BRIEFING NOTE

To: Freshwater Futures: Rangitāiki Community Group

From: Nicki Green, Principal Advisor, Policy and Planning; Rob Donald, Science Manager; and Rochelle Carter, Principal Advisor, Science

Date: 10 May 2019

Subject: **Workshop 10: Surface Water Quality - 27 May 2019, Galatea Hall**

1 Introduction

1.1 Purpose

The purpose of this workshop is to talk through surface water quality information and implications with the aim of approval in principle of draft objectives and potential policy direction.

This will include a recap on some material already discussed by the group, as well as presentation of some new information.

1.2 Outcomes sought

Group members:

1. understand and accept/confirm the key water quality issues and proposed focus of management approaches for the Rangitāiki Water Management Area.
2. approve in principle the management options being explored.

1.3 Agenda

The agenda is attached.

2 Technical modelling session - *Optional*

Some members have indicated they would like to read the detailed full technical report about the SOURCE biophysical catchment model. A draft of the report (dated 10 May 2019) is being made available to all members, but is certainly not compulsory reading. This report has only recently been received by Council staff and so has not been approved for public release.

For this reason, **please do not circulate it**. Staff will let you know of any amendments and will make the final report publicly available.

Modellers will attend the first hour of the workshop (9am-10am), specifically so that those group members with an interest in the detail can ask questions. This first hour is entirely optional.

3 Updates

3.1 National

Central government has a large *Essential Freshwater* work programme focussed on:

- Stopping degradation and loss of freshwater resources, waterways and ecosystems;
- Reversing past damage to freshwater resources waterways and ecosystems; and
- Addressing allocation issues.

Government is also undertaking a *Three Waters Review* to improve the regulation and supply arrangement for drinking water, wastewater and stormwater (three waters). Changes will be made to legislation, national policy and environmental standards for freshwater and three waters management. Government intends to release public discussion documents for feedback around mid-year.

Some changes being considered have implications in this Water Management Area, such as possible changes to stock exclusion regulations; land use intensification constraints; regulations for high risk land uses like intensive winter grazing of crops; and farm environment plan and good practice standards.

Bay of Plenty Regional Council will not notify any more freshwater plan changes until government policy changes and implications are understood. We will continue our work towards a *draft* plan change.

3.2 Regional

Proposed Plan Change 9: Region wide water quantity

Council is holding meetings with groups of appellants to clarify matters of appeal, with a view to addressing some of those matters out of Court, and narrowing those matters that need to go to Court. No Court dates have been set.

Plan Change 10: Lake Rotorua Nutrient rules

The first part of the Environment Court hearing has been held. Council is now awaiting the interim decision and dates for the remainder.

Focus catchments

Council's Coastal Catchments team have recently changed the way catchments are managed, from an area based approach to one that looks at prioritising smaller catchments and sub-catchments based on risk. The selected catchment areas will be small enough to enable a measurable success. Upper Rangitāiki/Otamatea has been provisionally selected as one of the region's focus catchments.

Lowland water quality and ecology

Staff have heard concerns from you and others about ecological health, fish habitat/passage, and natural form/character in the lowlands. At the same time, we also understand that land drainage is in place to enable agriculture and protect people, land and infrastructure from flooding.

Late last year you were sent this link (pages 105-113) to a report to Council about lowland drainage scheme water quality and ecology and implications. In particular council will need to work towards improving ecological health in lowland modified watercourses. The full report is here.

Some drains and some land drainage canals were monitored and these are managed differently. The Regional Natural Resources Plan defines a natural water body (modified or not) and what is not a water body. The following applies in the Rangitāiki Plains:

Table 1: Rivers and drains in Rangitāiki Plains

Rangitāiki Plains (extending across lower Whakatāne/Tauranga, Rangitāiki and Tarawera Water Management Areas)		
Rivers		**Drains**
Natural watercourse	**Modified natural water course**	**Artificial water course**
All other rivers and streams in mid and upper catchments	Land drainage canals: Awaiti, Omeheu, Awakaponga, Waikamihi, Mangaone, Western Drain, Ngakauroa, Te Rahu, Otarere, Reids Central Potentially others if natural watercourses flow in to them from the mid-upper catchment, or it can be demonstrated that they have replaced/modified a pre-existing natural watercourse.	Remainder of land drainage network, farm drains, other road side drains that do not have a natural water watercourse flowing in to them.

Council *must* manage water bodies (i.e., natural or modified, not drains) for ecological health and contact recreation values, and they *may* be managed for other important values too (e.g., mahinga kai). Drains/drain discharges will be managed to support values in water bodies. Council can control (via rules) water quality of discharges from the land into water (in a drain or water body), and from pipes and drains in to water bodies (natural or modified).

4 Matahina Hydroelectric Power Dam Lake Water Quality

At workshop 7 we noted that artificial Hydroelectric Power (HEP) dam lakes Matahina and Aniwaniwa (Aniwhenua) are quite different. Aniwaniwa behaves more like a slow running stretch of river whereas Matahina behaves more like a lake. Both are quite different from natural lakes. Using national and regional measures of lake water quality, scientists reported comparatively poor water quality in Matahina, which is likely to affect ecosystem health and human health for recreation.

Scientists have now reported on what we do and don't understand about water quality in dam Lakes Matahina and Aniwaniwa, and have recommended attributes and potential measurable objectives.

Setting expectations around water quality and ecology attributes requires consideration of what might be reasonably expected of an artificial lake managed for the purpose of generation of electricity (recognising that these systems are sinks for sediment and nutrients), and maintaining (or improving) current state water quality and ecology. Considering this and our current information base, the key recommendations are:

- **Set objectives at C state band to *maintain* water quality in Lake Matahina, using TN, TP and chlorophyll-*a* as attributes.** (Note that TN state is currently in D band).
- Arrest the increasing trend of nitrogen supply from the upper catchment (as seen at Murupara and Aniwaniwa) as a priority to achieve the objective.
- Additional monitoring and modelling to better understand contaminant processes and relationships.

A more aspirational objective could be considered, that is, a 5 year median TN of less than 550 mg-N/m^3. Modelling and research would be required to estimate how achievable this is. Water quality objectives for Matahina should be based on TN and linked to water clarity, chlorophyll-*a*, and TP, particularly if water clarity improvements are needed.

Table 2: Recommended attributes and draft measurable objectives for HEP dam Lakes.
Boxes shaded green – monitoring data indicates objective is currently met.
Boxes shaded orange – monitoring data indicates objective is not met.
Boxes shaded grey – insufficient data to determine.
Boxes with no shading – attribute not applicable.

Attribute	River Attributes	Lake Attributes	Objective value
	Aniwaniwa	Matahina	
Total nitrogen (TN)		C	• Ecosystem health • Indigenous species • Mahinga kai • Fishing
Nitrate	A		
Ammoniacal-nitrogen	A	A	
Total phosphorus (TP)		C	
Chlorophyll-*a* (Phytoplankton)		C	
Water clarity (Secchi depth)		? To be established	• Ecosystem health • Human health
Macrophyte (LakeSPI)		? To be established	• Fishing • Ecosystem health • Indigenous species
Cyanobacteria - planktonic		A	• Human health • Customary use

A more detailed memo is attached for those who want to read it.

At the workshop, we will ask you ….

1. Do you accept the objectives *to maintain* water quality in the C band for TN, TP and Chlorophyll *a*? (Note that TN is currently in D band)
2. Do you accept the need to *arrest* increasing trends in nitrogen supply from the upper catchment (as seen at Murupara and Aniwaniwa) as a priority?
3. What concerns/questions do you have about this?

5 The story so far

Late last year we provided a summary of draft measurable objectives that would support the in-river values and preferred state you communicated to us in Workshops 4 and 5. . The measurable objectives for rivers are summarised below. The recommended measurable objectives for HEP dam Lake Matahina are above.

Table 3: Recommended attributes and draft measurable objectives for Rangitāiki Water Management Area.
Boxes shaded green – monitoring data indicates objective is currently met.
Boxes shaded orange – monitoring data indicates objective is not met.
Boxes shaded grey – insufficient data to determine.

FMU	Lower Rangitāiki	Mid-Upper Rangitāiki	Whirinaki/Urewera (Natural)
Attribute	*Objective*	*Objective*	*Objective*
Macro Invertebrate Community Index (MCI)	*B*	*B*	*A*
EPT	*B*	*B*	*A*
Bay of Plenty Index of Biotic Integrity (BOP-_IBI)	*B*	*B*	*A*
Periphyton	*B*	*B*	*A*
Macrophytes	*<50%*	*<50%*	*<50%*
Nitrate-nitrogen (toxicity)[5]	*A*	*A*	*A*
Ammonia-nitrogen (toxicity)	*A*	*A*	*A*
Dissolved Oxygen (below point sources)	*B*	*A*	*A*

FMU	Lower Rangitāiki	Mid-Upper Rangitāiki	Whirinaki/Urewera (Natural)
Acidity (pH)	*B*	*A*	*A*
Temperature (summer Cox-Rutherford Index)	*B*	*A*	*A*
Habitat protection level provided by river flows for indicator species (% of habitat available at Mean Annual Low Flow)	*95% for trout angling* *90% for trout spawning and Koaro* *80% for juvenile longfin eels* *75% for adult longfin eels*	*Same as Lower Rangitāiki*	*Same as Lower Rangitāiki*
Toxicants/irritants	*>90%*	*>90%*	*99%*
E. Coli	*A*	*A*	*A*
Benthic Cyanobacteria	*A*	*A*	*A*
Cyanobacteria- planktonic (lake fed rivers)		*A*	
Deposited fine sediment			
Visual clarity			
Turbidity			

Scientific monitoring using these indicators, and modelling of nitrogen, phosphorus and *E. coli* indicates:

- **Algal growth in rivers and streams is generally not an issue, but there are localised issues in some areas**. Phormidium (blue-green algae) in Rangitāiki River and some tributaries can be an issue, but it is uncertain whether this is related to nutrient concentrations.
- Sediment, phosphorus and nitrogen loads from human activities (i.e., rural land uses and discharges) contribute to **poor nutrient status** (too many nutrients) and **likely poor ecological health of Matahina Dam Lake**, although relationships need to be clarified.
- **Nitrate concentrations appear to be getting worse over time** downstream of Murupara.
- Macro-invertebrate monitoring indicates **ecological health is generally fair to good but compromised in some lowland water bodies.**
- **Surface water quality is generally safe for** swimming (contact recreation), using *E.coli* as our water quality indicator/attribute, and using national standards for swimming water quality[1]. There may be localised *E.coli* hot spots in the WMA.
- **Nitrate and ammonia concentrations do not currently directly pose risk to aquatic life**, but these nutrients promote plant, weed or algal growth, particularly in the Hydro Electric Power Dam Lakes Matahina and Aniwaniwa.
- Modelling indicates the total load of suspended solids from human activities/land uses is a lot higher than would occur naturally. Yet, the natural nitrogen loads in the river are high compared to other catchments (e.g., Kaituna), owing to catchment size, geology

[1] Appendices 2, 5 and 6 of the National Policy Statement for Freshwater Management.

and current landuse. However, this varies across the catchment and in the Rangitāiki Plains, the nutrient levels are high.

6 Management Focus

The results suggest our focus should be on the following:

- Stopping the increasing nitrate and phosphorus trends.
- Understanding how nutrients from the catchment, and the dam itself, are affecting ecosystem health in HEP dam lake.
- Keeping *E. coli* levels in their current A or B band (doing no worse), and potentially improving over time.
- Reducing sediment loss, particularly during and after forest harvesting.
- Improving ecological health in streams in the plains.
- Prioritising key source or ”hot spots” where contaminants are from land use and other human activities.

At the workshop, we will ask you ….

4. What is your comfort level with this summary of issues and water quality management focus?

7 Scenarios

We will explore ways to manage nitrogen, phosphorus and sediment, using scenarios and modelling. In this project, a scenario is a description of a possible land and water use and management situation in the catchment that is different from now. Each scenario is run through our catchment modelling tool to:

- estimate what might happen to nitrogen, phosphorus, and suspended solids/sediment loads in the rivers and also to source areas in the catchment; and
- estimate what might happen to E. coli concentrations in the river.

At the meeting we will summarise the land use change scenarios you have already discussed and provided input to at previous workshops (workshop 6), just to ensure everyone remembers and understands.

Table 4: Summary of Land Use scenarios

	Scenario	Description	
A	Naturalised	Natural land cover. No productive/developed land use. No water takes or discharges. HEP scheme not operating. Existing major structural modifications remain in place (e.g., dams, channel straightened and cut to sea).	
B	**Current/Baseline**	Current land use, estimated current takes, discharges, and land use practice.	
C	Development C	Estimated future credible land use change. Estimated takes, discharges, and land use practice based on the current scenario assumptions, except for known/consented changes like the initiation of the Waiari water supply take.	Horticulture and mānuka expansion, wetlands extend over the full extent of estimated ~2050 sea level rise.
D	Development D		Dairy expansion, wetlands extend over part of the extent of estimated ~2050 sea level rise.

If you have time, please look over the discussion about scenarios in the briefing notes, slides and meeting notes from workshops 6 and 7 to refresh your memory. If there is anything you don't understand, bring your questions to the workshop.

7.1 Good Practice Mitigation Scenario Modelling Results

In workshop 7, community group members looked at a range of management/mitigation practices that farm/horticulture blocks could do to reduce sediment, phosphorus, nitrogen and *E.coli* coming from the land and entering water. The group helped to categorise these in to lists based on whether they thought these practices are:

- Standard current practice
- Good practice that should really be expected of every farmer/horticulturalist – Mitigation 1 (M1)
- More advanced practices that might be more expensive or difficult to implement, but should also be quite effective- Mitigation 2 and 3 (M2 and M3)

Based on your input, input from industry organisations and professional advisors Council has developed a good practice scenario M1. This will be presented / explained at the workshop, including explanation of the big assumptions we had to make in the absence of data.

The modelling results for the good practice mitigation scenario will be presented at the workshop alongside all of the results you have seen before. We will also present the key conclusions staff have made based on the modelling, and will ask Group members to consider and provide feedback on these. Unfortunately we will not be presenting sediment results yet because we are waiting for some sensitivity testing of the model and for some industry advice about the sediment losses from forestry.

At the workshop, we will ask you ….

5. Do the results and conclusions seem about right to you?
6. Would you draw other conclusions?

8 Potential management options

The following management options are starting to be considered to arrest increasing nitrogen trends and better manage sediment, phosphorus and *E.coli*.

1. **Control change to more intensive land use** (for example, apply a cap on stocking rates, or require resource consents to convert forest land to pastoral or orchard uses), unless nitrogen and phosphorus losses can be mitigated.
2. Require **good management practice** through **Farm/Orchard Environmental Plans**. This could also include requiring:
    a. Farmers/horticulturalists to estimate current nutrient losses from farms. Currently Council doesn't have records of what is happening on each farm/horticulture block.
    b. Specific actions or standards, such as better exclusion of stock from streams, and better management of effluent, run-off and fertiliser, nutrient-leaching hot spots.
    c. Land use activities to stay at or below current nutrient generation or losses, or to stay within/reduce to a certain "good management" range of nutrient generation/losses.

3. **Stronger water quality requirements for discharges**, including water from factories, businesses, wastewater or land drainage.

4. **Action planning to improve ecological health in streams in the plains.** This will need to include consideration of fish passage/connectivity, habitat, and flow, as well as water quality.

5. **Prioritising action in "hot spots"** (e.g., investment in fencing and planting) where there are particularly high contaminant sources.

At the workshop, we will ask you ….

7. What are the pros and cons of options 1 and 2(a)-(c)? What alternatives would you like us to consider?

Attachment: Attribute selection for the Rangitāiki HEP Lakes – DRAFT

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