



Memorandum

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Attention: Arron Cox

Company: Ministry for the Environment (MfE)

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Message Ref: Outline of Proposed Changes to Freshwater Attributes

Project No: BM200132

Introduction

This memorandum provides a high-level overview of amendments to freshwater attributes in the National Policy Statement for Freshwater Management 2014 (as updated in August 2017) ('NPSFM') proposed in the Draft National Policy Statement for Freshwater Management 2019 ('Draft NPS'). The purpose of the memo is to enable an assessment of whether changes in wastewater treatment would be required to meet these amended attributes in addition to those already identified in the report titled 'Cost Estimates for upgrading Wastewater Treatment Plants to meet Objectives of the NPS Freshwater' dated September 2018 prepared by Boffa Miskell and GHD.

Changes to attributes

The Draft NPS proposes to replace Appendix 2 of the NPSFM with two new appendices:

- Appendix 2A: 'Attributes requiring limits;' and
- Appendix 2B: 'Attributes requiring action plans.'

Regional councils will be required to identify and implement limits on resource use to achieve defined target freshwater attribute levels for the 12 attributes listed in Appendix 2A¹.

Appendix 2B lists an additional 11 freshwater attributes and will require regional councils to prepare and publish actions plan for each attribute to meet defined attribute target states².

Amendments resulting from the introduction of Appendix 2A, Draft NPS

In effect, Appendix 2A reproduces the nine freshwater attributes set out in Appendix 2 of the NPSFM and introduces three new attributes that were not identified in the NPSFM. The new attributes are:

- dissolved inorganic nitrogen;
- dissolved reactive phosphorus; and
- suspended fine sediment.

Details of proposed amendments to the attributes contained within Appendix 2 of the NPSFM are presented in Table 1, while a summary of the Attribute State B limits for the new attributes introduced by the Draft NPS is presented in Table 2. The amendments will not affect the numeric Attribute State B limits defined for the nine attributes contained within the NPSFM.

¹ Clause 3.10(1) of the Draft NPS.

² Clause 3.10(2) of the Draft NPS.

Table 1. Summary of proposed amendments to attributes contained within the NPSFW. Amendments proposed by Appendix 2A of the Draft NPS are annotated against the base text of the NPSFW and are shown in blue. Note that the Draft NPS proposes a new order of attributes.

Attribute	Details of change		Reference to Draft NPS
Phytoplankton	No change.		Table 1.
Total Nitrogen	No change.		Table 3.
Total Phosphorus	No change.		Table 4.
Attribute	Proposed change	Proposed change as annotated against the base text of the NPSFM 2014.	
Periphyton	The Draft NPSFW 2019 proposes the removal of words from Narrative Attribute State 'C'.	"Periodic short-duration nuisance blooms reflecting moderate nutrient enrichment and/or alteration of the natural flow regime or habitat."	Table 2.
	The Draft NPSFW 2019 proposes the addition of the word 'very' to the wording of Narrative Attribute State 'D'.	"Regular and/or extended-duration nuisance blooms reflecting <u>very</u> high nutrient enrichment and/or significant alteration of the natural flow regime or habitat."	
	The footer of the attribute table is amended as indicated.	<p>"4. Classes are streams and rivers defined according to types in the River Environment Classification (REC). <u>Numeric attribute states must be derived from the rolling median of monthly monitoring over five years.</u> -The <u>Productive periphyton class is defined by the combination of REC "Dry" Climate categories (i.e. Warm-Dry (WD) and Cool-Dry (CD)) and REC Geology categories that have naturally high levels of nutrient enrichment due to their catchment geology (i.e. Soft-Sedimentary (SS), Volcanic Acidic (VA) and Volcanic Basic (VB)). Therefore the productive category is defined by the following REC defined types: WD/SS, WD/VB, WD/VA, CD/SS, CD/VB, CD/VA. The Default class includes all REC types not in the Productive class.</u></p> <p><u>2. Based on a monthly monitoring regime. The minimum record length for grading a site based on periphyton (chl-a) is 3 years."</u></p>	
Nitrate	No change.		Table 8.
Ammonia	The Draft NPSFW 2019 removes reference to 'Lakes' in the attribute table. This is a substantive change and narrows the application of this attribute table to Rivers.	"Lakes and rivers"	Table 7.

	The footer of the attribute table is amended as indicated.	* <u>Numeric attribute state is based</u> on pH 8 and temperature of 20°C. Compliance with the numeric attribute states should be undertaken after pH adjustment.	
Dissolved Oxygen	The Draft NPSFW 2019 inserts the word 'only' under the Freshwater Body Type to clarify the scope of application to 'point sources only'.	"Rivers (below point sources <u>only</u>)".	Table 9.
	The footer of the attribute table is amended as indicated.	± "The <u>seven day mean minimum is the</u> mean value of 7 consecutive daily minimum values. ± The <u>one day mean minimum is the</u> lowest daily minimum across the whole summer period.	
<i>Escherichia coli</i> (<i>E.coli</i>)	The reference to 'cfu' is replaced by ' <i>E.coli</i> ' in all units contained within the attribute table	Median concentration (cfu <u><i>E.coli</i></u> /100 mL).	Table 11.
<i>Cyanobacteria - Planktonic</i>	No change.		Table 12.

The three new attributes proposed by the Draft NPS aim to improve water quality in rivers or streams. Attribute State B for each of the new attributes is shown in Table 2 below.

Amendments resulting from the introduction of Appendix 2B, Draft NPS

Appendix 2B of the Draft NPS proposes the insertion of 11 new attributes requiring the preparation and implementation of action plans to achieve attribute target states. The style and format of Appendix 2B is consistent with Appendix 2A. Attribute State B for each of the new 11 attributes in Appendix 2B is presented in Table 3.

These attribute states will only need to be achieved if a regional council prepares and publishes an action plan that requires water quality improvement or sets resource use limits for these attributes.

Assessment of Wastewater Treatment Plant Upgrades

The studies completed by Boffa Miskell and GHD relating to estimating cost estimates for upgrade of wastewater treatment plants, assumed that for WWTPs discharging to freshwater the treatment target was Attribute B *in the treated wastewater*. This approach was taken to provide a consistent benchmark to compare current likely treatment performance of WWTPs to. The report did explain that the receiving water quality downstream was subject to other contributors including landuse and the level of dilution available for treated wastewater.

The Attribute B limits proposed for Dissolved Reactive Phosphorous and Dissolved Organic Nitrogen in the Draft NPS could technically be achieved at the end of pipe however a very high and unprecedented level of treatment would be required. We consider it likely that the Attribute B limits for these two parameters are likely to be met in the receiving environment after dilution, however there may be some plants that will require further upgrade from that set out in the DIA study because dilution in the receiving environment is not sufficient (e.g. where a WWTP discharges into a small receiving environment).

Table 2. Summary of Attribute State B for new attributes requiring resource limits as introduced by Appendix 2A of the Draft NPS.

Attribute	Unit	Freshwater Body Type	Numeric Attribute State B											Reference to Draft NPS	
			Median						95 th percentile						
Dissolved inorganic nitrogen	<ul style="list-style-type: none"> DIN mg/L (milligrams per litre) 	Rivers	> 0.24 and ≤0.50						> 0.56 and ≤01.10					Table 5	
Dissolved reactive phosphorus	<ul style="list-style-type: none"> DRP mg/L (milligrams per litre) 	Rivers	> 0.006 and ≤0.010						> 0.021 and ≤0.030					Table 6	
Suspended fine sediment	<ul style="list-style-type: none"> Turbidity (FNU) 	Rivers and streams	Numeric Attribute State B by Suspended Sediment Class*												Table 10
			1	2	3	4	5	6	7	8	9	10	11	12	
			<2.5	<7.9	<1.6	<3.9	<9.8	<6.3	<2.8	<5.2	<1.4	<1.3	<1.3	<2.7	

* Sediment Classes are defined in Appendix 2C of the Draft NPS.

Table 2. Summary of Attribute State B for 11 attributes requiring action plans introduced by Appendix 2B of the Draft NPS.

Attribute	Unit(s)	Freshwater Body Type	Numeric Attribute State B		Reference to Draft NPS
			QMCI	MCI	
Macroinvertebrates (1 of 2)	<ul style="list-style-type: none"> Quantitative Macroinvertebrate Community Index (QMCI) score Macroinvertebrate Community Index (MCI) score 	Wadeable streams and rivers	≥5.5 & <6.5	≥110 & <130	Table 13
Macroinvertebrates (2 of 2)	<ul style="list-style-type: none"> Macroinvertebrate Average Score Per Metric (ASPM) 	Wadeable streams and rivers	<0.6 & ≥0.4		Table 14
Fish (rivers)	<ul style="list-style-type: none"> Fish Index of Biotic Integrity (F-IBI) (Average) 	Wadeable streams and rivers	<34 and ≥28		Table 15
Submerged plants (natives)	<ul style="list-style-type: none"> Lake Submerged Plant Indicators: Native Condition Index (% of maximum potential score) 	Lakes	>50 & ≤75%		Table 16

Attribute	Unit(s)	Freshwater Body Type	Numeric Attribute State B										Reference to Draft NPS		
Submerged plants (invasive species)	<ul style="list-style-type: none"> Lake Submerged Plant (Invasive Impact Index) (% of maximum potential score) 	Lakes	>1 & ≤25%										Table 17		
Deposited fine sediment	<ul style="list-style-type: none"> % fine sediment cover 	Wadeable streams and rivers	Numeric Attribute State B by Deposited Sediment Class*												Table 18
			1	2	3	4	5	6	7	8	9	10	11	12	
Dissolved oxygen	<ul style="list-style-type: none"> mg/L (milligrams per litre) 	Rivers	7-day mean minimum					1-day mean minimum					Table 19		
			≥7.0 and <8.0					≥5.0 and <7.5							
Lake-bottom dissolved oxygen	<ul style="list-style-type: none"> mg/L (milligrams per litre) – measured or estimated annual minimum 	Lakes	≥2.0 and < 7.5										Table 20		
Mid-hypolimnetic dissolved oxygen	<ul style="list-style-type: none"> mg/L (milligrams per litre) – measured or estimated annual minimum 	Seasonally stratifying lakes	≥ 5.0 & <7.5										Table 21		
Ecosystem metabolism	<ul style="list-style-type: none"> G O₂ m⁻² d⁻¹ (grams of dissolved oxygen per square metre per day). Both Gross Primary Production and Ecosystem Respiration 	Rivers	Value not specified – Councils are to monitor, and develop an action plan to respond to deteriorating trends										Table 22		
Escherichia coli (<i>E.coli</i>) (primary contact sites)	<ul style="list-style-type: none"> 95th percentile of <i>E.coli</i>/100ml (number of <i>E.coli</i> per hundred millilitres) 	Primary contact sites in lakes and rivers (during the bathing season)	Numeric Attribute State for Attribute Band 'Good' (as no explicit 'B')										Table 23		
			131 - 260												

* Sediment classes are defined in Appendix 2C of the Draft NPS.

