



Ministry for the
Environment
Manatū Mō Te Taiao

Ministry for Primary Industries
Manatū Ahu Matua



FRESHWATER MANAGEMENT GUIDANCE

A Draft Guide to Swimming, *E. coli*, and the National Targets

Under the National Policy Statement for Freshwater Management 2014 (as amended 2017)

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Aotearoa – he whenua māna kura mō te tangata

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1 Introduction

1.1 About this guide

In August 2017, the National Policy Statement for Freshwater Management (Freshwater NPS) was amended to include new objectives for and policies on the human health risk from primary contact recreation. This includes activities involving a higher risk of ingesting water, such as swimming and whitewater rafting. This guide for councils focuses on these amendments, and how they can be implemented alongside other objectives and policies in the Freshwater NPS.

Iwi/hapū and community members participating in a regional freshwater planning process may also find this guide useful.

This guide is not part of the Freshwater NPS, and does not have statutory weight. This guide is not a substitute for legal advice. Its primary purpose is to help local authorities (in particular regional councils and unitary authorities) understand the objectives and policies in the Freshwater NPS, so they can implement it effectively.

Give us your feedback

This guide is being released as a draft. We welcome your feedback or suggestions on the content. If you would like to provide feedback, please email freshwater@mfe.govt.nz. A final guide will be published in June 2018.

Any future changes to the Freshwater NPS will be reflected in updated guidance.

1.2 Structure of this guide

This guide is structured into the following five sections:

- Section 1 introduces the guide and provides an overview of the new objectives and policies in the Freshwater NPS relating to the human health risk from primary contact recreation.
- Section 2 provides information about the national swimming target.
- Section 3 provides information about the regional swimming targets and how they fit with the national target.
- Section 4 discusses the Freshwater NPS objectives and policies related to the swimming target.
- Section 5 provides information on monitoring and reporting on the target and the compulsory value 'human health for recreation'.

1.3 Overview of ‘primary contact’ objectives and policies

In 2017, the Government introduced national swimming targets, and a suite of amendments to the Freshwater NPS to acknowledge a strong public desire for water quality that is suitable for swimming throughout New Zealand. This included a requirement to develop regional targets to achieve the national swimming target.

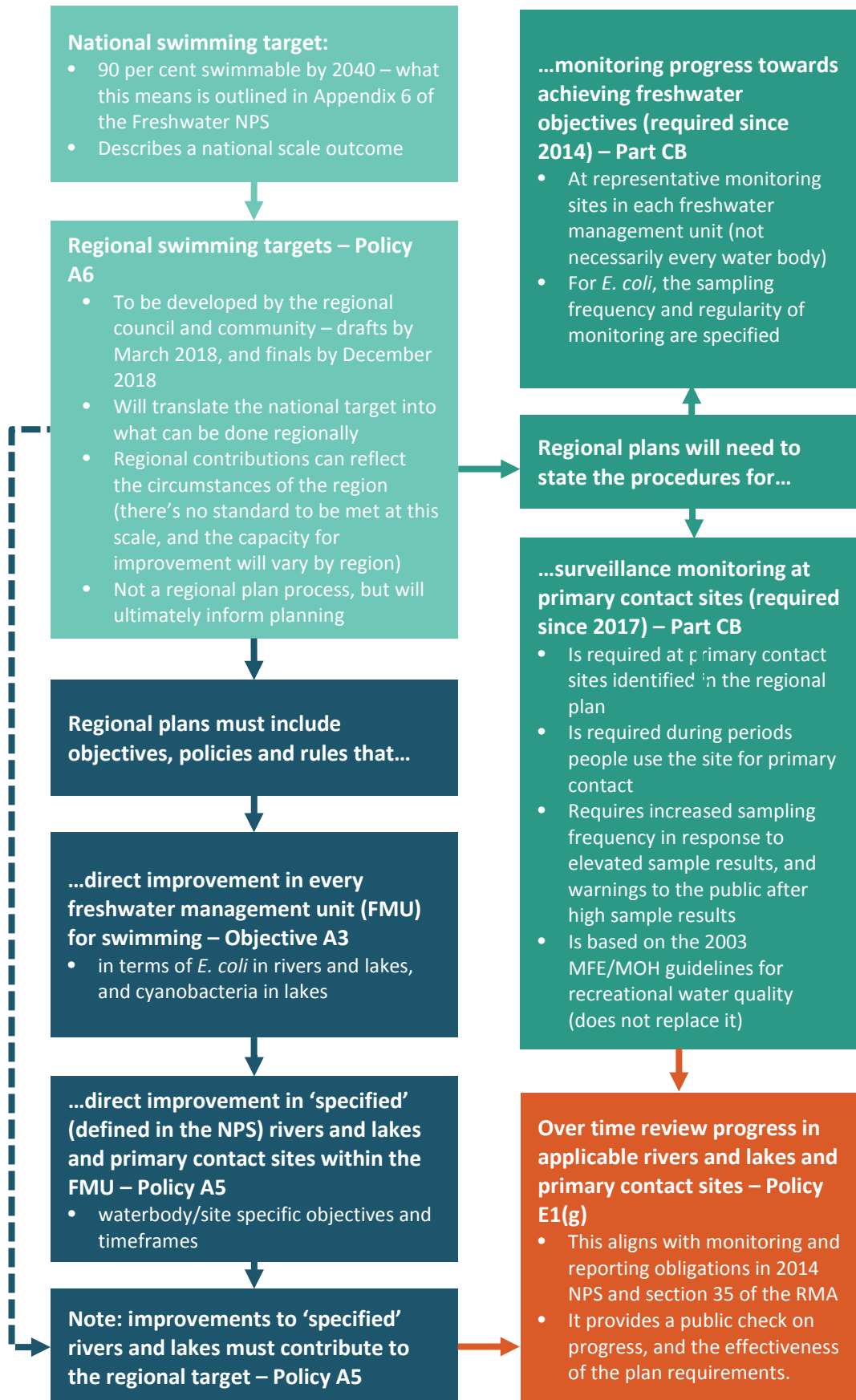
The national target, objectives and policies can be summarised as follows:

- **A national target** which describes a national-level outcome for swimming water quality in fourth order rivers* and lakes with a perimeter greater than or equal to 1.5 km. The desired outcome is to make 80 per cent (of total river length of fourth order rivers) suitable for swimming by 2030, and 90 per cent by 2040, as determined by measuring levels of *E. coli* in rivers and lakes, and cyanobacteria in lakes (Appendix 6).
 - **A requirement to develop regional targets** that describe regional outcomes, aimed at contributing to the national target (Policy A6).
- An **objective to improve (not maintain)** freshwater management units so they are suitable for primary contact more often, in terms of *E. coli* in rivers and lakes and cyanobacteria in lakes. This means improving water quality across all attribute states,¹ even those that are already considered suitable for swimming (Objective A3).
 - Policies requiring **more specific plan content, stating how specified rivers and lakes and primary contact sites will be improved**. Councils have discretion around timeframes for achieving improvements, and where they focus their efforts (Policy A5).
- **Reporting requirements** to track efficacy of planning and progress toward regional targets over time (Policy E1(g)).
- **Surveillance monitoring** requirements at primary contact sites (Appendix 5 of the NPS).

Figure 1 shows how these new objectives and policies fit together, and distinguishes the surveillance monitoring requirements (which are new) from state of the environment monitoring of objectives (already required).

* The term fourth order is derived from the New Zealand River Environment Classification (REC). Stream order is the numerical position of a tributary or section of river within the entire network. Headwater streams are considered first order. When two tributaries of the same stream order meet, the order increases by one for the next downstream section.

Figure 1: Overview of 'primary contact' objectives and policies

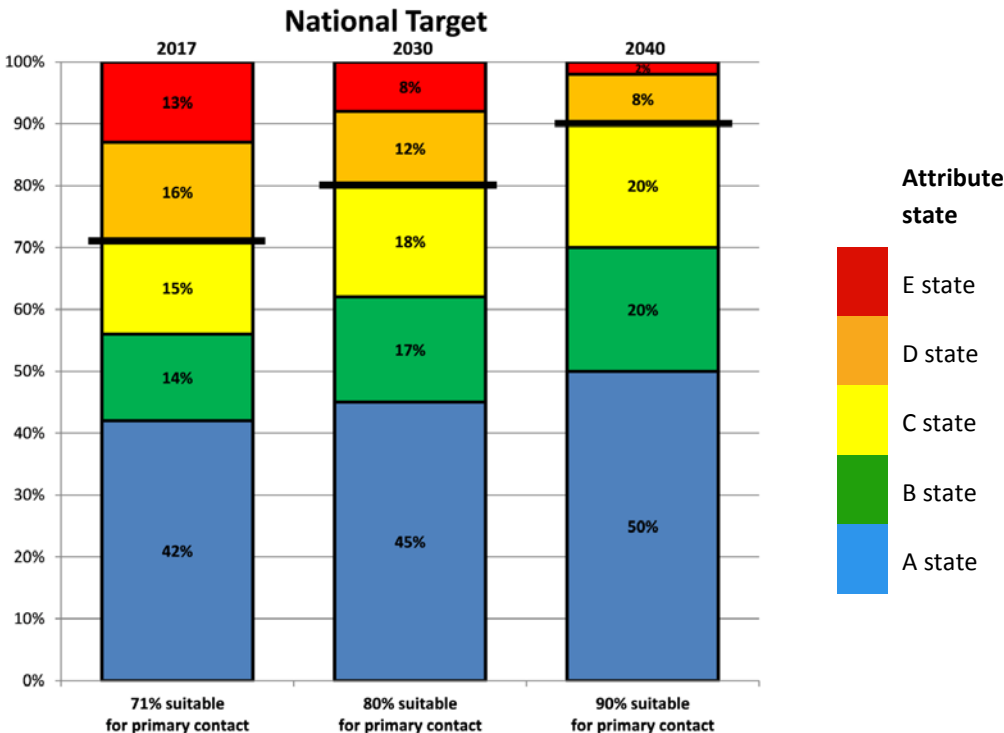


2 The national swimming target

The national target is a national-level outcome for water quality in terms of *E. coli* (in rivers and lakes) and cyanobacteria (in lakes and lake fed rivers), as at 2030 and 2040. The target is set out, with some explanatory notes, in Appendix 6 of the Freshwater NPS.

Specified **rivers and lakes**¹ are assigned a **category** from best to worst (ie, A (best) – E (worst)), based on *E. coli* concentrations. **Lakes and lake fed rivers** are assigned a category based on *E. coli*, and the attribute planktonic cyanobacteria biovolume (ie, A – D). When determining a category for lakes and lake fed rivers using the attributes *E. coli* and cyanobacteria, the category must be whichever attribute state is lower (ie, higher health risk). For example, if a lake is in the ‘A’ attribute state of planktonic cyanobacteria, but the ‘B’ attribute state for *E. coli*, then the lake is in the ‘B’ category for the purposes of the swimming targets.

The categories for the national target are the same as the attribute states that are defined in the attribute tables for *E. coli* and cyanobacteria, with one minor difference. For lakes and lake fed rivers the D state has been split into two categories (orange and red) to provide granularity for tracking improvements over time (see the note in Appendix 6 of the Freshwater NPS). To achieve the national target, the proportion of specified rivers and lakes in each category² looks like this, as at 2017, 2030, and 2040:



¹ ‘Specified rivers and lakes’ are defined as rivers that are fourth order or above using the methods outlined in the River Environment Classification system, and lakes with a perimeter of 1.5 kilometres or more.

² The colours correspond to the attribute states as outlined in Appendix 2 of the Freshwater NPS.

2.1 Achieving the national target means improving across all categories

In 2017, about 71 per cent of specified rivers and lakes were in the A, B or C categories. By 2030, the proportion of specified rivers and lakes in these categories will need to increase to 80 per cent. By 2040, this will need to increase to 90 per cent.

But it is important to remember that the national target aims to *improve specified rivers and lakes in all categories*, and will not be achieved by shifting rivers and lakes over a single line. To achieve the national target, rivers and lakes that are already in the 'B' and 'C' categories will also need to improve. The aim is to make improvements across the board.

We will be able to track improvement by using data supplied by regional councils (as required by Policy E1(g)). This policy requires councils to review and make available to the public the improvements made to rivers and lakes that were committed to under Policy A5 (see [section 4.3](#) of this guide for a discussion on Policy A5 requirements).

The Ministry for the Environment will also update the swimming maps available on our website³ using state of the environment monitoring data collected by councils available on the [LAWA](#) website.

³ <http://www.mfe.govt.nz/fresh-water/state-of-our-fresh-water/water-quality-swimming-maps>.

3 Regional swimming targets

Policy A6 requires regional councils to develop regional targets by 31 December 2018 (with draft targets available from 31 March 2018). These must contribute to achieving the national target.

The purpose of regional targets is for regional councils and communities to translate the national target – describing a national-scale outcome – into a regional-scale outcome that takes local circumstances into account. Ultimately, this is intended to drive improvement in all rivers and lakes.

The categories in the target are based on water quality in terms of the two attributes which relate to the compulsory value ‘human health for recreation’: *E. coli* and planktonic cyanobacteria. Measuring progress towards the target uses the same protocols as monitoring progress towards freshwater objectives for these two attributes.

3.1 Relationship between the national target and regional targets

The national swimming target describes a national-scale outcome that will be achieved through the combined improvements in all regions. Regional councils can decide the extent of their contributions, which can reflect local circumstances. For example, regions with better water quality can still contribute to the national target by improving those rivers and lakes that are already in the B or C categories.

While the national target aims to have 50 per cent of specified rivers and lakes in the top category by 2040 – a regional target can aim for more or less than this. This recognises that different regions have different capacities for improvement. Regional targets should reflect how much communities can or want the rivers and lakes in their region to improve, and the impact this will have.

3.2 Regional targets are not a regional plan requirement

Regional targets do not need to be adopted in a regional plan, and must be set regardless of the planning stage a council is at. A good place to publicise the targets once they are set would be the council website.

Once the targets are set, the regional plan (at the next plan change) must state what improvements will be made that will contribute to achieving the regional target (Policy A5, discussed in more detail below).

For this reason, decisions about the scale of improvements and the timeframes for the regional target should be informed by community engagement including following the direction in Policy D1, and after considering the matters set out in Policy CA2.

The process for developing a regional target is also an opportunity to identify primary contact sites with the community. This will determine where surveillance monitoring under Policy CB1(aa)(i) is required.

3.3 The relationship between regional targets and setting objectives and limits

Regional councils have started the process setting freshwater objectives and limits for every freshwater management unit – often referred to as ‘limit setting’. They must have completed this process by 2025, or in some circumstances by 2030.

Limit setting defines how much of the total resource can be used, while meeting freshwater objectives. This is a complex process that requires the input of communities, information on the cost of making improvements, and the science to define the size of resource, and translate objectives into limits on resource use. The process also requires finding out what communities want to achieve for the water bodies in their regions, and policy options to do it – for example, valuing better water quality, improving security of supply, providing for new users, and costs of improvement.

There is a risk that committing to regional targets by December 2018 will commit the council to particular provisions to achieve the targets before complete information about the cost of making improvements and the science needed to understand the links between resource use and water quality is available.

Some uncertainty is common in environmental management. Risks can be addressed by reviewing the regional targets when developing the objectives and limits in the regional plan, and adapting them as appropriate. For example, if it becomes clear that improvement in a freshwater management unit is more or less difficult than initially thought, the regional target can be adjusted to reflect that – *as long as there is a regional target in place that freshwater objectives and limits can work towards*.

For additional guidance on setting freshwater objectives see *A Guide to Attributes under the Freshwater NPS*. The Ministry is working on A Draft Guide to Limits under the Freshwater NPS.

4 Freshwater NPS objectives and policies related to the swimming target

4.1 The Freshwater NPS policies and the target

The compulsory value ‘human health for recreation’ applies to all fresh water, at a freshwater management unit scale, at all times. In the same way that the compulsory value for ecosystem health focuses on the elements of a freshwater management unit that are necessary to support a healthy ecosystem, the compulsory value for human health for recreation focuses on the elements of a freshwater management unit that are necessary to support people’s recreational use of the water body.

The year-round quality of water in ‘specified’ rivers and lakes will be used to calculate the achievement of the national and regional swimming targets (see section 4.3.1).

The targets do not apply to ‘primary contact sites’ (see section 4.3.2 below). This is because primary contact sites are listed in regional plans, and sites may be added or removed from the lists. Also, sites can be managed for the type of recreation undertaken there, and this use may be seasonal, whereas the targets apply year round.

4.2 Objective A3 – improving not maintaining

Objective A3 directs the quality of fresh water in a freshwater management unit to improve so it is suitable for primary contact more often, unless regional targets have been achieved or naturally occurring processes prevent further improvement. This means councils cannot adopt objectives or policies that would mean water quality is maintained in its current state or allowed to degrade.

Suitable for primary contact more often

The term ‘*suitable for primary contact more often*’ is defined in the interpretation of the Freshwater NPS to mean improvement in terms of the *E. coli* and cyanobacteria attributes set out in Appendix 2, and relative improvement on the *status quo*.

The objective is directed at the two attributes that have been used to define the national swimming target (and will be used to define regional targets). Councils may choose to improve a broader range

of water quality aspects that can affect the suitability of the water body for primary contact (eg clarity, sediment or algae).

Objective A3 requires relative improvement on the *status quo*, rather than achieving a specific standard or to a national bottom line. This is in contrast with other attributes in the Freshwater NPS for which regional councils are able to set freshwater objectives to maintain, and are only required to set freshwater objectives to improve water quality if the current state is below a national bottom line, or the council decides (after following the process set out in Policy CA2) that water quality must be improved.

4.3 Policy A5 – improvements to specified rivers and lakes and primary contact sites

Policy A5 requires councils to make or change regional plans to:

- a) Identify specified rivers and lakes, and primary contact sites;
- b) State what improvements will be made, and over what timeframes, to specified rivers and lakes, and primary contact sites, so they are suitable for primary contact more often; or
- c) State how specified rivers and lakes, and primary contact sites, will be maintained if regional targets have been achieved.

Policy A5 requires councils to be explicit in their regional plans about which water bodies will be improved, how, and over what timeframes. This may require that some policies and rules apply to specified rivers and lakes or primary contact sites within the freshwater management unit, so those water bodies contribute to regional swimming targets.

Policy A5 is intended to drive improvements to achieve the national swimming target, as well as improving water quality for swimming more generally at the specific places where people swim ('primary contact sites').

Specified rivers and lakes

The term '*specified rivers and lakes*' is defined in the Freshwater NPS to mean rivers that are fourth order and above, and lakes with a perimeter of 1.5 km or more. Policy A5 focuses improvements on the same rivers and lakes that are the focus of the national target. This does not mean that smaller rivers and lakes can be left behind. Objective A3 applies to all freshwater management units, including smaller rivers and lakes within them. Thus, water quality in all freshwater management units will need to be improved so the water bodies are suitable for primary contact more often.

Primary contact sites

Primary contact sites are identified in regional plans as:

- places in a 'specified' river or lake where people swim or otherwise come into contact that involves immersion in water, or where they *would* do this if the water quality was improved to a swimmable standard,
- any site in a non-'specified' river or lake that is determined through the regional plan process.

The definition in the Freshwater NPS is:

- a) any part of a specified river or lake that a regional council considers is used, or would be used but for existing freshwater quality, for primary contact; and
- b) any other site in any other river or lake that a regional council has determined should be managed for primary contact.

4.4 Policy A6 – developing regional targets

Policy A6 makes clear the timeframes for developing regional targets.

Policy A6

By every regional council developing regional targets to improve the quality of fresh water in specified rivers and lakes and contribute to achieving the national target in Appendix 6, and ensuring:

- a) draft regional targets are available to the public by 31 March 2018; and
- b) final regional targets are available to the public by 31 December 2018.

Contact the Ministry at freshwater@mfe.govt.nz if you have questions about this process.

5 Monitoring and reporting on the target and the compulsory value

5.1 The *E. coli* attribute

E. coli has been adopted in Appendix 2 of the Freshwater NPS as an attribute for the compulsory value ‘human health for recreation’ (values are described in Appendix 1). As with the other attributes in Appendix 2, the *E. coli* attribute table provides a nationally-consistent measure which contributes (in part) to achieving the human health for recreation value in a freshwater management unit. The *E. coli* attribute is used to set freshwater objectives and then monitor progress towards achieving the human health value and the *E. coli* freshwater objectives over the life of the regional plan.

Measuring progress towards an objective for a freshwater management unit is not the same as assessing human health risk at a specific place. Human health risk at a specific place is assessed by undertaking surveillance monitoring as directed by Policy CB1(aa)(i), as well as by using any predictive modelling or sanitary surveys that inform the risks to human health present in the catchment.

Monitoring the attribute state applies all year and in all weather

The attribute state should be determined by using a minimum of 60 samples over a maximum of 5 years, *collected on a regular basis regardless of weather and flow conditions* (see the *E. coli* attribute table in Appendix 2 of the Freshwater NPS). In practice, this will mean using samples collected monthly, including during high rainfall or flows. If samples are missed during adverse weather conditions (eg, because of the health and safety risks that may arise when collecting samples) a longer timeframe may be used.

High *E. coli* concentrations associated with weather events

In some places, stormwater runoff and overland flows associated with rainfall can temporarily increase *E. coli* concentrations in rivers and lakes. The baseline for the targets was calculated from collected and modelled data representing all weathers. Policy A6 requires regional councils to set targets to improve water quality relative to this baseline. This means that measuring progress towards the target should be done using data representing all weathers.

E. coli and its suitability as an indicator of risk to human health

There is evidence that in some circumstances *E. coli* can replicate outside of the gut of warm blooded animals. When that happens, *E. coli* may not necessarily indicate an associated health risk in the

water. Councils may decide to take this into account when setting their freshwater objectives using the *E. coli* attribute but surveillance monitoring of primary contact sites must still follow the direction in Appendix 5 of the Freshwater NPS.

If there is a likelihood that high *E. coli* levels revealed in surveillance monitoring may be reflecting naturalised *E. coli* populations, the council may need to investigate the sources and provide information about likely health risks based on sanitary surveys or other investigations.

Information on sanitary surveys can be found in the *Microbiological water quality guidelines for marine and freshwater recreational areas*, prepared by the Ministry for the Environment and the Ministry of Health in 2003 (the guidelines).

The monitoring requirements for *E. coli* in Appendix 5 of the Freshwater NPS are based on the guidelines. These guidelines are underpinned by the Freshwater Microbiological Research Programme which included a microbiological study of 10 variables in 25 sites around New Zealand from December 1998 to February 2000.⁴ In 2017, the Ministry for the Environment started scoping an update of the Freshwater Microbiological Research Programme.

Using all criteria, or ‘tests’, to establish attribute state

As set out in Appendix 2 of the NPS, the *E. coli* attribute table has five attribute states (A, B, C, D and E). Each state has four criteria, or ‘statistical tests’, that need to be satisfied for water quality to be in that attribute state. All four criteria must be met to establish an attribute state. If one or more criteria can’t be satisfied, a lower attribute state must apply.

For example, for water quality to be in the A state, *E. coli* must:

- not exceed 540 cfu⁵/100ml more than 5 per cent of the time
- not exceed 260 cfu /100ml more than 20 per cent of the time
- have a median of less than or equal to 130 cfu/100ml
- have a 95th percentile of less than or equal to 540 cfu/100ml.

If any of those criteria are not satisfied, water quality is in a lower state (eg, B, or lower, as long as all criteria can be satisfied).

Below is an example of applying the tests to calculate an overall attribute state at different sites. The table shows results for each statistic assessed against the criteria outlined in the attribute table. The overall attribute state is based on the lowest state of the four statistics.

⁴ See *Freshwater microbiology research programme report: Pathogen occurrence and human health risk assessment analysis*.

⁵ cfu = colony-forming units.

Table 1: Example of applying the statistical tests to calculate an overall attribute state

Site	Percentage exceedance 540 cfu/100ml	Percentage exceedance 260 cfu/100ml	Median <i>E. coli</i>	95th percentile <i>E. coli</i> (Hazen)	Overall attribute state
1	42	100	1,550	2,811	E (red)
2	9	25	56	1,052	C (yellow)
3	3	7	27	295	A (blue)
4	8	23	1,120	800	B (green)
5	25	29	150	2,000	D (orange)
6	33	35	170	1,205	E (red)
7	19	32	150	1,250	D (orange)

The overall attribute state should be determined by using a minimum of 60 samples over a maximum of 5 years, collected on a regular basis regardless of weather and flow conditions. However, where a sample has been missed due to adverse weather or error, the attribute state may be determined using samples over a longer timeframe.

When categorising individual rivers or lakes using the *E. coli* attribute, the 95th percentile criteria may not apply if the council considers there is insufficient monitoring data to establish a precise 95th percentile. This is to acknowledge that monitoring data at this scale may be limited, and may not be sufficient to model the 95th percentile precisely.

Human health risks associated with each *E. coli* attribute state

For more information about each attribute state, and its relationship to human health risk, see the tables below. They explain what the proposed categories mean for people’s risk of getting sick when they swim.

Table 2: Risk of Campylobacter infection based on swimming categories

Category	Percentage exceedances over 540 cfu/100ml	Percentage exceedances over 260 cfu/100ml	Median concentration (cfu/100ml)	Description of swimmability – risk of Campylobacter infection (based on <i>E. coli</i> indicator)
Blue / Excellent	<5%	<20%	≤130	For at least half the time, the estimated risk is <1 in 1,000 (0.1% risk) Less than 5% of the time, the estimated risk is ≥50 in 1,000 (>5% risk) Overall risk across all time (not taking season or weather into account) is less than 1%

Category	Percentage exceedances over 540 cfu/100ml	Percentage exceedances over 260 cfu/100ml	Median concentration (cfu/100ml)	Description of swimmability – risk of Campylobacter infection (based on <i>E. coli</i> indicator)
Green / Good	5-10%	20-30%	≤130	For at least half the time, the estimated risk is <1 in 1,000 (0.1% risk) 5-10% of the time the estimated risk is ≥50 in 1,000 (>5% risk) Overall risk across all time is less than 2%
Yellow / Fair	10-20%	20-34%	≤130	For at least half the time, the estimated risk is <1 in 1,000 (0.1% risk) 10-20% of the time the estimated risk is ≥50 in 1,000 Overall risk across all time is less than 3%
Orange / Intermittent	20-30%	>34%	>130	20-30% of the time the estimated risk is ≥50 in 1,000 (>5% risk) Overall risk across all time is less than 7%
Red / Poor	>30%	>50%	>260	For more than 30% of the time the estimated risk is ≥50 in 1,000 (>5% risk) Overall risk across all time is less than 12%

Table 3: Average risk from each swimming category

Category	Average theoretical risk across all time (assessed by Massey University) ⁶	Average theoretical risk across all time (assessed by NIWA) ⁷	Average risk per exposure at monitored sites ⁸	Average risk during normal flows ⁹
Excellent	0.9%	1.0%	0.4%	0.3%
Good	1.9%	2.4%	1.7%	1.3%
Fair	3.1%	3.1%	2.6%	2.0%
Intermittent	More than 8.0%	More than 3.1%	More than 6.8%	More than 5.4%
Poor	More than 15.0%	More than 3.1%	More than 11.7%	More than 10.6%

⁶ Based on analysis by Dr Jonathan Marshall of Massey University, available on github.com.

⁷ Based on analysis by Dr Graham McBride of NIWA and Jeff Soller of Soller Environmental, available on the [NIWA website](https://www.niwa.co.nz).

⁸ Based on analysis by the Ministry for the Environment.

⁹ This is the level of risk if people follow the category advice and avoid swimming during high flows (determined as three times normal flows) based on analysis by the Ministry for the Environment.

5.2 State of the environment and surveillance monitoring

The Freshwater NPS requires councils to adopt procedures for two kinds of monitoring for *E. coli* levels. These are:

- (i) Representative monitoring of a freshwater management unit, to establish attribute state, set freshwater objectives, and monitor progress towards achieving them (Policy CB1(a)) – these are existing requirements since 2014; and
- (ii) Surveillance monitoring of microbial health risks to people at primary contact sites, to identify periods of high *E. coli* concentrations at specific sites, and warn the public (Policy CB1(aa)(i) and Appendix 5) – these are new requirements as of 2017.

Sites for the two monitoring purposes (state of the environment monitoring to establish attribute state and surveillance monitoring to assess public health risks) may overlap.

Reporting on improvements to specified rivers and lakes, and primary contact sites

Policy E1(g) requires councils to compile and make publicly available a review of improvements to specified rivers and lakes, and primary contact sites, at least every 5 years. This is similar to existing state of the environments monitoring reporting requirements under the RMA, while requiring additional information about improvements to specified rivers and primary contact sites under Policy A5.

This reporting requirement has been added to the Freshwater NPS to ensure councils provide communities with regular updates about the state of specified rivers and lakes, and primary contact sites, and what has been done to improve them. While councils already report on the state of the environment and identify improvements, they will also need to make a clear link to what has been done to achieve these improvements. Making this reporting a national requirement means all communities are informed about whether the outcomes they want are being achieved, and how.

For more information about representative monitoring requirements, see [A Draft Guide to Monitoring](#) available on the Ministry for the Environment website.

The swimming maps and tracking progress toward the national target over time

The water quality swimming maps are an information tool which provides a consistent estimate of the baseline water quality as at 2017, these will be updated over time (while retaining the 2017 baseline) and are one method of tracking improvements at a national scale. The maps are not part of the Freshwater NPS, and do not hold any legal status. They have been designed to provide broad information to communities, and reflect the state of the water in terms of *E. coli* and planktonic cyanobacteria. They do not reflect whether there is public access to the water body, or whether other factors may affect the water body (eg, poor clarity or high weed growth).

Councils may provide additional monitoring data and analysis (such as summer only results, or excluding days people don't swim because of poor weather).

The water quality for swimming maps for *E. coli* in rivers are based on the regression modelling approach outlined in Snelder et al (2016). A separate model was constructed for each of the four statistics outlined in the Freshwater NPS *E. coli* attribute table human health.

The models were used to predict the values of each statistic for each segment of a digital representation of the national river network.¹⁰ These predictions are the basis for the river water quality for swimming maps. However, the 95th percentile model was excluded from the swimming maps because subsequent analysis showed that these predictions were unreliable. There is high uncertainty around predictions of the 95th percentile, due to the high variability in the underlying monitoring data associated with peak concentrations at any given site.¹¹ This imprecision cannot be reduced because 95th percentiles are by their nature rare events, and are therefore difficult to detect and estimate with discrete monitoring data. The grades shown on the swimming maps were derived by applying the criteria (tests) defined by the Freshwater NPS *E. coli* attribute table to the predicted values of the three retained statistics.

In compiling the final map we adjusted the modelled map grades to account for actual monitoring data, where this was available and was considered to provide a more accurate estimate of the infection risk.

We also adjusted the modelled data to ensure grades at network segments that represent monitoring sites were brought into line with the 95th percentile values calculated for those sites. Adjustments were made based on the following.

- Expert opinion from freshwater scientists.
- Fact-checking with regional councils.
- Actual data at a monitoring site. River network segments were adjusted to be consistent with all four *E. coli* statistics calculated from monitoring site data. Changes were made at and upstream of the monitoring site if a category was incorrectly assigned (ie, a grade had been assigned based on the three retained predicted statistics compared to the grade implied by the calculated values of the four statistics for the monitoring site). The calculated value of the 95th percentile was included in the grade assignment for segments representing monitoring sites provided the site had 5 years of data. The maps were adjusted to match the monitoring site category.
- The values for network segments adjacent to monitoring sites. If one segment was surrounded by segments with a higher or lower category, the reach was changed to the predominant category to account for model error (ie, the reach was only just over or under a category threshold).

It was necessary to adjust the modelled data in places, because the statistics calculated for a site from the monitoring data are the best measure of the swimming grade at that site and are a more accurate assessment than the model predictions. Since the maps are a public health indicator it is important that they communicate the most reliable information. The modelled data provides the

¹⁰ River Environment Classification version 1

¹¹ Technical note on initial assessment of modelled *e coli* data.

best estimate of the broad scale pattern of water quality for swimming. However, monitoring site data should always be the first preference for understanding local-scale water quality.

It is planned that the 'water quality for swimming' maps will be reviewed and updated annually.

Surveillance monitoring

The surveillance monitoring requirements are based on the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* (the Guidelines). Changes to the Freshwater NPS do not replace the Guidelines. The Guidelines provide relevant information on good practice when managing health risks at swimming sites (eg, sanitary surveys).

Surveillance monitoring is required at all sites identified in a regional plan as a 'primary contact site', or a site that is representative of a one or more primary contact sites. Given the purpose of the surveillance monitoring is to understand the potential effects of the microbiological contamination on human health, the representativeness should be focussed on the representativeness of the sampling site from a public health perspective. Thus, would the health risks at the sampling site provide a reasonable indication of the health risks at another site?

Councils may choose to supplement their surveillance monitoring with predictive modelling or sanitary surveys to help them assess actual health risks present in the catchment.