

19 August 2016

Hon Dr Nick Smith
Minister for the Environment
Parliament Buildings
Wellington

Hon Nathan Guy
Minister for Primary Industries
Parliament Buildings
Wellington

Dear Ministers

You have asked the Land and Water Forum for advice on how the National Policy Statement on Freshwater Management (NPS-FM) could/should:

- Incorporate the Macroinvertebrate Community Index (MCI) as a mandatory measure of water quality;
- Address nitrogen as a nutrient;
- Provide for a better focus on “swimmability”.

The Forum has had the benefit of the work on these three issues carried out by the National Objectives Framework (NOF) Reference Group and associated Science Review Panel.

Our specific comments on each of the three matters are set out below.

Macroinvertebrates

Status quo and problem

Macroinvertebrate communities are an important component and indicator of the health of freshwater ecosystems. Ecosystem health is a compulsory national value in the NPS-FM. Macroinvertebrate measures are considered to be good indicators of ecosystem health.

The MCI is the most commonly used macroinvertebrate measure and is monitored by most regional councils. MCI is based on a well-established national dataset of macroinvertebrate samples that has been collected over many years, although the quality of the dataset varies across regions.

There is currently no macroinvertebrate attribute in the National Objectives Framework (NOF) leading to a concern that the NPS-FM does not provide sufficient consideration of the role of macroinvertebrates as a potential indicator for water quality and ecosystem health. There is a concern that inconsistent approaches will continue to be taken to the use of macroinvertebrate measures in local objective setting processes and in identifying the most effective management responses. There is a concern that this will result in negative environmental or economic outcomes.

The Forum's view

The Forum considered whether MCI should be added to the NPS-FM as a NOF attribute, or as a monitoring measure. It would be technically possible to develop a NOF attribute table for MCI. However, the links between what affects MCI scores and what is required to improve them is not straightforward or predictable at a broad regional or national scale. The Forum's preference is for MCI to be used as a compulsory monitoring tool to measure progress towards whether the NPS-FM objective to 'maintain or improve' the quality of fresh water is being met in terms of ecosystem health. **The mandatory monitoring requirement should have the following features:**

- **Regional councils to monitor, report and analyse MCI scores and trends**

To support implementation of the new requirement, consistent data gathering and reporting methods for MCI should become mandatory for councils. This would take into account the impacts of typical activities that would occur in various Freshwater Management Units (FMUs). This would help to improve robustness of macroinvertebrate data collection. The National Environment Monitoring Standards (NEMS) initiative is developing national standards for macroinvertebrate monitoring, including MCI, which could support the new monitoring requirement.

- **Regional councils to use monitoring information as a trigger requiring action if there is a downward trend in MCI scores or if MCI is below a particular threshold**

Downward trend – Many regional councils currently sample macroinvertebrates once per year, which means that robust trend information is derived only once several years of data is gathered. The monitoring requirement should have sampling intervals and trend analysis timeframes¹ that would be sufficient to deliver robust trend information.

Threshold – The Forum recommends that there should be a threshold that indicates if a waterbody is in poor ecosystem health. The Forum has been advised that an MCI score of 80 would be an appropriate and broadly scientifically defensible numeric threshold below which a waterbody could be considered to be in poor ecosystem health, and that this could vary marginally at a site scale.

- **Regional councils to investigate and develop an action plan to either maintain or improve MCI scores in the waterbody**

The Forum endorses a decision support tool for councils that is based on the flow chart in Appendix 1. The flow chart sets out the process to investigate the causal factors for an MCI

¹ i.e. the consensus is that there should be a requirement for a rolling mean of at least three years of data.

score being low or declining, and to develop an action plan to maintain or improve water quality. The key points in this process are:

- If the **natural state** MCI score in a waterbody is below 80, then the requirement is maintain MCI at that level.
- If the MCI score in a waterbody is below 80 for **human-induced reasons**, then the requirement is to develop an action plan to improve the MCI score.
- If there is a downward trend in MCI in a waterbody, then the requirement is to develop an action plan to reverse the trend.

- **Report to the public on the monitoring and actions**

There was also endorsement for the monitoring information and action plans to be made public.

- **There should be consistency in its application to waterbody types**

It is important to have consistent application of this requirement on different waterbody types, and not to have blanket exceptions. We have been advised that the new monitoring requirement should apply in both urban and rural environments.

There are two variants on MCI; the hard-bottom MCI and the soft-bottom MCI. The new requirement should apply to both of these stream types although it is important that where a soft-bottomed stream is **not naturally** soft-bottomed, the hard-bottom MCI variant should be used. The mandatory data gathering and reporting methods would need to address this.

There are, however, areas where MCI should not apply. The new monitoring requirement should not apply in non-wadeable rivers², standing water (wetlands, lakes), tidal reaches, or geothermal areas as the science is clear that the MCI does not work in these situations.

- **There should be good guidance to support implementation**

The Forum acknowledges that the drivers for MCI scores, and appropriate management responses, are complex. Good guidance to support any new monitoring requirement will therefore be critical. Guidance should include the proposed MCI bands table shown in Appendix 2. This guidance and information on MCI scores and trends would support community conversations about their aspirations for waterbodies. The narrative in the table in Appendix 2 would benefit from further scientific input and refinement over time, but this should not lead to implementation delays.

In addition, the Forum is supportive of the Ministry's programme to improve the MCI indicator for the medium term.

² The term 'wadeable' in this context is different from whether a waterbody is suitable for secondary contact recreation, which is sometimes referred to as 'wadeable'. Macroinvertebrate sampling methods have been developed in smaller streams and rivers that can be waded in i.e. 'wadeable'. Sampling is problematic in deeper rivers, referred to as non-wadeable rivers, which is why MCI does not work in these situations.

- **Relationship to previous recommendations**

The Forum's advice in this matter is contingent on the resolution of an outstanding matter relating to Appendix 3 of the NPS-FM. In its 2nd report the Forum made some recommendations on how objectives and limits should be set while recognising the constraints in significantly hydrologically modified catchments.³ These recommendations have not been addressed by the Government, in particular the use of a waterbody classification system. Instead the Government chose to deal with this issue through Appendix 3, which it has not yet developed.

Dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP)

Status quo and problem

The effects of nitrogen in waterbodies relate to:

- the ecosystem health effects from the growth of undesirable plants (e.g. slime – a type of algae known as periphyton) because nutrients affect plant growth; and
- the toxicity effects on ecosystem and human health.

There are several existing NOF attributes that cover these effects in rivers and lake ecosystems. Where a waterbody can support plant growth, it is important that nitrogen be managed at significantly lower levels to avoid undesirable plant growths than would be required to prevent toxicity effects. Undesirable plant growths are an important driver of poor ecological health; for example, some plant types affect dissolved oxygen, which is essential for aquatic life.

Best practice periphyton management requires considering DIN and DRP together as both are essential for plant growth. There are other site specific factors that influence what the appropriate maximum in-stream nutrient concentrations should be, such as flow, temperature and light. Robust and justified limits for nitrogen and phosphorus discharges need to be set off the back of robust in-stream nutrient concentrations having been set. However, the NPS-FM does not make these linkages explicit and this has led to a concern that the NPS-FM does not address this issue well enough. This could lead to litigation and/or negative environmental or economic outcomes.

The Forum's view

There should be a new requirement in the NPS-FM for councils to set maximum in-stream concentrations for dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP), as objectives in regional plans, to support the existing periphyton NOF attribute. This new requirement should make it clear that councils should set these concentrations with regard to downstream receiving environments. These new requirements would need to be supported by policy direction on the process that councils would follow to set DIN and DRP concentrations. An important part of this process is a series of decisions that need to be made about:

³ In particular, recommendation 10 of our second report states that: *Central and regional government should, when setting state objectives, consider the constraints in significantly hydrologically altered catchments. These catchments are those that have been modified by long-term major structures for hydro-generation, municipal water supply dams, and irrigation dams. This use category should be accommodated in a waterbody classification system.*

- Whether there are sensitive downstream receiving environments.
- Whether the site would never support problematic plant growths.
- If the site can support problematic plant growths, then what type would dominate (i.e. periphyton or something else).
- How to derive the maximum in-stream nutrient concentration ranges.
- How to determine the appropriate management response, including setting limits for the discharges of nitrogen and phosphorus.

The Forum endorses mandatory adoption of a decision support tool for councils, which would need to be developed, that is based on the flow chart in Appendix 3. The flow chart covers the steps above and also clarifies when the current nitrate toxicity attribute in the NPS-FM should or should not apply. The NPS-FM should be amended to include explicit language stressing that the nitrate toxicity attribute in the NOF is **not** a bottom line where there is the potential for problematic plant growths to occur (i.e. periphyton, macrophytes or phytoplankton).

The Forum also considered whether nationally defined numeric approaches for DIN and DRP might help to support implementation of the periphyton attribute. We have received advice that NOF attribute tables would not be credible or scientifically defensible as it is not feasible to deal with the range of site specific factors in a numeric, tabular way at a national level. This is because of the interaction between flow, temperature, light, and nutrients on plant growth, as well as the existence of sensitive downstream receiving environments. There would be significant environmental or economic risk of getting the numbers wrong.

The Forum was also wary of an approach which would set absolute maximum nutrient concentrations as the Forum does not want to provide an incentive to manage towards a lowest common denominator. For many rivers there could be negative environmental consequences. Neither of these approaches is recommended.

There is however benefit in a multi-variate look-up table for DIN and DRP concentrations, which should be provided in guidance to give councils and communities a broad idea of what nutrient concentration ranges may be appropriate in a variety of conditions. The look-up table would need to be developed. It would not be scientifically defensible for the look-up table to be used where there are significant abstractions, dams or diversions or where there are nutrient-sensitive downstream receiving environments. The mandatory decision support tool would need to cover when the look-up table should be used or should not be used.

Primary contact recreation

Status quo and problem

The Forum considered this issue in terms of activities involving *primary contact* with water, rather than just *swimming*, as there are many activities involving full immersion. This advice is also only about microbiological infection risk. Broader issues such as turbidity will be considered by the Forum in its next phase of work.

The NPS-FM currently deals with primary contact under its Appendix 1 compulsory national value *human health for recreation*. This value is concerned only with the health risk from pathogens and toxic algae arising from both primary and secondary contact activities.

The current NPS-FM Appendix 2 *E. coli* attribute table contains both a primary contact standard (which uses the 95th percentile) and a secondary contact standard (which uses the annual median). At present they are combined into one table.

While the NPS-FM therefore currently does contain a minimum primary contact standard - the bottom of the 'B' band of the *E. coli* attribute – councils and communities must decide for themselves whether to set this as an objective in their plans. The only compulsory requirement is the national bottom line for *E. coli*, which is currently only a secondary contact (or *wadeable*) standard.

There has been criticism that the current NPS-FM framework does not do enough to promote the community value and management of rivers for primary contact. This view was reflected in feedback on the recent consultation on the Ministry for the Environment's (MfE's) *Next Steps for Fresh Water* discussion document. The Forum shares this view.

The Forum's view

While not all of New Zealand's rivers have an acceptable microbiological infection risk for primary contact *all of the time*, most will for at least *some of the time*. The Forum therefore recommends an approach where councils and communities set objectives for, and assess the infection risk from, primary contact activities according to the proportion of time a waterway exceeds a primary contact *E. coli* threshold.

This approach involves two separate sets of requirements:

- a. setting objectives and assessing the attribute state according to the general level of microbiological infection risk using a new time-based primary contact *E. coli* attribute; and
- b. providing communities with more finely detailed site and time specific information on the level of infection risk from primary contact that they can use to decide when and where to engage in primary contact activities.

Although under this approach the national bottom line, by itself, would be less precautionary than the primary contact standard in the current MfE and Ministry of Health (MoH) microbiological guidelines, more finely detailed information on the specific times and places where waterways were likely to have a low infection risk would be required to be provided to the public, so they could make informed decisions about when and where to swim. A uniform, consistent sampling, monitoring and reporting regime would need to be made compulsory in order for this approach to work. This could be designed through the NEMS process referred to earlier in conjunction with MoH.

The Forum considered an example of a *time-based* attribute table (refer to Appendix 4). While there has been no agreement to specific band-levels or a bottom line, the Forum supports this approach in principle, subject to further consideration of whether MoH is comfortable with this risk-based approach to a human health issue. If this approach were progressed, further work would be needed

to ensure the band levels and national bottom line were scientifically robust and set at appropriate levels. The assessment of attribute-state should account for whether the times the water body is suitable for primary contact are times people actually want to use it.

A key advantage the Forum sees in this approach is that people would be able to use rivers for primary contact during typical summer conditions, which are currently classified as unsuitable due to conditions prevailing in winter, or conditions during flood flows.

This approach fits well within the existing NPS-FM by providing a national framework, with local community decision-making, the latter being crucial as communities should have real input into and ownership of the process and outcomes. By adopting this approach, more waterways would be able to be managed for primary contact without introducing a potentially extensive exceptions framework⁴ that might undermine the credibility of the NPS-FM.⁵ Community decision-making will be centred on the desired amount of time a waterway should meet the primary contact threshold, rather than a binary decision of whether to manage it for primary contact or merely “wadeability.”

Specific proposals

To give effect to this approach, the Forum recommends the following modifications to the way primary contact is dealt with in the NPS-FM (these work as a package and should be implemented together):

- The preamble and objectives A1 and A2 should be strengthened to reflect communities’ aspirations for primary contact in waterways.
- A new compulsory national value for primary contact should be inserted into Appendix 1 of the NPS-FM to make it clear that primary contact is of national importance (suggested wording for the new primary contact value is included in Appendix 4).
- Instead of a single *E. coli* attribute, there should be two – one reflecting a secondary contact *E. coli* standard and one reflecting a primary contact *E. coli* standard, so that at those times the infection risk from primary contact is too high, waterways are still managed to an acceptable risk level for secondary contact.
- Subject to testing and agreement from MoH and the relevant scientific experts, the new primary contact *E. coli* attribute should have a national bottom-line and band levels that vary according to the proportion of time a water body meets a primary contact *E. coli* threshold. [Note that the Forum has reached no agreement on what the national bottom line or band-levels should be].
- Alongside these modifications, uniform, systematic sampling, monitoring and reporting regimes for *E. coli* should be made compulsory.

⁴ In the course of its deliberations, the Forum considered a paper from officials outlining options requiring councils to either *opt-in* or *opt-out* of managing water bodies for primary contact. The Forum identified shortcomings with both these options. The time-based approach renders them redundant.

⁵ Although further work is needed to ascertain the current state – i.e. the proportion of time different rivers exceed the *E. coli* threshold – and the likely costs a new bottom line would impose.

- In the longer-term, the MfE/MoH Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas should be reviewed and updated with close involvement from MoH.

The Forum has also agreed to further consider primary contact during the next phase of its work. This will include defining aspects of primary contact other than microbiological infection risk – including aesthetic, access, clarity and cultural factors.

Concluding remarks

I would note that this advice is at a high level – it does not contain the detailed technical analysis considered by the Forum, nor detailed drafting advice. The advice was however developed after assessing a number of scientific and technical papers, which provide considerable detail on the problem and the options considered. You and your officials of course have these scientific and technical papers available for an understanding of the fuller reasoning behind the advice.

The approach that we have developed for each issue is aimed at resolving that issue. We believe they are appropriate, provide the right level of rigour, and strike a balance between national consistency and local decision-making. The approaches that we have proposed also sit together, in the sense that they represent the overall views of a broad membership. Partially implementing them risks the loss of consensus and the constituency for change which the consensus has generated.

The Forum also recognises that the NOF requires good science to populate it, and should recognise the way that the various attributes interact with each other and contribute to water quality outcomes in particular places. The Forum was very mindful of these factors when it considered the advice in this paper. We intend to consider these issues further and will report to you in 2017.

Finally, as with water management matters in general, these technical matters need to be seen within the broader framework within which the NPS-FM operates and is implemented. There are implementation challenges across all three of these issues including resourcing and capacity issues for some regional councils, and inconsistent interpretation of national guidance. There is also a need to make progress on decisions about Appendix 3 of the National Objectives Framework dealing with existing nationally important infrastructure.

As we have made clear in previous reports, and in our submission on ‘Next Steps’, the Government has a role in facilitating freshwater reforms through, among other things, encouraging greater national consistency where that is appropriate, and ensuring that councils are able to carry out their roles effectively. It is clear to the Forum that the rate and extent of some regional councils’ implementation of the NPS-FM is affected by the resources they need for their freshwater planning and management. The Forum will look to provide you with some specific ideas on these issues during 2017, but the Government will also need to consider these implementation issues as it works through the changes to the NPS-FM.

Finally, these are important enhancements to the NPS-FM. We understand that you intend to consult on changes to the NPS-FM in November, and promulgate changes before the middle of next year. We strongly support your intention to proceed quickly with enhancements to the NPS-FM.

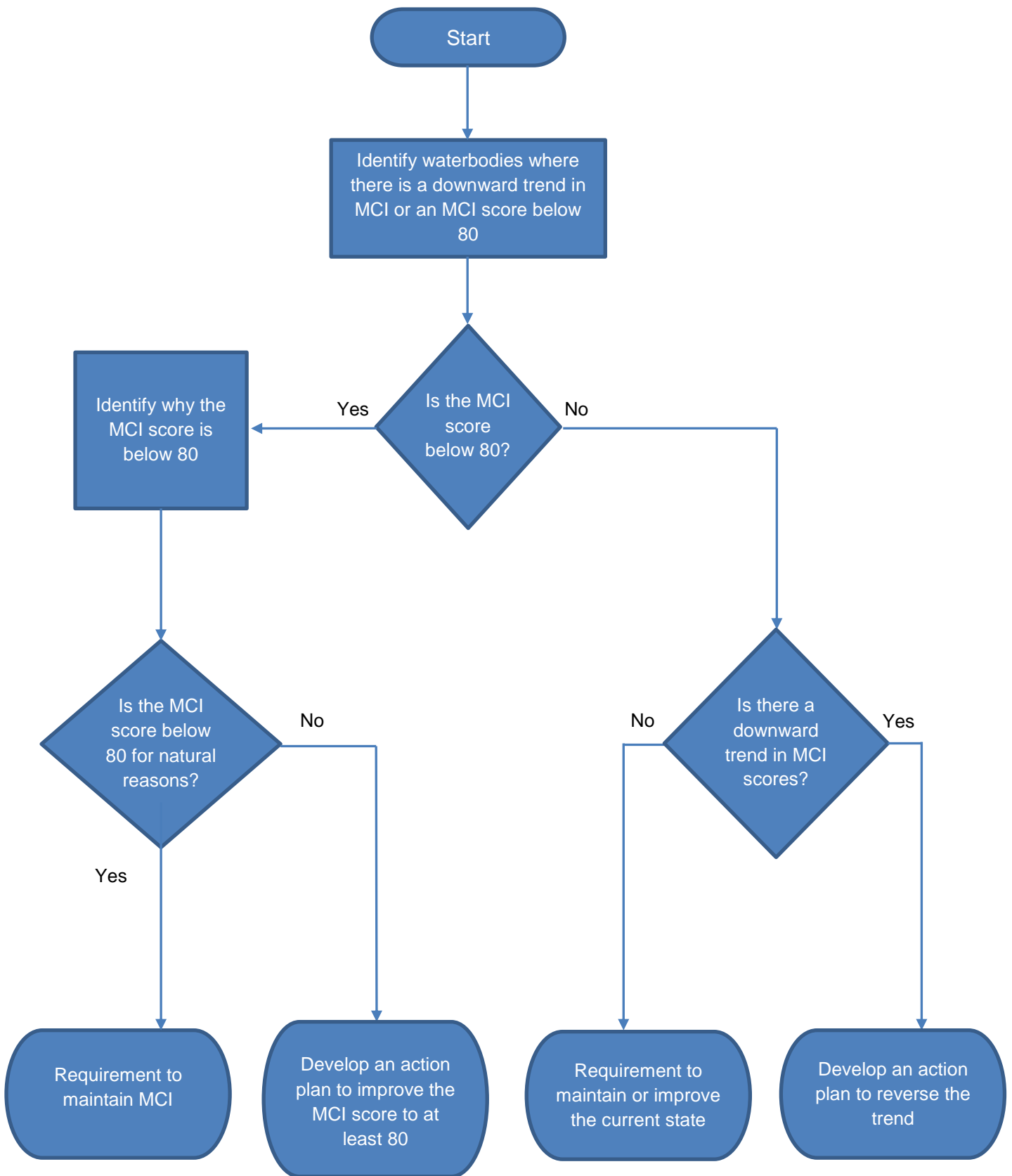
Yours sincerely

A handwritten signature in blue ink that reads "Hugh Logan". The signature is written in a cursive style with a large initial "H" and a long, sweeping underline.

Hugh Logan
Chair

Appendix 1

Flow chart of process to determine response to MCI score or trend



Appendix 2

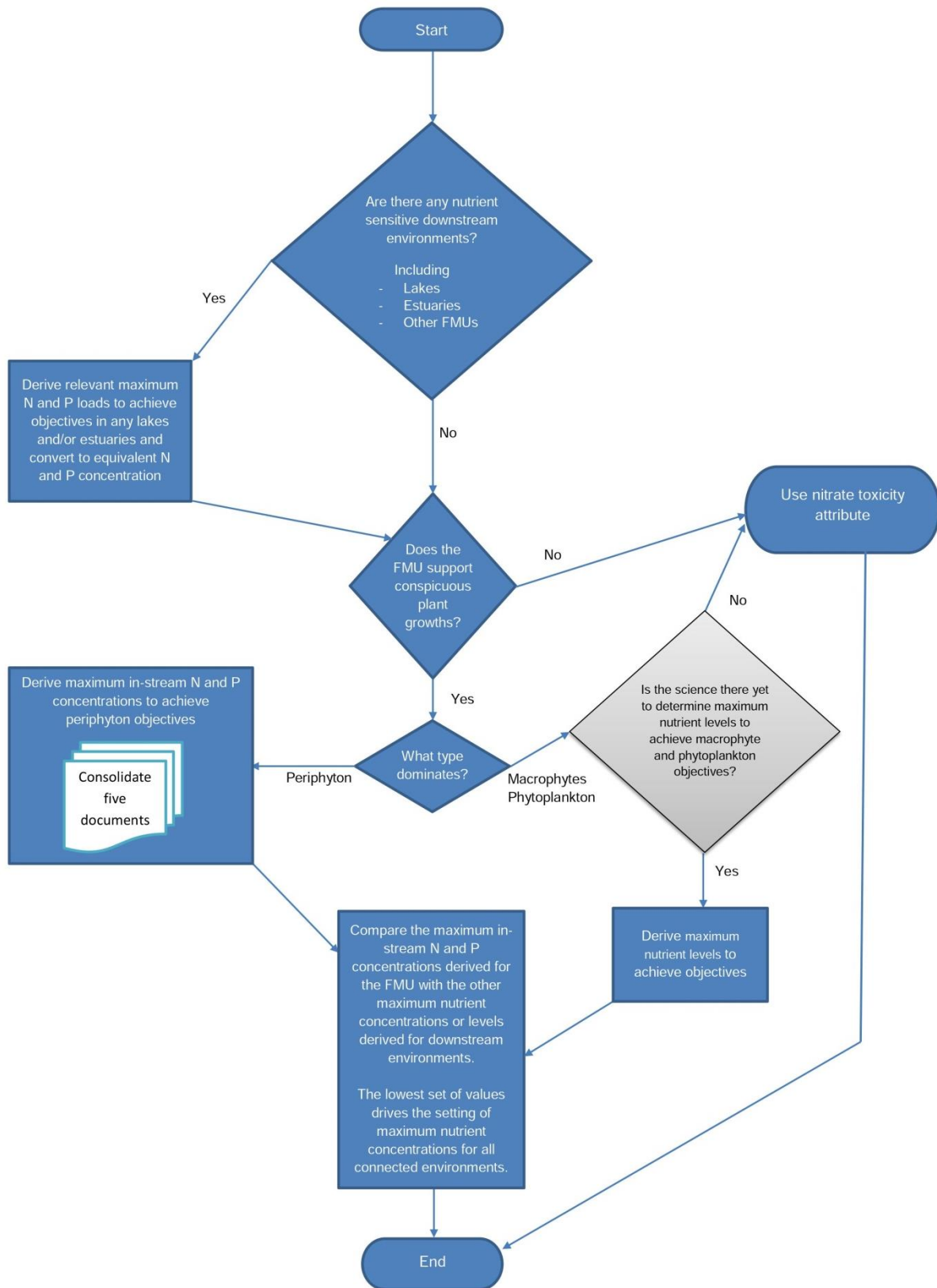
Indicative table for MCI guidance

National Value	Ecosystem Health	
Freshwater Body Type	Rivers (wadeable) – hard bottom and soft bottom.	
Measure	Macroinvertebrate Community Index	
Unit	Dimensionless units (up to a theoretical 200)	
State	Numeric State ⁶	Narrative State
A	≥120	Probable high quality environment where macroinvertebrate species composition is close to natural state most of the time
B	≥100 and <120	Probable good quality environment where human activities and/or natural disturbances cause some loss of sensitive macroinvertebrate species
C	≥80 and <100	Probable fair quality environment where moderately-highly tolerant macroinvertebrate species dominate The national threshold for what could be considered poor ecosystem health is 80.
D	<80	Probable poor quality environment where highly tolerant macroinvertebrate species dominate most of the time

⁶ Using a three year rolling mean

Appendix 3

Flow chart of process to determine maximum in-stream concentrations in a waterbody to support the periphyton objective



Appendix 4

A new compulsory national value for primary contact in Appendix 1 of the NPS-FM

The Forum recommends the following compulsory national value for *primary contact* be inserted into Appendix 1 of the NPS-FM:

The freshwater management unit can be used for primary contact activities, including swimming, kayaking, white-water rafting canoeing, waka ama, waterskiing and for mahinga kai.⁷

This value includes activities where people come into contact with the water, particularly where there is a high incidence of ingestion, inhalation, or intimate contact with water and water droplets such as swimming, kayaking and mahinga kai. In these freshwater management units, health risk assessments of catchment and instream contamination would indicate low risk of infection for those engaging in these activities. The appropriate quality of water would depend on the extent and kind of activity.

Time-based primary contact *E. coli* attribute [Indicative]

[Note: The Forum has agreed no specific band-levels or national bottom line for primary contact. The attribute table below is intended only to illustrate the approach in principle.]

Below is an example of a time-based primary contact *E. coli* attribute. The bands reflect the percentage of time an FMU meets the minimum primary contact threshold of 550/100mL.

Primary contact *E. coli* attribute – time-based [EXAMPLE ONLY]

Value	Primary contact recreation	
Freshwater Body Type	Lakes and rivers	
Attribute	<i>E. coli</i>	
Attribute Unit	Percentage of time that the 550/100mL <i>E. coli</i> threshold is met	
Attribute State	Numeric Attribute State	Narrative Attribute State
	Percentage of time the 550/100mL <i>E. coli</i> threshold is met	
A	>95%	Acceptable risk for primary contact at all times.
B	70-95%	Acceptable for risk for primary contact most of the time. Check LAWA or your regional council website.
C	50-70%	Sometimes suitable risk for primary contact. Check LAWA or your regional council website.
National Bottom Line	50%	
D	<50%	Risk not acceptable for primary contact most of the time.

⁷ Clarification on Mahinga Kai – refers to the area where the food is gathered and also the gatherer of the food and therefore includes the person's health