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MEMORANDUM

To: Policy
From: Rachel Ozanne
Date: 9 November 2023
Re: Mixing zones and Receiving Water Standards Appendix

Name	Role	Date Completed
Kirstie Wyss (Incite)	Author/Reviewer	30 November 2023
Rachel Ozanne	Reviewer/Author	30 November 2023

APPX [RWS] – Mixing zones and receiving water standards

Part 1 – Mixing zones

A mixing zone is the area (and underlying volume) of a receiving *water* where the *water* quality standards specified for *river*, *modified watercourse*, *artificial watercourse* and *lake*s do not have to be met.

A mixing zone, as a result of a point source *discharge* of a *contaminant*, is:

- (1) For *river*, *modified watercourse*, and *artificial watercourse* locations with flowing *water* present at all times:
 - (a) no longer than 200 m along the longest axis of the zone *or* 10 times the wetted channel width for that location (whichever is the lesser); and
 - (b) occupies no greater than two-thirds of the wetted channel width for that location; and
- (2) For *river*, *modified watercourse*, and *artificial watercourse* locations with intermittent flows, no longer than 20 m at times of flow and 0 m at no flow; or
- (3) For *lake* locations:

- (a) if the *discharge* location is within 50 m of the *lake water edge*³ at any time, a circle with a diameter of 50 m; or
- (b) if the *discharge* location is greater than 50 m from the *lake water edge*³ at all times, a circle with a diameter of 100 m; or
- (4) When within a *drinking water protection zone*, 0 m; or
- (5) A distance determined through a resource consent process, having regard to:
 - (a) clauses (1) to (4); and
 - (b) using the smallest zone necessary to achieve the required water quality in the receiving waters; and
 - (c) ensuring that within the mixing zone contaminant concentrations will not cause acute toxicity effects on aquatic ecosystems.

Notes:

- (1) *The wetted channel width is estimated by a suitably experienced and qualified person for the proposed discharge location. For a braided river the wetted channel width is the width of water in the braid receiving the discharge.*
- (2) *The lake water edge is estimated by a suitably experienced and qualified person for the proposed discharge location at the lowest lake level with a ten-year reoccurrence interval.*

Part 2 – Receiving water standards

- (1) For *artificial watercourses*, the *discharge* must not have an adverse effect that is more than minor, including any of the following effects:
 - (a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - (b) any conspicuous change in the colour or visual clarity;
 - (c) any emission of objectionable odour;
 - (d) the rendering of *fresh water* unsuitable for consumption by farm animals; or
 - (e) any significant adverse effects on aquatic life.
- (2) For *rivers, modified watercourses, and lakes*, the receiving water standards in Table 1 and Table 2 apply.

Table 1 - Receiving water standards that apply irrespective of REC class

Water body	Temperature		pH Change must not exceed (pH unit)	Change in sediment cover	Chlorophyll a	Suitability for consumption
	Increase must not exceed (°C)	Temperature must not exceed (°C)				
All rivers, modified watercourses, and lakes	3.0	25.0	+/- 0.5	No increase in the deposition of matter on the bed of the water body if it has an adverse effect on aquatic life.	No undesirable biological growths as a result of any discharge of a contaminant into the water. This standard applies within the mixing zone.	The discharge must not cause the water to be rendered unsuitable for treatment (equivalent to coagulation, filtration, and disinfection) for human consumption by the presence of contaminants.

Table 2 - Receiving water standards that apply to rivers, modified watercourses, and lakes based on REC class

Water quality class	Ammoniacal nitrogen	Dissolved reactive phosphorus	Nitrate	Total nitrogen	Total phosphorus	Conductivity	Turbidity	Suspended solids	Visual clarity	Dissolved Oxygen		Toxicants, metal and metalloids (excludes nitrate or ammonia toxicity)	Escherichia coli
	Must not exceed (µg/L)	Must not exceed (µg/L)	Must not exceed (µg/L)	Must not exceed (µg/L)	Must not exceed (µg/L)	Must not exceed (µS/cm)	Must not exceed (NTU)	Must not exceed (mg/L)	Percentage change must not exceed ¹	7-day mean minimum ² must be within (mg/L)	1-day mean minimum ³ must be within (mg/L)	Must not exceed the default guideline value for the level of species protection specified for any toxicant, metal or metalloid in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018. ⁴	(E.coli/100mL)
Cool Dry Hill	6	6	18	103	9	83	0.9	1.6	20	≥7.0 and <8.0	≥5.0 and <7.5	95%	The discharge must meet the relevant interim target attribute state or target attribute state for the 95 th percentile for E.coli as set out in FMU1 to FMU5
Cool Dry Low-elevation	10	8	265	913	14	116	1.3	2.1	33	≥5.0 and <7.0	≥4.0 and <5.0	80%	
Cool Dry Lake	9	7	40	160	16	101	1.9	2.6	33	≥7.0 and <8.0	≥5.0 and <7.5	80%	
Cool Dry Mountain	7	7	30	144	13	94	2.9	5.1	10	≥8.0	≥7.5	99%	
Cool Wet Hill	6	8	87	238	16	95	2.4	2.6	20	≥7.0 and <8.0	≥5.0 and <7.5	95%	
Cool Wet Low-elevation	9	11	170	272	18	145	2.3	1.8	33	≥5.0 and <7.0	≥4.0 and <5.0	80%	
Cool Wet Lake	7	3	11	104	13	102	1.3	1.6	10	≥8.0	≥7.5	99%	
Cool Wet Mountain	5	4	24	85	17	87	4.6	11.8	10	≥8.0	≥7.5	99%	

¹ This standard applies within the mixing zone.

² The 7-day mean minimum is the mean value of seven consecutive daily minimum values.

³ The 1-day minimum is the lowest daily minimum across the whole summer period (1 November to 30 April).

⁴ Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018). <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search>

Cool Extremely Wet Hill	5	6	54	119	13	87	2.1	4.1	20	≥ 7.0 and < 8.0	≥ 5.0 and < 7.5	95%	
Cool Extremely Wet Low-elevation	8	9	92	179	13	107	2.6	1.7	33	≥ 5.0 and < 7.0	≥ 4.0 and < 5.0	80%	
Cool Extremely Wet Lake	5	4	47	194	10	87	2	4	10	≥ 8.0	≥ 7.5	99%	
Cool Extremely Wet Mountain	6	5	48	128	19	98	3.5	4.2	10	≥ 8.0	≥ 7.5	99%	