Healthy Rivers: Wai Ora - Interim Objectives & Targets for a Staged Approach

Technical Leaders Group

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Purpose

Provide technical advice to CSG on options for defining interim targets/objectives that provide greater clarity on what success looks like in 10, 20 and 60 years.

TLG Recommendation

Given the range of options presented below, TLG thought it expedient to provide a summary recommendation to CSG that combines narrative objectives, numeric targets and measures of practice change to give confidence that the proposed policy mix will achieve the steps in a staged approach:

1. *Narrative objective(s).* For example, implementation of actions in tailored property plans and compliance with region-wide rules will result in changes in land management practice that reduce losses of sediment, nutrients (N & P) and *E. coli* to water. These changes will lead to a demonstrable reduction in monitored contaminant concentrations and reduce the gap between current state and target state across all attributes by an average of 10% in 10 years.
2. *Interim numeric targets*. At every water quality monitoring site numeric targets will be set for all relevant attributes. Current state information will be paired with long-term desired state (see desired state table below) to determine the size of the 'gap'. Interim targets could be set for all steps (10, 20, 60 & 80 years). For example, a year 10 numeric target will be set as a 10% reduction in the gap between current state and long-term desired state, and so on. Note that we cannot expect all interim targets to be met, due to lags in biophysical systems and prioritisation of property plan implementation. The 10% gap reduction could be assessed as the average % gap reduction across the relevant water quality attributes (N, P, clarity, E coli and Chl a, as appropriate for the site).
3. *Monitoring of actions in tailored property plans*. The efficacy of property plans should be monitored and include analysis to provide:
    a) Assurance that the 'right' actions are being included in property plans
    b) Assurance that actions are being completed
    c) Evidence of changes in engagement and attitude
    d) Modelling of completed actions to confirm plan effectiveness (even if numeric targets have not been met)

Background

CSG have agreed the following:

- Achieve key aspects of the Vision and Strategy in 80 years – safe to swim in all seasons across a range of flows, safe to harvest kai for eating, able to support abundant and diverse freshwater fisheries, flora and fauna. Restored water quality is protected for future generations.

- Restoration and protection achieved in a series of staged improvements over the next 80 years.
- Recognition that nitrogen concentrations may increase in the short term due to N load to come, then improvement.

CSG have established attribute limits consistent with the Vision & Strategy (Scenario 1):

No	Narrative description	Attributes			
		E. coli	**Clarity**	**Algae (Chlorophyll)**	**Nutrients**
1st	**Substantial improvement in water quality for swimming, taking food and healthy biodiversity** Means: Swimmable in all seasons for microbes and clarity. Water quality supports ecological health. Some improvement in all parameters. [Represents CSG suggestion of E. coli to B, TP to minimum B, all others up one band – 'Restore']	**Upper** Main stem remains A. Tributaries min B at 95%ile **Middle** Main stem A at Narrows at 95%ile; Horotiu and tributaries B **Lower and Waipa** Main stem and tributaries B at 95%ile	**Upper** Main stem A to Waipapa, tributaries go up 1 band **Middle** Main stem B, tributaries go up 1 band **Waipa** Upper stem B, lower stem C, tributaries go up 1 band **Lower Waikato** C in main stem and tributaries	**Upper** A sites improve. B sites to A, C sites to B. **Middle** B for median, A for max. **Lower** B for median and max; Huntly moves to B for med and A for max.	**TP** Maintain where already A, raise to B for rest of river. **TN** Improve where already A, all sites to Waipapa to A, rest of river to B. **Ammonium and nitrate** Improve where already A, other sites go up 1 band.

CSG have agreed the concept of staging as shown in the Figure below, but are unclear as to how that should be expressed technically.

The Task

The CSG has tasked the Technical Leaders Group to report back with a technically robust definition of how these steps might be described and whether interim water quality targets could be included in the policy. Something seemingly simple has its 'wrinkles':

- *Time lags* between certain mitigations on the land and responses in the observed stream water quality. The most obvious of these is nitrogen, given the long travel times through the groundwater observed in some sub-catchments in the Upper Waikato. However these lagged responses may also occur with other contaminants where mitigation efficiency improves with age, e.g., erosion control through hillslope and riparian retirement and plantings.
- *Spatial sequencing* where, for pragmatic reasons, implementation of all actions will not occur everywhere across the catchment on 'day one'. For example, current thinking is that top priority catchments will be done in the first 3 years and the whole catchment by year 10. The implementation of actions within these plans will be spread over time.

In addition, we have raised the approach with CSG of using 'pressure indicators' and 'action and awareness indicators' as part of the mix of understanding if the policies underpinning the Plan are leading to the actions required to eventually achieve Vision & Strategy water quality. These type of indicators were proposed in the WRISS (2010) and are included in the Report Card framework recently launched by the WRA (http://versite.co.nz/~2016/19099/; Project lead was John Quinn). These indicators make two important and reasonable technical assumptions:

- That the actions on land will, at some future point, lead to the desired water quality improvements. At a broad-scale (sub-catchment and above), the modelling has shown what an optimised set of mitigations will achieve for water quality. In reality, the mitigation mix that will actually be implemented will be a different set, as yet unknown (mitigations within tailored property plans plus sub-catchment-scale interventions). In the future, the model could be used in simulation mode to estimate what this implemented mix of mitigations will eventually achieve for water quality. This approach would seem to be most helpful say at 5 or 10 year intervals where water quality responses (or non-responses) to the Plan change might be being reviewed and need to be explained. It would require three things: the continuation and perhaps some expansion of WRC's water quality monitoring network; the collection and storage of data on mitigations implemented (action indicators); and the further refinement of components of the modelling framework.
- That positive changes in community awareness and attitude indicators will be reflected in better, 'water quality friendly' operational decisions being made on a day-to-day basis. While rules, consents, certified farm plans and implementation audits provide an important set of tools, it is axiomatic that improvements in water quality across a >1 million hectare catchment will be strongly influenced by the collective day-to-day decisions that farmers make and the social norms of what is acceptable practice.

There are a number of options that CSG could consider for interim targets/objectives

1. Targets that relate to the gap between current and desired attribute states at individual sites

2. Numeric objectives set across the monitoring network
3. Narrative objectives that link practice change on land to catchment outcomes
4. Targets that reflect modelled improvements resulting from changes in land owner practice

Option 1: Interim targets

Under this option every monitoring site would have interim targets set. These targets would relate to 'closing the gap' between current state and the long-term (80 yr) target.

For each attribute we know the difference between current state and the threshold of the long-term target band (desired state) at monitored sites. It is this difference that we are seeking to reduce. Following the staged approach, targets would be set at 10% reduction in the gap after 10 years; 25% reduction in the gap at 20 years; 50% reduction at 60 years and 100% closure of the gap between current and desired state after 80 years.

For example, let's imagine a site X where monitoring data shows the annual median Chlorophyll a concentration (i.e. phytoplankton biomass) is 4.5 mg/m^3 (B band). The long-term target is to achieve an annual median of 2 mg/m^3 (A band). The gap between current and desired state is 2.5 mg/m^3. The following interim targets might be set for that particular site and attribute combination:

- By 2026, annual median Chlorophyll a concentration at site X will not exceed 4.25 mg/m^3
- By 2036, annual median Chlorophyll a concentration at site X will not exceed 3.88 mg/m^3
- By 2066, annual median Chlorophyll a concentration at site X will not exceed 3.25 mg/m^3
- By 2096, annual median Chlorophyll a concentration at site X will not exceed 2.00 mg/m^3

The other relevant attributes for a site (e.g. TN, TP, clarity, *E. coli*, ammonia and nitrate) would have targets set in a similar manner.

In the plan change this could be included as a schedule of interim targets – a table of attribute targets (10, 20, 60 and 80 year) by river and lake monitoring site. Monitoring of plan effectiveness could use a simple pass-fail approach (e.g. 75% of sites achieved their 10-yr target for Chlorophyll a).

One of the issues with this approach are the 'wrinkles' mentioned above. That is, different attributes will respond to practice change on different timescales and rates of change will not be similar across the catchment. In some sub-catchments we will not see land management changes reflected in reductions in in-stream concentrations within the first 10 years. We know that for some attributes and sites we will not see a closing of the gap in the first 10 years (i.e. some sites will fail to meet targets). The implication of this is something for the policy team to consider – can interim targets be set at levels that are known to be unachievable?

Dealing with issues of lags and sub-catchment prioritisation is not straightforward. Some of the options to address the lag issue include, (i) ignore (problematic for showing progress and sets up for failure); (ii) adjust current state for the load to come in 10 y by generating an estimate of current + load to come (technically difficult to do with required accuracy); (iii) anticipate <10% improvement where we expect slow 10 y response made up for in the 20 y period by reducing the target improvement at 10y to say 7% as appropriate; iv) include 'pressure' indicators as a back-up to the in-stream 'state' targets to provide explanation and a more rounded evaluation.

The roll-out of property plans will generate an extensive dataset of land management practices. This dataset could be used to track changes in pressure indicators (e.g. X km of stock excluded from waterways, Y% increase in effluent irrigation area, X% reduction in P fertiliser use). To date, the gathering-up and reporting of this 'pressure' level data is poorly done – the TLG sees such data as vitally important in understanding progress towards achieving the Vision & Strategy and the provision of such data into a central database should be a considered as a requirement. Improving trends in these pressure indicators could be used to measure effectiveness of the plan change, as well as supplementing information from monitoring of attribute targets. Trends in 'Pressure' indicators could provide confidence to the community that we are tracking in the right direction despite lags in in-stream (state) responses. In addition to measuring actions, the TLG also considers it important for community awareness and attitude indicators (e.g. understanding of what constitutes good management practice) to be monitored and reported on.

A potential issue with Option 1 is its communication to the public. The way the targets are set there is no requirement for any site to achieve the desired end state for 80 years. This may be a difficult sell to the community who may have expectations of more rapid gains. In reality, it is likely that the implementation of region-wide rules and property plans will see a scale of improvement that results in some attributes shifting into their desired state much earlier than scheduled at some sites (and this was what the scenario modelling showed).

What we are likely to see are some attributes at some sites probably closing the gap at a much faster rate than other sites. Overall, the average of gains observed in 10 years may well be around 10% (see Option 3 below), but individual sites or attributes may fail to achieve the target.

Option 2: Numeric objectives

Rather than apply interim targets to every site, the plan could put in place interim objectives. In option 2 these objectives are numeric and relate to changes in the percentage of sites achieving desired state.

For example, let's say that only 15% of monitored sites currently meet desired state with respect to *E. coli* concentrations. At a catchment scale the objective is to increase from 15% to 100% of sites meeting swimming standards (i.e., the gap is 85%). This could be set up and reported against at catchment or FMU scale. Interim objectives could be set as:

- By 2026, 25% of monitored sites have 95th percentile *E. coli* concentrations that meet desired state (10% of 85% is 8.5%. 15% + 8.5% = 23.5%. Rounded up to 25%)
- By 2036, 35% of monitored sites have 95th percentile *E. coli* concentrations that meet desired state
- By 2066, 60% of monitored sites have 95th percentile *E. coli* concentrations that meet desired state
- By 2096, 100% of monitored sites have 95th percentile *E. coli* concentrations that meet desired state

The other six attributes would have similar objectives, but the gap between % of sites meeting current state and desired state will vary.

In terms of reporting to the community on progress towards the Vision and Strategy, Option 2 has the benefit of simplifying detailed site information down to a single catchment or FMU number (e.g. we've increased the % of swimmable sites over the last 10 years). Option 2 is similar to current WRC State of the Environment reporting (see http://www.waikatoregion.govt.nz/Environment/Environmental-information/Environmental-indicators/Freshwater/River-and-streams/river-water-quality-contact-recreation-keypoints/).

An issue with this approach is the lack of targets at the site scale. The criticism of this approach is that the only real targets are set at 80 years. Also, the approach does not explicitly address the requirement for no further degradation, as it might be possible for some sites to degrade while still achieving the overall objective.

Option 3: Narrative objectives

Use evidence of changes in land use practices to demonstrate direction of travel and staged achievement of Vision & Strategy.

Narrative objectives could be provided for each stage:

1. Implementation of actions in tailored property plans and compliance with region-wide rules will result in changes in farm practice that reduce losses of sediment, nutrients (N & P) and *E. coli* to water. These changes will lead to a demonstrable reduction in monitored contaminant concentrations and reduce the gap between current state and target state across all attributes by an average 10% in 10 years.
2. Continued implementation of property plans, targeted rehabilitation of degraded lakes through catchment management plans and allocation of nitrogen to the property level will lead to a demonstrable reduction in monitored contaminant concentrations and reduce the gap between current state and target state across all attributes by an average 25% in 20 years.

This approach essentially sums sites and attributes across the whole catchment (or FMU) and sets an objective of an average 10% (or 20%) reduction in the gap between current and desired state. The objective makes the assumption that the changes in land management driven through methods in the plan change (and future plan changes) will achieve the overall reduction in the gap between current and desired state. As with Option 2 there is no explicit requirement for improvements at all sites, as the objective could be met with an 'unders and overs' averaging approach (sensu NPS-FM 2014).

Option 4: Modelling effects of practice change

The catchment scenario modelling carried out for CSG has estimated an optimal set of land management changes required to achieve future desired water quality states. The modelling could be turned around to estimate the level of change in water quality attributes that might accrue from implemented catchment-wide rules and tailored property plans. This approach would likely identify the different spatial and temporal sequencing of changes that would occur throughout the catchment. Like Option 1, Option 4 could be applied at the site scale, or more broadly (e.g. FMU or catchment scale).

Application of a suite of good management practices, along with the catchment-wide rules will reduce contaminant losses to water. It would be possible to model what this looks like at Year 10 and Year 20. At the catchment scale this could be represented as likely % reductions in the gap between current and desired state. The % reduction achievable will vary by attribute, and this variation can be explained, but so long as the average is equal to or greater than 10% for year 10 (and 25% by Year 20) this would provide confidence of the direction of travel.

Summary

1. Option 1(targets) is relatively straightforward to implement, but generates a complex matrix of targets by site, attributes and years. This option may suffer from a perception that no meaningful improvements will occur until year 80, as all targets (other than the 80 year ones) are 'steps on the journey'. Some attributes and sites are unlikely to achieve 10-year targets due to spatial prioritisation and time lags, so there is the possibility of being set-up to fail. Incorporation of pressure indicators would benefit monitoring of plan effectiveness and potentially reduce the perception impact of sites failing to achieve interim targets.
2. Option 2 (numeric objectives) is simpler than Option 1, but may be seen as weaker through not having defined site targets, or an explicit requirement for no further degradation..
3. Option 3 (narrative objective) probably fits alongside Option 1 – i.e. there is an over-arching objective with the site/attribute targets sitting underneath it. On its own this option appears relatively weak.
4. Option 4 (modelled targets) represents a very substantial body of work that could generate interim targets, but with significant uncertainty around the numbers.