Date: 19 May 2017

MEMORANDUM

FROM: Ned Norton (LWP)

TO: Lois Easton (Group Manager Environmental and Regulatory Services, Gisborne District Council)

SUBJECT: REVIEW OF WAIPAOA CATCHMENT PLAN LIMITS

Purpose

1 The purpose of this memo is to consider the approach that should be taken to the setting of freshwater quality objectives, limits, targets and methods through the Waiapoa Catchment Plan process, and also to give you my thoughts generally on this topic now that I have read some of the relevant material in the Section 32 Report, Section 42A Report, State of Environment Report and hearing evidence by Dr Ausseil, Dr Canning and Mr Conland.

Introduction

2 I have structured this memo as a series of responses to six questions. Answering these questions allows me to most clearly communicate my view, and also provides an efficient order for questions to be addressed further beyond this memo. While I think addressing them in this order is useful I do note that they are all interconnected and should be considered iteratively rather than linearly. This structure is as follows:

1) Being clear about the difference between objectives and limits

2) Which attributes make good objectives and which are better used as limits, targets or other state of environment type indicators?

3) Once the planning framework for which attributes to use as objectives and limits is chosen (i.e., topics 1 and 2 above), what should the numbers be for each attribute?

4) What are the management methods (policies, rules, regulatory and non-regulatory actions) that are being used to constrain resource use in a way that is designed to achieve any limits set and to thus ultimately achieve the objectives?

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5) *To what extent are the management actions linked to any triggering mechanism that relies on comparing monitoring results to determine whether any limit or objective is being met? Specifically what management actions, if any, need to be triggered within short turnaround times?*

6) *What clarification is needed around how compliance with limits and objectives will be assessed by monitoring and how natural variability will be taken into account?*

3 Before I address each of these six topics I offer a couple of general observations:

- There is not a silver bullet technical solution to the six questions. These things need to be handled by using carefully considered planning architecture that makes sensible use of the available technical information, and accommodates unavoidable limitations in information and analytical techniques.

- I don't think there is an established and recognised right or wrong way to do objective and limit setting under the National Policy Statement for Freshwater Management (NPSFM), other than the need to apply the general process laid out in Policy CA2. Councils around the country are trying to figure out what is best for their circumstances. However, in response to your desire to be "*sufficiently robust to be defensible if these aspects of the plan are appealed to the Environment Court*", my experience is that justification and defensibility is most readily built on i) sound logic flow, ii) cumulative confidence from approaches used in other regions that have made it through NPSFM processes to operative plans, and iii) consistency with available Ministry for the Environment (MfE) guidance material, which is usually based on council experience to date. This is not to say that novel approaches are not good or ultimately defensible, just that they are less able to draw on the cumulative confidence that comes with approaches used elsewhere and in guidance material. Novel approaches thus rely even more on communication of sound logic flow.

1. Being clear about the difference between objectives and limits

4 I approach this topic based on my familiarity with regional plan architecture that employs relationships between values, attributes, objectives, limits and management actions as illustrated in figures in MfE guidelines (see Figures 1-3 attached) and laid out in Policy CA2. I am also familiar with plan architecture where the objectives are the ultimate expression of the outcomes sought to support values, and the policies and rules (which might contain limits, targets and other regulatory actions) and non-regulatory management actions, are all used to achieve the objectives; ultimately success is achievement of the objectives.

5 I struggle with the sentence on Page 163 of the s32 Report which says "*To provide some context to the limits and their application, it is proposed that the objectives, policies, rules and non-regulatory methods/projects are the vehicle to achieve the catchment limits and targets."* I find this quite unsettling because I believe the common practice is the opposite – the catchment limits and targets are one of a number of vehicles to ultimately achieve the plan objectives. Further on in the s32 report it seems to at least partly retract back to this common practice but it is not

entirely clear. I do get a sense that the catchment limits and targets have in fact become blended in as the objectives and this appears to be the case, for almost every available biophysical attribute, at section 2.2.1 and 2.3.2 of the s42A version of the proposed plan.

6 In the NPSFM (both the 2011 and 2014 versions) a "*freshwater objective describes an intended environmental outcome…*" and a limit is defined as "*the maximum amount of resource use available, which allows a freshwater objective to be met.*" Thus a limit is definitely not an objective and in fact has a specific defined relationship to an objective. I note here that everything in my writing assumes that objectives are the ultimate expression of desired outcomes of a plan and that the policies and rules containing limits are one of several means of achieving the "end" that we want (i.e., the freshwater objectives).

2. Which attributes make good objectives and which are better used as limits, targets or other state of environment type indicators?

7 There are many reasons that it is useful to be clear about the difference between objectives and limits, other than simply being consistent with NPSFM definitions and MfE guidelines. One crucial reason is that this can be used to establish the hierarchy of importance of different attributes and the relationships between them. For example nuisance amounts of periphyton in a river directly affects the values we are interested in (e.g., ecological health, recreation, aesthetics) and so periphyton biomass is a useful attribute to use as an objective; the amount of periphyton in the river is an "end" that we are interested in achieving. On the other hand the nutrients nitrogen (N) and phosphorus (P) are two (of several[1]) things that we may want to manage in order to achieve our periphyton objective, but N and P are not an "end" in themselves; we wouldn't much care about the results of future monitoring of P concentrations if future monitoring showed that we were always meeting our periphyton objective. Being clear about this, rather than blending all attributes in together as limits inside objectives, as appears to be the case in the proposed Waipaoa plan, helps avoid misinterpretations and inefficient management emphasis on the wrong attributes. In my experience lack of clarity around this has led to many difficulties for some councils even after their plans have been made operative.

8 In my view another example of a good attribute to use as an objective is MCI (or QMCI) because, like periphyton, this index fairly directly measures an "end" that we are interested in; i.e., a component of ecosystem health. We would ideally like to have numeric attributes that directly reflect other aspects of ecosystem health, such as perhaps fish and bird community indicators and also physical habitat, but for now these are areas of developing science and GDC would be breaking new ground incorporating numeric indicators of these into a regional plan (Note: narrative inclusion of these in objectives is still advisable however as discussed further below). Now, we need to manage many things in order to achieve MCI objectives including flows (minimum and allocation limits), nutrients (because these affect periphyton

[1] Other things that also need to be managed to achieve periphyton outcomes include flow regimes (i.e., minimum flow and allocation limits), riparian condition, temperature and habitat.

which in turn indirectly affects invertebrates), sediment (because it affects invertebrate habitat) and riparian condition (affects habitat as well as periphyton). Some of these things make useful limits; minimum flows and allocation limits are a specific type of limit defined as such in the "Interpretation" of the NPSFM, and N, P and sediment attributes can be useful as limits. These latter things are all "means to an end" rather than being the end in themselves, with the possible exception of sediment which could be a useful objective (as visual clarity or percent cover of deposited bed sediment for example) but is technically tricky. There is a line of argument which contends that sediment (either as percentage bed cover of deposited fine sediment or visual clarity or suspended sediment concentration) directly affects values (ecosystem health, recreation and amenity) to the extent that it justifies being used as an objective, but this is under technical development[2].

9 I'll further illustrate the conceptual relationship between attributes that make good objectives and those that make good limits using another analogous example in the water quantity area. We do not particularly care about the absolute numbers for minimum flow limits and allocation limits[3] in a river being (say for example) 100 or 110 L/s – this number is not the desired "end". What we are interested in is that the environmental flow regime left behind in the river satisfactorily supports invertebrate, fish and bird communities, as well as cultural, recreation and aesthetic values, and we identify measurable minimum flow and allocation limits (i.e. limits to resource use) that we think can support those values, in order to help us manage water takes. The objectives in this case are healthy invertebrate, fish and bird communities, as well as mahinga kai, angling and other recreation opportunities. All these objectives could be expressed using numeric habitat attributes (such as the percentage of habitat area available at natural mean annual low flow) if we wished, but it has been more common in regional plans in the past to express these things narratively. I note here that both periphyton and macroinvertebrate (MCI) attributes used as objectives for water quality are doubly useful in that they also partly reflect the effects of water quantity management (i.e. the effects of using minimum flows and allocations).

10 The main point here is that it is helpful to establish the hierarchy of importance of different attributes in the plan. An approach based on taking a very literal interpretation to "maintain or improve", which sets the current state of all measurable attributes as the objective, with apparent equal emphasis on all attributes, misses communicating a whole layer of information on the linkages between attributes and values (see Figures 1-3 attached). Hopefully it is clear from the discussion above how such an approach could lead to misinterpretation and inefficient distribution of management effort in the most important areas. For example the council could be forced down a path of maintaining the current estimated concentration of P in a stream simply because that has become a stated objective, even if monitoring shows that periphyton and macroinvertebrate attributes are healthy and management effort could best be spent elsewhere.

[2] For example see http://www.mfe.govt.nz/publications/fresh-water/sediment-attributes-stage-1
[3] And I note that we (and the NPSFM) call these things limits not objectives.

11 I believe Dr Ausseil's evidence is expressing similar concerns and he suggests a similar conceptual approach to objectives and limits as I have outlined here. I also note that Dr Canning's evidence describes the same ecosystem health attributes suggested by Dr Ausseil and myself (i.e. periphyton biomass and MCI (or QMCI)) and he thinks these are more appropriate than relying solely on instream chemical concentrations. While he does not discuss planning architecture and the relationship between objectives and limits I believe his technical evidence supports the approach described by Dr Ausseil and myself.

12 My first cut at separating GDC's attributes, which are all generally relevant, into objectives, limits and/or indicators is outlined below:

Objectives

- Periphyton (mandatory as an objective under the NPSFM National Objectives Framework Appendix 2 (NOF) – suggest use NOF thresholds and related monitoring and statistical compliance testing regime).

- MCI (or QMCI) – suggest use literature thresholds and related statistical compliance testing regime[4].

- *E.coli* concentration (mandatory as an objective under the NPSFM NOF – suggest use NOF thresholds and statistical regime). However for full transparency I think the objective should also be expressed in terms of the accepted risk of infection that goes with the *E.coli* concentration chosen (as provided in the NOF table) because this makes it clear that it is the acceptable level of health risk that has been chosen rather than the *E.coli* concentration per se. This helps if future changes in science knowledge provide updated *E.coli* numbers to reflect the same predicted level of health risk – a plan change is still required to change the *E.coli* number but it can be clearer that the intent of the objective is not changing.

- *Dissolved oxygen* (mandatory as an objective under the NPSFM NOF – suggest use NOF thresholds and statistical regime).

- Ecosystem toxicity protection level – expressed as the desired percentage species protection level (e.g., 99%, 95%, 80% etc) and the numeric threshold for both the toxicants ammonia and nitrate that go with that protection level (mandatory as an objective under the NPSFM NOF). The reason for expressing both the protection level and the toxicant concentration is to make it clear that the objective is the level of species protection chosen, not the absolute nitrate or ammonia concentration per se – in order to help clarify the difference between this and any instream concentration limits that might be set for dissolved inorganic nitrogen (DIN). In my view nitrate and ammonia concentrations behave as limits to achieve an identified objective of a defined species protection level;

[4] See Collier et al., (2014) - http://www.mfe.govt.nz/publications/fresh-water/macroinvertebrate-attribute-assess-ecosystem-health-new-zealand-waterways

however I accept that the NPSFM (NOF) has made it mandatory to express the nitrate and ammonia concentrations in the plan objectives.

- Consider using benthic cyanobacteria mat bed cover (%) (using MfE interim guideline values[5] as suggested by Dr Canning in his evidence. These have been used as objectives in some other operative regional plans (e.g., Canterbury).

- Consider using bed cover deposited fine sediment (%) (using literature values[6][7]) as have been used as objectives in some other operative regional plans (e.g., Canterbury).

- Consider the merits of percent EPT taxa as an attribute for rivers impacted by sediment.

- In addition to the numeric attributes for objectives listed above, consider including narrative objectives to express the intention to maintain or improve physical habitat and health of macroinvertebrates, fish and birds, for the reasons described in paragraph 8 above. I note that it is not just water quality limits (described next) but also other management actions promulgated by the plan such as minimum flows and allocations, fish passage and habitat restoration initiatives, as well as potentially other non-regulatory actions outside the plan, which will contribute to achieving all these objectives.

Limits/targets and/or indicators – depending on plan architecture

- Consider interim Dissolved Inorganic Nitrogen (DIN) – in relation to achieving periphyton objectives. The options appear to be i) maintain current median and 95th percentile statistics (existing proposed plan approach); ii) provide for a small amount of headroom on top of current median and 95th percentile statistics based on modelling of headroom required for anticipated development on the Poverty Bay Flats as proposed by Mr Conland in his evidence[8]; or iii) estimate the DIN concentration required to adequately limit periphyton growth based on guideline relationships with large uncertainty associated with them, as discussed by Dr Ausseil in his evidence.

- Consider interim Dissolved Reactive Phosphorus (DRP) - in relation to achieving periphyton objectives. The options appear to be the same as the three described for DIN above.

[5] See Wood et al., (2009) - http://www.mfe.govt.nz/publications/fresh-water-environmental-reporting/guidelines-cyanobacteria

[6] See Clapcott et al., (2011) - http://www.cawthron.org.nz/media_new/publications/pdf/2014_01/SAM_FINAL_LOW.pdf

[7] See Davies-Colley et al., (2015) - http://www.mfe.govt.nz/publications/fresh-water/fine-sediment-effects-freshwaters-and-relationship-environmental-state

[8] Plus including the minor rounding adjustments proposed by Mr Conland to accommodate measurement uncertainties, which seem reasonable.

- Toxicant concentrations for nitrate and ammonia. These should be the same as expressed to achieve a percentage species protection level in the objectives (see above).

- Suspended sediment.Consider risks of unknown relationship of this attribute to deposited fine sediment (which was suggested as an objective above), and what actions the plan offers to plausibly achieve any given limit or target set. Both Dr Ausseil and Mr Conland have made comments on this in their evidence.

- Temperature (will be important to establish protocols around sampling to account for diurnal fluctuations when testing against any limit set – suggest base this on the statistical regime used for DO in the NPSFM NOF, which is a similarly diurnally fluctuating variable).

- pH (will be important to establish protocols around sampling to account for diurnal fluctuations when testing against any limit set – suggest base this on the statistical regime used for DO in the NPSFM NOF, which is a similarly diurnally fluctuating variable).

3. Once the planning framework for which attributes to use as objectives and limits is chosen (i.e., topics 1 and 2 above), what should the numbers be for each attribute?

13 First, it is crucial to recognise that the decision on which number to choose for each attribute being used as an objective or a limit involves value judgements that should, under New Zealand's resource management planning process, be made by decision makers who weigh information about consequences for multiple values. Technical people inform those decisions by describing the consequences of options for numbers but they do not decide on the best number.

14 With regard to the objectives, both Dr Ausseil and Dr Canning offer valid options for numbers for periphyton and MCI (or QMCI) objectives based on well-established literature. My reading of their evidence is that they are suggesting essentially the same numbers for lowland streams/rivers but they differ a little for the upland streams/rivers, with Dr Ausseil's suggestion reflecting the B NOF band (120 mg chl-a/m^2) and Dr Canning's reflecting the A NOF band (50 mg chl-a/m^2) for periphyton biomass, the latter reflecting a higher level of protection of ecological values but with consequently greater implied constraint on resource use in those upland streams/rivers. The choice involves value judgements by hearing commissioners.

15 I think caucusing with the relevant expert witnesses could help confirm which of the attributes I have listed in paragraph 12 above could be agreed by technical witnesses to recommend for use as objectives. I think caucusing could also helpfully frame the decision for commissioners as to the choice of numbers for each attribute recommended. I appreciate that use of these attributes as objectives would involve a structural change to the proposed plan that other parties could be interested in.

16 With regard to limits, there is a more contentious choice of which attributes to use as limits with hard immediate meaning, versus indicators that could be used to monitor and identify areas where attention or management change is needed in future. The decisions for the commissioners on this are inextricably linked with:

a) the whole plan architecture (e.g., what actions are triggered by a breach of a limit – as discussed further below);

b) the appetite for the risk involved in putting up numbers based on sparse monitoring data and/or numbers from the literature that have been used elsewhere but whose suitability for the Waipaoa catchment are not yet known, perhaps stated as "interim" limits;

c) the value judgements involved in setting numbers that allow (or not) for any further future resource use, weighed against accepting the increased risk of not achieving objectives as a result of that further resource use;

d) the practicalities associated with how compliance with the numbers could be tested and linked to any management actions; and

e) legal opinions about what must be done at this stage to meet the requirements of the NPSFM; clearly the NPSFM requires councils to establish objectives and to set related limits to resource use, but the question becomes: what constitutes a limit? – and this is discussed further below. In my view, based on experience with other regional plans, the numeric attributes I've suggested for use as objectives in the previous section would satisfy the NPSFM requirement to establish objectives.

17 There are many possibilities for the treatment of limits and/or indicators that depend partly on whether attributes for objectives and limits are separated, and also on whether effects-based literature thresholds are accepted for use versus maintaining the use of current state data statistics. I think it makes sense to address this question once some clarity has been reached on the approach to topics 1 and 2 above. It may be possible to make some progress on this with additional technical caucusing following caucusing of topics 1 and 2 and this might help better frame the options for GDC and commissioners.

4. What are the management methods (policies, rules, regulatory and non-regulatory actions) that are being used to constrain resource use in a way that is designed to achieve any limits set and to thus ultimately achieve the objectives?

18 This section is really a series of questions that I am posing to GDC for clarification. With reference to Figures 2 and 3 (attached), setting numeric objectives and some instream concentration-based limits (say for nutrients, toxicants and suspended sediment), only goes part way along the chain in the diagrams from left to right. The instream concentrations are what some people refer to as environmental limits that implicitly imply absolute constraint of any resource use that could result in those

concentrations being exceeded, but which do not directly quantify the amount of resource use that is possible, such as has been attempted by some other councils by linking instream concentrations to catchment contaminant loads and allocation of those loads at property level (see right hand boxes in Figures 2 and 3). However, consensus around the country seems to be that instream concentrations constitute a type of limit under the NPSFM definition and I have no issue with that.

19 I understand that GDC has made the informed decision that the management constraints on land use to achieve water quality instream contaminant concentration limits (and by association also achieve the objectives) will involve the less regulatory approach of requiring and supporting the development of Farm Environment Plans (FEPs) rather than estimating loads and allocating contaminants (e.g., nutrients) at the property level. In my mind this means that the requirement to prepare and implement FEPs constitutes the main property level constraint on resource use (i.e., it is arguably a form of limit under the NPSFM definition – albeit much less quantified than an allocable load limit) that sits in the right hand boxes of Figures 2 and 3, along with the requirement for any necessary consents for point source discharges and water takes, presumably stock exclusion requirements, and various mitigation and restoration projects (e.g., managed aquifer recharge, fish passage and spawning enhancements).

20 In order to maintain justifiable linkages through the plan values, objectives, policies (including limits) and methods (i.e., through left to right in Figures 1-3), the implicit assumption must be that the FEPs in combination with flow regime rules and other regulatory and non-regulatory methods mentioned above, will be sufficient to meet any instream concentration limits set, and to thus achieve identified objectives. This assumption should be made explicit and reality checked during the process of deciding on which attributes to set as limits (i.e., with hard meaning) versus indicators, and what the numbers should be.

21 It should be transparent that the current plan approach of setting instream limits based on current nutrient concentration statistics for example, implies (according to the NPSFM definition of a limit) a hard constraint on any further resource use (e.g., any further water takes or increase in area or intensification of landuse without balanced reduction in takes or contaminant production being possible elsewhere). I haven't seen the analysis of the plausibility of the FEPs and other methods achieving such hard limits but I presume it is recorded somewhere. I do wonder what is constraining further area and/or intensity of land use because either of these would probably lead to increased total catchment contaminant (e.g., nutrient) production (and probably increased instream concentrations) even if everyone was operating at good management practice according to their FEPs. If there is potential for further area and/or intensification of landuse in the Waipaoa catchment and nothing is constraining it (or offsetting it by mitigations) then this would raise a question-mark for me as to the achievability of maintaining all current contaminant concentration statistics as limits.

22 To me, the integrity of a plan is weakened if the objectives and limits appear to promise more than the methods can deliver. If some increase in area or intensity of

landuse is anticipated then that should be transparently recognised by providing some headroom in the limits (e.g., such as the headroom recommended by Mr Conland for nitrate limits based on his modelling of effects of further landuse), unless there are identifiable mitigation measures that are predicted to offset the anticipated increase. On the other hand if there is a desire to maintain the absolute current state concentrations of contaminants even though it restricts further resource use, then that should be made clear, probably by putting constraints on further resource use as well as setting the current concentration limits. Failure to be transparent about these things in some past regional plans has made decisions seem easier and people feel temporarily better (because they think they are having their cake and eating it too) but ultimately leads to lack of clarity about resource use, potential for disappointment when objectives aren't achieved, and in some cases has contributed to cumulative effects, over-allocation and a difficult claw-back problem.

23 Once the logic flow (e.g., through Figure 1) has been established and justified all the way through to the right hand end, albeit necessarily acknowledging unavoidable uncertainty in the linkages (e.g., inevitable uncertainty about the ability of the proposed management methods to achieve the limits and ultimately the objectives), it is in my view a matter of backing that framework, implementing it, and then monitoring through time to test effectiveness against indicators, limits and most importantly the objectives, to inform the next round of the plan review cycle.

5. To what extent are the management actions linked to any triggering mechanism that relies on comparing monitoring results to determine whether any limit or objective is being met? Specifically what management actions, if any, need to be triggered within short turnaround times?

24 The answer to this question follows logically on from question 4 above. If all the plan's proposed management actions are both pre-determined (such as the requirement to prepare and implement FMPs), and based on an explicitly stated prediction that this will be sufficient to achieve instream concentration limits and objectives in the long term, then the need to monitor and assess compliance and trends through time becomes essentially a similar exercise to regular state of environment reporting employing any of numerous available statistical techniques. However if there are hard actions that need to be triggered by monitoring compliance with thresholds within short turnaround times (e.g., < 5 years) then this places a different and significant requirement on the design of any trigger threshold and the intensity of monitoring needed to test it.

25 It takes time and significant monitoring effort to establish with confidence that a threshold for an environmental attribute has been breached[9]. This is one of many reasons why some councils have found it useful to use modelling tools (e.g., OVERSEER) to give an early (i.e., immediate) estimate of what the effects of management change might be on nutrient contaminants; detecting the effect of that

[9] I note that point discharge management is different. It is much easier to monitor effluent quality in a point discharge and to determine compliance quickly because this type of monitoring is not subject to so much natural environmental variability.

same management change in the receiving environment might take years due to the lag times for contaminant transport and for sufficient sampling to occur to detect the change against background variability. Trends, by definition, take time to detect and can be notoriously difficult to interpret the effects of individual causes against background influences such as climate change. In my view trend detection is an analytical tool that is appropriate for use in state of environment time scale applications (i.e. plan review timescales in the order of 5-10 years or more) not for triggering any kind of hard short term response management actions.

26 All these unavoidable limitations of monitoring and threshold compliance and trend detection need to be considered when deciding on limits, and actions that relate to those limits. Importantly, if effects-based thresholds are selected from the NPSFM NOF and other guidelines then these come with statistical design built into them and so the monitoring required to test compliance is already reasonably clearly defined[10].

27 On the other hand if local current state data statistics are chosen as the thresholds (i.e. based on the simple objective to maintain or improve all water quality indicators) then the compliance testing challenge is compounded because the threshold itself (as well as the future monitoring data being used to test future compliance against the said threshold) is only an estimate of the true value for current state[11]. If the current state estimate is based on a short data set gathered during a period with non-average conditions (during a climate cycle such as el Nino for example) then future estimated medians and 95 percentiles will very likely be different from the original estimate of current state. In short, while a very literal interpretation of “maintain or improve” that sets current state as the threshold for each attribute appears conceptually attractive, it actually places a much greater burden on the need for monitoring data and for developing statistical analysis protocols than using effects-based literature thresholds such as the NPSFM NOF thresholds.

6. What clarification is needed around how compliance with limits and objectives will be assessed by monitoring and how natural variability will be taken into account?

28 It should be clear from the discussion above that this question should logically be addressed once the approach to topics 1-5 above is clear. If the solutions at topics 1-5 lead to the use of compliance testing and trend analysis for purposes at state of environment reporting and plan review timescales (5-10 years) then this becomes a relatively more straight forward technical exercise and definitions of protocols could be advanced using caucusing of technical witnesses. Similarly if literature thresholds (e.g., NOF) are used then monitoring and statistical requirements defined there can be easily adopted. If short turnaround responses to monitored limits are required then this is going to be more difficult and will likely lead towards using different types of limits such as modelling outputs (e.g., OVERSEER nutrients) and/or more prescriptive immediately testable limits such as the allowable area and type of certain

[10] For example on page 27 of the NPSFM the periphyton attribute table describes the number of sample exceedances that constitute a breach of the provided thresholds, based on a monthly monitoring programme for a minimum of 3 years.
[11] This is a point that is also described in more detail in Dr Ausseil’s evidence.

defined land use activities or practices. That is a large and complex conversation and one that may not be fit for purpose in the circumstances at this time for the Waipaoa catchment.

Sincerely

Ned Norton

Figure 1: This is from the MfE (2015) A Guide to the National Policy Statement for Freshwater Management 2014. Wellington: Ministry for the Environment

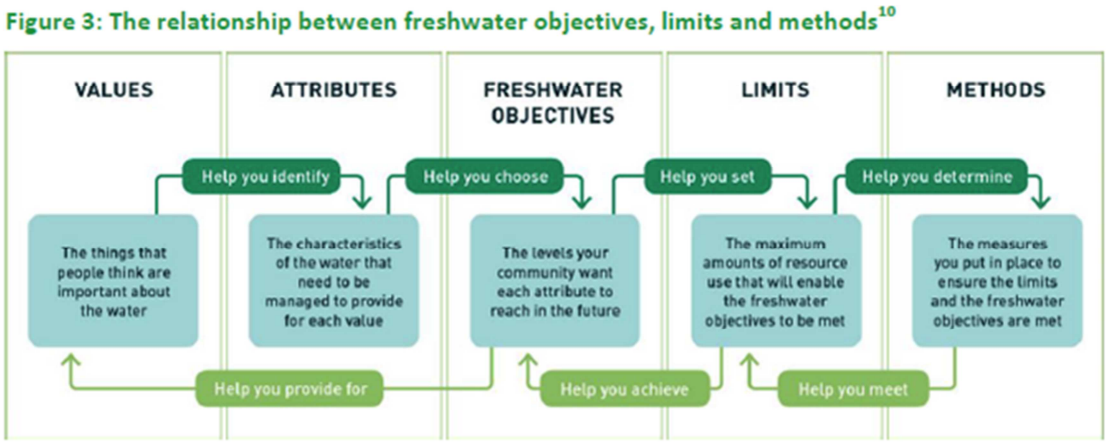


Figure 2: This is from the MfE (2015) A Draft Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management 2014. Wellington: Ministry for the Environment

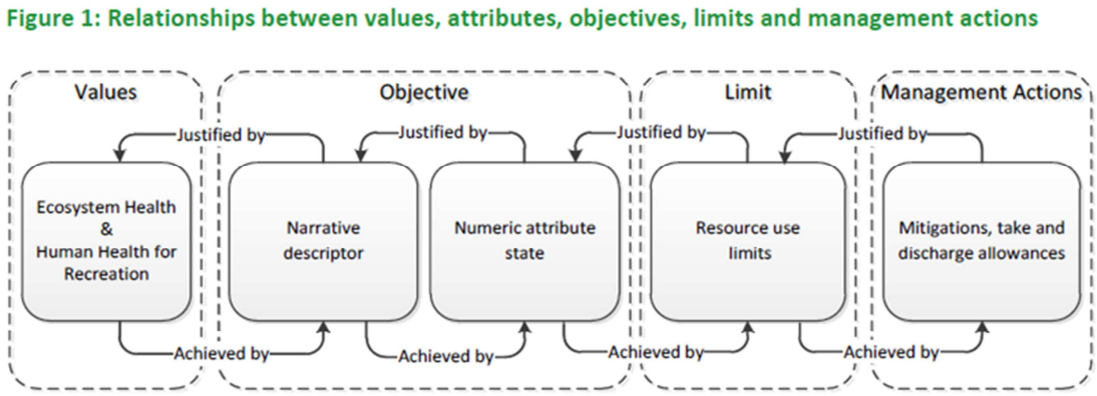
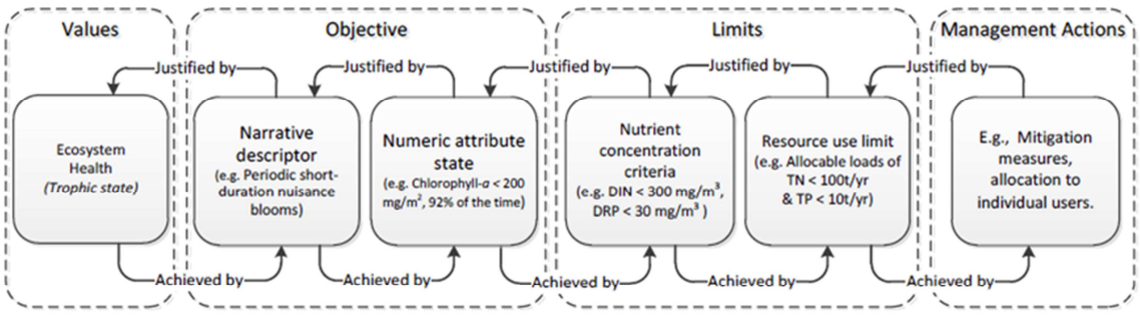


Figure 3: This is from the MfE (2015) A Draft Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management 2014. Wellington: Ministry for the Environment



Note: DIN = dissolved inorganic nitrogen; DRP = dissolved reactive phosphorus; TN = total nitrogen; TP = total phosphorus.