

# Memorandum

28 March 2018

<b>To:</b>	<b>Environment and Community Committee</b>
<b>Subject:</b>	<b>Setting Draft Swimmability Targets for Larger Rivers and Lakes in the Auckland region</b>
<b>From:</b>	Jonathan Benge, Wai Ora Partnerships Team Manager

## Purpose

1. To inform the committee of a draft target for swimmability for Auckland's larger rivers.

## Summary

- The National Policy Statement for Freshwater Management requires regional councils and unitary authorities to prepare draft regional targets to improve the quality of fresh water. The draft regional targets must be made publicly available by 31 March 2018, with final regional targets publicly available by 31 December 2018.
- Draft regional targets only apply to E. coli (for rivers) and cyanobacteria (for lakes). See the full list of applicable rivers and lakes in Attachment A and map in Attachment B.
- A governance group and taskforce were created comprising Ministry for the Environment and Ministry for Primary Industries officials and staff from regional councils and unitary authorities. This taskforce supported councils to set the draft targets. They have developed information for each region in a technical report that will be made publicly available before 31 March 2018.
- Currently, 23 per cent of the length of applicable rivers and 97 per cent of applicable lakes in Auckland are classified as swimmable, according to criteria used by the Ministry for the Environment.
- A draft regional target for the Auckland region of 30.5 per cent by 2030 has been identified based on initial modelling by the governance group, with input from Auckland Council staff. This is an increase in swimmable length of river of 7.5 per cent. Lakes were not modelled and therefore the target only applies to rivers.
- Auckland Council is currently undertaking its own modelling work, including the development of a regional contaminant load model, which will enable final targets to be set with a higher degree of accuracy.
- The final targets will be brought to Environment and Community Committee for their approval by December 2018.
- Attachment C provides an overview of the draft regional target and Auckland Council priorities and work programmes to improve freshwater quality. This attachment will be published on the Auckland Council website on 31 March 2018.

## Context/Background

### *National Context and Background*

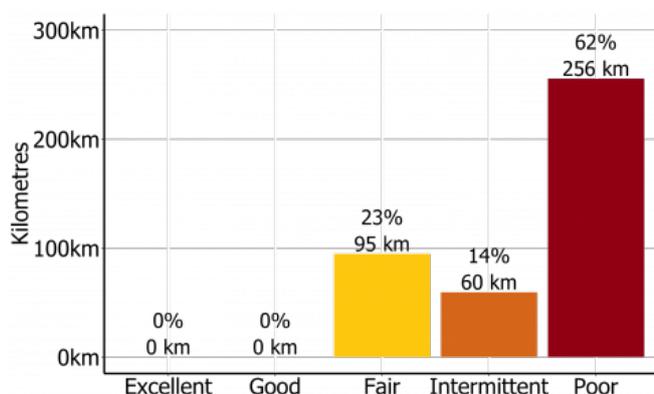
1. The National Policy Statement for Freshwater Management requires regional councils and unitary authorities to prepare draft regional targets to improve the quality of fresh water (Policy A6). The draft regional targets must be made publicly available by 31 March 2018, with final regional targets publicly available by 31 December 2018.
2. The regional targets must contribute to achieving the following national targets:
  - 80 per cent of specified rivers and lakes are suitable for primary contact (e.g. swimming) by 2030; and

- 90 per cent are suitable by 2040.
3. The term “specified rivers and lakes” is defined in the national policy statement as rivers that are fourth order or above<sup>1</sup>, i.e. larger rivers and lakes with a perimeter greater than 1,500 metres.
  4. A full list of applicable rivers in Auckland is shown in Attachment A and a map in Attachment B.
  5. There are a wide range of factors and contaminants that affect swimming, however, the requirement to set a draft regional target relates only to E. coli (for rivers) and cyanobacteria (for lakes) as indicators of the risk to human health.
  6. To help develop these regional targets central and local government established a governance group and taskforce comprising Ministry for the Environment and Ministry for Primary Industries officials and staff from regional councils and unitary authorities.
  7. The taskforce has recently prepared the report ‘Regional information for setting draft targets for swimmable lakes and rivers’. The report provides information on progress across the country towards the national targets as a result of councils’ work programmes. It will be released publicly when draft targets are published on 31 March 2018.
  8. The report relies on scientific modelling by the National Institute of Water and Atmospheric Research (NIWA) using a national version of the Catchment Land Use for Environmental Sustainability water quality model, which is relevant to rivers only.
  9. The report identifies the work committed in each region and gives an indication of the expected improvement in water quality for swimming. It forms the basis for the taskforce’s recommendation for an interim (draft) target for the Auckland region.
  10. Attachment C provides an overview of the draft regional target and Auckland Council priorities and work programmes to improve freshwater quality. This attachment will be published on the Auckland Council website on 31 March 2018.
  11. Further detail regarding the national context and background is available in Attachment D.

## Discussion

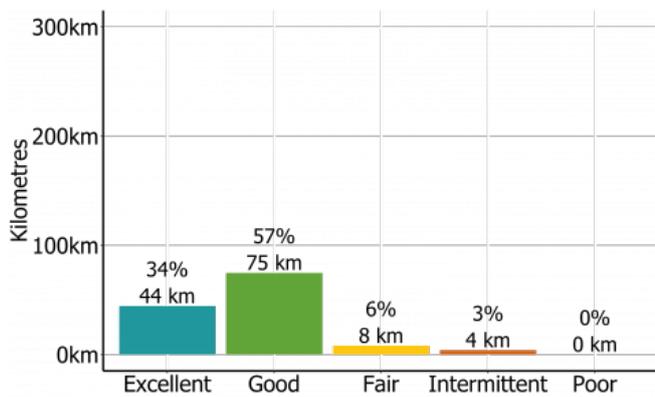
### *Current State of Auckland’s Applicable Rivers and Lakes*

12. Based on the national scale modelling, as of 2017, 23 per cent of applicable rivers in Auckland are considered safe for swimming (based only on modelled concentrations of E. coli). For lakes (with a perimeter greater than 1500m), 97 per cent are considered to be safe for swimming (based on biovolume of toxic algae and E. coli in any streams which feed the lakes). Figure 1 shows the percentage of rivers in Auckland in each swimmability category, whilst Figure 2 does the same for lakes.



**Figure 1. Percentage of length of Auckland river in each swimmability category.**

<sup>1</sup> A first order stream is the smallest of the streams and has no tributaries. First order streams, which may not be permanently flowing, flow into second order streams, which flow into third order streams and so on.



**Figure 2. Percentage of Auckland lake perimeter in each swimmability category.**

### *Taskforce Recommendation*

13. Modelling carried out on behalf of the governance group and taskforce has shown that a projected improvement of 7.5 per cent of the total river length being swimmable is realistic and achievable for Auckland's rivers by 2030. Lakes were not modelled and therefore the target only applies to Auckland's rivers.
14. The recommended draft target is based on the best available information as of late 2017, based on the current work programmes the council has in place.
15. Attachment C provides an overview of the draft target and Auckland Council's current priorities and work programmes to improve water quality. It will be published on the Auckland Council website on 31 March 2018.

### **Next steps/implementation**

#### *Final Targets and Improved Data*

16. The final targets will be brought to Environment and Community Committee for their approval by December 2018.
17. Auckland Council is developing a regional contaminant load model, with initial outputs due to be delivered in September 2018. The model will enable us to better calculate the pathogen inputs to Auckland's rivers and develop effective solutions. In turn, this will inform the setting of final targets for primary contact.
18. Staff will use the regional contaminant load model to determine whether an improvement of 7.5 per cent is realistic, and what additional projects or interventions might be needed to further increase freshwater swimmability.
19. The regional modelling will be supported by investigations such as microbial source tracking to identify sources of faecal contamination to enable appropriate targeting of interventions.
20. Whilst recognising that significantly more swimming occurs in coastal waters, Auckland Council is currently identifying freshwater sites where Aucklanders swim. We can use this to take a public health risk-based approach to prioritising projects and activities to improve swimmability.

#### *Costs*

21. The draft target improvement of 7.5 per cent assumes that planned work and existing initiatives (for example, the regional Waterway Protection Fund and similar local board initiatives) will continue until 2030. However, when setting the final targets council will have a more detailed understanding of the costs required to achieve an agreed level of improvement.
22. In addition, prior to setting the final targets, Auckland Council will have certainty on any increased level of funding through the draft Long-term Plan 2018-2028 and on the status of national regulations for stock exclusion. These can then be factored into the modelling of potential increases in freshwater swimmability.

### *Local Board Engagement*

23. Staff have sought feedback on the draft target from the following local boards which have applicable rivers within their boundaries:
- Franklin
  - Great Barrier
  - Henderson – Massey
  - Manurewa
  - Maungakiekie – Tāmaki
  - Ōtara-Papatoetoe
  - Papakura
  - Rodney
  - Upper Harbour
  - Waitākere Ranges.
24. Staff received similar feedback from each local board which has been summarised as:
- All local boards understand the constraints for setting a draft target different to that recommended by the taskforce.
  - Concern expressed that the swimmability target only addresses E. coli and no other contaminants that may affect swimming.
  - All local boards would like to be kept informed and given the opportunity to contribute to the setting of final targets later in 2018.
25. A follow up workshop will be scheduled with affected local boards for late 2018 when final swimmability targets can be refined.

### *Mana Whenua Engagement*

26. Wai Māori (freshwater) has an inherent mauri (life-force) and is valued for its fundamental role as a life-sustaining force for all life.
27. Mana whenua representatives were engaged through the Infrastructure and Environmental Services Monthly Information Hui in February 2018. Feedback can be summarised as:
- The group acknowledged the rationale for the draft target and the need for better data to inform the setting of final targets.
  - They would like to understand the contaminant load model that is under development.
  - They want to help develop the final targets.
28. A workshop with mana whenua will be scheduled for June 2018 to provide an overview of the contaminant load model and a follow up workshop will be scheduled for late 2018 when final swimmability targets can be refined.

### *Adoption of Final Targets*

29. In addition to the work above, Auckland Council staff will continue to work with the national taskforce and other regional councils to enable sharing of information and best practice. This will ensure Auckland is taking a consistent approach to other councils and utilising the best information available.
30. Once the final targets have been identified, these will be presented to Environment and Community Committee for their adoption. They will then be published by 31 December 2018.

### **Attachments**

- Attachment A: List of applicable rivers and the local board in which they are situated.
- Attachment B: Map of applicable rivers and lakes.
- Attachment C: Draft Swimmability Target.
- Attachment D: National Context and Background.

**Attachment A****Applicable rivers and the local board in which they are situated.**

<b>River</b>	<b>Local Board</b>
Cosseys Creek	Franklin
Hingaia Stream	Franklin
Hunua Stream	Franklin
Mangawheau Stream	Franklin
No Name	Franklin
Ngakoroa Stream	Franklin
Orere River	Franklin
Orere Stream	Franklin
Papakura Stream	Franklin
Symonds Stream	Franklin
Taitaia Stream	Franklin
Turanga Creek	Franklin
Tutaenui Stream	Franklin
Wairoa River	Franklin
Whangapouri Creek	Franklin
Kaitoke Creek	Great Barrier
Whangapoua Creek	Great Barrier
Henderson Creek	Henderson - Massey
Momutu Stream	Henderson - Massey
Opanuku Stream	Henderson - Massey
Oratia Stream	Henderson - Massey
Swanson Stream	Henderson - Massey
Papakura Stream	Manurewa
No Name	Maungakiekie - Tāmāki
Otara Creek	Ōtara - Papatoetoe
Hays Stream	Papakura
Hingaia Stream	Papakura
Ngakoroa Stream	Papakura
Papakura Stream	Papakura
Slippery Creek	Papakura
Symonds Stream	Papakura
Araparera River	Rodney
Ararimu Stream	Rodney
Brigham Creek	Rodney
Dairy Stream	Rodney
Haruru Stream	Rodney
Hoteo River	Rodney
Kaipara River	Rodney
Kaitoto Stream	Rodney
Kaukapakapa River	Rodney
Kourawhero Stream	Rodney
Kumeu/Kaipara River	Rodney
Mahurangi River	Rodney
Mahurangi River (Left Branch)	Rodney
Mahurangi River (Right Branch)	Rodney

Makarau River	Rodney
Matakana River	Rodney
Onehunga Stream	Rodney
Pakiri River	Rodney
Poutawa Stream	Rodney
Puhoi River	Rodney
Rangitopuni Stream	Rodney
Rauhori Stream	Rodney
Tahekeroa River	Rodney
Tikokopu Stream	Rodney
Waikoukou Stream	Rodney
Waitapu Stream	Rodney
Waiteitei Stream	Rodney
Waitoki Stream	Rodney
Waiwera River	Rodney
Waiwhiu Stream	Rodney
Whangaripo Stream	Rodney
Brigham Creek	Upper Harbour
Lucas Creek	Upper Harbour
Huia Stream	Waitākere Ranges
Karekare Stream	Waitākere Ranges
Kumeu/Kaipara River	Waitākere Ranges
Opanuku Stream	Waitākere Ranges
Waitakere River	Waitākere Ranges

# Attachment C. Draft Regional Targets for the Auckland Region

## Introduction

The National Policy Statement for Freshwater Management (as amended in August 2017) directs all regional councils (including unitary authorities) to set draft regional targets to improve the quality of rivers and lakes so they are suitable for swimming and other activities that require immersion in water.

There are a wide range of factors and contaminants that affect swimming. However, the requirement to set a draft regional target relates only to E.coli (for rivers) and cyanobacteria (for lakes) as indicators of the risk to human health.

All regional councils and unitary authorities have worked together to use the best information available to identify:

- The improvements that will be made to water quality in rivers in their respective regions under programmes that are planned or underway – i.e. current commitments.
- When the anticipated water quality improvements will be achieved.
- The likely costs of all interventions and where these costs will fall.

A report on these theoretical improvements and costs, presented region by region, is available on the Ministry for the Environment's website. The assumptions and limitations of the modelling approaches taken are described in the report.

This document sets out the draft target for Auckland's major (fourth order or higher) rivers and the process Auckland Council will follow to develop a final regional target, as required by 31<sup>st</sup> December 2018.

## Regional context and focus

### Auckland Context

Auckland is mostly known for its urban centre, however this only represents about 11 per cent of the region's land area.<sup>1</sup> Nearly half the region is farmland, and the rich soils around Pukekohe and Franklin are among the nation's most productive for agriculture. Another quarter of Auckland is covered by native vegetation, with the remainder being exotic forests and other uses.<sup>2</sup>

Catchments in the Auckland region are generally small, with short first- or second-order rivers, and intermittent streams. Fewer than 10 per cent of these drain urban areas. Most come from rural farmland, native bush or exotic forests.<sup>3</sup>

Despite covering less than 2 per cent of New Zealand's total land area, the Auckland region contains over a third of the population and is growing at a very high rate. This population growth is driving significant land use change in Auckland's rural areas with productive rural land uses such as dairying, pastoral and horticulture declining in favour of suburban development and lifestyle blocks. The resulting housing and infrastructure development,

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<sup>1</sup> Ministry for the Environment. n.d. *Environmental Reporting: Area of land cover 1996–2012*. Retrieved from <https://data.mfe.govt.nz/table/2478-land-cover-area-of-land-cover-1996-2001-2008-and-2012/data/> (10 July 2017).

<sup>2</sup> Land Air Water Aotearoa [www.lawa.org.nz/explore-data/auckland-region/](http://www.lawa.org.nz/explore-data/auckland-region/)

<sup>3</sup> LAWA

increasing vehicle numbers and delivery of wastewater services places severe pressures on freshwater quality, particularly with regard to sediment, metals and other contaminants associated with urban areas.<sup>4</sup>

*E. coli* levels do not meet guidelines for swimming or other primary contact recreation in many Auckland rivers. Health risks are also evident at popular beaches, to varying degrees, where the majority of swimming takes place. In urban areas, this is typically the result of wastewater overflows and contaminated stormwater during rainstorms. Rural streams generally have better water quality, although they also face problems with elevated levels of nutrients, sediment and *E. coli* in some areas of more intensive agriculture and towns with aging or improperly maintained septic systems.

The overall swimmable state of the Auckland region's rivers is 23% swimmable (that is, 23% of rivers that are fourth order or larger are currently considered safe in terms of *E. coli* levels). For lakes with perimeters greater than 1500 metres, 97% are currently considered safe in terms of cyanobacteria levels.

### **Regional Priorities:**

Auckland Council's priority is to manage faecal contamination using a public-health, risk-based approach. The approach is to minimise the risk of people getting sick as a result of being in contact with water containing faecal contamination.

In the Auckland region the risk is not limited to rivers and is often heightened in coastal waters where the majority of swimming occurs.

Auckland Council launched Safeswim in 2017 to report on bathing beach water quality on an almost live basis. Safeswim communicates health risk to the public from immersion and highlights areas for investigation, remediation and investment. Safeswim currently focusses on coastal waters as this is where the majority of swimming takes place in Auckland.

Auckland Council has proposed a water quality targeted rate in the long term plan for 2018-2028. This would generate \$400 million towards funding a Water Quality Improvements Programme including:

- reducing wastewater overflows into the Waitematā Harbour from hundreds of events to six or less each year.
- reducing stormwater volumes into the Manukau Harbour.
- reducing contaminants such as litter, sediments, metals and oils in stormwater across the region, and in the South Kaipara Harbour.
- improving water quality and creating healthy habitats for plants and animals in streams across the region.
- establishing a system for proactive monitoring of onsite waste water treatment systems such as septic tanks.

### **Existing Work Programme:**

Auckland Council is currently implementing a range of measures to reduce health risk from faecal contamination associated with swimming.

Upgrades are planned for both of Auckland's major point sources:

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<sup>4</sup> Implementation Review, Auckland Chapter

- The Warkworth wastewater treatment plant will stop discharging treated wastewater to the Mahurangi River. Instead, wastewater will be transferred to an upgraded treatment plant at Snells Beach and discharged into coastal waters adjacent to Martins Bay. Construction expected is expected to be complete by 2022.
- The Wellsford wastewater treatment plant will be upgraded to an advanced wetland treatment process. This upgrade was successfully consented in November 2017.

In areas with combined wastewater and stormwater networks, the council has placed emphasis on the use of enlarged interceptor systems to manage wastewater overflows, combined with localised sewer separation as part of long-term infrastructure upgrades. Projects include:

- The Central Interceptor, a wastewater tunnel that will run between Western Springs and the Mangere Wastewater Treatment Plant.
- Okahu Bay stormwater and wastewater separation project.

Auckland Council is currently supporting rural communities on a number of stock exclusion and riparian planting projects (to better manage sediment, E.coli and other contaminants entering waterways) throughout rural Auckland, such as:

- Auckland Council's Waterway Protection Fund for fencing and planting, to prevent livestock having free access to waterways, will match up to 50 per cent of project costs on private land in priority catchments.
- The Rodney Local Board's Healthy Harbours and Waterways Fund will provide \$230,000 to match fund 46,000 new plants and 322 km of new fencing aimed at increasing swimmability in Mahurangi, Makarau and Upper Kaipara River catchments.
- The Lower Kaipara River Land Owner Collective Project supports land owners to manage river banks.
- Support community organisations such as the Wairoa landcare community group and Forest Bridge Trust to work with local land owners to increase planting and fencing.

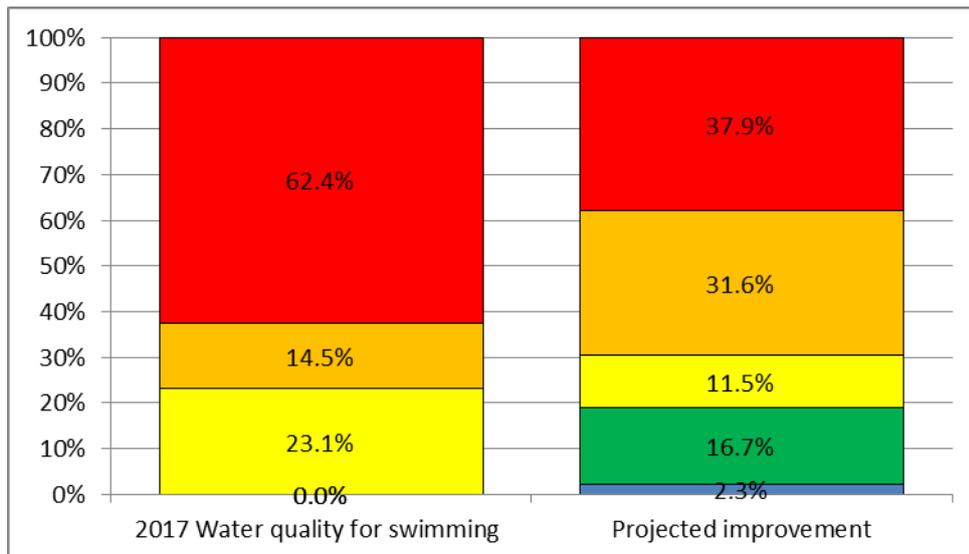
The Auckland Unitary Plan requires stock exclusion from water sources on intensively grazed farm land (where a stocking rate is equal or more than 18 stock units) from 2021 onwards and from intermittent streams from 2026 onwards. The Auckland Unitary Plan also introduces new rules for farm effluent storage and disposal. The measures and behaviours required by the plan should reduce levels of E. coli originating from farms.

## Draft regional targets

The draft swimmability targets for the Auckland region, based on the predictive modelling of programmes underway, are for 30.5% of rivers that are fourth order or larger to be in the blue, green or yellow category in terms of *E. coli* by 2030, shown in the graph below.

E.coli is used as an indicator of the risk to human health presented when swimming in a river, represented as five attribute states (i.e. A, B C, D and E) each represented by colour blue, green, yellow, orange and red respectively.

The draft target of 30.5% is based on modelling using the best available information as of late 2017 which indicates that Auckland can, under current commitments, achieve an increase in swimmable length of river of 7.5 per cent by 2030.



## Regional process from here

### Improved Data

Auckland Council is developing a regional contaminant load model, due to be delivered in September 2018. The model will enable Auckland Council to better calculate the pathogen inputs to Auckland's rivers and develop effective solutions. In turn, this will inform the setting of final targets for swimmability by 31<sup>st</sup> December 2018.

Staff will use the regional contaminant load model to determine whether an improvement of 7.5 per cent is realistic, and what additional projects or interventions might be needed to further increase freshwater swimmability.

The regional modelling will be supported where applicable, by investigations such as microbial source tracking to identify sources of faecal contamination to enable appropriate targeting of interventions.

Whilst recognising that significantly more swimming occurs in coastal waters, Auckland Council is currently identifying freshwater sites where Aucklanders swim. We can use this to take a public health risk based approach to prioritising projects and activities to improve swimmability.

### Costs

The draft target improvement of 7.5% in large rivers assumes that planned work and existing initiatives (for example, the Waterway Protection Fund and similar Local Board initiatives) will continue until 2030. However, on setting the final targets we will have a more detailed understanding of the costs required to achieve an agreed level of improvement.

In addition, prior to setting the final targets, Auckland Council will have certainty on any increased level of funding through the proposed water quality targeted rate included in the Long-term Plan 2018-2028 and on the status of national regulations for stock exclusion. These can then be factored into the modelling of potential increases in freshwater swimmability.

## Attachment D

### National Context and Background

On 23 February 2017, the Government announced its proposals to amend the National Policy Statement for Freshwater Management (NPS-FM) and introduce a national (non-statutory) target for swimmable lakes and rivers (*Clean Water: 90% of lakes and rivers swimmable by 2040*). The Hon Dr Nick Smith (as Minister for the Environment) wrote to all regional councils and unitary authorities on 28 February 2017 to inform them of the national target and to “encourage input and an early start to the implementation of these ambitious goals.”

After considering submissions to the proposals in *Clean Water*, the Government made a suite of amendments to the NPS-FM, which were gazetted in August 2017. These amendments included setting a national target for water quality improvement in rivers and lakes as follows:

- 80% of specified rivers and lakes are suitable for primary contact (e.g. swimming) by 2030; and
- 90% are suitable by 2040.

The term “specified rivers and lakes” is defined in the NPS-FM as rivers that are fourth order or above and lakes with a perimeter greater than 1,500 metres.<sup>1</sup> Primary contact is defined as people’s contact with water that involves immersion, including swimming.

To achieve the national targets, the NPS-FM directs regional councils and unitary authorities to set regional targets. Draft regional targets must be made available to the public by 31 March 2018 and final targets made available by 31 December 2018. The NPS-FM does not specify whether these regional targets should be for the 2030 or 2040 timeframe.

To help councils respond to the requests for information and develop their regional targets as directed in the NPS-FM, central and local government established a governance group and taskforce comprising MfE and MPI officials and staff from regional councils and unitary authorities. The governance group has been responsible for coordinating the sector’s response to the policy proposals more generally and overseeing the work of the taskforce. The taskforce has focused on a programme of work to collect the information needed to achieve the deadlines set by government.

Some regional councils have raised concerns with the taskforce about the national targets. The concerns include:

- The target’s focus on *E. coli* and cyanobacteria (human health attributes in the NPS-FM) as measures of suitability for swimming. In some regions, the community outcomes sought will mean other contaminants such as nitrogen, phosphorus and sediment may be a higher priority.
- There is a risk that prioritising actions to achieve the national targets for swimming will affect the process of identifying other community values (such as irrigation or mahinga kai) and setting freshwater objectives and limits for those values as required under the NPS-FM.
- The method of assessing and reporting *E. coli* takes no account of seasonal effects that influence when people swim, or whether there is any public access to the rivers and lakes that are part of the target.

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<sup>1</sup> A first order stream is the smallest of the streams and has no tributaries. First order streams, which may not be permanently flowing, flow into second order streams, which flow into third order streams and so on.

The taskforce will continue to discuss these wider issues related to setting and achieving the targets and work with government officials to resolve them.

Developing regional targets is a challenging process because of delays and uncertainties relating to the Government regulation on stock exclusion, and the work committed to by the coalition Government on seasonality for swimming. Furthermore, while there are areas where the science can be improved, for example, the ability to model all four criteria for *E. coli* results in rivers. It is unlikely these matters will be resolved over the next six months. The taskforce feel that these uncertainties should not prevent councils making the best estimations possible with the tools and knowledge available to meet the deadline set in the NPS-FM.

The governance group has interpreted the NPS-FM direction as being that the draft targets should be set for the 2030 target date, with the final targets, which must be made available by 31 December 2018, to be for both 2030 and 2040. This reflects that there has been insufficient time for consultation on where water quality improvements should be focussed and how quickly any mitigations works should be implemented. Because of the timing issue the taskforce modelled the impact on water quality of existing programmes and initiatives.

The taskforce used the “water quality for swimming map” on the Ministry for the Environment website as a basis for establishing the extent of water quality improvements that will be required region by region, and the associated costs. Auckland Council along with other councils provided information on areas where the maps were inaccurate; the maps were adjusted accordingly and taken as a baseline of national river “swimmability”. We also provided the taskforce with information about the commitments to water quality mitigation work in the Auckland region in regional plans, long term plans, annual plans and asset management plans - the “committed work”. This committed work included investment in infrastructure and was assumed by the taskforce to include the stock exclusion requirements proposed by the Government in *Clean Water* in February 2017, although these have not yet been promulgated as national regulations.

The National Institute of Water and Atmosphere (NIWA) used the regional information to model the water quality improvements in rivers that should be achieved. The modelled improvements relate only to improvements in *E. coli* concentrations (a measure of the risk to human health) in rivers. They do not relate to improvements in lake water quality (due to modelling limitations) which are also required as part of achieving the swimmable lakes and rivers target, or to associated water quality improvements (such as nutrient levels or water clarity).

Estimations of the costs of the committed work have been modelled by Professor Graeme Doole of Waikato University.

The draft regional targets and how they fit with the wider programme of freshwater management for the Auckland region are set out in Attachment A.

The taskforce’s report “Regional information for setting draft targets for swimmable lakes and rivers” provides information on progress towards the national targets as a result of committed work programmes. It will be released publicly when draft targets are published on 31 March 2018. The report identifies the work committed in each region, and gives an indication of the expected improvement in water quality for swimming and the associated costs arising from that committed work.

The report relies on scientific modelling by NIWA using a national version of the Catchment Land Use for Environmental Sustainability (CLUES) water quality model, which is relevant to rivers only. Water quality improvements related to point-source discharge upgrades were included in the modelled estimations. For improvements that will arise from non-point source discharges, relevant information was provided to a mitigation expert panel who worked with

NIWA to determine the effectiveness of mitigations in our region. The mitigation interventions largely fell into three categories: stock exclusion, riparian planting and management of farm dairy effluent.

The water quality and economic modelling provides an estimate of how far each council's existing work programmes will go to meet the national targets and provides an informed interim (draft) target.

The assumptions and limitations of the modelling approaches taken are described in the report. The report was distributed to all regional councils and unitary authorities in December 2017 for review and comments.