43	330.5	50	9.35	6	2125	723	8.0	445.5	42.2	0.52	0.130	0.085	0.058	0.015	2.86	0.950	ID
8 - New England Granite	20th	32	44	6	10	3	9	20	5	30	34	3.2	1	0.21	0	273	45	6.6	16.0	33.9	0.20	0.003	0.010	0.030	0.010	1.80	0.034	ID
	50th	65	64	23	18	9	14	74	37	78	51	12.0	4	1.00	0	600	106	7.1	60.5	52.0	1.36	0.010	0.110	0.925	0.015	3.10	0.217	ID
	80th	173	78	48	39	25	21	175	53	321	85	25.4	11	13.30	4	1225	244	7.7	146.0	65.7	3.00	0.125	0.663	2.583	0.043	6.12	4.489	ID

Zone	%ile	Na		Ca		Mg		HCO ₃		Cl		SO ₄		NO ₃		EC	Hard	pH	Alk	SiO ₂	F	Fe	Mn	Zn	Cu	SAR	TN	TP
		mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%													

s3. Sediments overlying GAB

1 - Weathered Alluvium	20th	168	67	13	5	8	7	73	1	144	47	36.3	6	0.00	0	624	71	7.0	78.6	45.0	0.13	0.000	0.000	0.008	0.000	8.10	0.000	0.000	
	50th	666	76	82	10	73	13	197	10	982	77	281.7	12	2.40	0	2690	569	7.6	199.7	57.0	0.40	0.000	0.010	0.050	0.015	19.45	0.011	0.000	
	80th	4418	87	592	15	550	19	384	40	8590	86	1600.0	16	12.50	0	22710	3706	7.9	333.3	80.0	0.80	0.120	0.184	0.190	0.035	30.10	2.717	0.000	
1 - Weathered Alluvium near stream	20th	104	63	7	4	4	2	156	5	75	33	15.1	5	0.00	0	525	27	7.2	134.6	18.3	0.15	0.000	0.000	0.017	0.000	4.65	0.130	ID	
	50th	289	74	24	10	10	13	256	49	180	40	76.0	11	2.40	0	1269	102	7.7	210.0	70.0	0.30	0.000	0.010	0.040	0.015	11.50	1.930	ID	
	80th	1368	92	170	22	149	20	388	58	2398	83	504.5	15	7.20	1	6400	1000	8.3	321.0	86.0	0.52	0.044	0.043	0.210	0.017	28.32	0.000	ID	
3 - Tertiary	20th	395	81	3	1	0	0	0	4	195	34	0.0	0	ID	ID	0	9	ID	136.1	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID

Queensland Border Rivers-Moonie Water Quality Management Plan: Supporting Information and Measures

Zone	%ile	Na		Ca		Mg		HCO ₃		Cl		SO ₄		NO ₃		EC	Hard	pH	Alk	SiO ₂	F	Fe	Mn	Zn	Cu	SAR	TN	TP
		mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meg/L	mg/L	mg/L
Sediments																												
	50th	432	97	15	2	4	2	212	26	520	74	1.8	0	ID	ID	1575	58	ID	207.5	ID	ID	ID	ID	ID	ID	ID	ID	ID
	80th	3058	99	50	8	6	11	682	63	4712	96	34.9	5	ID	ID	2180	203	ID	609.0	ID	ID	ID	ID	ID	ID	ID	ID	ID
s9. Earlier Basins Partially Underlying the GAB																												
1 - Bowen Basin	20th	51	96	2	0	0	0	113	56	14	9	0.0	0	0.00	0	218	5	7.4	105.0	13.0	0.20	0.000	0.000	0.005	0.001	89.57	0.000	0.000
(Merged with Fitzroy River basin zone '8 Lower Bowen')	50th	440	99	2	1	1	0	685	78	109	19	0.0	0	0.00	0	1700	7	8.3	611.0	17.0	1.65	0.040	0.005	0.005	0.001	50.82	0.000	0.000
	80th	853	99	5	3	1	1	1217	90	316	42	2.9	1	0.50	0	3001	19	8.6	1080.9	22.0	5.46	0.150	0.010	0.010	0.015	109.14	0.109	0.000

Part 2: Justification for alternative water quality target values developed under Basin Plan section 10.32 (3)

The aim of **Part 2** is to provide justification for the accreditation of the water quality target values developed under section 10.32 (3) of the Basin Plan.

The Department of Environment and Science (the department) considers the default application of Basin Plan water quality targets for fresh water-dependent ecosystems as inappropriate as the targets were developed for a broad spatial scale that does not reflect the variation in local water quality across the eleven water types of the Queensland Border Rivers-Moonie plan area. Where data was available at a finer spatial scale, objectively determined water quality targets that reflect local conditions were developed. This is to ensure the quality of water is sufficient to protect and restore water-dependent ecosystems at a local scale. **Table 3** below details the quantity of water quality data used to derive water quality targets for the surface waters of the Queensland Border Rivers-Moonie plan area, as well as the spatial and temporal scale of data collection.

Local water quality target values for fresh water-dependent ecosystems were objectively determined in accordance with the Queensland legislative water quality framework. In Queensland, water quality target values are developed under the frameworks outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) and the Queensland Water Quality Guidelines (QWQG). Finalised water quality target values, termed water quality objectives, are then scheduled under the Environmental Protection (Water) Policy 2009 (EPP Water) to inform statutory and non-statutory planning and decision-making. A full description of the procedure used to determine the local water quality target values is described in **Appendix 1** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Of a total of 100 water quality target values across eleven different local water types (including base flow and event flow conditions where sufficient data was available), 53% (53 values) are *better than* the target values set out in Schedule 11 of the Basin Plan.

For the purposes of the WQM Plan, the 53 values highlighted blue in **Part 1A - Table 1** of this document are the water quality targets for accreditation under section 10.32 (3) of the Basin Plan for Turbidity, Total Phosphorus, Total Nitrogen and pH for fresh water-dependent ecosystems (other than declared Ramsar wetlands). These water quality target values are better than the water quality target values set out in Section 9.16 and Schedule 11 of the Basin Plan. These values are included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Part 3: Justification for alternative water quality target values developed under Basin Plan sections 10.32 (4) and 10.35B (3)

The aim of **Part 3** is to provide justification for the accreditation of the water quality target values developed under sections 10.32 (4) and 10.35B (3) of the Basin Plan.

The department considers the default application of Basin Plan water quality targets for fresh water-dependent ecosystems as inappropriate as the targets were developed for a broad spatial scale that does not reflect the variation in local water types or the variation in groundwater sub-aquifer chemistry zones across the Queensland Border Rivers-Moonie plan area. Where data was available at a finer spatial scale, alternative water quality target values that reflect local conditions were developed. This is to ensure the quality of water is sufficient to protect and restore water-dependent ecosystems at a local scale. As with the water quality targets developed under section 10.32 (3) of the Basin Plan, alternative water quality target values were developed in accordance with the Queensland legislative water quality framework (ANZECC and QWQG), and seek to maintain and improve the existing, local water quality and ensure no further deterioration. Once finalised the values are then scheduled under the EPP Water to inform statutory and non-statutory planning and decision-making. A full description of the procedure used to determine the local water quality target values is described in **Appendix 1** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

For the purposes of the WQM Plan, the 47 values highlighted yellow in **Part 1A - Table 1** of this document are the *alternative* water quality target values for surface waters proposed for accreditation under section 10.32 (4) of the Basin Plan for Turbidity, Total Phosphorus, Total Nitrogen and pH for fresh water-dependent ecosystems (other than declared Ramsar wetlands). These values are included in **Table 30** and **Table 32** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Additionally, the values displayed in **Part 1B - Table 2** of this document are the *alternative* water quality target values for groundwaters proposed for accreditation under section 10.35B (3) of the Basin Plan for water dependent ecosystems other than declared Ramsar wetlands. These values are included in **Table 35, Table 36, Table 37** and **Table 43** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

The alternative water quality guidelines were derived in accordance with the Queensland legislative water quality framework which is consistent with the procedures set out in the ANZECC Guidelines. Under the water quality framework of the ANZECC guidelines and the EPP Water, local water quality targets hold higher precedence over regional, state or national targets. Local water quality targets for fresh water-dependent ecosystems are critical for appropriate economic and environmental management, as the direct application of default regional, state or national water quality targets often do not reflect local water types or water quality characteristics. This results in water quality targets, particularly for physico-chemical indicators, that potentially offer insufficient protection for the local aquatic ecosystem or impose excessive constraints on stakeholders to manage water quality to an inappropriate standard for the local area. As the default Basin Plan target values are based on regional water quality zones, the targets set unachievable or unrealistic benchmarks for particular indicators of water quality due to the low resolution of the target application zones.

To manage the unsuitability of Basin Plan target values at a local level, the Department of Environment and Science has developed alternative water quality target values for both surface and groundwaters at a spatial scale finer than those listed in Schedule 11 of the Basin Plan. This approach provides for better consistency with the objectives in Part 3, Chapter 9 of the Basin Plan, namely to achieve the objective to protect and restore water-dependent ecosystems. The Water Quality Technical Panel, established by the department and described in **Section 4.1** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins), defined eleven local water types for the Queensland Border Rivers-Moonie plan area surface waters. These water types can be viewed in **Figure 30** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins). In comparison, the Basin Plan separated the same region into three water quality target application zones - A2, B2 and C2. The derivation of water type zones allows for factors that contribute to variations in water quality, including soil type, climate and geology, to be considered when setting water quality target values. Further, where data was sufficient, targets were developed for both low and high flow conditions. This allows for the variability in water quality under differing flow conditions to be reflected in the targets. **Table 3** below details the quantity of surface water quality data used to derive the alternative water quality target values for the water types in the Queensland Border Rivers-Moonie plan area, as well as the spatial and temporal scale of data collection.

The Department of Environment and Science has provided the New South Wales Department of Industry (Water) with opportunities to comment on the alternative water quality target values developed for the plan area. The consultation with New South Wales under section 10.32 (4)(d) of the Basin Plan is detailed in **Part 6** of this document.

In addition to the above, the water quality parameters shown in Schedule 11 of the Basin Plan are also unsuitable as groundwater water quality targets, as the water quality target application zones shown in Schedule 11 do not allow for the complexities of groundwater aquifer systems and accompanying variability in water quality to be represented. To manage this, the Department of Environment and Science has developed alternative water quality target values for the sixteen sub-aquifer chemistry zones within each of the four relevant aquifers included in the Queensland Border Rivers-Moonie plan area. **Table 3** below details the quantity of groundwater quality data used to derive the alternative water quality target values for the groundwaters of the Queensland Border Rivers-Moonie plan area, as well as the spatial and temporal scale of data collection. The groundwater sub-aquifer chemistry zones that apply to the plan area can be viewed in **Figures 17, 18, 19** and **25** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins). The alternative groundwater water quality target values that apply to the plan area for fresh water-dependent ecosystems (other than declared Ramsar wetlands) are displayed in **Part 1B - Table 2** of this document. The alternative water quality target values are consistent with the water quality objectives in Part 3 of Chapter 9, specifically the objective for water-dependent ecosystems, as they were developed based on the best available data for sub-aquifer chemistry zones within each aquifer of the Queensland Border Rivers-Moonie plan area. This provides the best opportunity to protect and restore the existing groundwater ecosystems and functions, and establish the baseline water quality to measure any impacts of climate change on the aquifers through time.

Schedule 11 of the Basin Plan provides a limited set of water quality indicators, whereas an expanded range of water quality indicators is recognised to protect and restore water quality for fresh water-dependent ecosystems under the Queensland legislative water quality framework.

These additional indicators, listed in **Table 31** and **Table 33** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) for surface waters, include Electrical Conductivity, Total Suspended Solids, Alkalinity, Oxidised Nitrogen, Ammonium, Filterable Reactive Phosphorous, Sulphate, and Chlorophyll-a. Similarly, for groundwater, while not accredited under the Basin Plan, the water quality target values in Error!

Reference source not found. to Error! Reference source not found., which were developed under the Queensland legislative water quality framework, are recognised to support the accredited water quality target values to protect and restore water-dependent ecosystems.

The approach to develop alternative water quality target values allows local surface and groundwater conditions to be reflected in the water quality targets, resulting in targets that are appropriate, realistic and locally relevant to the waters of the Queensland Murray-Darling Basin. Once finalised the values will be scheduled as 'water quality objectives' under the EPP Water to inform statutory and non-statutory planning and decision-making. The EPP Water specifies that scheduled water quality objectives must be an improvement on existing water quality – hence the values have been calculated to be in line with this requirement.

Table 3 Summary information for water quality data used to develop surface and groundwater water quality targets under 10.32(3), 10.32(4) and 10.35B (3) of Basin Plan.

Surface water – All water types	
Number of samples – all parameters	Low flow: 15,421 High flow: 1,587
Sites sampled (spatial scale)	365
Sample period (temporal scale)	1952 - 2017
Groundwater – All aquifers	
Number of samples – all parameters	24,482
Bores sampled (spatial scale)	330
Sample period (temporal scale)	1965 - 2017

Part 4A: Measures addressing risks arising from water quality degradation under Basin Plan section 10.31

The Water Quality Risk Assessment – Border Rivers-Moonie identified the risks associated with elevated levels of salinity or other types of water quality degradation (as per section 10.41 (2) (d) of the Basin Plan). The total number of surface water quality risks for the Queensland Border Rivers-Moonie plan area caused by either water management or land management was assessed as 283. Of these, 219 risks were due to factors associated with land management and 64 risks were associated with the management of water resources (Refer to **Table 4** Below).

Table 4: Risk summary for surface water in the Queensland Border Rivers-Moonie plan area based on the cause of risk being due to Land Management or Water Management

	Land Management	Management of water resources
Number of low risks identified	203	61
Number of medium risks identified	12	0
Number of high risks identified	4	3
Total number of risks identified	219	64

Measures were included in the WQM Plan under Section 10.31 if the following criteria were met:

- the measure addresses a risk that is medium or higher
- the measure is an action within the scope of the management of water resources under the Water Act 2007 (Cth) and Water Act 2000(Qld);
- the measure is fit-for-purpose and cost effective.

Measures have not been recommended for accreditation under the WQM Plan for low risks or risks due to land management. However, these risks are addressed through the management responses in **Section 8** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins). The management responses in the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) are *recognised* to address risks arising from elevated levels of salinity or other types of water quality degradation. However, as the management responses in the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) are focussed on land management, they are not within the scope of the management of water resources under the Water Act 2007 (Cth.) and Water Act 2000 (Qld.) and therefore have not been recommended for accreditation under the Basin Plan.

Box 1 presents the measures recommended for accreditation to address the three high risks arising from water quality degradation under section 10.31 of the Basin Plan – which meet the criteria outlined above. The three high risks are associated with identified 'hotspot' locations within the assessment units where impacts are localised. Each hotspot location is downstream of water reservoirs or deep weirs where stratification of water is able to occur which can result in dissolved oxygen and water temperature outside the natural range.

Note that the measures recommended for accreditation under Basin Plan Section 10.33 will also have a beneficial impact on addressing identified risks.

Box 1: Measures recommended for accreditation to address risks arising from water quality degradation under Basin Plan section 10.31

Measures to address risks arising from water quality degradation under Basin Plan section 10.31

The measures recommended for accreditation under section 10.31 of the Basin Plan aim to address the following risks:

- SWQ WM21: High risk of dissolved oxygen being outside of natural ranges in the Upper Border Rivers (Downstream of Glenlyon Dam and Coolmunda Dam)
- SWQ WM23: High risk of water temperature being outside of natural ranges in the Upper Border Rivers (Downstream of Glenlyon Dam)
- SWQ WM24: High risk of water temperature being outside of natural ranges in the Upper Border Rivers (Downstream of Coolmunda Dam)

Measure 1 (BP 10.31) – Continue to manage water under the water management arrangements and principles of the Queensland water planning framework

Description:

Continue existing principles and managements arrangements which were considered in the risk identification and assessment process, including:

- Resource operations licence holders are required to operate infrastructure in accordance with an approved Operations Manual.
- Resource operations licences have detailed monitoring and reporting requirements, consistent with DNRME's Water Monitoring Data Reporting Standards, and includes temperature and dissolved oxygen profiles for storages.
- Best available science is used to facilitate ongoing improvement over the life of the plan.

Measure 2 (BP 10.31) – Ensure ecological outcomes in the Water Plan are specific, measurable and relate to water quality, as recommended from the Review of Plan (Border Rivers) 2003 and Resource Operation Plan – Environmental Assessment.

Description:

The Water Plan contains two revised and updated environmental outcomes that relate directly to minimising water quality degradation in relation to surface waters and water released from storages.

- 24(1)(e) to minimise adverse environmental impacts, relating to water to which this plan applies, caused by the operation of infrastructure in the plan area (e.g. bank erosion, thermal alteration of waters, degradation of water quality)
- 24(1)(f) to minimise water quality degradation in relation to–
 - (i) for surface water to which this plan applies–flow

Measure 3 (BP 10.31) – Ongoing monitoring and evaluation of risk and treatments, including the effectiveness of the Water Plan in delivering on its outcomes.

Description:

- The Water Act 2000 requires the Minister to prepare a report about each water plan every 5 years to assess the effectiveness of the plan and its implementation in advancing the sustainable management of water resources. This includes assessing all ecological outcomes.
- Water Plan (Border Rivers and Moonie) 2019, Part 4, includes the requirement for a Monitoring, Reporting and Evaluation Strategy to be prepared by 1 July 2020. This will support the Minister's report and also reporting requirements under the Commonwealth Water Act 2007 and Schedule 12 of the Basin Plan.
- Following the recent review of the Water Plan (Border Rivers) 2003, the DNRME is working closely with ROL holders to review and update the Water Monitoring Data Collection and the Water Monitoring Data Reporting standards to ensure accurate, relevant and timely water quality data is collected and provided

Measure 4 (BP 10.31) – Improve knowledge over the life of the plan as recommended by the Review of Plan (Border Rivers) 2003 and Resource Operation Plan – Environmental Assessment Report.

Description:

- To facilitate ongoing improvement over the life of the plan, water planning in Queensland is supported by a highly targeted monitoring and research program (Environmental Flows Assessment Program) and guided by the Queensland Water Planning Science Plan. Current research under this program includes mapping the thermal footprint downstream of Glenlyon Dam, and investigating the effects of waterhole drawdown on water quality parameters such as temperature and dissolved oxygen.
- The Healthy Waters Management Plan for the plan area establishes the water quality targets for dissolved oxygen and temperature.

Part 4B: Measures that contribute to the achievement of objectives in Chapter 9 under Basin Plan section 10.33

Box 2 and **Box 3** outline the measures that contribute to the achievement of objectives in Chapter 9 under Basin Plan Section 10.33 in the Queensland Border Rivers-Moonie plan area.

Box 2: Measures recommended for accreditation that contribute to the achievement of objectives under Basin Plan section 10.33 (Measure 1)

Measure 1 (BP 10.33):			
a) Establishment of Environmental Values (EVs) and Water Quality Objectives (WQOs) for the waters of the plan area under schedule 1 of the Queensland Environmental Protection (Water) Policy 2009, to inform statutory and non-statutory planning and decision-making relating to water quality.			
Section 10.33(1)	Section 10.33(2)(a)	Section 10.33(2)(b)	Section 10.33(2)(c)
Objective/s measure contributes towards achieving	Regard to the causes, or likely causes, of water quality degradation identified in accordance with section 10.30	Regard to the target values identified in accordance with section 10.32	Regard to the targets in Division 4 of Part 4 of Chapter 9.
<p>Section 9.04 – Objectives of water-dependent ecosystems</p> <p>Section 9.05 – Objectives for raw water for treatment for human consumption</p> <p>Section 9.06 – Objective for irrigation water</p> <p>Section 9.07 – Objective for recreational water quality</p> <p>Section 9.08 – Objective to maintain good levels of water quality</p> <p>Note: Refer to Appendix 1 below for additional information regarding <i>Measure 1 (BP 10.33)</i>.</p>	<p>As part of the statutory process to develop EVs and WQOs for Queensland Waters, the economic and social impacts of protecting environmental values must be considered. Thus, the measures identified in Part 4B of this document have been developed with consideration to a cost-effective approach.</p> <p>The key causes, or likely causes, of water quality degradation identified in accordance with section 10.30 were used as the basis to assess the impact to social, cultural, economic and environmental values.</p> <p>The key causes, or likely causes, of water quality degradation underpinned the risk assessment of water being of a quality unsuitable for use as detailed in Section 7 and Appendix 3 of the <i>Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins)</i>.</p>	<p>The water quality target values identified under section 10.32 for the plan area will be recommended for inclusion in Schedule 1 of the EPP Water as Water Quality Objectives to inform statutory and non-statutory planning and decision-making in the plan area to maintain and improve water quality. This includes:</p> <p><u>For fresh water-dependent ecosystems:</u></p> <p>Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) – Section 10.2.1: Table 30 and 32</p> <p><u>For irrigation water:</u></p> <p>There are no sites in the Queensland Border Rivers and Moonie River Basins that qualify as an irrigation infrastructure operator for the purposes of Basin Plan Section 10.32 (2)(b).</p> <p>However, Table 50 provision (1) for the Border Rivers and Moonie River basins is recognised to provide targets for irrigation water in the plan area for the purposes of Queensland water quality planning and management.</p>	<p>The water quality target values for long-term salinity planning and management referred to in Division 4 of Part 4 of Chapter 9 will be recommended for inclusion in schedule 1 of the EPP Water as Water Quality Objectives to inform statutory and non-statutory planning and decision-making.</p>

Measure 1 (BP 10.33):			
a) Establishment of Environmental Values (EVs) and Water Quality Objectives (WQOs) for the waters of the plan area under schedule 1 of the Queensland Environmental Protection (Water) Policy 2009, to inform statutory and non-statutory planning and decision-making relating to water quality.			
Section 10.33(1)	Section 10.33(2)(a)	Section 10.33(2)(b)	Section 10.33(2)(c)
Objective/s measure contributes towards achieving	Regard to the causes, or likely causes, of water quality degradation identified in accordance with section 10.30	Regard to the target values identified in accordance with section 10.32	Regard to the targets in Division 4 of Part 4 of Chapter 9.
		<p><u>For recreational purposes are for primary, secondary and visual recreation:</u></p> <p>Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) – Section 10.3.5: Table 64, provision (1).</p>	

Box 3: Measures recommended for accreditation that contribute to the achievement of objectives under Basin Plan section 10.33 (Measure 2)

Measure 2 (BP 10.33):			
a) Implementation of Basin Salinity Management 2030 in Queensland, in accordance with Appendix 1 of Schedule B of Schedule 1 of the Commonwealth Water Act 2007 (and as revised) – for the purposes of long-term salinity planning and management.			
Section 10.33(1)	Section 10.33(2)(a)	Section 10.33(2)(b)	Section 10.33(2)(c)
	<i>Note: Groundwater statements below have linkages to 10.35A and 10.35C of the Basin Plan due to surface water-groundwater connectivity in the Border Rivers region. To avoid duplication, they have been addressed here due to the relevance to BSM2030.</i>		
Objective/s measure contributes towards achieving	Regard to the causes, or likely causes, of water quality degradation identified in accordance with section 10.30	Regard to the target values identified in accordance with section 10.32	Regard to the targets in Division 4 of Part 4 of Chapter 9.
<p>This measure seeks to achieve the Objectives of water-dependent ecosystems (Section 9.04) by maintaining salinity at targets set at End-of-Valley sites in the plan area to protect the Murray-Darling Basin ecosystem and its functions from the impacts of high salt concentrations. Maintaining salinity within End-of-Valley targets will ensure ecosystems remain resilient to future risks and threats.</p> <p>Measure 2 also contributes to the achievement of the Objective to maintain good levels of water quality (Section 9.08). As Queensland is currently operating within the threshold of the End-of-Valley targets, the implementation of Basin Salinity Management 2030 is assisting in the maintenance of good levels of water quality.</p>	<p>Elevated levels of salinity based on the causes, or key causes, of water quality degradation identified in section 10.30 of the Basin Plan were assessed as a potential localised high risk for Broadwater Creek, which forms part of the <i>Granite Belt</i> assessment unit. Groundwater unit <i>Queensland Border Rivers Fractured Rock (GS55)</i> was identified as a medium risk for elevated levels salinity arising from land management. This is due to the high connectivity of the groundwater resource unit to surface water and the irrigation activity that occurs in this region. The remaining assessment areas for surface and groundwaters in the plan area returned a low risk for elevated levels of salinity.</p> <p><i>Measure 2 (BP 10.33)</i> addresses the key causes, or likely causes, of water quality by monitoring and reporting salinity in the plan area to ensure the risk of salinity does not increase over the long-term.</p>	<p>Not applicable as the target values identified in accordance with section 10.32 are not salinity targets for the purposes of long-term salinity planning and management.</p> <p>However, it should be noted that the water quality objectives to be recommended for inclusion in Schedule 1 of the EPP Water under Measure 1 (BP 10.33) include electrical conductivity, which will contribute to achieving the end-of-valley salinity targets.</p>	<p>Under <i>Measure 2 (BP 10.33)</i>, the Queensland Government will continue to monitor End-of-Valley targets in accordance with Division 4 of Part 4 of Chapter 9 for the purposes of performing long-term salinity planning and management functions.</p>

Part 5 Groundwater measures under Basin Plan section 10.35C

Part 5 and **Box 4** outlines the measures that contribute to the achievement of objectives under Basin Plan Section 10.35C in the Queensland Border Rivers-Moonie plan area. Rules or measures that support the maintenance of water quality within groundwater SDL resource units against the effects of elevated levels of salinity and other types of water quality degradation were recommended for accreditation under the WQM Plan under Section 10.35C if they met the following criteria:

- the measure addresses a risk that is medium or higher (or in the absence of medium or high risks, seeks to maintain a low risk level)
- the measure is an action within the scope of the management of water resources under the Water Act 2007 (Cth) and Water Act 2000(Qld);
- the measures are fit-for-purpose and cost effective.

The causes, or likely causes, of water quality degradation identified under section 10.35A formed the basis of the groundwater quality risk assessment, which assessed the risks arising from elevated levels of salinity and other types of water quality degradation. A total of five groundwater quality risks relating to the management of water resources were identified over seven groundwater SDL assessment units and are provided in Appendix 7 of the Border Rivers-Moonie Risk Assessment Report. All five groundwater quality risks relating to the management of water resources were assessed as low (Refer to **Table 5** below).

Table 5: Risk summary for groundwater in the Queensland Border Rivers-Moonie plan area based on the cause of risk being due to Land Management or Water Management

	Land Management	Management of water resources
Number of low risks identified	25	5
Number of medium risks identified	5	0
Number of high risks identified	0	0
Total number of risks identified	30	5

The WQM Plan seeks to accredit measures under 10.35C that will maintain the low risk of elevated levels of salinity and other types of water quality degradation in the plan area arising due to the management of water resources. For risks to groundwater quality arising from land management, the management responses specified in **Section 8** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins) are recognised to manage the effects of elevated levels of salinity and other types of water quality degradation. These land management responses however, are not recommended for accreditation under Section 10.35C.

With reference to section 10.35C (2) of the Basin Plan:

- It was considered unnecessary to include rules about times, places and rates of extraction from the groundwater SDL resource units as the water plan will provide for no increase in volume able to be taken.
- It was considered necessary to include rules about resource condition limits for only some resources:
 - for the Border Rivers Alluvium (GS54) and the Border Rivers Fractured Rock (GS55), resource condition limits were set in the water plan to limit permitted take to current levels; and
 - for the Sediments above the Great Artesian Basin (GS57), the St George Alluvium (GS62) and the Queensland Murray Darling-Basin deep (GS56) it was considered unnecessary to include rules about resource condition limits; as the water plan allows for some growth in take consistent with the SDLs.
- For resource units where resource condition limits are set in the water plan, restrictions are included in the form of water sharing rules included in the water management protocol to prevent them being exceeded.
- Since permitted take will be limited and no medium or high salinity risks were identified in the risk assessment for the groundwater SDL units, the installation of additional salinity monitoring bores were not considered necessary.

Refer to the measures in **Box 4** for further information on what was included to address section 10.35C.

Box 4: Groundwater measures recommended for accreditation under Basin Plan section 10.35C

Groundwater measures under Basin Plan section 10.35C

a) The following measures seek to maintain the low risk of elevated levels of salinity and other types of water quality degradation in the plan area arising due to the management of water resources.

Measure 1 (BP 10.35C) – Continue to manage water under the water management arrangements and principles of the Queensland water planning framework.

Description: Continue existing principles and management arrangements which were considered in the risk identification and assessment process, including:

- For extreme events, section 28 and 29 of the Queensland Water Act 2000 provides the Minister with powers to limit water take and prohibit interference during contamination events.
- Best available science is used to facilitate ongoing improvement over the life of the plan.

Measure 2 (BP 10.35C) – Limit on the amount of water taken under the Water Plan

Description:

Under the Water Plan (Border Rivers-Moonie) 2019:

- Part 7, Section 35 specifies that decisions must not increase the amount of water taken. There should not be decisions made to increase the amount of groundwater taken above current issued entitlement, unless there is identified unallocated groundwater.

Measure 3 (BP 10.35C) – Limits on taking or interfering with underground water that may trigger salt water intrusion

Description:

Under the Water Plan (Border Rivers-Moonie) 2019:

- Part 8, Section 38 places limits on taking water for particular activities, including for the Border Rivers Alluvium and the Border Rivers Fractured Rock.
- Part 8, Section 40 places limitations on taking or interfering with underground water in an underground water management area.
- Part 8, Section 41 specifies limitations on taking or interfering with underground water from land in service area for stock purposes or domestic purposes and applies to the Border Rivers Alluvium and the Border Rivers Fractured Rock.

Measure 4 (BP 10.35C) – Inclusion of water plan outcomes for underground water

Description:

Under the Water Plan (Border Rivers-Moonie) 2019, the following outcomes are included:

- s24(1)(f) To minimise water quality degradation in relation to: (ii) for underground water to which this plan applies – flow and pressure; and
- s24(1)(g) To maintain an underground water regime in the plan area that supports ecosystems dependent on underground water to which this plan applies.

Measure 5 (BP 10.35C) – Water Management Protocol water allocation dealing rules

Description:

Under the Border Rivers and Moonie Water Management Protocol 2019 –

- Section 143 and Section 144 limit the extraction/use of groundwater under an entitlement to the Sustainable Diversion Limit and agreed sustainable share of the resource with New South Wales.

Measure 6 (BP 10.35C) – Ongoing monitoring and evaluation of risk and treatments, including the effectiveness of the Water Plan in delivering on its outcomes

Description:

- The Water Act 2000 requires the Minister to prepare a report about each water plan at regular intervals (every 5 years) to assess the effectiveness of the plan and its implementation in advancing the sustainable management of water resources.
- Water Plan (Border Rivers-Moonie) 2019, Part 4, Section 25 (6) includes the requirement for a Monitoring, Reporting and Evaluation Strategy to be prepared by 1 July 2020. This will support the Minister's report and also reporting requirements under the Commonwealth Water Act 2007 and Schedule 12 of the Basin Plan.
- The Healthy Waters Management Plan for the plan area includes groundwater quality targets for electrical conductivity.

Regard to the causes, or likely causes, of water quality degradation identified under section 10.35A

The key causes, or likely causes, of water quality degradation underpinned the risk assessment of water being of a quality unsuitable for use in accordance with section 10.35A of the Basin Plan and as detailed in **Section 7** and **Appendix 3** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

The risks to the quality of groundwater were predominantly related to land management practices. Of the 5 risks attributed to water management, all have a low risk profile. *Measure 1* and *Measure 2 (BP 10.35C)* seek to ensure measures are in place to maintain the identified low risks to water quality in Queensland Border Rivers and Moonie groundwater SDL resource units due to the management of water resources. Land management risks are addressed through the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

Regard to the water quality target values identified under section 10.35B

The measures identified under section 10.35C aim to protect and maintain groundwater quality within the water quality target values identified under section 10.35B, particularly with regard to electrical conductivity (salinity) which can often be impacted by the management of water resources.

The groundwater quality target values developed under Section 10.35B include electrical conductivity. This ensures that the baseline salinity in the groundwater resource units has been established which will enable any salinity impacts through time to be assessed.

The full suite of groundwater quality target values developed under Section 10.35B of the Basin Plan will be recommended for inclusion in Schedule 1 of the EPP Water as Water Quality Objectives to inform statutory and non-statutory planning and decision-making in the plan area to maintain and improve water quality. This includes:

For fresh water-dependent ecosystems:

Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins – **Section 10.2.6: Table 35, 36, 37 and 43**

For irrigation water:

There are no sites in the Queensland Border Rivers and Moonie River Basins that qualify as an irrigation infrastructure operator for the purposes of Basin Plan Section 10.32 (2)(b).

However, Table 50 provision (1) for the Border Rivers and Moonie River basins is recognised to provide targets for irrigation water in the plan area for the purposes of Queensland water quality planning and management.

For recreational purposes are for primary, secondary and visual recreation:

Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins – **Section 10.3.5: Table 64, provision (1).**

Part 6: Impact on New South Wales water resources

Consultation with the New South Wales Government on the Queensland Border Rivers-Moonie Water Quality Management Plan (WQM Plan), encompassing the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins), was undertaken in accordance with section 10.05, 10.32 (4)(d) and 10.35 of the Basin Plan. This consultation is described in **Section 4.7** of the Healthy Waters Management Plan (Queensland Border Rivers and Moonie River Basins).

On 5th February 2019, the final draft HWMP and WQM Plan was provided to water quality representatives from the New South Wales Department of Industry (Water) for comment on the:

- water quality target values refined through local data;
- impact of Queensland measures on the ability of New South Wales to meet water quality targets; and
- any adverse impacts measures may have on New South Wales water resources.

On 12th February 2019, the New South Wales Department of Industry (Water) provided a statement in support of the Queensland Border Rivers-Moonie Water Quality Management Plan. This statement is included below in line with the requirements of 10.05, 10.32 (4)(d) and 10.35 of the Basin Plan.



**Department
of Industry**

DATE	12 February 2019
SUBJECT	New South Wales Feedback: Queensland Border Rivers-Moonie WQMP

The New South Wales Department of Industry, Water is supportive of Queensland's Border Rivers-Moonie Water Quality Management Plan, including the impact of targets and measures on New South Wales.

Proposed alternative water quality target values based on local analysis

Queensland's surface water and groundwater water quality targets are appropriate. Where the targets differ from those listed in Schedule 11 of the Basin Plan, the ANZECC guidelines framework for setting local targets has been followed, resulting in stronger and more relevant targets.

The impact of Queensland measures on the ability of New South Wales to meet water quality targets; any adverse impacts the measures may have on New South Wales water resources.

Queensland has identified the risks associated with elevated levels of salinity and other types of water quality degradation to the Border Rivers – Moonie resource plan area. Measures to address the risks identified as low, or risks as a result of land management, are outside the scope of water resource planning and have not been recommended for accreditation.

Water temperature and dissolved oxygen levels being outside of natural ranges in the Upper Border Rivers catchment, downstream of both Glenlyon and Coolmunda Dams, has been identified as a high risk. Measures relating to the management of water resources to address these risks are the inclusion of provisions in the Resource Operation Licence, revise and update environmental outcomes in the Water Plan and ongoing monitoring.

Risks to groundwater quality due to the management of water resources were assessed as low. To maintain the low risk, existing principles and resource management arrangements will be maintained. Measures for accreditation include limiting the amount of water taken, limiting interference with underground water that may trigger salt water intrusion, maintain the underground water regime and ongoing monitoring and evaluation of risks.

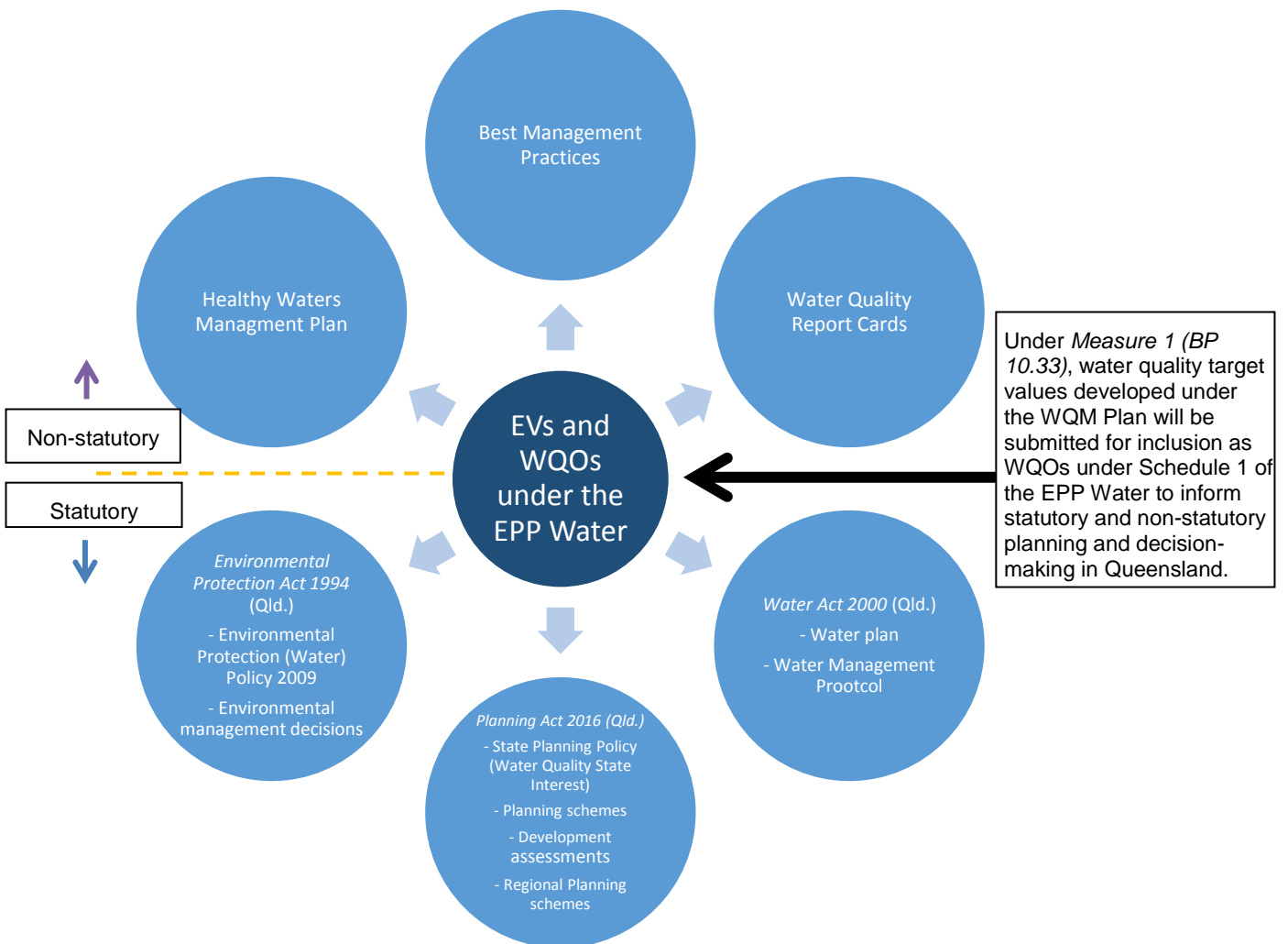
There are no accredited measures in the Border Rivers-Moonie Water Quality Management Plan that will have adverse impacts on New South Wales water resources.

Appendix 1 – Measure 1 (BP 10.33): Additional information

The quality of natural waters in Queensland (e.g. water in rivers, creeks, wetlands, lakes, estuaries and coastal areas and ground waters) is protected under the Environmental Protection (Water) Policy 2009 (EPP Water). The EPP Water achieves the object of the *Environmental Protection Act 1994* (EP Act) to protect Queensland's waters while supporting ecologically sustainable development. Queensland waters include water in rivers, streams, wetlands, lakes and aquifers. Within the Queensland water quality management framework, Environmental Values (EVs) and Water Quality Objectives (WQOs) are included in Schedule 1 of the EPP Water to inform statutory and non-statutory planning and decision-making. EVs and WQOs are developed by the Department of Environment and Science, in consultation with a variety of stakeholders including government, local Aboriginal Nations, environmental organisations, industry groups and the community.

EVs define the uses of the water in a specified plan area for aquatic ecosystems and for human uses (e.g. drinking water, irrigation, recreation, etc.). Setting EVs through community and stakeholder consultation reflects how a local region values and uses water. Accompanying WQOs then seek to define what the quality of water should be to protect the identified EVs. WQOs define objectives for the physical characteristics of the water (e.g. nitrogen content, dissolved oxygen, turbidity, etc.). Under *Measure 1*, water quality target values specified in the Queensland WRP package within the Queensland Border Rivers-Moonie WQM Plan, as well as related EVs, will be submitted for inclusion under Schedule 1 of the EPP Water to inform statutory and non-statutory planning and decision-making.

Appendix 1 – Figure 1 summarises the ways in which EVs and WQOs can be used in statutory and non-statutory planning and decision-making. EVs and WQOs become part of the legislation by being included in Schedule 1 of the EPP Water. Under Queensland legislation, conditions can be placed on regulated activities to reduce or avoid potential impacts to the receiving waters through consideration of scheduled EVs and WQOs.









Appendix 1 - Figure 1: The linkages between EVs and WQOs under the Queensland EPP Water and statutory and non-statutory activities.

Appendix 1 - Table 1 presents the linkages between objectives specified in sections 9.04-9.07 of the Basin Plan and the corresponding EVs and WQOs that will be scheduled under the EPP Water to inform statutory and non-statutory planning and decision-making. This establishes how *Measure 1* contributes to the achievement of objectives 9.04-9.07.

With regard to the objective specified in section 9.08 of the Basin Plan (Objective to maintain good water quality), *Measure 1* achieves this by scheduling the water quality targets developed for the plan area under the WQM Plan as WQOs under the EPP Water. The EPP Water specifies that scheduled water quality objectives must be an improvement on existing water quality – hence the values have been calculated to be in line with this requirement.

In the majority of cases, the water quality targets based on local data were at a level that is better than the target values specified in Schedule 11 of the Basin Plan, as described in **Part 2** of this document. Once scheduled, Section 14 of the EPP Water (Management intent for waters) will apply (See **Appendix 1 – Table 2**). In high ecological value (HEV) areas, WQOs are to be maintained. In slightly disturbed (SD) areas, water quality is to be improved such that the WQOs are achieved for HEV waters. In moderately disturbed (MD) areas, if water quality meets the WQOs, it is to be maintained, or if it does not, water quality is to be improved to meet the WQOs for MD waters. In highly disturbed (HD) areas, the water quality is to be progressively improved to achieve the WQOs for MD waters.

Appendix 1 - Table 1: Linkages between objectives specified in Sections 9.04-9.07 of the Basin Plan and the EVs/WQOs framework

Objective	Corresponding Environmental Value (EV)	Corresponding Water Quality Objective (WQO)
Section 9.04 – Objectives of water-dependent ecosystems	Aquatic Ecosystem EV 	Water quality targets for the protection of the Aquatic Ecosystem EV – for highly disturbed aquatic ecosystems, moderately disturbed aquatic ecosystems, slightly disturbed aquatic ecosystems and high ecological value aquatic ecosystems.
Section 9.05 – Objectives for raw water for treatment for human consumption	Drinking Water EV 	Water quality targets for drinking water – Suitability for drinking water supply.
Section 9.06 – Objective for irrigation water	Primary Industry – Irrigation EV 	Water quality targets for primary industry – Suitability for irrigation.
Section 9.07 – Objective for recreational water quality	Primary Recreation EV  Secondary Recreation EV  Visual Recreation EV 	Water quality targets for the protection of the Primary, Secondary and Visual Recreation EVs – Suitability for primary, secondary and visual recreation

Appendix 1 – Table 2: Management intent under the EPP Water for levels of aquatic ecosystem protection

Level of protection	Management intent
High ecological value (HEV) waters	The measures for the indicators for all Environmental Values are maintained i.e. maintain water quality objectives (target values) for HEV waters.
Slightly disturbed waters	The measures for the slightly modified physical or chemical indicators are progressively improved to achieve the water quality objectives (target values) for HEV waters.
Moderately disturbed waters	If the measures for indicators of the Environmental Values achieve the water quality objectives (target values) for the water—the measures for the indicators are maintained at levels that achieve the water quality objectives (target values) for the water, or; If the measures for indicators of the Environmental Values do not achieve the water quality objectives (target values) for the water—the measures for indicators of the Environmental Values are improved to achieve the water quality objectives (target values) for the water.
Highly disturbed waters	The measures for the indicators of all Environmental Values are progressively improved to achieve the water quality objectives (target values) for the water.